A report by

Final Report

Minventory: EU raw materials statistics on resources and reserves

A study to document the prevalence, metadata and standards employed by EU Member States and neighbouring countries of Europe in quantifying resource and reserve information related to primary and secondary raw materials; further, to produce a roadmap outlining the barriers and possible voluntary actions that might be taken to harmonise and publish the resource and reserve data at an EU level; and how this would be implemented in a European Minerals Yearbook.

Value-driven consulting

Science-led research

Final Report

Minventory: EU raw materials statistics on resources and reserves

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Version	Date	Description	Author	Editor
2	8/09/14	Revised version to DG ENTR		
3		Version to BGS		
4	30/09/14	Revised version to DG-ENTR (with v2 comments)		
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6	20/10/14	Final version to DG-ENTR	DP et al	DP
7.3	20/11/14	Minventory Final Report for approval	DP et al.	DP
8	17/12/14	Post-review adjustments		DP,EP,JM
9.3	18/02/15	Minventory Final Report		DP

Executive Summary

Purpose of the project

The European Commission commissioned this work to analyse the availability of public geological data (land and marine), and household, commercial and industrial waste data, related to **resources and reserves** of mineral raw materials. Many different organisations have amassed and even published aspects of such data. However, it is often presented in different formats using varying terminologies. An important aspect has therefore been the proposals for **harmonising these protocols** to ensure congruency in the presentation and use of statistical geological data.

On the policy front, a unified source of statistical information for resources and reserves within the European Union is supported by three pillars set out in the European Raw Materials Initiative (RMI) of 2008:

Access to raw materials on world markets at undistorted conditions.
Foster sustainable supply of raw materials from European sources.
Reduce the EU's consumption of primary raw materials

This work contributes to the second pillar. However, specific data infrastructure needs were identified by DG Enterprise's Raw Materials Supply Group already in its April 2009 report[1], and include amalgamating such statistical information in an EU-wide **harmonised database**.

This project has addressed these needs by identifying the barriers to achieving harmonised reporting systems and developing a **roadmap** and set of **options for action** in it. It should be noted that all the proposed actions are **voluntary**.

Scope

Minventory has characterised the **metadata** held in Member States and their offshore dependencies, and 13 neighbouring European Countries concerning **stocks of:**

- **primary raw materials** i.e. geological deposits of minerals and ores (land-based and marine);
- **secondary raw materials** i.e. materials consigned as waste having been once used, but which might be reprocessed for re-use; and (as a scoping exercise only)
- **'in use' materials** i.e. materials embedded in products and infrastructure which might, in future, become secondary raw materials.

For primary raw materials, the range of materials studied is identical to that specified by the Raw Materials Initiative (RMI, COM (2008) 699 final) on land and in marine environments encompassing metallic, construction and industrial minerals. Within secondary materials, the study has focussed on long-term accumulations held within **landfill** and **mining waste facilities** (including **Category A waste facilities**).

[1] Land Use Consultants (2010) *Exchanging Best Practice on Land Use Planning, Permitting and Geological Knowledge Sharing*

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It was anticipated and confirmed by the study that metadata and data relating to landfill stocks would be sparse. Accordingly, metadata relating to **waste flow data** was collected as an extension to the project.

Outputs

The outputs of this project take the form of:

- A description of the current situation at national and, where relevant, regional level, with respect to statistical information on resources and reserves in Europe, including an assessment of the level of application of a system of reporting resource and reserve data.
- **Analysis of barriers** to harmonising data and interoperability development, and remedial action required including:
    - A combined timeline (**"roadmap"**) and **outline plan** for implementation including: a statement of target outcomes on the road to harmonisation; options for action; and target dates for achievement by 2020 or beyond.
    - An action plan to incorporate a section on harmonised resources and reserves statistics into a future **European minerals yearbook**.
- A Commission **portal** that summarises metadata available on primary raw material resources and reserves (by mineral, country and land/marine domain), on secondary raw materials (mining wastes, landfill inventories and waste flows), and where such data might be found.

Process

The process of this project was centred on **questionnaires** sent to State public authority data owners, providers or publishers and other stakeholders in the domains of geological knowledge, mining waste, and of landfill and waste flows. This primary data was supplemented by **desk-based research** which investigated key topics, especially in relation to other initiatives. The metadata gathered was translated into a format to populate the metadata portal (itself the subject of a user survey) and to inform the planning process for the parallel Minerals4EU project dealing with European Minerals Yearbook. Further, the basic knowledge gathered for each nation provided a basis for examination of data availability, reporting standards, ownership and **barriers to harmonisation** in each of the material domains. Findings and proposals were tested at three stakeholder workshops.

In developing a roadmap and options for action, account has been taken of current data harmonisation practices and systems of reporting used across Europe; relevant legislation, such as the Mining Waste Directive, the Waste Framework Directive and related Directives on waste treatment (i.e. Landfill Directive) and on specific waste streams (various End-of-Life Directives), and the INSPIRE Directive on the reporting of spatial data; of related activities such as EuroGeoSource, ProMine, Minerals4EU, GIS Central Europe, OneGeology Europe and European Geological Data Infrastructure; and policies in other domains, such as the standards for public reporting of resources and reserves data endorsed by the European Securities and Markets Authority.

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Barriers to harmonisation were examined under broad themes identified in the second pillar of the RMI:

- Policy, legislation and regulation.
- Data quality and comparability.
- Data infrastructure, provision and accessibility.

Findings for primary raw materials

Minventory has determined the **availabilit**y and **accessibility** of statistical data on resources and reserves for 42 key minerals held in Member States and 13 neighbouring countries. Data categories include resources, reserves and 'other' non-statistical data. 17 of 21 respondent countries do not consider minerals data to be confidential at the aggregated national level. In addition 25 of 29 respondents make some or all data available to the public.

In general, data on metalliferous minerals is deemed more sensitive than that for bulk minerals. This reflects that there are typically rules within State mining laws that restrict dissemination or at least set a moratorium on disclosure. In other cases, private companies will limit disclosure based on self-interest. **Confidentiality, aggregation and redaction protocols** (as already operate within Eurostat) will therefore be a critical component of EU level harmonisation.

In respect of statistical data on marine resources at national level, 11 countries are landlocked and therefore have no interest. Of the remainder, one third offered no response; one third do collect such data; and one third do not collect data. The data is almost entirely related to sand and gravel (and fossil fuel deposits – not in the project scope) and is commonly in the form of maps.

In respect of overseas territories, resources and reserves statistics are sparse. Because of their administrative relationship, a number of the former French colonies offer some structured data via BRGM, but this is exceptional.

A review of **systems of reporting** shows that the process of collecting data on mineral resources and reserves is far more structured for countries in Eastern Europe (7 of these are aligned or in the process of aligning to a widely accepted code or standard). Here, requirements to provide data to the relevant authority commonly form part of the legislation on mining. Likewise, it is also a requirement to provide data in a format that complies with a national Reporting Code. National Reporting Codes often align to the international CRIRSCO Template. Whilst only the UK does not have a national mining policy, all other States have such a law or policy, and two thirds of these mandate data disclosure.

Considering the full responses to the questionnaires, issues and gaps in practice which would hamper harmonisation were identified as summarised in the table below.

The severity of each of these issues has been rated on a scale of 1 (least) to 5 (most) according to the judgement of the project team and feedback from participants in the Stakeholder Meetings and the steering group. They reflect broad parameters of: **Stakeholder alignment** i.e. are there **conflicts of interest** in policy or IP ownership; **volume of data** to render into a harmonised format; and **technical difficulty** in creating solutions e.g. through diversity of standards for historic materials, and absence of electronic data

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infrastructure. These issues are the targets for action in the roadmap, an overview of which is shown graphically in Figure 1.

All of these actions can be initiated relatively soon, and many of them could be complete by the target date of 2020. Some of the more tractable issues relate to: converging use of terminology; establishing data confidentiality and redaction rules at EU level; and asking Member States to nominate single contact points for data handling. More problematic are the issues associated with making data available for publishing; adopting a common system of reporting; and dealing with historic data in diverse systems of reporting.

Topic	Issues/Gaps	Severity
I. Policy, legislation and regulation	1. National mining law or minerals policy	4
	2. Legal requirement to provide resources/reserves data	5
	3. Terminology of primary RM and dedicated legislation	5
II. Data quality and comparability	1. Mandated use of a system of reporting	5
	2. Alignment of national systems of reporting with a widely accepted standard or code	3
	3. Process of harmonising data	4
	4. Data reliability	4
	5. Application of the INSPIRE Directive	3
III. Data infrastructure, provision and accessibility	1. Number of organisation(s) in charge of collecting and centralising data	4
	2. Data ownership and confidentiality	4
	3. Public access to open data	3
	4. Multilingual format of data	2

It should be emphasised that a range of voluntary actions are suggested to tackle the issues. However, it is recognised that, due to diversity of obligations to report and report to a standard (CRIRSCO-aligned or not), implementation will be easier for some Member States than others.

A reporting standard or code aligned to the CRIRSCO-template or the UNFC system could be adopted for reporting resources and reserves at the European level. The Final Report presents advantages and disadvantages of each, but further discussion amongst Member States is needed to come to a firm conclusion. Note that this does not imply that Member States must adopt such a code nationally, but that it should be used for transmission of information to the EU level and by the EU in its subsequent publication or communication of statistical data related to resources and reserves. In any event, any CRIRSCO-based reporting system can be mapped to UNFC by prevailing bridging documents.

This process would be facilitated by EU level harmonisation processes, both to ensure comparability of application of harmonisation rules and to perform redaction prior to publication. These tasks could be performed by one or more bodies, if necessary, to merge minerals competence with proven confidential data management capabilities. For example, Eurostat is a model for data redaction; a public institution (Geological Survey for example) or private data company could manage the harmonisation task. An overview of a possible harmonisation process which tackles these steps is shown in Figure 2.

The INSPIRE Directive goes some way to providing a framework for public authority data reporting in this domain, but would require a recommendation on systems of reporting employed and possibly further work to define pragmatic minimum metadata sets and mineral codes to reflect EU minerals priorities in the necessary detail.

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Findings for secondary raw materials

Mining waste and landfill inventories have been investigated separately. In general, they are regulated and monitored by different national authorities. Mining wastes fall under the Mining Waste Directive (2006/21/EC) and landfill under the Landfill Directive (1999/31/EC). However, if mining wastes are classified as 'permanent' waste facilities, their contents too will be characterised using the EU List of Wastes[2] used for landfill deposits. They may therefore have some features in common.

Mining wastes

Wastes deriving from the extraction and refining industries are regulated under the Mining Waste Directive. This covers operating, closed, abandoned and Category A (high hazard) waste facilities. However, the Directive targets identification of facilities of high associated safety, health and environmental risks. As a result, inventories created by Member States under the Directive represent only a small fraction of sites. To compound this, not all Member States generally publish this information or submit it to the Commission as required. Since it came into force, the Directive obliges publication of certain basic data related to operating mine facilities.

Commonly, the inventory of mining waste facilities is characterised in terms relevant to the mine or processing facilities, but this data is not always made public even though the Mining Waste Directive requires reporting. Once the inventory is classified as a permanent storage, it certainly falls under the Landfill Directive and contents are codified using the List of Wastes, but there is still no obligation to report waste generated. These codes are materially different from the mineralogical classifications that apply to primary raw material reporting, and hence there is an information discontinuity that prevents full harmonisation across the different material domains.

A harmonisation issues analysis has been performed using the same framework as for primary raw materials. The issues found are broadly similar to, but a subset of, the primary raw materials issues. Notable amongst them are the absence of any agreed system of reporting; any need to regularly report waste generated; the lack of suitable data that can identify the resource potential from mining waste and the difference in material classification between facilities that are 'historic' and those that are operating with the status of landfill.

If abandoned or closed mining waste facilities are considered worthy of further survey and reporting, they should be treated as **analogous to primary raw materials**. The UNFC codings recommended for those materials are equally applicable to the characterisation of mining waste accumulations. However, although there are many thousands of closed facilities in the EU, the state of knowledge around these assets is much lower or held confidentially in the hands of operators, asset investors, or public archives.

[2] Commission Decision of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste

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A range of options for action to address the issues have been proposed. However, it is the strong recommendation of this work that an extensive campaign of data discovery and harmonisation is not undertaken until a **scoping exercise** to locate high potential mining wastes has been conducted.

Landfill wastes

With regards to availability and accessibility of data, there is an almost total **lack of characterisation** of the material composition of landfill in the EU. Member States generally make available only limited metadata, such a location, capacity, and type (inert, hazardous etc.). There is **no standard** akin to those used in the primary raw materials domain which offers a framework for the structured prospecting, analysis, characterisation and reporting of contents of landfill.

Unlike primary raw materials and possibly mining wastes, landfill deposits contain more diverse and sparse resources as different types of wastes (and products in which they are embedded) are mixed and landfilled in the same deposits. The Landfill and other end-of-life Directives have motivated greater waste segregation and attention to recycling, such that newer landfill contain fewer valuable resources. Therefore, **older landfills** are more likely to **generate interest as stocks of secondary raw materials**.

On the other hand, reporting of **aggregated waste flows** is universal across the EU at EU level, through a process managed by Eurostat as stipulated by the Waste Framework Directive and the protocol of Regulation (EC) No 2150/2002 on waste statistics. The EU **List of Wastes** provides the characterisation framework for data collection, but other metadata, such as treatment option and industry source are included; and **EWC-Stat codes** are used for EU level reporting. Eurostat's role in the domain of waste provides a good model for other material tracking initiatives as it has **well-proven harmonisation and redaction protocols**.

A harmonisation issues analysis has been performed using the same framework as for primary raw materials. Many of the issues are the same, but the emphasis is distinctly different: Whilst aggregated waste flows are relatively well recorded (as above), the availability of detail at site level is lower because the operators commonly have no obligation to publish whether the site is in public or private ownership. For waste flows and landfill stocks (household and industrial), the **List of Waste codes lack detail** required to identify secondary materials of prime interest; further work in this area is recommended.

In addition to lack of characterising data, landfill offers a range of technical, logistical and spatial challenges before exploitation. These impact on their realisable potential. Therefore, embarking on an extensive campaign of data discovery and harmonisation is not recommended until a **scoping exercise** to locate high potential landfill has been conducted.

Conclusions and implications

Minventory has presented a pathway for the establishment of harmonised reporting of resources and reserves statistics at the EU level. For primary raw materials, this centres on adoption of a CRIRSCO-aligned reporting standard at the EU level. In the short term, as targeted by Minerals4EU, un-harmonised aggregated national statistics to mixed (but known) standards can be collated for publication in a Minerals Yearbook. Data owners and

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providers have been identified and reported in this project, and they form a resource already in use by the Minerals4EU project.

We envisage a progressive alignment to the agreed EU template for information submitted at EU level. The creation of bridging documents between national codes and the CRIRSCO template would be a useful project. Inclusion of UNFC codes will allow extension to mine or deposit-level information, but will require EU level processes to ensure harmonisation and redaction for publication.

The characterising data associated with secondary wastes is much sparser. Minventory has proposed that a number of 'bridging projects' be carried out in order to determine the realisable potential in this area before any large scale harmonisation project is attempted. A summary of these actions is given in Figure 3 and Figure 4.

All the metadata collected by this project has been encapsulated for public access through the Commission's portal at ec.europa.eu.

Follow-on work

An advocacy programme which promotes voluntary harmonisation, identifies national experts and assists Member States to set harmonisation planning targets would be beneficial across a number of projects. However, the project identified a number of areas beyond its scope which are worthy of further investigation. These include: Investigation of the pros and cons of contracting a private company to manage access to harmonised data; researching how the International Seabed Authority's marine deposit data could be integrated into a minerals inventory; undertaking further work to assess and prioritise, per country, the potential of wastes held in mining waste facilities and landfills; and undertaking a critical materials-focussed assessment of in-use stocks and strategic stockpiles across the EU.

Consultation

The information in the final report and its findings have been contributed to and validated at a number of key stages, by a variety of routes including: direct polling of the knowledge of potential data providers through surveys; dialogue with DG Enterprise & Industry's R3 Unit; testing outputs with a 'Steering Group' of minerals industry and geology trade associations and professional bodies; stakeholder inputs at three workshops; and consultation of relevant bodies such as the EEA, Eurostat, UN Economic Commission for Europe (Expert Group on Resource Classification - EGRC) and the Pan-European Resources Committee (PERC).

Delivery

This project was executed by a consortium comprising primarily Oakdene Hollins Ltd, British Geological Survey (BGS), and Bureau de Recherches Géologiques et Minières (BRGM), and which also included other partners: Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Cesky Geologicky Ustav (CGU), Hrvatski Geološki Institut (HGI), Geološki zavod Slovenije (GeoZS), Greek Institute of Geology and Mineral Exploration (IGME), Institutul Geologic al Romăniei (IGR), Państwowy Instytut Geologiczny (PIB) and SNL Metals & Mining.

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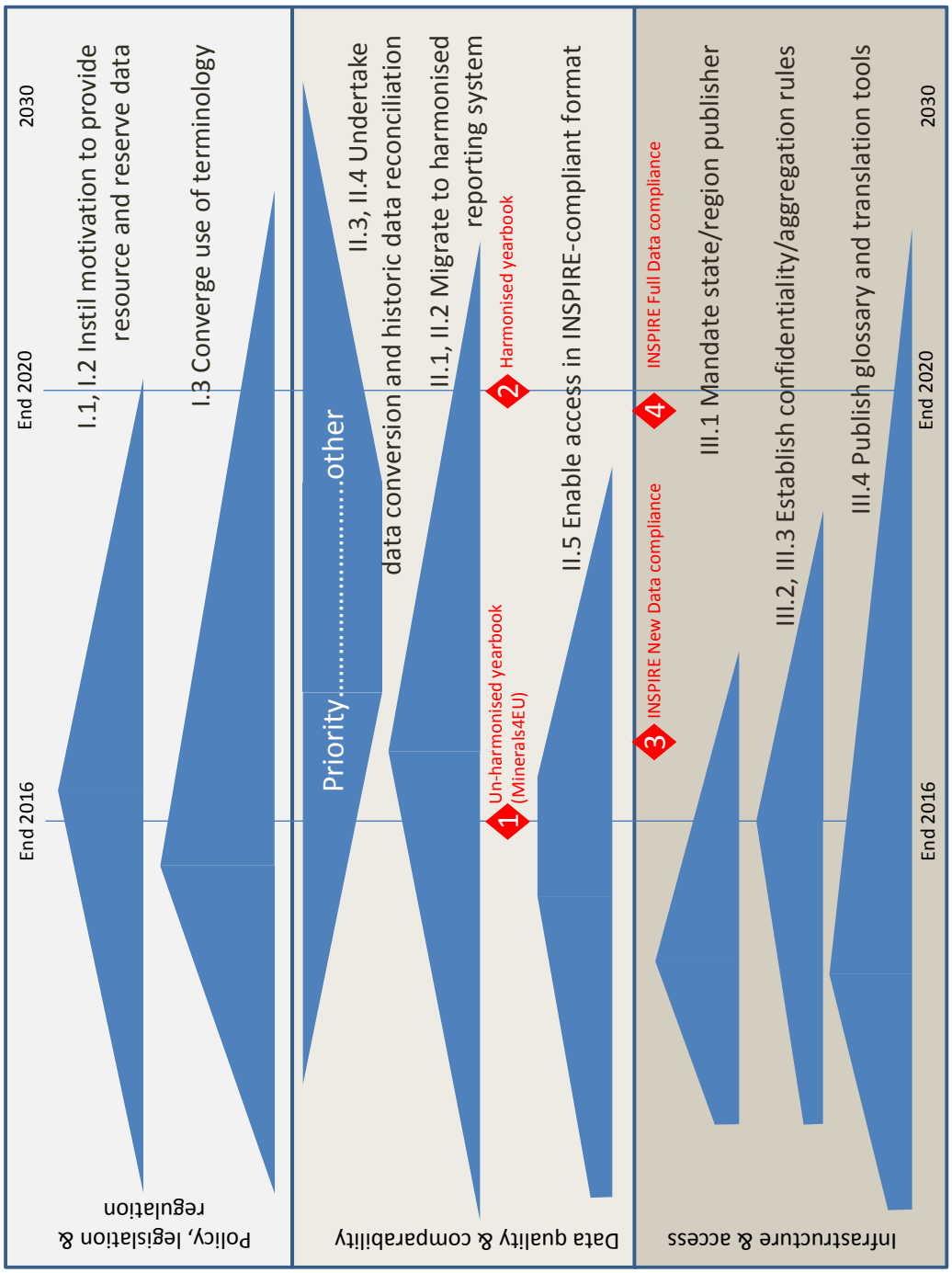
Figure 1: Summary of roadmap outcomes, timings and milestones for primary raw materials



Note: 21 October 2020 is the full INSPIRE implementation date for new and historic spatial data sets under Directive Annexe III (mineral resources) (See also http://inspire.ec.europa.eu/index.cfm/pageid/44)

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Figure 2: Potential implementation of the harmonisation process

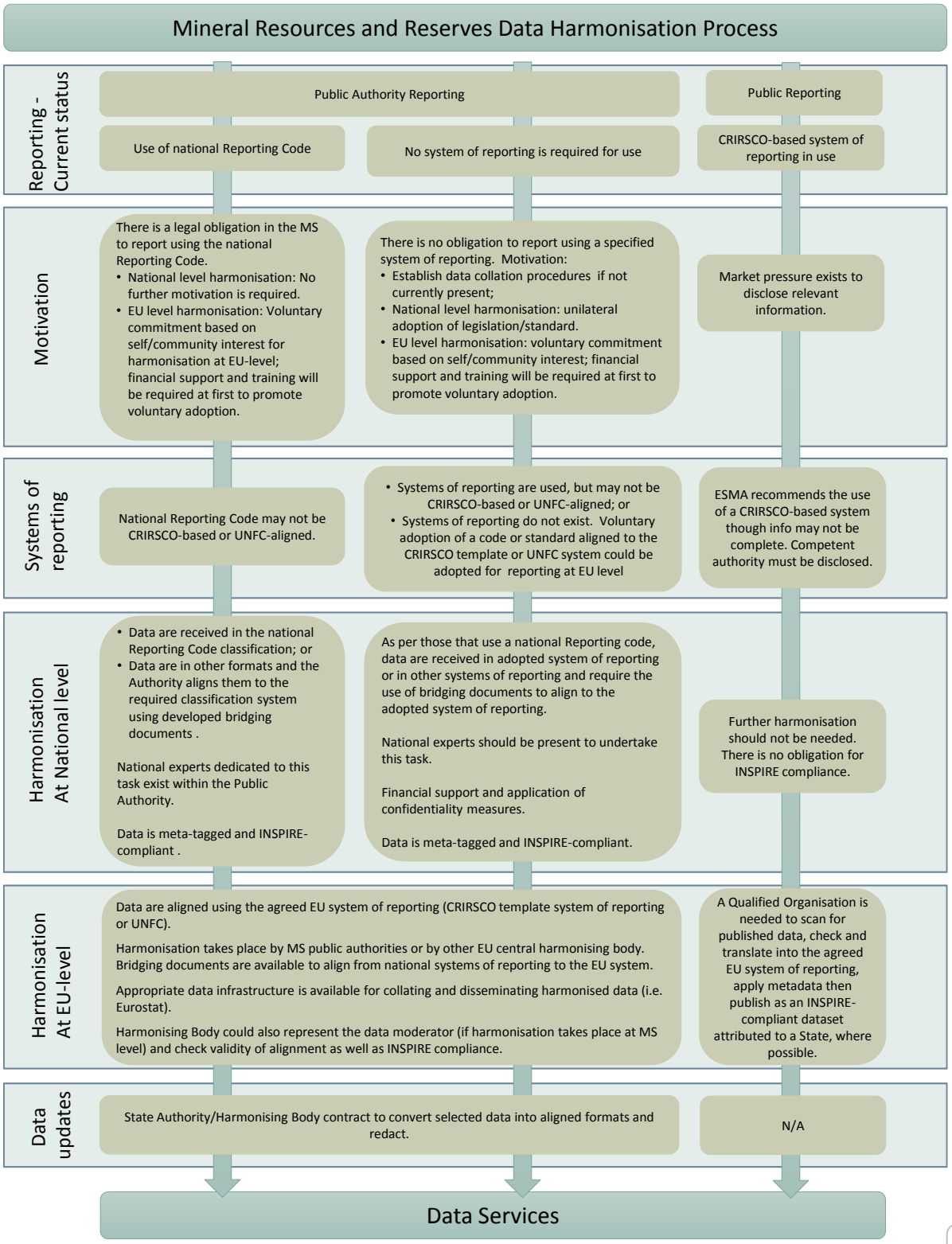

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Figure 3: Abridged Mining Waste roadmap showing key outcomes

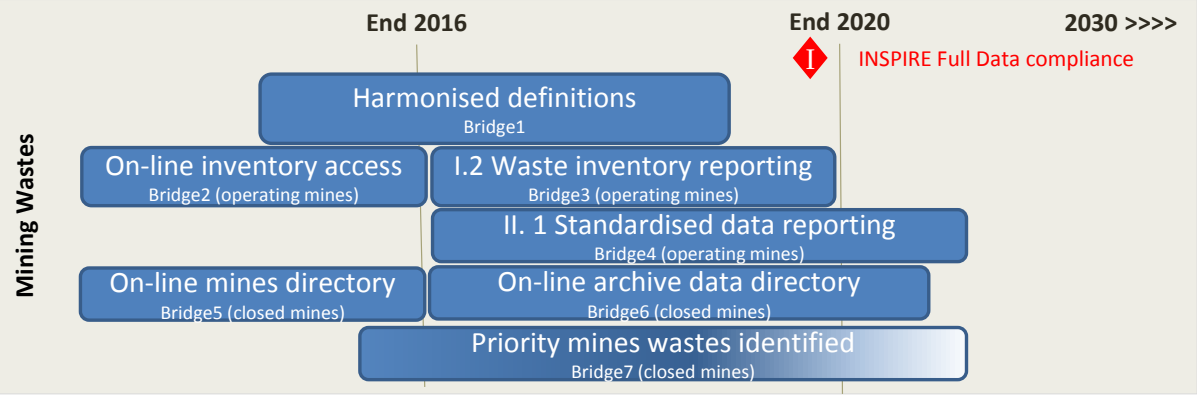
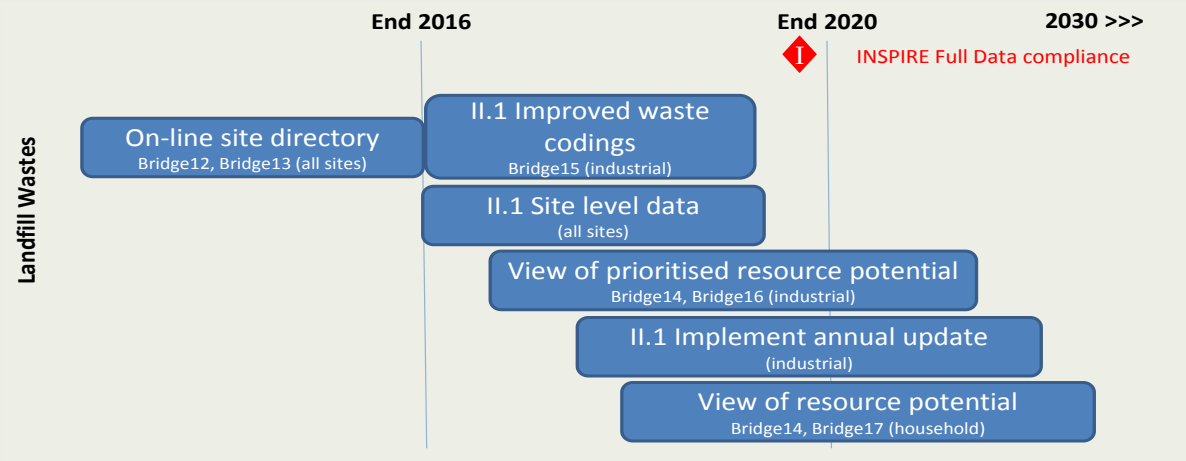


Figure 4: Abridged Landfill Stock roadmap showing key outcomes



Résumé de Synthèse

Objectif du projet

La Commission européenne a commandé la présente étude pour analyser la disponibilité des données géologiques publiques (terrestres et marines) et des données sur les déchets ménagers, commerciaux et industriels par rapport **aux ressources et réserves** de matières premières minérales. Un grand nombre d'organisations a récolté et même publié des données individuelles. Toutefois, ces données sont représentées dans des formats divers en utilisant des terminologies différentes. Pour cette raison, les propositions pour **l'harmonisation de ces protocoles** en vue d'assurer la présentation et l'utilisation cohérentes des données statistiques géologiques ont constitué un aspect important de ce travail.

Au niveau politique, une source unifiée d'informations statistiques concernant les ressources et réserves disponibles au sein de l'Union européenne repose sur les trois piliers définis en 2008 dans l'Initiative européenne sur les matières premières (RMI) :

Garantir l'accès à des conditions non biaisées aux matières premières sur les marchés mondiaux.
Favoriser l'approvisionnement en matières premières durables au sein de l'UE.
Réduire la consommation de matières premières primaires dans l'UE.

Ce travail contribue à la mise en œuvre du deuxième pilier. Toutefois, le groupe sur l'approvisionnement en matières premières de la DG Entreprise a déjà identifié dans son rapport d'avril 2009[3] des besoins supplémentaires en infrastructures de données spécifiques qui incluent notamment la synthèse des informations statistiques disponibles dans une **base de données harmonisée** au niveau de l'UE.

Ce projet a pris en considération ces besoins en identifiant les obstacles aux systèmes de reporting harmonisés et développé une **feuille de route** et un ensemble **d'options pour des actions à entreprendre** dans le cadre de celle-ci. Bien entendu, les actions proposées sont toutes des actions **volontaires**.

Étendue

Minventory a examiné les **métadonnées** détenues par les Etats-membres et leurs dépendances en-dehors de l'UE ainsi que par 13 pays européens voisins concernant les **réserves :**

- **de matières premières primaires**, c'est-à-dire des gisements géologiques de minerais (terrestres et marins) ;
- **de matières premières secondaires**, c'est-à-dire des matériaux qui ont été consignés en tant que déchets après une première utilisation mais qui pourraient être retraités en vue d'une nouvelle utilisation (uniquement dans le but de délimiter leur étendue) ;
- **des matières actuellement en cours d'utilisation**, c'est-à-dire des matériaux contenus dans des produits et dans des infrastructures qui pourraient à l'avenir devenir des matières premières secondaires.

[3] Consultations sur l'utilisation des terrains (2010) *Echange de bonnes pratiques en matière de planification de l'utilisation des terrains, de l'attribution d'autorisations et de la mise en commun des connaissances géologiques*

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Pour ce qui est des matières premières primaires, nous avons étudié la gamme de matériaux figurant dans l'Initiative sur les matières premières (RMI, COM (2008) 699 version finale) pour les environnements terrestres et marins, incluant des minerais métalliques et des minerais utilisés pour la construction et l'industrie. Dans le groupe des matières secondaires, notre étude s'est concentrée sur les réserves accumulées sur le long terme dans les **décharges** et les **installations de gestion des déchets de l'industrie extractive** (y compris les **installations de catégorie A**).

L'étude avait prévu que les métadonnées et les données concernant les réserves contenues dans les installations de gestion de déchets seraient rares, et ceci s'est confirmé. Par conséquent, les métadonnées concernant les **données sur les flux de déchets** ont été recueillies dans le cadre d'une extension du projet.

Résultats

Les résultats du projet se présentent comme suit :

- Description de la situation actuelle au niveau national et, le cas échéant, au niveau régional en considérant les informations statistiques sur les ressources et réserves en Europe, y compris l'estimation du niveau d'application d'un système de reporting pour les données concernant les ressources et réserves.
- L'**analyse des obstacles** à l'harmonisation des données et au développement de leur interopérabilité et des actions requises pour remédier aux obstacles constatés, y compris :
  - un agenda combiné (**« feuille de route »**) et un **planning** d'implémentation comprenant : la désignation de résultats-cibles pour parvenir à l'harmonisation ; des options pour des actions à entreprendre ; et des dates-cibles pour atteindre les objectifs à partir de 2020.
  - un plan d'action consacré à l'intégration d'une section sur les statistiques harmonisées des ressources et réserves dans un futur **Annuaire européen des minerais**.
- un **portail** de la Commission réunissant les métadonnées disponibles sur les ressources et réserves de matières premières disponibles (indexés par minerai, par pays et en fonction des gisements terrestres/marins), de matières premières secondaires (déchets de l'industrie extractive, inventaire des installations de gestion de déchets et flux de déchets) et précisant où trouver ces données.

Réalisation

Dans sa réalisation, le projet s'est concentré sur l'envoi de **questionnaires** aux autorités publiques propriétaires, fournisseurs ou éditeurs de données des différents Etats ainsi qu'à d'autres parties intéressées dans les domaines de l'expertise géologique, des déchets de l'industrie extractive et des installations de gestion de déchets et des flux de déchets. Ces données primaires ont été complétées par une **recherche en bureaux** qui s'est concentrée sur des sujets-clés et surtout sur d'autres initiatives. Les métadonnées recueillies ont été formatées pour renseigner le portail des métadonnées (lui-même sujet d'un sondage auprès des utilisateurs) et pour être utilisées dans le processus de planification du projet Minerals4EU, mené en parallèle et ayant pour objet l'Annuaire européen des minerais. De plus, les connaissances de base obtenues pour chaque nation ont fourni une base pour

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l'analyse de la disponibilité des données, concernant les standards de reporting, les propriétaires des données ainsi que les **obstacles à l'harmonisation** pour chacune des matières. Nous avons ensuite testé nos résultats et nos propositions dans trois ateliers organisés pour les parties intéressées.

En élaborant la feuille de route et les options des actions à entreprendre, nous avons pris en compte les pratiques actuelles pour l'harmonisation des données et les différents systèmes de reporting utilisés en Europe ; la législation pertinente, comme la Directive sur les déchets de l'industrie extractive, la Directive-cadre sur les déchets et les Directives associées sur le traitement des déchets (la Directive concernant la mise en décharge) et sur des flux de déchets spécifiques (diverses directives concernant la fin de vie des produits), et la Directive INSPIRE sur l'obligation de rapport concernant les informations géographiques ; les initiatives associées comme EuroGeoSource, ProMine, Minerals4EU, SIG Europe centrale, OneGeology Europe et Infrastructure européenne des données ; et les données fournies par les Autorités européennes de la sécurité et des marchés.

Les obstacles à l'harmonisation ont été examinés selon les grands thèmes identifiés par le deuxième pilier de l'Initiative sur les matières premières :

- politique, législation et règlementation.
- qualité et comparabilité des données.
- infrastructure, fourniture et accessibilité des données.

Résultats pour les matières premières primaires

Minventory a déterminé la **disponibilité** et l'**accessibilité** des données statistiques sur les ressources et réserves pour 42 minerais principaux trouvés dans les Etats-membres et 13 pays voisins. Les catégories de données comprennent les ressources, les réserves ainsi que des données « autres » qui n'entrent pas dans les statistiques. Sur les 21 pays ayant fourni des réponses, 17 ne considèrent pas que les données concernant les minerais, consolidées au niveau national, soient confidentielles. De plus, 25 des 29 pays ayant fourni des réponses rendent publique une partie ou l'intégralité de ces données.

Généralement, les données sur les minerais métallifères sont considérées comme plus sensibles que celles concernant les minerais pondéreux, ce qui reflète le fait qu'il existe généralement des règlementations dans la législation minière des Etats qui limitent leur diffusion ou imposent du moins un moratoire pour leur divulgation. Dans d'autres cas, des sociétés privées restreignent la divulgation pour des motifs d'intérêt propre. Pour ces raisons, **la confidentialité et l'agrégation des données ainsi que la rédaction des protocoles** (comme déjà pratiqué dans le cadre d'Eurostat) pourraient présenter des difficultés lors de l'harmonisation au niveau de l'UE.

En ce qui concerne les données statistiques sur les ressources marines au niveau national, 11 pays n'ont pas d'ouverture maritime et ne sont donc pas concernés. Parmi les pays restants, un tiers n'a pas fourni de réponse ; un tiers procède à la collecte des données pertinentes ; et un tiers ne recueille pas de données. Les données se réfèrent presque dans leur intégralité au sable et au gravier (ainsi qu'aux dépôts de combustibles fossiles qui ne font pas partie du projet) et elles sont généralement disponibles sous forme de cartes.

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En ce qui concerne les territoires d'outre-mer, les statistiques sur les ressources et réserves sont rares. En raison de leur appartenance administrative, un certain nombre des anciennes colonies françaises proposent des données structurées via le BRGM mais elles constituent une exception.

L'évaluation des **systèmes de reporting** indique que le processus de collecte de données sur les ressources et réserves minérales est beaucoup plus structuré dans les pays d'Europe de l'Est (dont 7 se sont alignés ou sont en cours d'alignement sur un code ou un standard largement accepté). Dans ces pays, l'obligation de fournir des données aux autorités compétentes fait généralement partie de la législation minière. De même, il est obligatoire de fournir ces données dans un format qui corresponde à un code national de reporting. Les codes de reporting nationaux sont fréquemment alignés sur le modèle international CRIRSCO. Alors que la politique minière nationale est inexistante dans le seul Royaume-Uni, tous les autres Etats disposent d'une loi ou d'une politique dans ce domaine et les deux tiers de ces Etats imposent la déclaration des données.

En prenant en considération les réponses intégrales aux questionnaires, nous avons identifié les problèmes et les lacunes dans la mise en pratique qui entraveraient l'harmonisation, comme cela est synthétisé dans le tableau ci-dessous.

La gravité de ces problèmes a été représentée sur une échelle de 1 (gravité minimale) à 5 (gravité maximale) selon le jugement de l'équipe de projet et les retours des participants aux réunions des parties intéressées et du groupe de pilotage. Ils reflètent des paramètres larges de l'**alignement des parties intéressées**, c'est-à-dire qu'il existe des **conflits d'intérêts** entre détenteurs de contrats ou en raison de droits de propriété intellectuelle ; des **quantités de données** nécessitant le transfert dans un format harmonisé ; et des **difficultés techniques** lors de la création de solutions, par ex., en raison de standards divers utilisés pour des matériaux historiques ainsi que de l'absence d'infrastructure électronique pour les données. Ces problèmes constituent les objectifs de la feuille de route dont la Figure 5 présente un aperçu graphique.

Toutes ces actions peuvent être démarrées rapidement et beaucoup d'entre elles pourraient être terminées en 2020, année-cible des objectifs. Certains problèmes auxquels on peut remédier plus facilement sont dus : à l'emploi d'une terminologie convergente ; à l'établissement de règles concernant la confidentialité et la rédaction des données au niveau de l'UE ; et à la désignation d'un seul point de contact pour le traitement des données. Des problèmes plus importants se posent concernant la disponibilité des données pour leur publication ; l'adoption d'un système de reporting commun ; et le traitement des données historiques contenues dans des systèmes de reporting différents.

Il convient de souligner que nous suggérons un éventail d'actions volontaires pour s'attaquer à ces problèmes. Toutefois, il paraît évident que, en raison des différentes règlementations en vigueur concernant l'obligation de reporting, voire de rapports à établir conformément à un standard précis (alignés sur CRIRSCO ou non-alignés), l'implémentation des solutions sera plus facile pour certains Etats-membres que pour d'autres.

Résumé de Synthèse

Sujet	Problèmes/lacunes	Gravité
I. Politique, législation et règlementation	1. Législation minière nationale ou politique en matière de minerais	4
	2. Obligation légale de fournir des données concernant les ressources/réserves	5
	3. Terminologie des matières premières primaires et législation dédiée	5
II. Qualité et comparabilité des données	1. Utilisation obligatoire d'un système de reporting	5
	2. Alignement de systèmes nationaux sur un standard ou format largement accepté	3
	3. Processus d'harmonisation des données	4
	4. Fiabilité des données	4
	5. Application de la Directive INSPIRE	3
III. Infrastructure, fourniture et accessibilité des données	1. Nombre d'organisations compétentes pour la collecte et la centralisation des données	4
	2. Propriété et confidentialité des données	4
	3. Accès public aux données libres	3
	4. Format multilingue des données	2

Il serait possible d'adopter un standard ou un code de reporting aligné sur le modèle CRIRSCO ou sur le système UNFC (Classification-cadre des Nations Unies pour l'énergie fossile et les réserves et ressources minérales) pour rapporter les ressources et réserves au niveau européen. Le rapport final présente les avantages et les inconvénients des deux systèmes mais des discussions supplémentaires entre les Etats-membres sont requises pour parvenir à une conclusion définitive. Veuillez noter qu'il ne s'agit pas d'imposer aux Etats-membres l'utilisation de l'un des deux formats au niveau national mais uniquement de permettre la transmission des informations au niveau de l'UE et la publication ou la communication subséquentes des données statistiques concernant les ressources et réserves par l'UE. Dans tous les cas, tout système de rapport basé sur le système CRIRSCO permet d'établir un rapprochement vers le système UNFC en utilisant les documents de rapprochement existants.

Cette démarche serait facilitée par des processus d'harmonisation au niveau européen, autant pour assurer la comparabilité de l'application des règles d'harmonisation qu'en vue de la rédaction à effectuer avant la publication. Ces tâches pourraient être exécutées par un ou plusieurs organismes s'il s'avère nécessaire de combiner la compétence dans le domaine des minerais avec des capacités éprouvées de gestion de données confidentielles. Eurostat, par exemple, est un modèle dans la rédaction des données ; l'harmonisation pourrait alors être effectuée par une institution publique (comme un service géologique) ou il serait possible de la confier à une société privée de traitement des données. Pour un aperçu d'un processus d'harmonisation possible qui aborderait ces problèmes, veuillez consulter la Figure 6.

La Directive INSPIRE fournit dans une certaine mesure un cadre pour les rapports de données des autorités publiques dans le domaine en question mais il serait nécessaire d'y ajouter une recommandation concernant les systèmes de reporting utilisés et des travaux supplémentaires seraient éventuellement requis pour définir les ensembles minimaux de métadonnées dans une perspective pragmatique ainsi que les codes des minerais pour refléter les priorités de l'UE en matière de minerais avec la précision requise.

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Constats pour les matières premières secondaires

Les inventaires des déchets des industries extractives ainsi que des décharges ont été examinés séparément. Ils sont en général réglementés et surveillés par des autorités nationales distinctes. Les déchets de l'industrie extractive relèvent de la Directive concernant la gestion des déchets de l'industrie extractive (directive 2006/21/CE) alors que les décharges relèvent de la Directive concernant la mise en décharge des déchets (directive 1991/31/CE). Toutefois, même si les décharges pour les déchets de l'industrie extractive sont classifiées comme « permanentes », nous les caractériserons en nous basant sur la Liste des déchets établie par l'UE[4] pour la mise en décharge des déchets.

Déchets de l'industrie extractive

Les déchets produits par les industries extractives et de raffinage sont réglementés par la Directive concernant la gestion des déchets de l'industrie extractive qui s'applique aux installations de gestion de déchets en fonctionnement, fermées, abandonnées et de catégorie A (déchets très dangereux). Toutefois, la directive vise à identifier les installations de gestion de déchets à risques élevés pour la sécurité, la santé et l'environnement. Il en résulte que les inventaires établis par les Etats-membres en vertu de la directive ne représentent qu'une petite partie des sites. Ce qui complique encore la situation, c'est que certains Etats-membres ne procèdent pas toujours à la publication des informations ni ne les soumettent à la Commission comme cela est requis. Depuis l'entrée en vigueur de la directive, la publication de certaines données de base relatives aux sites d'extraction est obligatoire.

L'inventaire des installations de gestion de déchets de l'industrie extractive est habituellement caractérisé selon les mines ou les installations de traitement correspondantes mais, malgré la Directive concernant la gestion des déchets de l'industrie extractive, ces données ne sont pas toujours rendues publiques. Une fois le stockage classé comme dépôt permanent, il relève assurément de la Directive concernant la mise en décharge des déchets et la Liste des déchets est utilisée pour attribuer un code à son contenu mais il n'y a toujours pas de règlement rendant obligatoire l'établissement de rapports pour les déchets générés. Les codes présentent des différences concernant les matières par rapport aux classifications minéralogiques qui s'appliquent aux reporting des matières premières primaires. Il en résulte une discontinuité d'information qui empêche une harmonisation complète entre les différentes familles de matièr.

Nous avons effectué une analyse des problèmes d'harmonisation en utilisant le même cadre que pour les matières premières primaires. Les problèmes relevés sont, pour une grande partie, semblables aux problèmes concernant les matières premières primaires et en constituent un sous-ensemble. Parmi ces problèmes, il convient de souligner l'absence de tout système convenu de reporting ; de toute obligation d'établir des rapports réguliers des déchets générés ; le manque de données appropriées permettant d'identifier le potentiel en

[4] Décision de la Commission du 3 mai 2000 remplaçant la décision 94/3/CE établissant une liste de déchets en application de l'article 1er , point a), de la directive 75/442/CEE du Conseil relative aux déchets et la décision 94/904/CE du Conseil établissant une liste de déchets dangereux en application de l'article 1er , paragraphe 4, de la directive 91/689/CEE du Conseil relative aux déchets dangereux

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ressources des déchets de l'industrie extractive et les divergences dans la classification des installations entre celles qui sont « historiques » et celles qui sont en fonctionnement avec le statut d'installations de gestion de déchets.

Lorsque l'on considère que des installations de gestions des déchets de l'industrie extractive abandonnées ou fermées méritent une surveillance et des rapports ultérieurs, il faudrait les considérer **de manière analogue aux matières premières primaires**. Les codes recommandés par l'UNFC pour ces matières peuvent également être appliqués pour caractériser les accumulations de déchets des industries extractives. Toutefois, malgré le fait qu'il existe plusieurs milliers d'installations fermées dans l'UE, les connaissances concernant ces actifs sont considérablement inférieures ou gérées de manière confidentielle par les exploitants, par les investisseurs ou par les archives publiques.

Nous avons proposé une gamme d'actions pour s'attaquer à ces problèmes. Toutefois, cette étude recommande fortement d'effectuer un inventaire préliminaire dans le but de localiser les déchets de l'industrie extractive à potentiel élevé avant de procéder à une campagne exhaustive d'exploration et d'harmonisation des données.

Déchets dans les décharges

En ce qui concerne la disponibilité et l'accessibilité des données, il faut constater **l'absence complète de caractérisation** des matières qui composent les décharges dans l'UE. Généralement, les Etats-membres ne divulguent que des métadonnées limitées, comme l'emplacement, la capacité et le type des déchets (inertes, dangereux etc.). Il n'existe **pas de standard** semblable à ceux utilisés dans le domaine des matières premières primaires qui pourraient présenter un cadre pour la prospection, l'analyse, la caractérisation et le reporting structurés des contenus des décharges.

À la différence des matières premières primaires et potentiellement aussi des déchets de l'industrie extractive, les décharges contiennent des ressources plus diverses et plus rares, ce qui est dû au fait que les différents types de déchets (et produits contentant ces derniers) sont mélangés et mis en décharge dans les mêmes sites. La Directive concernant la mise en décharge des déchets et d'autres directives concernant les produits en fin de vie ont conduit à un tri accru des déchets et attiré l'attention sur le recyclage, de façon à ce que les décharges plus récentes contiennent moins de ressources de valeur. Pour cette raison, la probabilité qu'elles **présentent de l'intérêt en tant que réserve de matières premières secondaires** est plus élevée pour les **décharges plus anciennes**.

Pour ce qui est des rapports concernant les **flux de déchets agrégés**, ils sont établis partout dans l'UE au niveau européen grâce à un processus géré par Eurostat, comme stipulé par la Directive-cadre relative aux déchets et par le protocole du Règlement relatif aux statistiques sur les déchets (Règlement (CE) n° 2150/2002). La **Liste des déchets** de l'UE fournit un cadre pour la caractérisation concernant la collecte des données mais elle inclut aussi d'autres métadonnées comme les options de traitement et les sources industrielles ; en outre, les **codes des statistiques du CED** sont employés pour les rapports au niveau européen. Le rôle d'Eurostat dans le secteur des déchets constitue un bon modèle pour d'autres initiatives de traçage des déchets, disposant d'une **harmonisation et** de **protocoles de rédaction éprouvés**.

Nous avons conduit l'analyse des problèmes d'harmonisation en utilisant le même cadre que pour les matières premières primaires. Une grande partie des problèmes est identique mais

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l'accent est clairement différent : tandis que les flux de déchets agrégés sont plutôt bien documentés (comme on l'a vu ci-dessus), la disponibilité de détails au niveau des sites individuels est limitée car les exploitants ne sont généralement pas soumis à l'obligation de publication, indépendamment du fait que le site relève du secteur publique ou privé. Pour les flux de déchets et les réserves dans les décharges (déchets ménagers et industriels), **les codes de la Liste des déchets ne sont pas suffisamment détaillés** pour identifier les matières premières secondaires importantes ; nous recommandons d'effectuer des travaux supplémentaires dans ce domaine.

En plus du manque de données caractéristiques, les décharges posent tout un ensemble de défis technologiques, logistiques et géographiques avant de pouvoir être exploitées. Ces défis ont un impact sur leur potentiel. Pour cette raison, il n'est pas recommandé de se lancer dans une campagne extensive d'exploration et d'harmonisation des données avant d'avoir conduit un inventaire préliminaire dans le but de localiser les décharges à potentiel élevé.

Conclusions et implications

Minventory a indiqué une direction à suivre en vue de l'établissement de rapports harmonisés sur les statistiques des ressources et des réserves au niveau de l'UE. En ce qui concerne les matières premières primaires, ces recommandations se concentrent sur l'adoption d'un standard de reporting aligné sur CRIRSCO au niveau de l'UE. Comme solution à court terme, il est possible de collationner des statistiques nationales agrégées non-harmonisées selon des standards mixtes (mais connus) pour les publier dans un Annuaire des minerais, ce qui est l'objectif du projet Minerals4EU. Les propriétaires et les fournisseurs des données ont été identifiés et cités dans le présent projet et ils constituent une ressource queMinerals4EU utilise déjà.

Nous envisageons un alignement progressif sur un modèle convenu de l'UE pour les informations transmises au niveau de l'UE. Un projet utile serait d'établir des documents de rapprochement entre les codes nationaux et le modèle CRIRSCO. L'intégration des codes UNFC permettrait d'inclure les informations concernant les mines ou les dépôts mais elle nécessiterait des processus au niveau de l'UE pour assurer l'harmonisation et la rédaction en vue de la publication.

Les données concernant la caractérisation associées aux déchets secondaires sont beaucoup plus rares. Minventory a proposé plusieurs « projets de rapprochement » dans le but de déterminer le potentiel réalisable dans ce domaine avant de tenter un projet d'harmonisation à grande échelle. Les Figure 7 et Figure 8 présentent un aperçu de ces actions.

Toutes les métadonnées recueillies pour ce projet ont été synthétisées sur le portail de la Commission à l'adresse ec.europa.eu pour les rendre accessibles au public.

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Travaux de suivi

Un grand nombre de projets bénéficierait d'un programme promouvant l'harmonisation volontaire, identifiant les experts au niveau national et assistant les Etats-membres dans l'établissement d'objectifs-cibles. Toutefois, ce projet a identifié plusieurs domaines qui dépassent les limites d'un tel programme et qui requièrent des études supplémentaires. Il s'agit notamment : de mener une enquête pour déterminer les avantages et les inconvénients résultant de la gestion des données harmonisées par une société privée ; d'examiner les possibilités d'intégration des données sur les dépôts marins de l'Autorité internationale des fonds marins dans un inventaire des minerais ; de conduire des travaux ultérieurs afin d'évaluer et de classifier par ordre de priorité pour chacun des pays respectifs le potentiel des déchets de l'industrie extractive et des déchets contenus dans les décharges ; et d'entreprendre une évaluation critique des matériaux en cours d'utilisation et des réserves stratégiques à travers l'UE.

Organismes consultés

Les informations contenues dans le rapport final et ses constats ont été augmentés et validés au cours de plusieurs étapes-clés selon differents processus, comprenant : des sondages directs concernant les connaissances de potentiels fournisseurs de données à travers des enquêtes ; des échanges avec l'unité R3 de la DG Entreprise et industrie ; des retours de tests par un « groupe de pilotage » composé de représentants de l'industrie des minerais, d'associations commerciales géologiques et d'organismes compétents comme l'EEE, Eurostat, la Commission économique des Nations Unies pour l'Europe (groupe d'experts pour l'évaluation des Ressources – ERGC) et le Comité des ressources paneuropéennes (PERC).

Réalisation du projet

Ce projet a été réalisé par un consortium composé principalement de la société Oakdene Hollins Ltd, du British Geological Survey (BGS) et du Bureau de Recherches Géologiques et Minières (BRGM) et qui comprend également les partenaires suivants : Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Cesky Geologicky Ustav (CGU), Hrvatski Geološki Institut (HGI), Geološki zavod Slovenije (GeoZS), Greek Institute of Geology and Mineral Exploration (IGME), Institutul Geologic al României (IGR), Państwowy Instytut Geologiczny (PIB) et SNL Metals & Mining.

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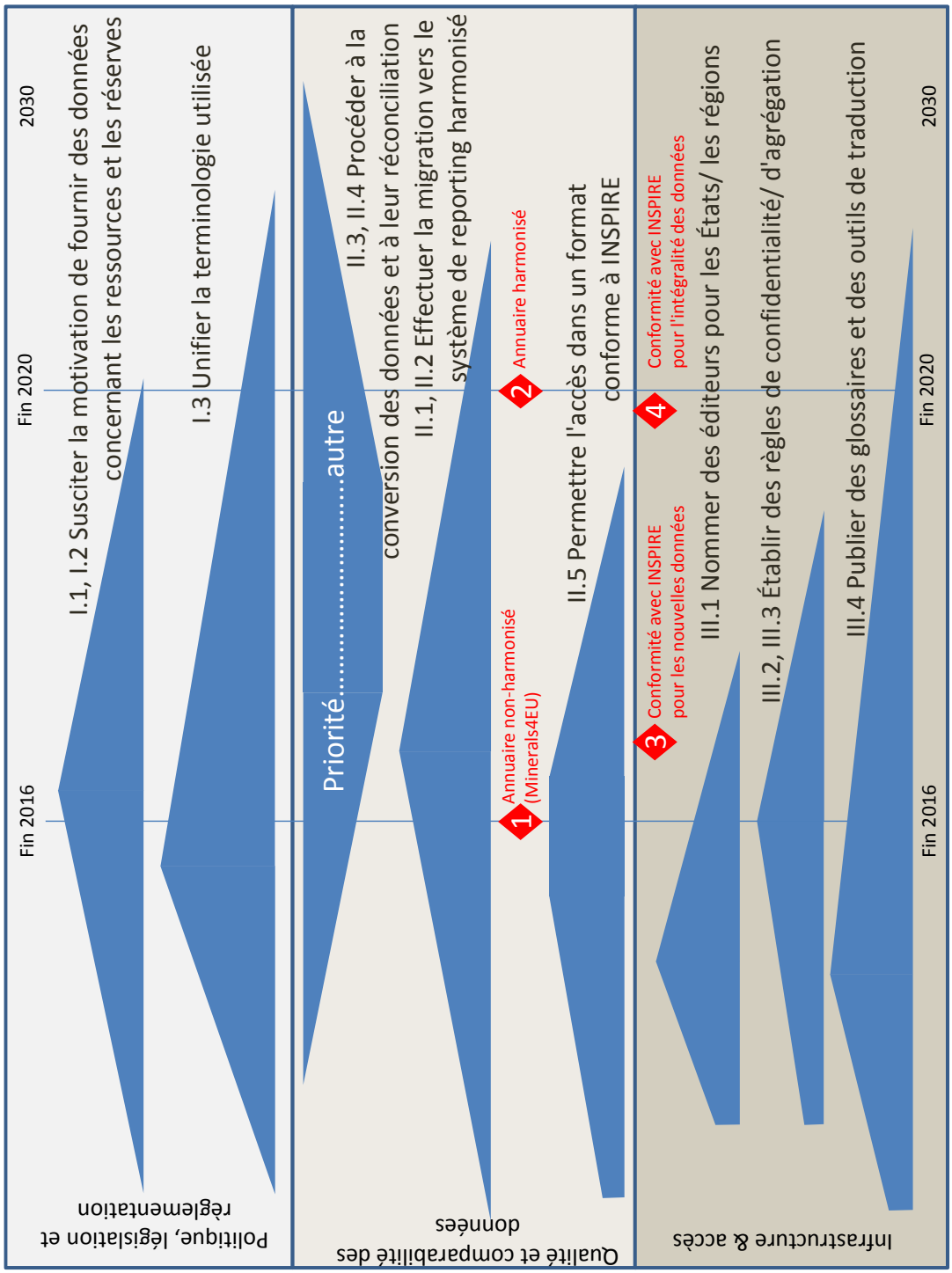
Figure 5: Résumé des résultats, de l'agenda et des étapes de la feuille de route pour les matières premières primaires



Note : Le 21 octobre2020 correspond à la date de l'implémentation complète des ensembles de données géographiques nouvelles et historiques conformément à l'annexe III de la directive INSPIRE (Ressources minérales) (cf. également le site http://inspire.ec.europa.eu/index.cfm/pageid/44)

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Figure 6: Implémentation potentielle du processus d'harmonisation

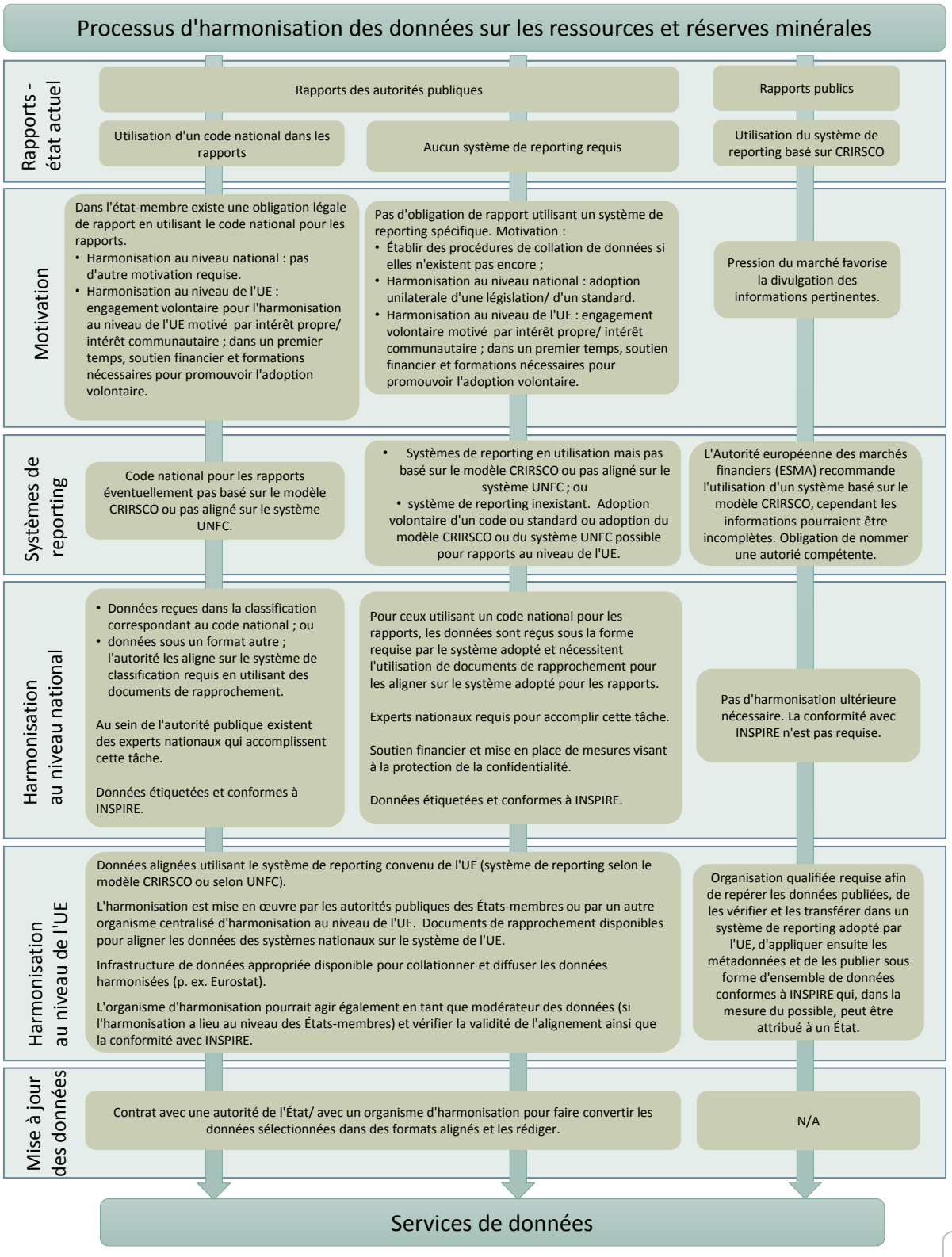

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Figure 7: Feuille de route abrégée pour les déchets des industries extractives indiquant les résultats-clés

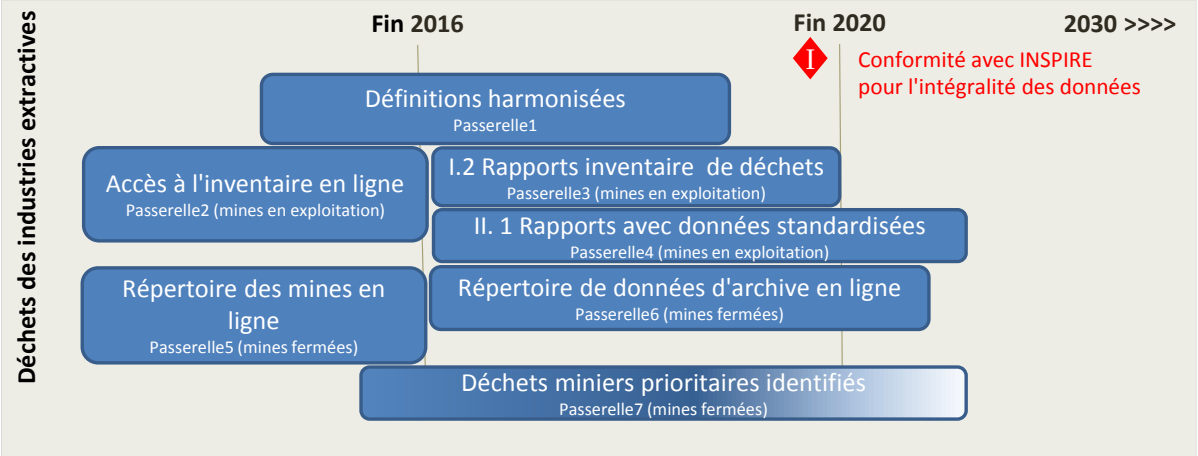
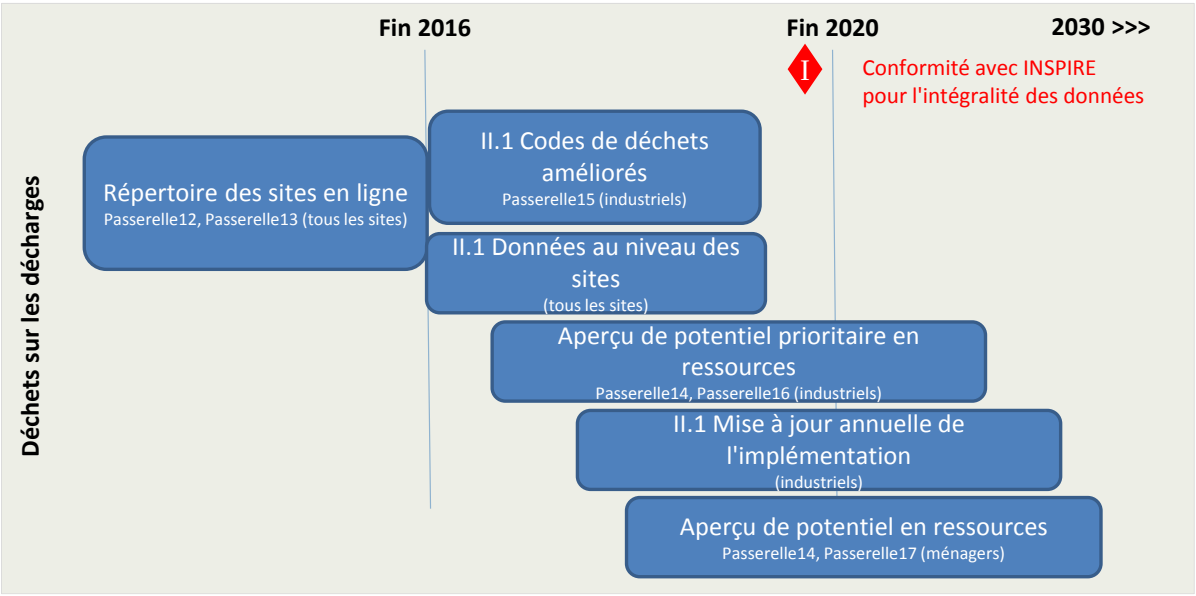


Figure 8: Feuille de route abrégée pour les décharges indiquant les résultats-clés



Kurzfassung

Zweck des Projekts

Die Europäische Kommission gab diese Studie in Auftrag, um die Verfügbarkeit der öffentlichen geologischen Daten (On- und Offshore) sowie Haushalts-, Gewerbe- und Industrieabfalldaten bezüglich der **Ressourcen und Reserven** von mineralischen Rohstoffen zu analysieren. Viele verschiedene Organisationen haben Aspekte derartiger Daten gesammelt und sogar veröffentlicht. Diese werden jedoch häufig in unterschiedlichen Formaten und verschiedenen Begrifflichkeiten präsentiert. Ein wichtiger Aspekt liegt daher in den Vorschlägen zur **Harmonisierung dieser Protokolle**, um die Deckungsgleichheit in der Präsentation und der Nutzung statistischer geologischer Daten zu gewährleisten.

Auf politischer Ebene wird eine einheitliche statistische Informationsquelle für Ressourcen und Reserven innerhalb der Europäischen Union von den drei Säulen der Europäischen Rohstoffinitiative (RMI) aus dem Jahr 2008 gestützt:

Zugang zu Rohstoffen auf den Weltmärkten zu unverzerrten Bedingungen.
Die nachhaltige Förderung von mineralischen Rohstoffen aus europäischen Quellen.
Die Reduzierung des Verbrauchs von Primärrohstoffen in der EU.
Diese Studie trägt zur zweiten Säule bei. Die Arbeitsgruppe Rohstoffversorgung der GD Unternehmen hat bereits in ihrem Bericht vom April 2009[5] spezifische Dateninfrastrukturbedürfnisse erkannt, einschließlich der Zusammenführung derartiger statistischer Daten in einer EU-weiten **harmonisierten Datenbank**.

Dieses Projekt berücksichtigte diese Bedürfnisse, indem es Barrieren bei der Erreichung harmonisierter Berichtsysteme erkannte und einen **Strategieplan** sowie **Handlungsmöglichkeiten** erarbeitete. Es ist zu vermerken, dass alle vorgeschlagenen Handlungen auf **freiwilliger Basis** erfolgen.

Umfang

Minventory hat die **Metadaten** in den Mitgliedsstaaten und ihren Offshore-Gebieten sowie 13 europäischer Anrainerstaaten in Bezug auf ihren **Vorrat an Folgendem untersucht:**

- **Primärrohstoffe**, d. h. geologische Mineral- und Erzablagerung (On- und Offshore);
- **Sekundärrohstoffe**, d. h. als Abfall ausgezeichnete Materialien, die bereits verwendet wurden, aber zur Wiederverwendung wiederaufbereitet werden können; sowie (nur in Form einer Vorstudie)
- **'aktuell genutzte' Stoffe**, d. h. derzeit in Produkten und Metrialienverarbeitete Rohstoffe, die möglicherweise in Zukunft Sekundärrohstoffe werden könnten.

Bei Primärrohstoffen entsprechen die betrachteten Rohstoffe denjenigen, die von der Rohstoffinitiative (RMI, COM (2008) 699 final) herangezogen wurden. Dazu zählen Metalle, sowie Baurohstoffe und Industrieminerale. Bei den Sekundärrohstoffen konzentrierte sich die Studie auf deren langfristige Ansammlungen innerhalb von **Deponien** und **Bergbauhalden** (einschließlich **Abfallentsorgungseinrichtungen der Kategorie A**).

[5] Land Use Consultants (2010) *Exchanging Best Practice on Land Use Planning, Permitting and Geological Knowledge Sharing*

Kurzfassung

In der Studie wurde die Annahme bestätigt, dass kaum Metadaten und Daten bezüglich Deponiebeständen vorhanden sind. Daher wurden in einer Projekterweiterung **Abfallflussdaten** gesammelt.

Ergebnisse

Die Ergebnisse dieses Projekt sehen wie folgt aus:

- Eine Beschreibung der aktuellen Situation auf nationaler, und ggf. auf regionaler Ebene in Hinblick auf statistische Daten über Ressourcen und Reserven in Europa. Dies umfasst eine Bewertung über den Grad der Anwendung eines Berichtsystems zu Ressourcen- und Reservendaten.
- **Analyse der Barrieren**, die eine Datenharmonisierung und Entwicklung einer Kompatibilität behindern, und die nötigen Abhilfemaßnahmen, einschließlich:
  1. Ein kombinierter Zeitrahmen (**„Strategieplan"**) und **Rahmenplan** für die Implementierung, einschließlich: Angabe der Zielergebnisse auf dem Weg zur Harmonisierung; Handlungsmöglichkeiten; und Zieldaten für die Erzielung bis 2020 und darüber hinaus.
  2. Ein Maßnahmenplan, um einen Abschnitt über harmonisierte Ressourcen- und Reservestatistiken in ein künftiges **European Minerals Yearbook** zu integrieren.
- Ein Kommissions**portal**, das die verfügbaren Metadaten über Primärrohstoffressourcen und -reserven (nach Mineralien, On- und Offshore), über Sekundärrohstoffe (Bergbauhalden, Deponiebestände und Abfallflüsse) und die Herkunft derartiger Daten zusammenfasst.

Ablauf

Im Verlauf des Projekts standen **Umfragen** im Mittelpunkt, die an staatsbehördliche Dateninhaber, Anbieter oder Herausgeber und andere Stakeholder in den Bereichen geologische Kenntnisse, Bergbauhalden und Deponien und Abfallflüsse versandt wurden. Diese Primärdaten wurden durch **sekundärstatistische Auswertungen** ergänzt, die zentrale Themen besonders in Bezug auf andere Initiativen untersuchten. Die gesammelten Metadaten wurden in ein Format übertragen, das in das Metadaten-Portal eingepflegt wurde (welches selbst einer Nutzerumfrage unterzogen wurde), und das zum Planungsprozess für das parallel laufende Minerals4EU-Projekt bezüglich eines European Minerals Yearbooks herangezogen wurde. Darüber hinaus bot das für jede Nation gesammelte Grundwissen eine Grundlage zur Untersuchung der Datenverfügbarkeit, der Berichtsstandards, des Eigentums und der **Barrieren zur Harmonisierung** in jedem der wesentlichen Bereiche. Erkenntnisse und Vorschläge wurden in drei Stakeholder-Arbeitsgruppen geprüft.

Bei der Entwicklung eines Strategieplans und Handlungsmöglichkeiten wurden aktuelle, in Europa verwendete Datenharmonisierungspraktiken und Berichtssysteme in Betracht gezogen; relevante Gesetzgebung wie zum Beispiel die Bergbauabfallrichtlinie, die Abfallrahmenrichtlinie und ähnliche Richtlinien zur Abfallaufbereitung (z. B. die Deponierichtlinie) und spezifische Abfallströme (verschiedene Altlastrichtlinien), sowie die INSPIRE-Richtlinie zur Berichterstattung von räumlichen Daten; von ähnlichen Aktivitäten wie beispielsweise EuroGeoSource, ProMine, Minerals4EU, GIS Central Europe, OneGeology Europe und European Geological Data Infrastructure; sowie Politik in anderen Bereichen wie

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die Normen zur öffentlichen Berichterstattung zu Ressourcen- und Reservedaten, die von der Europäischen Wertpapieraufsichtsbehörde gebilligt werden.

Barrieren zur Harmonisierung wurden unter den breiten Themenbereichen in der zweiten Säule der RMI untersucht:

- Politik, Gesetzgebung und Verordnungen
- Datenqualität und -vergleichbarkeit
- Dateninfrastruktur, -bereitstellung und -zugänglichkeit.

Erkenntnisse für Primärrohstoffe

Minventory hat die **Verfügbarkeit** und **Zugänglichkeit** von statistischen Daten über Ressourcen und Reserven für 42 wirtschaftlich wichtige mineralische Rohstoffe in den Mitgliedsstaaten und 13 Anrainerstaaten bestimmt. Zu den Datenkategorien zählen Ressourcen, Reserven und „andere" nicht-statistische Daten. 17 der 21 teilnehmenden Staaten erachten Mineraliendaten auf aggregierter nationaler Ebene nicht als vertraulich. Darüber hinaus machen 25 der 29 Teilnehmer manche oder alle Daten der Öffentlichkeit zugänglich.

Generell werden Daten über metallhaltige Bodenschätze im Vergleich zu Industriemineralien als vertraulicher erachtet. Daher enthalten staatliche Bergbaurechte typischerweise Regeln, die die Verbreitung einschränken oder zumindest ein Offenbarungsmoratorium bestimmen. In anderen Fällen begrenzen private Unternehmen die Offenbarung aus Selbstinteresse. **Vertraulichkeits-, Aggregation- und Aufbereitungsprotokolle** (wie sie bereits innerhalb von Eurostat aktiv eingesetzt werden) sind daher wesentliche Bestandteile einer Harmonisierung auf EU-Ebene.

Statistische Angaben auf nationaler Ebene zu Ressourcen im marinen Bereich sind für die elf Binnenländer nicht von Interesse. Von den restlichen Ländern machte ein Drittel keine Angaben, ein weiteres Drittel sammelt derartige Daten und das letzte Drittel sammelt keine derartigen Daten. Die Daten beziehen sich fast ausschließlich auf Sand und Kies (und fossile Brennstoffvorkommen, die nicht im Projektrahmen liegen) und liegen häufig in Kartenformat vor.

In Bezug auf Überseegebiete gibt es kaum Statistiken über Ressourcen und Reserven. Wegen ihrer verwaltungstechnischen Beziehungen bieten einige ehemalige französische Kolonien strukturierte Daten über BRGM an, dies ist jedoch die Ausnahme.

Eine Prüfung der **Berichtsysteme** zeigt, dass der Datensammlungsprozess über Mineralressourcen und -reserven für die Länder Osteuropas weitaus strukturierter ist (sieben Länder sind mit einem allgemein akzeptierten Code oder Standard harmonisiert oder durchlaufen derzeit einen Harmonisierungsprozess). In diesen Ländern fordern Bergbaugesetze, dass den relevanten Behörden Daten bereitgestellt werden. Außerdem müssen die Daten in einem Format bereitgestellt werden, der einem nationalen Meldekodex entspricht. Nationale Meldekodexe entsprechen häufig der internationalen CRIRSCO-Vorlage. Unter Ausnahme des Vereinigten Königreichs haben alle Staaten nationale Bergbaugesetze oder -richtlinien, und zwei Drittel davon verlangen eine Datenveröffentlichung.

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Nach Auswertungen der gesamten Umfragereaktionen wurden die Probleme und Lücken erkannt, die in der Praxis eine Harmonisierung behindern können. Sie sind in der nachstehenden Tabelle zusammengefasst.

Die Schwere jeder dieser Probleme wurde auf einer Skala von 1 (am wenigsten schwer) bis 5 (am schwersten) gemäß dem Urteil des Projektteams und dem Feedback der Teilnehmer an den Stakeholder-Treffen und dem Lenkungsausschuss bewertet. Sie folgen den folgenden breit gefassten Parametern: **Harmonisierung der Stakeholder**, d. h. bestehen **Interessenkonflikte** in der Politik oder im IP-Eigentum; **Datenvolumen**, das in ein harmonisiertes Format umgesetzt werden muss; und **technische Schwierigkeiten** in der Erstellung von Lösungen, beispielsweise durch die unterschiedlichen Standards für historische Daten und dem Mangel an einer elektronischen Dateninfrastruktur. Diese Probleme sind die Zielsetzungen für Maßnahmen im Strategieplan. Abbildung 9 zeigt einen grafischen Überblick.

Diese Maßnahmen können relativ zügig eingeleitet werden, und viele könnten bis zum Stichtag im Jahr 2020 abgeschlossen sein. Die greifbareren Themen beziehen sich auf: die Schaffung übereinstimmender Begrifflichkeiten; die Umsetzung von Regeln zur Datenvertraulichkeit und Aufbereitung auf EU-Ebene und darauf, Mitgliedsstaaten dazu aufzufordern, zu Datenpunkten Einzelansprechpartner zu nominieren. Problematischer ist die Veröffentlichung von Daten , die Übernahme eines gemeinsamen Meldesystems, und der Umgang mit historischen Daten in verschiedenen Meldesystemen zu sehen.

Thema	Probleme/Lücken	Schwere
1. Politik, Gesetzgebung und Verordnungen.	1. Nationale Bergbaugesetze oder Bodenschatzpolitik	4
	2. Gesetzliche Anforderungen, Ressourcen-/Reservedaten bereitzustellen	5
	3. Begrifflichkeit der Primärrohstoffe und spezifische Gesetzgebung	5
II. Datenqualität und Vergleichbarkeit	1. Vorgeschriebene Nutzung eines Meldesystems	5
	2. Harmonisierung nationaler Meldesysteme mit einem allgemein anerkannten Standard oder Code	3
	3. Prozess der Datenharmonisierung	4
	4. Datenzuverlässigkeit	4
	5. Anwendung der INSPIRE-Richtlinie	3
III. Dateninfrastruktur, Bereitstellung und Zugänglichkeit	1. Anzahl der Organisation(en), die für die Datensammlung und -zentralisierung zuständig sind	4
	2. Dateneigentum und Vertraulichkeit	4
	3. Öffentlicher Zugang zu offenen Daten	3
	4. Mehrsprachiges Datenformat	2

Zu betonen ist, dass eine Reihe freiwilliger Maßnahmen zum Umgang mit diesen Problemen vorgeschlagen wird. Es wird jedoch anerkannt, dass aufgrund der unterschiedlichen Meldepflichten und -standards (CRIRSCO-harmonisiert oder nicht) die Umsetzung in einigen Mitgliedsstaaten einfacher sein wird als in anderen.

Für die Berichterstattung von Ressourcen und Reserven auf europäischem Niveau könnte ein mit der CRIRSCO-Vorlage oder dem UNFC-System harmonisierter Meldestandard oder -code eingeführt werden. Der endgültige Bericht präsentiert die Vor- und Nachteile von beiden, aber es müssen weitere Absprachen unter den Mitgliedsstaaten erfolgen, um zu einem festen Beschluss zu kommen. Dies impliziert jedoch nicht, dass Mitgliedsstaaten einen derartigen Code auf nationaler Ebene einführen sollten. Vielmehr sollte er für die Informationsübertragung auf EU-Ebene und von der EU in seiner folgenden Veröffentlichung oder Kommunikation von statistischen Daten bezüglich der Ressourcen oder Reserven

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verwendet werden. Jedenfalls kann ein Berichtssystem auf der CRIRSCO-Basis mit den üblichen Brückendokumenten auf UNFC übertragen werden.

Dieser Ablauf könnte durch Harmonisierungsprozesse auf EU-Ebene ermöglichtwerden, um die Kompatibilität der Anwendung der Harmonisierungsregeln zu gewährleisten, sowie um die Ausarbeitung vor der Veröffentlichung zu bewerkstelligen. Diese Aufgaben sollten ggf. von einer oder mehreren Körperschaften ausgeübt werden, um Kompetenz im Bereich Bodenschätze mit erwiesenen Kenntnissen im vertraulichen Datenumgang zu vereinen. So ist Eurostat beispielsweise ein Modell für die Datenaufbereitung; eine öffentliche Einrichtung (z. B. Geologische Dienst) oder ein privates Datenunternehmen könnten die Harmonisierung verwalten. In Abbildung 10 wird ein Überblick über einen möglichen Harmonisierungsprozess gezeigt, der diesen Schritten folgt.

Die INSPIRE-Richtlinie liefert ein grundlegendes Rahmenwerk für die Datenmeldung an öffentliche Behörden in diesem Bereich. Allerdings wäre eine Empfehlung nötig, was die angewandten Berichtssysteme anbelangt. Möglicherweise müssten pragmatische Mindestdatensätze und Mineralien-Codes erarbeitet und definiert werden, um die Bodenschatzprioritäten der EU in den erforderlichen Einzelheiten wiederzugeben.

Erkenntnisse für Sekundärrohstoffe

Bergbauhalden und Deponiebestände wurden getrennt untersucht. Im Allgemeinen werden sie von unterschiedlichen nationalen Behörden reguliert und überwacht. Bergbauhalden fallen unter die Bergbauabfallrichtlinie (2006/21/EC) und Deponie unter die Deponierichtlinie (1999/31/EC). Wenn jedoch Bergbauabfälle als „permanente" Abfallanlagen klassifiziert werden, fallen ihre Inhalte ebenfalls unter das Abfallverzeichnis der EU[6] für Deponien. Einige Eigenschaften können also auf beide zutreffen.

Bergbauabfälle

Abfälle aus den Abbau- und Raffinerie-Industrien werden von der Bergbauabfallrichtlinie reguliert. Dies deckt aktive, geschlossene, verlassene Abfallanlagen der Kategorie A (hochriskant) ab. Diese Richtlinie zielt jedoch auf die Erkennung von Anlagen mit hohen Sicherheits-, Gesundheits- und Umweltschutzrisiken. Daher stellen die von den Mitgliedsstaaten unter der Richtlinie erstellten Inventare nur einen kleinen Bestandteil der Anlagen dar. Verschlimmert wird die Lage noch durch die Tatsache, dass nicht alle Mitgliedsstaaten diese Informationen veröffentlichen oder wie gefordert an die Kommission einsenden. Seit ihrer Einführung verpflichtet die Richtlinie zur Veröffentlichung gewisser Grunddaten in Bezug auf den Betrieb von Bergbauanlagen.

Häufig ist das Inventar von Bergbauabfallanlagen nach Kriterien charakterisiert, die für die Bergbau- oder Verarbeitungsanlagen relevant sind, aber diese Daten werden nicht immer veröffentlicht, obwohl die Meldung gemäß der Bergbauabfallrichtlinie bindend ist. Sobald ein Bestand als permanente Lagerung klassifiziert wurde, fällt er unter die Deponierichtlinie und die Inhalte werden nach dem Abfallverzeichnis kodifiziert, es besteht jedoch immer

[6] Die Entscheidung der Kommission vom 3. Mai 2000 ersetzt die Entscheidung 94/3/EC und bestimmt ein Abfallverzeichnis gemäß Artikel 1(a) der Richtlinie 75/44/EWC über Abfall und die Ratsentscheidung 94/904/EC, die ein Verzeichnis zu gefährlichen Abfällen gemäß Artikel 1(4) der Ratsrichtlinie 91/689/EWC zu gefährlichen Abfällen bestimmt.

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noch keine Pflicht, entstandene Abfälle zu melden. Diese Codes unterscheiden sich wesentlich von den mineralogischen Klassifikationen zur Meldung von Primärrohstoffen. Daraus entsteht ein Informationsbruch, der eine vollständige Harmonisierung über die verschiedenen Rohstoffbereiche verhindert.

Die Harmonisierungsprobleme wurden mit dem gleichen Rahmenwerk wie die Primärrohstoffe analysiert. Die Probleme ähneln generell denen der Primärrohstoffe, sind ihnen aber untergeordnet. Beachtenswert ist dabei der Mangel eines gemeinsamen Meldesystems, des Bedarfs, erzeugten Abfall regelmäßig zu melden, der Mangel an angemessenen Daten, die das Ressourcenpotenzial aus Bergbauabfällen erkennen und der Unterschied in der Rohstoffklassifikation zwischen Einrichtungen, die „historisch“ sind, und denen, die unter dem Status Deponie betrieben werden.

Falls verlassene oder geschlossene Bergbauabfalleinrichtungen einer weiteren Umfrage und Berichterstattung unterzogen werden sollten, sollten sie **analog zu Primärrohstoffen** behandelt werden. Die für diese Rohstoffe empfohlenen UNFC-Codierungen gelten ebenso für die Charakterisierung von Bergbauabfallansammlungen. Obwohl es jedoch Tausende geschlossener Anlagen in den EU gibt, liegt der Wissenstands um diese Vermögenswerte viel niedriger oder vertraulich in den Händen der Betreiber, Vermögensinvestoren oder öffentlichen Archiven.

Es werden eine Reihe von Handlungsmöglichkeiten zur Problemlösung vorgeschlagen. Jedoch empfiehlt diese Studie insbesondere eine umfangreiche Datenerfassungs- und Harmonisierungskampagne erst nach einer **Vorstudie** zur Erkennung der Bergbauabfälle mit hohem Potenzial durchzuführen.

Deponieabfälle

Was die Verfügbarkeit und den Zugang zu Daten angeht, besteht ein beinahe kompletter **Mangel an Charakterisierung** der Deponiezusammensetzung in der EU. Mitgliedsstaaten stellen generell nur begrenzte Metadaten wie den Standort, die Kapazität und den Typ (inert, gefährlich usw.) bereit. Es gibt **keinen Standard**, der mit denen im Bereich Primärrohstoffe vergleichbar wäre, bzw. der ein Rahmenwerk für eine strukturierte Erkundung, Analyse, Charakterisierung und Meldung von Deponieinhalten darstellen würde.

Im Unterschied zu Primärrohstoffen und möglicherweise auch Bergbauabfällen enthalten Deponien in der Regel vielfältigere und spärlichere Ressourcen, da verschiedene Abfalltypen (und Produkte, in denen sie enthalten sind), vermischt und auf der gleichen Deponie gelagert werden. Die Deponie- und andere Altlastrichtlinien haben zu einer besseren Abfalltrennung und ein erhöhtes Augenmerk auf Recycling geführt, sodass neuere Deponien weniger wertvolle Ressourcen enthalten. Daher ist es wahrscheinlicher, dass **ältere Deponien** eher **Interesse als Lagerstätten von Sekundärrohstoffen erregen**.

Andererseits ist die Meldung von **aggregierten Abfallflüssen** auf EU-Ebene universell in der gesamten EU. Dies erfolgt durch einen von Eurostat verwalteten Prozess, der von der Abfallrahmenrichtlinie und dem Protokoll von Regelungen (EC) Nr. 2150/2002 über Abfallstatistiken vorgeschrieben wird. Das **Abfallverzeichnis** der EU stellt das Charakterisierungsrahmenwerk für Datensammlung bereit, aber andere Metadaten wie Behandlungsmethoden und Industriequelle sind inbegriffen; und es werden **EWC-Stat Codes** für die Berichterstattung auf EU-Ebene verwendet. Die Rolle von Eurostat im Bereich Abfall

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ist dank seiner **erwiesenen Harmonisierungs- und Aufbereitungsprotokolle** ein gutes Modell für andere Initiativen zur Rohstoffverfolgung.

Harmonisierungsprobleme wurden mit dem gleichen Rahmenwerk wie für die Primärrohstoffe analysiert. Obwohl bei vielen Problemen eine Überschneidung herrscht, wird ein sehr unterschiedlicher Schwerpunkt gesetzt: Während aggregierte Abfallflüsse relativ gut gemeldet werden (siehe oben), sind Einzelheiten auf Anlagenebene weniger verfügbar, da für Betreiber generell keine Pflicht besteht, zu veröffentlichen, ob eine Anlage im öffentlichen oder Privatbesitz steht. Für Abfallflüsse und Deponieablagerung (Haushalts- und Industrieabfälle) **fehlen dem Abfallverzeichnis Einzelheiten,** die zur Erkennung von hochinteressanten Sekundärrohstoffen erforderlich sind. Es werden weitere Studien in diesem Bereich empfohlen.

Abgesehen vom Mangel an charakterisierenden Daten entstehen bei Deponien eine Reihe technischer, logistischer und räumlicher Abbauherausforderungen, die sich auf ihr realisierbares Potenzial auswirken. Eine umfangreiche Datenerfassungs- und Harmonisierungskampagne ist erst nach einer **Vorstudie** zur Erkennung der Deponien mit hohem Potenzial empfehlenswert.

Fazit und Implikationen

Minventory hat einen Weg für die Etablierung einer harmonisierten Berichterstattung zu Ressourcen- und Reservestatistiken auf EU-Ebene aufgezeigt. In Bezug auf Primärrohstoffe steht hier eine Übernahme der mit CRIRSCO harmonisierten Berichtsstandards auf EU-Ebene im Mittelpunkt. Kurzfristig können, wie bei Minerals4EU nicht-harmonisierte, aggregierte nationale Statistiken über vermischte (aber bekannte Standards) in einem Minerals Yearbook zur Veröffentlichung zusammengestellt werden. Dateninhaber und Anbieter wurden in diesem Projekt erkannt und gemeldet. Sie stellen eine Ressource dar, die bereits vom Minerals4EU-Projekt genutzt wird.

Wir gehen bei den auf EU-Ebene eingereichten Daten von einer fortschreitenden Harmonisierung an die vereinbarte EU-Vorlage aus. Die Erstellung von Brückendokumenten zwischen nationalen Codes und der CRIRSCO-Vorlage wird als nützliches Projekt vorgeschlagen. Die Einbeziehung der UNFC-Codes wird eine Ausdehnung auf Informationen auf Minen- oder Lagerstättenebene ermöglichen, benötigt jedoch Prozesse auf EU-Ebene, um die Harmonisierung und Aufbereitung zur Veröffentlichung zu ermöglichen.

Die charakterisierenden Daten in Bezug auf Sekundärabfälle sind weitaus spärlicher. Minventory hat eine Reihe von „Brückenprojekten" vorgeschlagen, die zur Bestimmung des realisierbaren Potenzials in diesem Bereich durchgeführt werden sollten, bevor ein großrahmiges Harmonisierungsprojekt angegangen wird. Abbildung 11 und Abbildung 12 fassen diese Maßnahmen zusammen.

Alle von diesem Projekt gesammelten Metadaten sind durch das Kommissionsportal ec.europa.eu zusammengefasst öffentlich zugänglich.

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Folgearbeit

Bei vielen Projekten wäre ein Förderprogramm, das freiwillige Harmonisierung vorantreibt, nationale Experten erkennt, und Mitgliedsstaaten bei der Festlegung von Planzielen zur Harmonisierung unterstützt, vorteilhaft. Bei diesem Projekt wurden jedoch einige Bereiche identifiziert, die seinen Rahmen sprengen, aber näher in Betracht gezogen werden sollten. Dazu zählen: Eine Ermittlung der Vor- und Nachteile, ein Privatunternehmen mit der Zugangsverwaltung zu harmonisierten Daten zu beauftragen; eine Recherche, inwieweit Daten der Internationalen Meeresbodenbehörde zu marinen Ressourcen in ein Ressourcenverzeichnis integriert werden könnten; weitere Arbeiten, um das Potenzial der Abfälle in Bergbauabfallanlagen und Deponien bewerten und priorisieren zu können und um eine kritische, auf Rohstoff fokussierte Bewertung der derzeitig im Verbrauch befindlichen Bestände und strategischen Lagerbestände in der EU durchführen zu können.

Beratung

Die Informationen im Abschlussbericht und seine Ergebnisse haben zu einer Reihe von wichtigen Schritten und verschiedenen Wegen beigetragen und wurden in diesem Zusammenhang validiert. Dies umfasst: direkte Befragung der Kenntnisse von potenziellen Datenanbietern durch Umfragen; Dialog mit der R3-Einheit des GD Unternehmen & Industrie; Stakeholder-Beteiligung an drei Arbeitsgruppen, und Beratung seitens relevanter Körperschaften wie der EEA, Eurostat, Europäischen Wirtschaftskommission der UN (Expertengruppe zur Ressourcen-Klassifizierung - EGRC) und dem Pan-European Resources Committee (PERC).

Lieferung

Dieses Projekt wurde von einem Konsortium durchgeführt, das in erster Linie aus Oakdene Hollings Ltd, British Geological Survey (BGS), und Bureau de Recherches Géologiques et Minières (BRGM) bestand. Beigetragen haben außerdem andere Partner: Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Cesky Geologicky Ustav (CGU), Hrvatski Geološki Institut (HGI), Geološki zavod Slovenije (GeoZS), Greek Institute of Geology and Mineral Exploration (IGME), Institutul Geologic al României (IGR), Państwowy Instytut Geologiczny (PIB) und SNL Metals & Mining.

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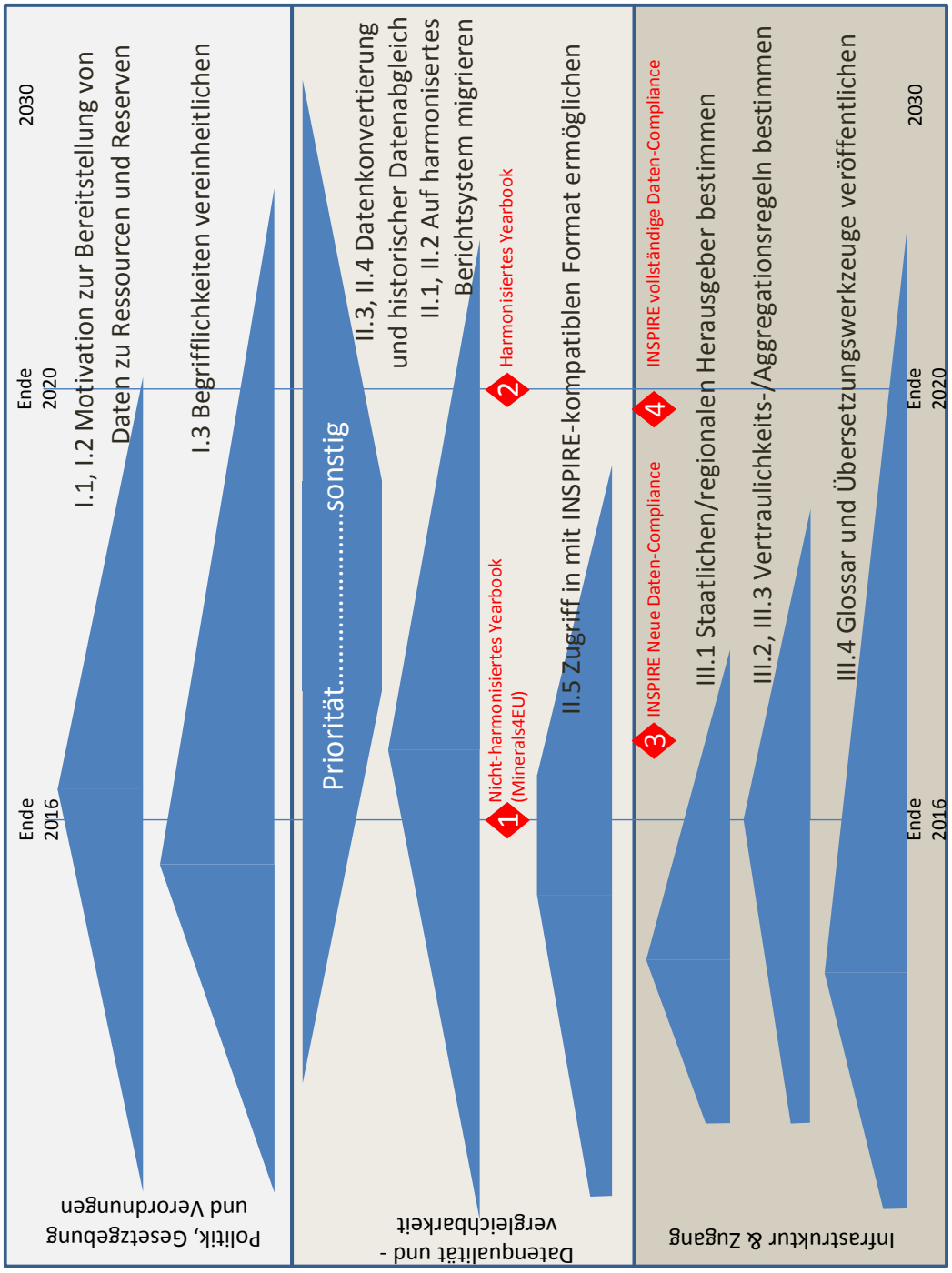
Abbildung 9: Zusammenfassung der Ergebnisse, des Zeitrahmens und der Meilensteine des Strategieplans für Primärrohstoffe



Hinweis: Der 21. Oktober 2020 ist der Stichtag für die vollständige INSPIRE-Implementierung für neue und historische räumliche Datensätze unter der Richtlinie Anhang II (mineralische Bodenschätze) (Siehe auch http://inspire.ec.europa.eu/index.cfm/pageid/44).

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Abbildung 10: Potenzielle Umsetzung für den Harmonisierungsprozess

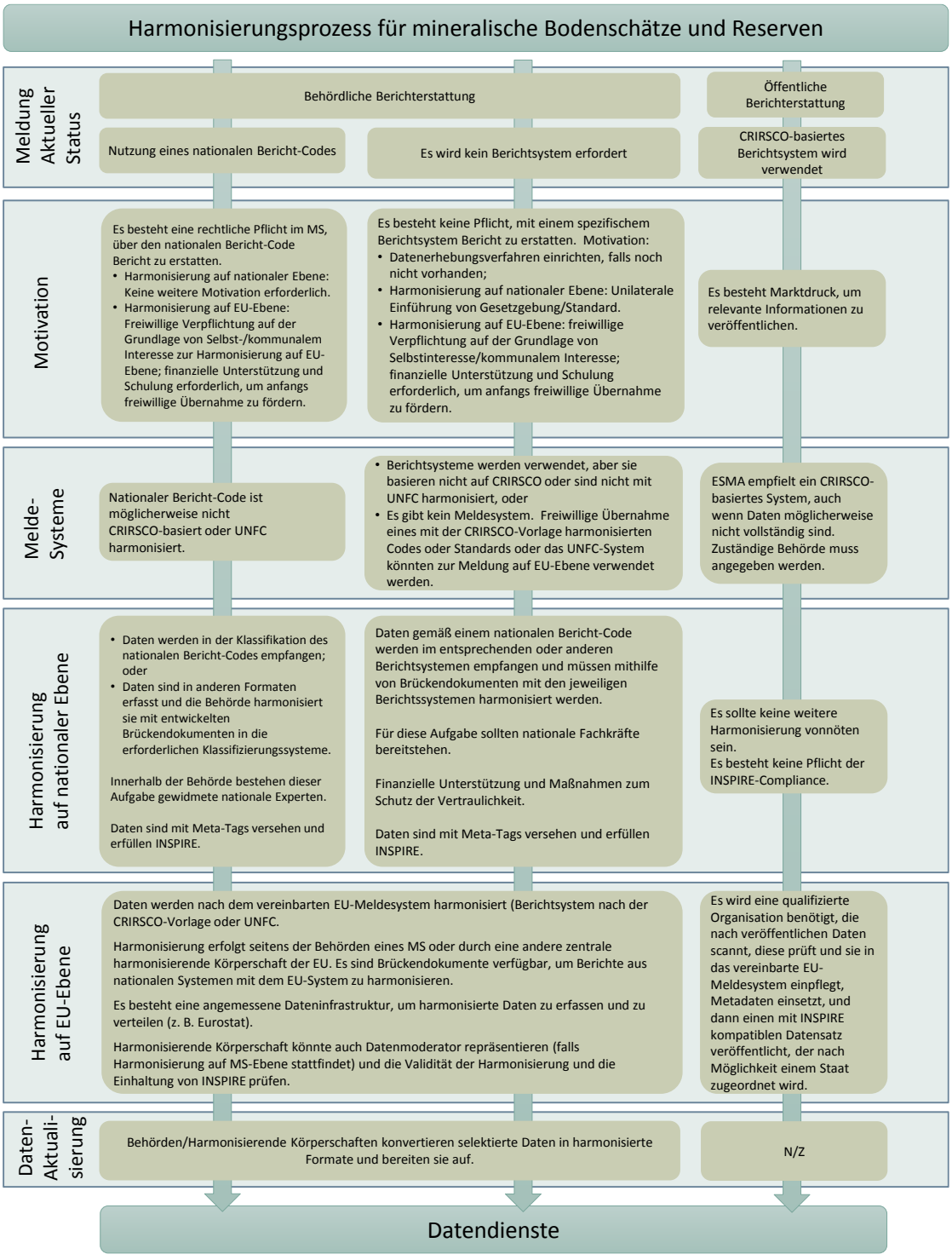

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Abbildung 11: Verkürzter Strategieplan zu Bergbauabfällen mit wichtigen Ergebnissen

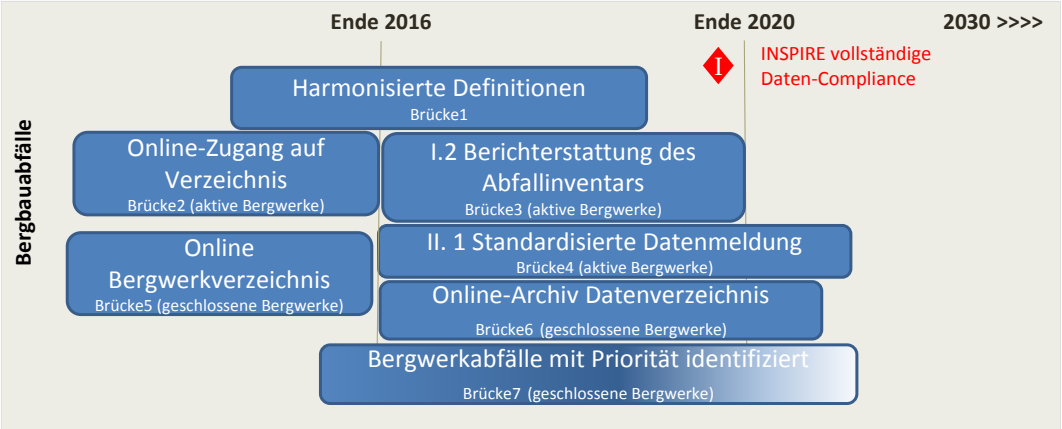
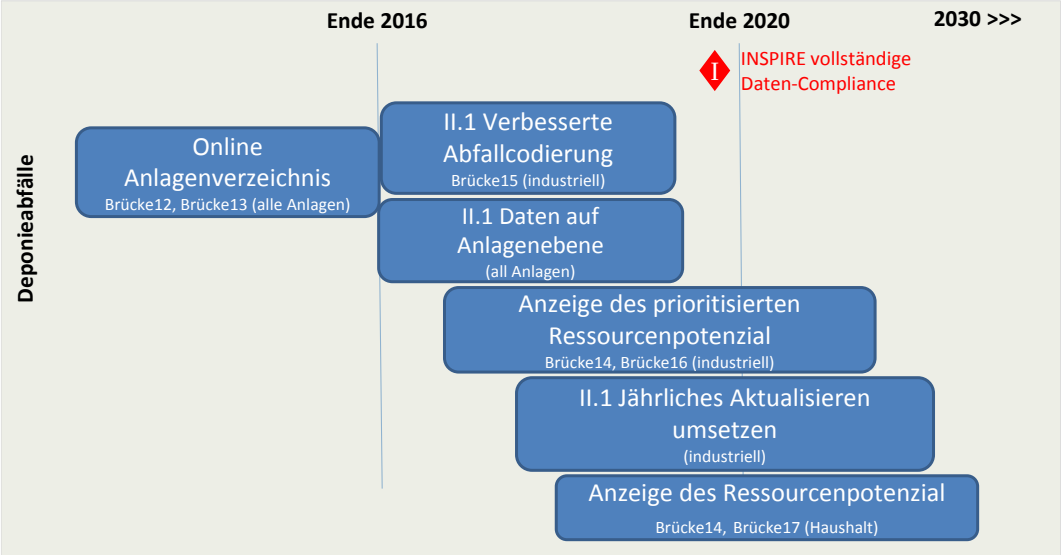


Abbildung 12: Verkürzter Strategieplan zu Deponieabfällen mit wichtigen Ergebnissen



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Part 1: Context

1.1 Introduction

This report summarises the work conducted on the Minventory study and the ensuing recommendations for the establishment of a harmonised system for raw material statistics.

Interim Report 1 presented largely on the results of the data (metadata) survey, reporting codes and reporting standards review, the outcomes of the first stakeholder meeting and the development of the metadata portal.

Interim Report 2 was substantially restructured compared to Report 1 to reflect the progress towards specific deliverables, but also to better differentiate the characteristics of the primary and 'secondary' materials aspects; in particular the impact on the harmonisation issue analysis and the direction of development of the portal were highlighted.

Interim Report 3, with a further concentration on concrete outputs, was restructured again. These changes were relatively minor, simply placing the description of study activities and status with annexes, leaving the main report to consider the outputs unimpeded. However, as an interim report, for transparency we continued to report any incomplete, in-progress or planned tasks where appropriate.

This final report has relegated all such process issues to the annexes and offers a consolidated and reviewed version of background research, findings and recommendations.

1.2 Report structure

This report is structured to examine in turn the sources of primary and secondary raw materials of highest priority.

To aid clarity, the report is divided into seven parts plus annexes:

- Part 1: Context
- Part 2: Primary Raw Materials
- Part 3: Mining Wastes
- Part 4: Landfill Stocks & Flows
- Part 5: In-use Materials
- Part 6: Portal & Yearbook
- Part 7: Diligence
- Annexes including Processes, Activities & Outputs

1.3 Project team

This study has been executed by a consortium of Member State Geological Surveys and two consultancies in the field of resources. Their roles are outlined in the table below.

Organisation	ISO	Role
Oakdene Hollins Ltd	gb	Project leadership, roadmap generation, report authorship and assembly, secondary/in-use materials survey.
British Geological Survey (BGS)	gb	Primary raw materials survey lead, standards review, issue analysis, report authorship and review.
Bureau de Recherches Géologiques et Minières (BRGM) **French Geological Survey**	fr	Issue analysis, report authorship and review, portal design and creation.
Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) **German Minerals Resources Agency**	de	Data collection from Länder, report reviewing.
Cesky Geologicky Ustav (CGU) **Czech Geological Survey (CGS)**	cz	Neighbouring GS survey coordination, report reviewing.
Hrvatski Geološki Institut (HGI) **Croatian Geological Survey**	hu	Neighbouring GS survey coordination, report reviewing.
Geološki zavod Slovenije (GeoZS) **Slovenian Geological Survey**	si	Neighbouring GS survey coordination, report reviewing.
Ινστιτουτο Γεωλογικον & Μεταλλευτικων Ερευνων (ΙΓΜΕ) **Greek Institute of Geology and Mineral Exploration (IGME)**	gr	Neighbouring GS survey coordination, report reviewing.
Institutul Geologic al Romăniei (IGR) **Romanian Geological Institute**	ro	Neighbouring GS survey coordination, report reviewing.
Państwowy Instytut Geologiczny (PIB) **Polish Geological Institute (PGI)**	pl	Neighbouring GS survey coordination, report reviewing.
SNL Metals & Mining	se	Neighbouring GS survey coordination, private data inputs, report authorship and reviewing.

The above roles exclude participation in Stakeholder Meetings and ad hoc working groups.

1.4 Glossary

Abbreviations and terms used in this report are defined and described in Table 1 and Table 2.

Table 1: Glossary of abbreviations used within the project

Abbreviation	Definition
ASME	American Society of Mechanical Engineers.
ASTM	American Society for Testing and Materials. (Now known as ASTM International.)
CCOP EPPM	The programme for Enhancing Public Petroleum Management under the auspices of the Coordinating Committee for Geoscience Programmes in East and Southeast Asia.
CESR	Committee of European Securities Regulators. (Predecessor of ESMA.)
CIM	Canadian Institute of Mining, Metallurgy and Petroleum.
CRIRSCO	Committee for Mineral Reserves International Reporting Standards for Exploration Results, Mineral Resources and Mineral Reserves. The body responsible for publishing and maintaining the CRIRSCO International Reporting Template ('CRIRSCO Template'). The member organisations of CRIRSCO are known as National Reporting Organisations (NROs) from 7 countries and regions (including Europe) and each is responsible for developing and maintaining a code or standard incorporating the CRIRSCO definitions and principles alongside national or regional regulatory requirements.
ECOSOC	Economic and Social Council, the United Nations organ facilitating international cooperation on standards-making and problem-solving in economic and social issues.
EDMED	European Directory of Marine Environmental Data.
EEZ	A sea zone prescribed by the United Nations Convention on the Law of the Sea over which a sovereign state has special rights over the exploration and use of marine resources, including energy production from water and wind. It stretches from the baseline out to 200 nautical miles from its coast. In colloquial usage, the term may include the continental shelf.
EFG	European Federation of Geologists.
EGDI	European Geological Data Infrastructure. Proposed infrastructure to enable European geological surveys to serve and maintain INSPIRE-compliant, interoperable geological data and information reflecting understanding of the subsurface.
EGRC	Expert Group on Resource Classification of the UN Economic Commission for Europe.
EGS	EuroGeoSurveys, the Geological Surveys of Europe, a not-for-profit organisation representing 33 National Geological Surveys and some regional Surveys in Europe.

Abbreviation	Definition
EIONET	A partnership network of the European Environment Agency (EEA) and its member and cooperating countries. It consists of the EEA itself, six European Topic Centres (ETCs) and a network of around 1000 experts from 39 countries in over 350 national environment agencies and other bodies dealing with environmental information.
EIP-RM	European Innovation Partnership - Raw Materials; one of the EU innovation initiatives addressing fundamental trans-national challenges, in this case, raw materials supply.
EMODNET	European Marine Observation and Data Network.
ESMA	European Securities and Market Authority. An independent EU Authority that contributes to safeguarding the stability of the European Union's financial system by ensuring the integrity, transparency, efficiency and orderly functioning of securities markets, as well as enhancing investor protection.
EURMKB	EU Raw Materials Knowledge Base, one objective noted in the European Innovation Partnerships - Raw Materials Strategic Implementation Plan (EIP-RM SIP).
EWC-Stat code	Substance-oriented classification system for publication of wastes at European level. Translation is generally made from (source-oriented) data collected according to LoW (see **LoW**) codes using the document Eurostat (2010), 'Guidance on classification of waste according to EWC-Stat categories'.
FRB	Fennoscandian Review Board.
INSPIRE	Infrastructure for Spatial Information in the European Community. The INSPIRE Directive in Europe establishes an infrastructure for spatial information to support community environmental policies and policies or activities that may impact on the environment. The purpose of the INSPIRE Directive is to ensure that the spatial data infrastructures of the Member States are compatible and usable in a community and trans-boundary context.
ISO	International Standards Organisation.
ISPRA	ISPRA Ambiente, the Italian Environment Agency.
JORC	Joint Ore Reserves Committee. A body managing the JORC Code which is the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. JORC is a member of CRIRSCO, being the National Reporting Organisation for Australasia. Reports prepared in accordance with the JORC Code and issued with a certificate of consent from the Competent Persons who prepared them are accepted by all major international stock exchanges including those regulated by ESMA in Europe.
LFD	EU Landfill Directive (1999/31/EC) of 26 April 1999 on the landfill of waste.

Abbreviation	Definition
LoW	List of Wastes described in the European Waste Catalogue as mandated by Commission Decision of 3 May 2000 replacing Decision (94/3/EC) pursuant to Article 1(a) of Council Directive (75/442/EEC) on waste and Council Decision (94/904/EC) establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive (91/689/EEC) on hazardous waste. (The 'list of wastes' also known as LoW codes.)
MWD	Mining Waste Directive. Directive 2006/21/EC on the management of waste from extractive industries and amending Directive 2004/35/EC.
NAEN	Russian Code for the Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves, published by The Society of Russian Experts on Subsoil Use (see OERN). Reports prepared in accordance with the NAEN Code and issued with a certificate of consent from the Competent Persons who prepared them are accepted by stock exchanges including those regulated by ESMA in Europe.
NACE	Nomenclature statistique des Activités économiques dans la Communauté Européenne; the digital coding system used for statistical classification of economic activities in the European Community.
NRO	National Reporting Organisation.
NUTS	Nomenclature of territorial units for statistics; a hierarchical system for dividing up the economic territory of the EU for the purpose of: The collection, development and harmonisation of EU regional statistics; socio-economic analysis of the regions; and framing of EU regional policies. It comprises NUTS 1: major socio-economic regions; NUTS 2: basic regions for the application of regional policies; NUTS 3: small regions for specific diagnoses.
OERN	Society of Russian Experts on Subsoil Use. This organisation is a member of CRIRSCO, representing Russia, which has defined and maintains the NAEN Code.
OGC	Open Geospatial Consortium. An international voluntary consensus standards organisation encouraging development and implementation of open standards for geospatial content and services, GIS data processing and data sharing.
OCT	Overseas Countries and Territories. Twenty five territories that have a special relationship with one of the member states of the EU: twelve with the United Kingdom, six with France, six with the Netherlands and one with Denmark. They are listed in Annex II acc. to Article 198 of the Treaty on the Functioning of the European Union.
PERC	Pan-European Reserves and Resources Reporting Committee. A not-for-profit organisation responsible for the PERC Reporting Standard, which incorporates all definitions and principles set out in the CRIRSCO International Reporting Template. PERC is a member of CRIRSCO being the National Reporting Organisation for Europe. Reports prepared in accordance with the PERC Standard and issued with a certificate of consent from the Competent Persons who prepared them are accepted by all major international stock exchanges including those regulated by ESMA in Europe.

Abbreviation	Definition
PRMS	Petroleum Resources Management System. A petroleum resources classifications framework sponsored by a range of industry bodies but published by the Society of Petroleum Engineers (SPE).
RMI	Raw Materials Initiative. An integrated EU strategy to address raw material availability, use and recovery that ties together various EU policies and promotes further cooperation between the Member States where appropriate. (See COM(2008)0699 of 4 Nov 2008.)
RMKB	Raw Materials Knowledge Base. An EU-level initiative to aggregate data and information on raw materials from different sources in a harmonised and standardised way. (Action II.C (*II.8*) of the EIP-RM.)
RPO	Recognised Professional Organisation.
SAMREC	The South African Mineral Resource Committee. A working group under the joint auspices of the Southern African Institute of Mining and Metallurgy and the Geological Society of South Africa. Responsible for the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves ('SAMREC Code'). SAMREC is a member of CRIRSCO being the National Reporting Organisation for South Africa. Reports prepared in accordance with the SAMREC Code and issued with a certificate of consent from the Competent Persons who prepared them are accepted by all major international stock exchanges including those regulated by ESMA in Europe.
SIP	The Strategic Implementation Plan of the European Innovation Partnership on Raw Materials (EIP-RM).
SPE/PRMS	Society of Petroleum Engineers/Petroleum Resources Management System.
UNCTAD	United Nations Conference on Trade and Development.
UNEP	United Nations Environment Programme.
UNFC	United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources.
WFD	EU Waste Framework Directive, (2008/98/EC) of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.

Table 2: Glossary of terms used within the study

Term	Definition
'A-waste' facility	More formally, a 'Category A Waste Facility', as defined in Annex III of the Mining Waste Directive (2006/21/EC) identifying waste facilities of high risk potential based on possible mal-operation, technical failure or on certain substances exceeding a defined threshold value.

Classification system of mineral resources and reserves	A classification system of resources and reserves is a scheme which allows the identification and recording of estimates of geological information (optionally with other parameters relevant for the intended audience and intended use of the information) each labelled to indicate 'essential characteristics' such as gradations of confidence in geological knowledge, technical and economic considerations, thus aiding decision making regarding the resources and reserves so described. (Working definition for the purposes of this study) All Reporting Standards and Reporting Codes include a system for the classification of mineral resources and reserves. Examples include the UNFC-2009 (United Nations Framework Classification), the PERC reporting standard 2013 (Pan-European Standard for Reporting of exploration results, mineral resources and reserves), and the JORC Code (the Australasian code for reporting of exploration results, mineral resources and ore reserves).
Competent Person (CP) **also** **Qualified Person (QP)**	A Competent Person is a minerals industry professional responsible for the preparation and/or signing off reports on exploration results and mineral resources and reserves estimates and who is accountable for the prepared reports. A Competent Person has a minimum of five years' relevant experience in the style of mineralisation or type of deposit under consideration and in the activity which that person is undertaking. A Competent Person must hold acceptable qualification titles as listed in all Reporting Codes and Reporting Standards *(NRO Recognised Professional Organisations with enforceable disciplinary processes including the powers to suspend or expel a member)* and thus is recognised by governments, stock exchanges, international entities and regulators. The use of a Competent Person is required by all CRIRSCO aligned Reporting Codes and Reporting Standards.
Construction minerals	Natural aggregates, recycled and manufactured aggregates, clays and gypsum, and building stone used for a wide range of construction purposes. These uses may be either directly as aggregates (e.g. sand and gravel) or in making cement, lime, concrete, plasterboard, bricks, asphalt mixes for surfacing roads and other building products. Natural aggregates include crushed rock of sedimentary, igneous and metamorphic origin.
Energy minerals	Non-renewable energy sources of both inorganic and organic origin in the earth's crust in solid, liquid and gaseous form. They are used in the production of electricity, as fuel for transportation and for heating. Examples included coal, oil and natural gas.
EU-level	Referring to overarching communal policies, systems or processes that are driven towards, embraced or adopted by - as a minimum - the EU Member States, and which may be adopted voluntarily by neighbouring or accession states.
(EU) Member States	Member countries of the European Union – currently comprising 28 countries. As of July 2013 these are: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom.

Eurostat	The statistical office of the European Union. Its task is to provide the European Union with statistics at European level that enable comparisons between countries and regions.
Flow	In the context of material streams (raw materials, secondary raw materials, wastes etc.) or their components, this is the mass per unit time (e.g. tonne per annum) passing through a defined point or set of points or boundary (e.g. waste collection facilities) in a system (i.e. production, consumption and waste). (Compare **Stock**.) It is obligatory under the EU Waste Framework Directive that States submit key flow data, such as waste flow data, to Eurostat at national or regional level according to source, type and treatment option.
Heap leaching	The technique of mineral recovery by application of a leach solution or solvent to mined ores deposited on an impervious membrane in order to extract specific components.
In-use materials	Term used to describe stocks of elements or compounds embedded in products still in use: consumer goods, industrial products and infrastructure (working definition for the purposes of this study). Within this study, these would not be designated as Secondary Raw Materials until they had entered the waste system.
Industrial minerals	Industrial minerals are minerals that are neither metallic nor energy related that are valued for their physical or chemical properties in a range of industrial applications. 'Physical' minerals include baryte, bentonite, graphite, kaolin, diatomite, feldspar mica, silica, and talc; whilst 'chemical' minerals include fluorspar, potash, magnesite, salt and others. These appear in a range of industrial applications such as the manufacture of chemicals, glass, paints, plastics and paper. Industrial minerals include 'construction minerals' used for non-construction purposes, such as gypsum and limestone. For the purposes of this study, gemstones are included in this group.
Marine minerals	Minerals obtained from the marine environment.
Metadata	Information describing datasets and data services and making it possible to discover, inventory and use them.
Metalliferous minerals	Minerals or aggregates of minerals from which metal can be extracted. Metals may be present either in their native form (e.g. gold, platinum), but more commonly as oxides, sulphides, sulphates, silicates etc. They include semi-metallic elements or metalloids (e.g. antimony, arsenic, germanium), which are frequently intimately associated with metals. For the purposes of this study, metalliferous minerals used for non-metallic purposes (e.g. ilmenite) and in energy production (e.g. uraninite) are included in this group.
Mineral Reserve	The term is synonymously used for 'mineral reserve', 'probable mineral reserve' and 'proved mineral reserve'. 'Probable' and Proved' reflect increasing relative amounts of geological knowledge.

	The standard CRIRSCO definition is: *"A Mineral Reserve is the economically mineable part of a Measured and/or Indicated Mineral Resource.* *It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors.* *Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified".* N.B. Note that, within the Minventory portal, where indicators show presence of reserve data in a country by mineral, due to variations in State practice, this definition may not be the interpretation used by the State in question. Refer to the actual template, standard or code declared for that State.
Mineral Resource	The term is synonymously used for 'mineral resource', 'inferred mineral resource', 'indicated mineral resource' and 'measured mineral resource'. 'Inferred', 'Indicated', and 'Measured' reflect increasing relative amounts of geological knowledge. The standard CRIRSCO definition is: *"A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction.* *The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling."* N.B. Note that, within the Minventory portal, where indicators show presence of resource data in a country by mineral, due to variations in State practice, this definition may not be the interpretation used by the State in question. Refer to the actual code, template or standard declared for that State.
National Expert on mineral resources and reserves estimation	The role of a National Expert is to produce mineral resources and reserves estimates using a national system of reporting, for the purpose of producing public authority reports and/or to assimilate information on mineral resources and reserves from data originators (for example, the minerals industry). These reports will comply with the national Reporting Code (if in use) or alternatively internal documented procedures which ensure consistency in the presentation of results. This task may involve, for example, statistical analysis and interpretation, data aggregation and addressing confidentiality issues. A National Expert is accountable for the prepared reports and must hold acceptable qualification titles as requested by the national authorities and where relevant the national Reporting Code. Therefore a National Expert is recognised by governments, international entities and, if they meet the requirements for a Competent Person, financial regulators.

Neighbouring countries	Countries neighbouring or closely associated with the EU28: Albania, Belarus, Bosnia, and Herzegovina, Greenland, Iceland, FYR Macedonia[7], Moldova, Montenegro, Norway, Serbia, Switzerland, Turkey and Ukraine. Data may not be present for all of these in all sections of the portal.
Non-energy minerals	All minerals except energy minerals. The non-energy minerals are divided into three sub-groups: construction minerals, industrial minerals and metalliferous minerals.
Open data	Data placed freely in the public domain from any source.
Other information	For the purposes of this study, any other data relevant to primary raw materials reserve and resource evaluation e.g. mineral resource maps, mineral occurrences databases, mine and quarry information, excluding statistical data on resources and reserves, but including statistical production data.
Overseas territories	Territories under the jurisdiction of the EU28, but which do not form part of them.
Primary raw materials	A primary raw material is a natural inorganic or organic substance, such as metallic ores, industrial minerals, construction materials or energy fuels, used for the first time. This may include previously unexploited raw materials from formerly abandoned mines. The scope of this study excludes agriculturally derived substances and energy reserves and resources. (Definition adapted from the INSPIRE Directive (2007/2/EC).)
Private data	Data held confidential to any organisation, public or privately owned, that is not openly and freely available.
Public authority reporting	Referring to data published in the public domain by Public Authorities comprising: (a) any government or other public administration, including public advisory bodies, at national, regional or local level; (b) any natural or legal person performing public administrative functions under national law, including specific duties, activities or services; and (c) any natural or legal person having public responsibilities or functions, or providing public services under the control of a body or person falling within (a) or (b). (Definition adapted from INSPIRE Directive (2007/2/EC) removing restriction that said authorities are acting only in "relation to the environment".)

[7] To avoid confusion with the Macedonian region of Greece, Macedonia is referred to as the Former Yugoslav Republic of Macedonia or FYR Macedonia for short.

Public reporting	Reporting of resource and reserve data by companies to stock exchanges and other financial/regulatory authorities.
Raw materials	As defined by the EU Raw Materials Strategy (COM (2011) 0025 final). Raw materials include metalliferous minerals, industrial minerals, and construction minerals but for the purposes of this study exclude wood and natural rubber.
Reporting Code	A code of practice that sets the minimum requirements for reporting mineral resources and reserves. Reporting Codes are incorporated within the laws of a particular jurisdiction and therefore provide a mandatory system for the reporting of mineral resources and reserves. In many cases Reporting Codes are used at national level for public authority reporting (national Reporting Codes). However, well-established national Reporting Codes, such as the JORC code, NI43-101, SAMREC and NAEN code, aligned to the CRIRSCO reporting template are recognised for use in public reporting of mineral resources and reserves used for financial markets. A Reporting Code incorporates two parts: • A classification system: which allows the organisation of different levels of geological data in relation to levels of confidence and different degrees of technical and economic evaluation. • The reporting rules: which prescribe the underlying principles on the reporting of mineral resources, mineral reserves and exploration results based on the reporting terminology and categorisation set by the Reporting Code classification system.
Reporting Standard	A code of practice that sets the minimum requirements for reporting mineral resources and reserves. Like a Reporting Code, a Reporting Standard is recognised by an official body such as a stock exchange regulator for use by companies or other entities in public reporting of mineral resources and reserves. An example is the CRIRSCO aligned Pan-European Reserves & Resources Reporting Standard (PERC 2013) which is recognised by ESMA and a number of other stock exchange regulators in Europe and elsewhere. However, a Reporting Standard is not incorporated within the laws of a particular jurisdiction. This is what distinguishes it from a Reporting Code. Like a Reporting Code, a Reporting Standard incorporates two parts: • A classification system: which allows the organisation of different levels of geological data in relation to levels of confidence and different degrees of technical and economic evaluation • The reporting rules: which prescribe the underlying principles on the reporting of mineral resources, mineral reserves and exploration results based on the reporting terminology and categorisation set by the Reporting Code classification system.
Reporting template	A Template is not itself a Standard or a Code but is a prototype designed to be used in preparation of new Standards or Codes. The CRIRSCO Template is based upon an agreed set of the common features of Standards and Codes maintained by the members of CRIRSCO.

Roadmap	This refers to the Minventory Roadmap that sets out a pathway to a harmonised European database of statistical data on resources and reserves by 2020.
Russian State Reporting System	The Russian State Reporting System is derived from the reporting system originally used in the Soviet Union and some Warsaw Pact countries from the 1960s. The current Russian system is administered by the State Commission on Reserves (GKZ). The Russian classification system and variants has been aligned to the CRIRSCO Template and a conversion/bridging document exists (published on the GKZ and CRIRSCO websites)[8] to allow conversion of company and state information prepared in accordance with this system to be reported in a CRIRSCO compliant manner, and therefore in compliance with the requirements and regulations of all major international stock exchanges.
Secondary raw materials	Waste materials that have been identified for their potential for recycling or reprocessing to generate raw materials (potentially displacing the use of primary materials), for example: mining wastes, manufacturing and processing waste, including scrap, and contents of landfill. For the purposes of this study, only the long-lived, accumulated and hence permanently geo-located sources have been considered, namely mining and landfill wastes.
Solution mining	The technique of sub-surface mineral recovery by in-situ dissolution and extraction. Also known as In-Situ Leaching or In-Situ Recovery.
Spatial data	Any data with a direct or indirect reference to a specific location or geographical area; the meaning of related terms 'spatial dataset', 'spatial data services' etc. may be deduced by extension.
Statistical information on mineral resources and reserves	Numerical quantified data produced from the evaluation of mineral resources and reserves.
Stock (Inventory)	In the context of materials, this is the quantity (typically mass or volume) held at a given point (e.g. a landfill) or set of points (e.g. all waste facilities) in a system at a given time. (Compare **Flow.)**
System of reporting	The term is used in this report to describe a Reporting Code or Standard as they both serve similar purposes (i.e. the reporting of mineral resources and reserves). This term is introduced to simplify the use of the terms Reporting Code and Reporting Standard in the report, in cases where it is impossible to distinguish between the two and in particular where the harmonisation of data available across Europe is discussed since this study and consequent roadmap considers only voluntary measures by States to harmonise their systems of reporting.

[8] http://www.crirsco.com/news_items/conversion_guidelines_final.pdf

Urban Mining	The process of extracting useful materials from urban waste. (Definition taken from EC COM (2011) 0025 p.18[9].)
Waste	Any substance or object which the holder discards, intends or is required to discard. The Waste Framework Directive 2008/98/EC (see WFD) provides detail on the full scope of waste in relation to parallel Directives on the treatment of specific products and materials and the way it should be classified and reported at EU level.

1.5 Purpose and motivation for this project

1.5.1 Policy context

The need for a unified source of statistical information for non-agricultural, non-energy minerallic reserves and resources stocks within the European Union is set within an over-arching need to maintain the competitive advantage of the countries within the European Union, and to continue development of environmentally-friendly technologies. It is supported by three pillars:

A desire to access raw materials on world markets at undistorted conditions, to be achieved largely by diplomatic means.
The need for greater security of supply within the EU caused by increasing import dependence and the potential for restriction of supply or lack of fair access that puts Europe's industries at a competitive disadvantage. This is linked to a resurgence in commodity prices that is expected to persist for a substantial period and makes competitive positioning in this area of increasing importance to industry. Currently around 3% of global mining exploration takes place in Europe, and around 3% of global production[10].
The need for greater resource efficiency that will improve material security, reduce environmental impact and improve competitive positioning.

The over-arching policy goals and strategy for raw materials are set within the European Raw Materials Initiative (RMI) of 2008, which fits within the broader context of the Europe 2020 Innovation Union initiative.

In support of the raw materials initiative's second pillar, the European Commission's DG Enterprise and the Raw Materials Supply Group it chairs established the Ad Hoc Working Group on 'Exchanging Best Practice on Land Use Planning, Permitting and Geological Knowledge Sharing' in April 2009. It consisted of a mix of experts from national and regional ministries, geological surveys, extractive and downstream industries, and universities. Its

[9] COM (2008) 0025 final, European Commission (2011) 'Tackling the challenges in commodity markets and on raw materials', published 2 February 2011;

[10] Pär Weihed, Presentation at "Raw Materials for a Modern Society" workshop, Brussels, February 2011

report, 'Improving framework conditions for extracting minerals for the EU: exchanging best practice on land use planning, permitting and geological knowledge sharing'[11] includes, amongst others, the following recommendations:

- The need for greater resource efficiency that will improve material security, reduce environmental impact and improve competitive positioning.
- Standardisation of the language used by Geological Surveys, for example, so that the terms reserve and resource are defined and used as such throughout Europe.
- Introducing a common European statistics sheet, as a uniform reporting system to underpin the concept of Minerals Intelligence.
- Amalgamating the data obtained through the reporting system in an EU-wide database of harmonised statistics.

The last step of the process could involve centralised data storage at an EU-level reporting agency such as Eurostat; it could also entail accessing distributed public national minerals intelligence databases maintained by the Member States (EU Geological Surveys or other relevant authorities).

With this in mind, the European Commission commissioned this work to analyse the availability of public geological and household, commercial and industrial waste data, amongst others, as a basis for an EU-level database on resources and reserves of non-energy, non-agricultural raw materials. Many different organisations, from geological survey organisations to mining companies, have amassed data with potential for inclusion in such a database. However, it is often presented in different formats using varying terminologies. An important aspect has therefore been the proposals for harmonising these protocols to ensure congruency in the presentation and use of statistical geological data. This has inevitably exposed data gaps and impediments to implementation, for which remedial measures are also suggested.

1.5.2 Policy drivers

The direct policy drivers for this study are set by the Raw Materials Initiative (RMI[12]) and the Communication on Commodity Markets and Raw Materials[13]. These were motivated by concerns over securing reliable and undistorted access to non-energy raw materials. This could be seen in an extreme form by the situation with rare earth metals, where reducing export quotas limited supply outside China and so consequently introduced a substantial price differential between products sold externally (overseas) and from those sold internally(within China). These results are detrimental to European manufacturers and consumers[14]. Similar situations, although not so extreme, are present with many of the

[11] Report by Land Use Consultants, published by DG Enterprise & Industry on 1 July 2010. Viewed at http://ec.europa.eu/enterprise/policies/raw-materials/files/best-practices/sust-full-report_en.pdf on 1 September 2014.

[12] COM (2008) 0699 final, 'The raw materials initiative — meeting our critical needs for growth and jobs in Europe'

[13] COM (2011) 0025, 'Tackling the challenges in commodity markets and on raw materials'

[14] There are a large number of analyses of the rare earths situation, for example "Lanthanide resources and alternatives" Oakdene Hollins, 2010 (for the UK Department of Transport) and "Study on rare earths and their recycling" Oeko-Institut, 2011 (for Greens/EFA Group, European Parliament)

technology metals experiencing high demand due to 'green' applications[15]. The RMI proposes action in three areas:

1. Trade and investment policy actions to promote fair access in countries where mining, extraction and processing takes place.
2. Increased use of 'secondary' raw materials and the promotion of recycling and resource efficiency to reduce demand for primary resources.
3. Increased sustainable mining, extraction, processing of European primary resources.

This study therefore covers not only data relating to primary raw materials, but also the less well quantified aspect of secondary raw materials. Under this theme, the Waste Framework Directive[16] is a response to the need both to reduce landfill as a disposal mechanism and to maximise the value of products and materials coming to the end of their use before they can reach landfill. To this end a number of 'end-of-life' Directives address best practice in recovering a range of products and materials from the waste stream with the intention to improve the recovery of 'critical' and other materials, as well as to address potential environmental hazards associated with the waste streams. It should be noted that these Directives address actions to be taken on waste flows and say nothing about the accumulations of these materials within the system or indeed about the residual fraction that may reach landfill (see section 1.5.6).

Secondary raw materials are a historic resource within abandoned or closed facilities and are also accumulating within both active mining waste facilities and landfill. Directives are in place which govern the permitting, operation, management, reporting and closure of facilities. These reporting requirements have relevance to the objective of the Minventory study. Legislation pertaining to these is summarised below (see section 1.5.5).

The above covers the motivation for a coherent raw materials knowledge base (RMKB), but equally important are the background 'technical' platforms that pursue coherent collation, distribution and use of data. Amongst the most important of these are the INSPIRE Directive and the implied needs of the European Securities & Markets Authority (ESMA).

1.5.3 INSPIRE Directive

Although covered elsewhere within this report, the INSPIRE Directive[17] forms an important framework instrument around which to motivate and build coherent statistical information related to minerals. The purpose of this Directive (in force since 15 May 2009) is to lay down general rules aimed at the establishment of the Infrastructure for Spatial Information in the European Community (INSPIRE) for the purposes of Community environmental policies and policies or activities which may have an impact on the environment. The data content of the Directive covers 34 data themes (defined in the three Annexes of the Directive) out of which

[15] See for example "Critical metals for future sustainable technologies and their recycling potential" Oeko-Institut, 2009 (for UNEP); "Assessing metals as supply chain bottlenecks in priority energy technologies" Oakdene Hollins, Hague Centre for Strategic Studies, 2011 (for Institute for Energy JRC of the European Commission)

[16] DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 on waste and repealing certain Directives; OJ L 312, 22.11.2008, p. 3–30

[17] DIRECTIVE 2007/2/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE); OJ L 331, 10.12.2013, p. 1-267

Mineral resources (Annex III) or Geology (Annex II) data themes are directly linked with the prime subject of this report. However, the scope of the study covers a multiplicity of raw materials sources, so other themes may also be relevant. A summary of such themes is given in Table 3.

Building upon infrastructures for spatial information already established and operated by the Member States, INSPIRE obliges them to make available spatial information related to reference data, environment, resources etc. on-line as web services accompanied by extensive metadata describing each available datasets. Further, datasets, as well as their metadata, have to be provided via Internet web services based on international standards ISO/OGC to ensure inter-operability within and between Member states to facilitate direct use within applications developed in any Member State.

The major components of the European 'Infrastructure for spatial information' are: metadata, spatial datasets and spatial data services; network services; agreements on sharing, access and use; and coordination and monitoring mechanisms, processes and procedures, established, operated or made available in accordance with the Directive. Since INSPIRE is a framework directive detailed provisions are included in legally binding Implementing Rules (Commission Regulations/Decisions) that were created and accepted for each of the components. Furthermore, each of the Implementing Rules is accompanied by the Technical Guidelines describing how the legally binding requirements can be technically implemented.

Table 3: Relevant spatial data themes from Annex II & III of INSPIRE

Annex/Theme	Descriptor	Relevance
(II) 4. Geology	Geology characterised according to composition and structure. Includes bedrock, aquifers and geomorphology.	Primary Raw Materials
(III) 4. Land use	Territory characterised according to its current and future planned functional dimension or socio-economic purpose (e.g. residential, industrial, commercial, agricultural, forestry, recreational).	All categories (marginal applicability)
(III) 6. Utility and governmental services	Includes utility facilities such as sewage, waste management, energy supply and water supply, administrative and social governmental services such as public administrations, civil protection sites, schools and hospitals.	Landfill Sites; Strategic Stockpiles
(III) 8. Production and industrial facilities	Industrial production sites, including installations covered by Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control and water abstraction facilities, mining, storage sites.	Primary Raw Materials; Mining Waste Facilities; Strategic Stockpiles
(III) 11. Area management/restriction/ regulation zones and reporting units	Areas managed, regulated or used for reporting at international, European, national, regional and local levels. Includes dumping sites, restricted areas around drinking water sources, nitrate-vulnerable zones, regulated fairways at sea or large inland waters, areas for the dumping of waste, noise restriction zones, prospecting and mining permit areas, river basin districts, relevant reporting units and coastal zone management areas.	Landfill Sites; Mining Waste Facilities (marginal applicability)
(III) 21. Mineral resources	Mineral resources including metal ores, industrial minerals, etc., where relevant	Primary Raw Materials; Mining Waste Facilities

	including depth/height information on the extent of the resource.	

Note: For convenience, themes from Annex I are omitted as they refer to basic geographic and ordnance survey elements that might be applicable generally to spatial descriptors.
Note: Primary Raw Materials may also include unexploited resources in abandoned mines.

The Directive does not oblige the collection of new data by Member States. However, Member states are encouraged to utilise the 'infrastructure' beyond the core scope defined by the legislation and for instance extend the data scope in order to address domain specific requirements. An example of such a theme-specific extension would be the mining waste information which is not in the core INSPIRE Mineral resources data model, but represents one of the key requirement of the EC Raw Materials initiative. The Member State obligation to provide metadata, data, services etc. according to various Implementing Rules follows the official INSPIRE roadmap accessible on the INSPIRE website (http://inspire.ec.europa.eu/index.cfm/pageid/44).

For the scope of the Minventory study the following obligatory dates are important:

- **Since 3 December 2013 all Member states already have to provide metadata** about all datasets defined by the 34 data themes (Annex I, II, III of the Directive) – thus also about the Mineral resources (Annex III) and Geology (Annex II) amongst others.
- **Since 3 December 2013 all Member states already have to provide INSPIRE based web services** for discovery, view, download and transformation if applicable, for all identified datasets – thus also about the Mineral resources (Annex III), Geology (Annex II) and others. However, the provision of data **do not yet need to conform to the "INSPIRE Data specification"** – (Commission Regulation (EU) No 1253/2013 of 21 October 2013 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC as regards interoperability of spatial datasets and services 10 December 2013).
- The deadlines for the provision of **datasets conforming** to the INSPIRE data specifications distinguish between Reference data (Annex I) and more environmental and other data (resources, statistics, facilities etc. defined in Annex II and III). Also there are different deadlines for data that are newly collected or extensively restructured and data that are currently in use. So, for potential primary and secondary raw materials data-containing schemas of Annexes II and III, the following are the obligatory deadlines for their provision:
  - 21 October 2015 for newly collected and extensively restructured datasets
  - 21 October 2020 for datasets currently in use.

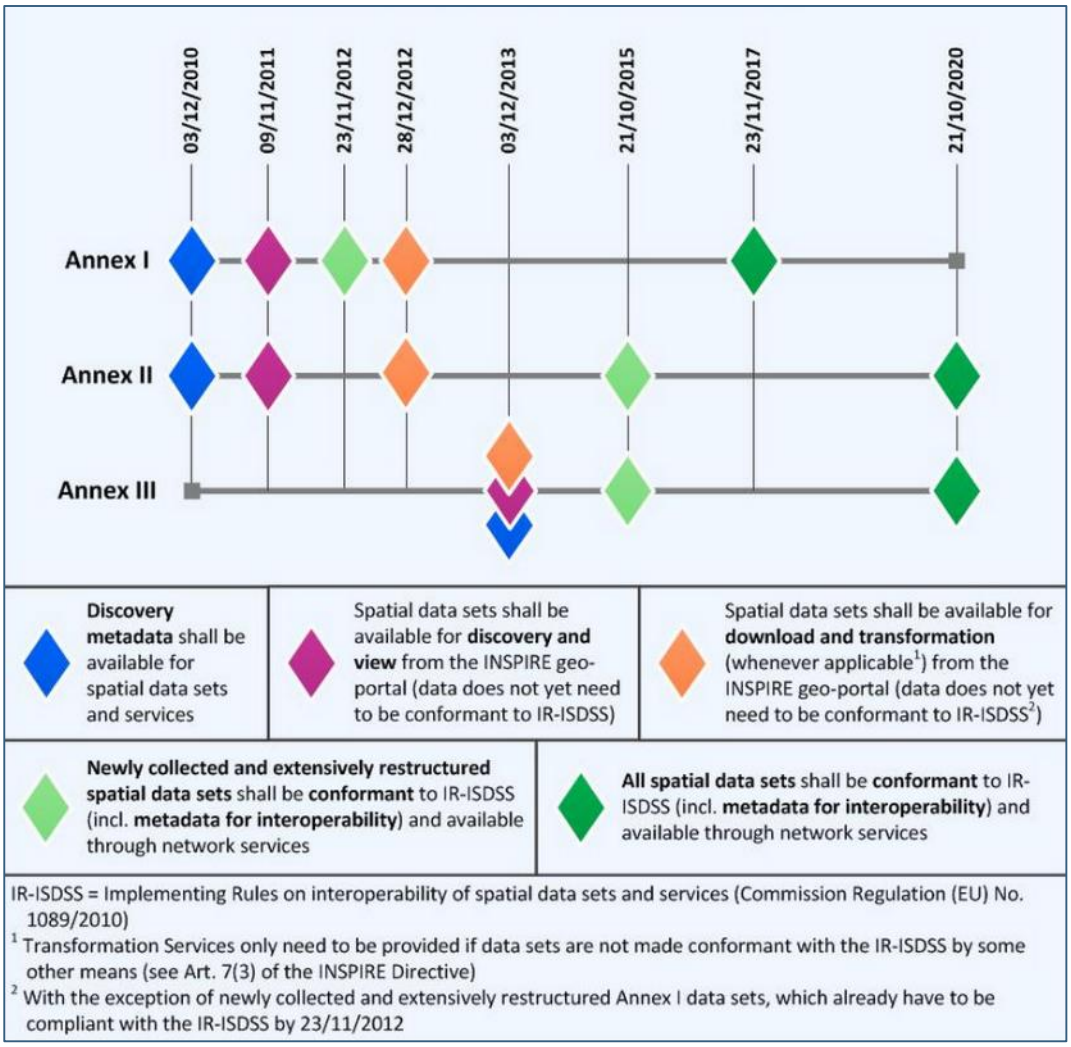
1.5.3.1 Implications

With respect to the timeline of this project, the following statements apply:

1. By the projected close of the study in December 2014, for INSPIRE Annexes I, II and III, **where available**, spatial datasets shall already be downloadable for transform from the INSPIRE geo-portal, though not necessarily conforming to IR-ISDSS. Newly collected or extensively restructured datasets from Annex I only are obliged to be available.
2. By the planning horizon of the Minventory roadmap (2020), for Annexes I, II and III, **all spatial datasets** (newly constructed or restructured historic) shall be conformant to IR-ISDSS and available through network services.

With respect to 'classification methods' (which includes reporting codes and standards under which data can be provided) there are no explicit obligations within the MineralResources INSPIRE data schema to use any particular one. However, the classification method used must be stated (it is a 'non-voidable' value). The exemplar values include PERC, JORC and CIM, but also allow a national code to be entered.

Figure 13: INSPIRE Implementation Roadmap



Source: http://inspire.ec.europa.eu/index.cfm/pageid/44

The extension to the basic schema, MineralsResourcesExtension, does include a field 'UNFClassification'. If used, a value for the UNFC codification must be provided although the allowable code values have not been listed to date.

It should be noted that these schemas also include fields and code relevant to the description of other resources within the current scope, such as mining wastes and also metal recycling wastes. It is therefore possible to conceptually describe many types of stock by use of one or more INSPIRE schemas.

1.5.3.2 Barriers

Although a powerful vehicle for presenting and communicating data in a structured format, INSPIRE on its own is considered insufficient for the harmonisation objective. This is largely because it does not stipulate explicitly the standards or process to be applied to ensure an equivalence of submitted data between States.

However, there are other considerations. For example, the mineral 'code' tables address key metals and minerals in some detail, but lack necessary detail in other, such as critical materials, like rare earths, which are lumped as a group. Although this can be fixed by extension of the schema, effort will need to be applied to define and agree better detail for a greater range of metals, ores and minerals of interest.

1.5.4 ESMA reporting

The European Securities & Markets Authority (ESMA) is the legal successor to the Committee of European Securities Regulators (CESR). Its purpose is to enhance the protection of investors and reinforce stable and well-functioning financial markets in the European Union. An independent EU authority, ESMA builds a single rule book for EU financial markets and ensures its consistent application and supervision across the EU.

In 2013, ESMA reissued CESR's recommendations for the consistent implementation of the European Commission's Regulation on Prospectuses (2004), published in 2005. These 'Recommendations' are relevant to reporting of resource and reserve potential by mining and minerals companies to the market. However, the Recommendations do not constitute European Union legislation and have been introduced by national competent authorities in their day-to-day regulatory practices on a voluntary basis. In summary they require that prospectuses for mineral companies include the following information:

1. details of mineral resources, and where applicable reserves (presented separately) and exploration results/prospects in accordance with one of the acceptable systems of reporting and/or organisations set out in its Appendix I[18];
2. anticipated mine life and exploration potential or similar duration of commercial activity in extracting reserves;
3. indication of duration and main terms of any licences or concessions and legal, economic and environmental conditions for exploring and developing those licences or concessions;
4. indications of the current and anticipated progress of mineral exploration and/or extraction and processing including a discussion of the accessibility of the deposit; and
5. explanation of any exceptional factors that have influenced (a) to (d) above.

A further ESMA communication, ESMA/2013/1896, of 9 December 2013 reinforced its recommendations in respect of systems of reporting:

> *"The reporting codes included in Appendix I of the Recommendations have been endorsed by ESMA. The codes are either aligned to the Society of Petroleum Engineers and World Petroleum Council's PRMS system (in the case of oil and gas) or, in the case of mining codes, those aligned to the international mining reporting body CRIRSCO."*

[18] Document visible at http://www.esma.europa.eu/system/files/11_81.pdf, viewed on 3 March 2014.

ESMA adopted this endorsement approach in order to foster international convergence of systems of reporting. ESMA took the view that the proliferation of many different national systems of reporting is generally undesirable and that investors are better served by international convergence, which brings with it the advantages of mutual comparability and comprehensibility. At the time, the CRIRSCO and PRMS Templates, neither of which is tied to any one jurisdiction, emerged as the only credible candidates around which resources and reserves reporting could possibly converge. Further, use of the systems of reporting endorsed by ESMA may also fulfil stock exchange reporting requirements in terms of disclosure and reporting thereby reducing any duplication of the regulatory and disclosure burden. Whether the use of such systems of reporting ensures full compliance with stock exchange reporting requirements is a matter for each individual exchange, and a future development area.

1.5.5 'Mining Waste Directive'

In the EU, wastes deriving from the extraction and refining industries are regulated under the so-called Mining Waste Directive (2006/21/EC)[19] (MWD). In this Directive, extractive waste is described as:

> *"Waste resulting from the prospecting, extraction, treatment and storage of mineral resources and the working of quarries but does not cover:*
>
> - waste which does not directly result from such activities;
> - waste which results from offshore activities; and
> - injection/re-injection of groundwater as defined by the Directive 2000/60/EC[20]."

Extractive waste includes waste rock, which is unused extraction product, and mine tailings, which are defined in the MWD as:

> *"waste solids or slurries that remain after the treatment of minerals by separation processes (e.g. crushing, grinding, size-sorting, flotation and other physico-chemical techniques) to remove the valuable minerals from the less valuable rock".*

According to Eurostat statistics, the mining and quarrying industry produced 671,810,000 tonnes of waste in 2010, in the EU-27[21]. This is equivalent to around 30% of the total waste generated in the same countries. Mining waste is a substantial part of secondary raw materials and has the potential for becoming a mineral resource. This is particularly true for older facilities where previous technologies may have not been able to recover certain materials that may now be recoverable due to advances in processing techniques.

The MWD does not specifically refer to secondary raw materials and excludes 'waste resulting from offshore' activities. It is principally focussed on 'waste management' to reduce the environmental and socio-economic impacts of extraction and processing of mineral resources, rather than the recovery of secondary raw materials or determining their

[19] Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC; OJ L 102, 11.4.2006, p.15

[20] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, OJ L 327, 22.12.2000, p. 1–73

[21] Accessed via Eurostat Mining & Quarrying Waste landing page http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/waste_generation_and_management/generation/mining_quarrying

stocks. However, some of the data requirements set out in this Directive may provide useful information in determining resource availability and may be an appropriate starting point for gathering data relevant to the raw materials database. In addition, it is possible that, within the roadmap, the scope of the Directive could be adjusted – directly or by use of supplementary guidance, perhaps in combination with INSPIRE - to include a greater emphasis on mining waste inventory assessment.

1.5.6 'Landfill Directive'

Council Directive 99/31/EC of 26 April 1999 on the landfill of waste (the 'Landfill Directive' (LFD)) entered into force on 16 July 1999. The deadline for implementation of the legislation in the Member States was 16 July 2001. The objective of the Directive is to prevent or reduce as far as possible negative effects on the environment from the landfilling of waste, by introducing stringent technical requirements for waste and landfills.

The Directive is intended to prevent or reduce the adverse effects of the landfill of waste on the environment, in particular on surface water, groundwater, soil, air and human health. It defines the different categories of waste (municipal waste, hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into land. Landfills are divided into three classes:

1. landfills for hazardous waste;
2. landfills for non-hazardous waste; and
3. landfills for inert waste.

The Directive sets up a system of operating permits for landfill sites. Applications for permits must contain amongst others the following information:

- a description of the types and total quantity of waste to be deposited;
- the capacity of the disposal site; and
- a description of the site.

In respect of the Minventory project, the Directive has relevance as far as it stipulates certain basic characterising data for landfills must be available within Member States, even if it is not publicly available or sufficient for waste stock estimation.

1.5.7 End-of-Life, material & product-oriented Directives

As mentioned in Section 1.5.2, a number of Directives have been enacted aimed at managing the end-of-life phase of high priority products and materials, and which are listed in Table 4.

Table 4: Directives dealing with specific waste materials and products

Directive
Council Directive 78/176/EEC of 20 February 1978 on waste from the titanium dioxide industry
Council Directive 91/157/EEC of 18 March 1991 on batteries and accumulators containing certain dangerous substances, and repealing Directive 91/157/EEC
European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste
Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles
Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE)

The policy context of these 'End of Life' Directives has these objectives:

- To minimise disposal to landfill.
- To promote the re-use of products and recovery of valuable materials.
- To avert hazards to the environment associated with disposal by:
    - improvement of disposal methods;
    - improvement to the design of products to enhance the ability to re-use or recycle; and
    - removal of hazardous content.

(Not all of these objectives may be applicable to all materials and products covered because of their specific features and contexts.)

The broad objective relevant to the Minventory study is therefore the minimisation of flow to landfill. Where not already in place, flows of these products and materials must be measured, collated and reported to Eurostat. For example, industrial waste materials which were characterised by a Eurostat waste code, such as titanium dioxide waste, would already be reported, whereas batteries and vehicles *per se* would not. Further, as with other waste, the sources and treatment methods and associated flows must also be recorded.

Apart from where the residue must be disposed in landfill in a defined manner because of its hazardous nature (for example, batteries and WEEE), there is no stipulation about what particular action should be taken at landfill sites (in respect of landfill data) that is any different form normal waste treatment. The Directives therefore have little relevance to the stock assessment issue, apart from ensuring a flow into landfill is recorded.

All of this flow data is available through the Eurostat web site.

1.5.8 Summary of drivers and enablers

Table 5 summarises the salient impacts of the 'external motivators' relevant to data reporting on the various themes of this study.

Table 5: Summary of impact of Directives etc.

Mechanism	Driver or Enabler	Primary RM	Mining Wastes & A-Waste facilities	Landfill
Policy Initiative	**RMI**	Establishes over-arching principle of greater resource efficiency, lower dependence on external sources and improved competiveness. Better information regarding mineral and waste resources is seen as a key enabler.		
Directive	**MWD**	Useful for ensuring sound management and basic characterisation of operating facilities. Useful for ensuring a register of high risk closed and open facilities exists. Does not enforce a characterisation protocol for inventories.		No current impact
	LFD	No current impact	Applicable to 'permanent' facilities on operating sites as they then come under the Waste Framework and the LFD.	Useful for ensuring States maintain a register of sites, but only described as hazardous, household and industrial etc.
	EoL Directive	No current impact	No current impact	Sets targets for diversion of products and materials from landfill and improves waste flow data, but has no impact on stock data availability.
	INSPIRE	Schema exist to fully describe geological and mineral properties using standardised terminology and descriptors including CRIRSCO and UNFC. Mandatory for public authority data.	Schemas exist to locate and spatially bound facilities as industrial facilities. Mandatory for public authority data.	Schemas exist to locate and spatially bound facilities as either public works or industrial facilities. Limited characterisation metadata available. Mandatory for public authority data.
Authority Code	**ESMA**	Strongly endorses the principle of 'CRIRSCO-aligned' reporting by private companies to stock exchanges.	No current impact	No current impact

1.6 Outputs of this project

The final outputs of this study are:

- A description or map of the current situation at national and, where relevant, regional level, with respect to statistical data on resources and reserves in Europe, including an assessment of the level of application of a system of reporting resource and reserve data.
- Analysis of gaps and bottlenecks in harmonising data and interoperability development, and remedial action required including:
    - reporting standards;
    - terminology;
    - data ownership;
    - inter-operability; and
    - quality control.
- A combined action plan and timeline ("roadmap") for implementation including:
    - a statement of target outcomes on the road to harmonisation;
    - options for action; and
    - target dates for achievement by 2020 or beyond.

    With consideration of:
    - How Member States might be persuaded to provide the detailed information required to a third party, while respecting commercial confidentiality.
    - Where the EU-level database could be implemented.
    - Feasibility of resources/reserves systems of reporting, including scenarios of different possibilities.
    - Ways of linking other research projects and commercial databases to the harmonisation action plan.
- An action plan to incorporate a section on resource and reserves statistics into a European Minerals Yearbook.
- A Commission portal that summarises metadata available for statistical data on resources and reserves, mining wastes and landfill, and where such data might be found.

1.7 Method and processes of the project

1.7.1 Data discovery

The basic method of this study has been to poll known or suspected data holders relevant to the themes of primary raw materials, mining wastes, and landfill stocks and waste arisings. Due to the evolving nature of the demands of the Commission, given improved knowledge of types of data held, this has been conducted in a number of phases:

- Phase 1: Essentially targeting geological surveys and relevant Ministry departments for information on primary raw materials data and – as a supplementary – knowledge of mining waste and any other wastes in the scope of this study. This latter aspect, as expected, was poorly illuminated compared to the primary materials which achieved a very high response.
- Phase 2: Used a modified questionnaire to inquire to a wider community regarding the mining waste and landfill aspects. Although sent to over 450 organisations, it achieved a very low response from relevant contributors.
- Phase 3: A highly targeted survey, broken down to address mining waste on the one hand and landfill and waste arisings on the other, specifically directed at State contacts identified by the team, and by Eurostat. This has had an improved response, though still not as great as for primary raw materials. In addition, because not all contact details were released by Eurostat, the Phase 3 survey had incomplete coverage in mining waste in particular.

Between phases 2 and 3, the team undertook substantial desk-based and internet research to attempt to fill information gaps. Because waste is highly regulated with well-established EU-level reporting requirements, it was expected that this should be a straightforward task. It is therefore instructive that it proved difficult to identify and differentiate organisations responsible for legislation, implementation and data publication, particularly in a multilingual format.

1.7.2 Portal definition

The Minventory web portal is an encapsulation of the description of metadata examined during this study and a directory with links to the relevant data-holders or owners. Its content has been agreed taking account of:

- The requirements of the Commission.
- A survey of stakeholders (users, data suppliers etc.).
- The basic metadata collected in the survey, which was feasible and practical to collate.
- Feedback from Stakeholder Meetings 2 and 3.

1.7.3 Roadmap

The Roadmap exercise draws upon a Harmonisation Issues Analysis conducted for primary raw materials and mining wastes subsequent to the three surveys of data-holders. This identified issues under the following three categories:

- Policy, legislation and regulation.
- Data quality and comparability.
- Infrastructure and access.

It assessed their severity and the motivation to address these within the framework of existing EU policies, legislation or strategic intent. See Part 3.

Landfill Wastes have been assessed by Oakdene Hollins under a looser framework that matches the state of development of data and knowledge. See Part 4.

The intent of the Roadmap is to set out a pathway to a harmonised European database of statistical data on resources and reserves by 2020. It will complement other initiatives which cover other or overlapping aspects of the intent, such as those which focus on geo-located or polygonal data (for primary ores); or materials systems analysis in the case of general materials flow in products and waste streams. The actions described in the roadmap are also compatible with obligations under various Directives related to the handling of materials and product wastes and information about them as listed in Table 6.

Table 6: Relevant Directives concerning handling of wastes and end-of-life products

Directive
Directive 2008/98/EC on waste (Waste Framework Directive)
Council Directive 99/31/EC of 26 April 1999 on the landfill of waste
Council Directive 78/176/EEC of 20 February 1978 on waste from the titanium dioxide industry
Council Directive 91/157/EEC of 18 March 1991 on batteries and accumulators containing certain dangerous substances, and repealing Directive 91/157/EEC
European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste
Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles
Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE)
Directive 2006/21/EC on the management of waste from the extractive industries (the Mining Waste Directive)

Note: The above Directives may also appeal to related Directives, Council Decisions, Regulations, Guidance and other implementing measures.

1.7.3.1 Process

Following survey and analysis of harmonisation issues, the study considered what actions would be recommended to address the issues. The ideas generation phase of this study involved a working day to review all issues and their real relevance to this aim, as wells as various motivating factors and approaches that might be taken on the path towards it.

Preliminary ideas were formulated within a stand-alone report and iterated with the Commission for feedback. The modified document was circulated to delegates prior to assessment and discussion at for Stakeholder Meeting 3.

Note that, because this roadmap has been created in line with the Commission's process requirements, it has not been through a rigorous iterative process involving a wide stakeholder community in its generation and testing (which is normally the case in roadmap exercises). Issue gathering and roadmap testing has been limited to that obtained by the surveys, Stakeholder Meetings, ad hoc consultations and involvement of the Steering Group. Therefore a firm understanding of any cost or administrative burdens imposed by these actions will naturally also be limited.

1.7.3.2 Basis for action

The underlying premise of the actions described in the roadmap is that they are voluntary and collaborative in order to maximise goodwill amongst Member States; avoid feelings of coercion; as far as possible avoid work beyond that which would be required anyway; and for agencies (and contributing private organisations) to recognise the mutual benefits of cooperation or disadvantages of not being involved.

Where actions are proposed at an 'EU level'[22], these should avoid legislation except where it builds on or clarifies existing Directives, or where it establishes non-mandatory guiding principles which are widely useful and acceptable.

In this respect, there is no intention to impose particular systems of reporting or legislative obligations upon Member States. Contribution of resource and reserve data collated and published under current systems to an EU-level database[23] is to be encouraged, but not mandated. This being said, contribution to such a database would be congruent with the longer term objectives of the INSPIRE Directive that Member States should use the to-be-established infrastructure for data and services beyond its original remit.

Further, development of an EU-level database would be assisted by States employing a system of reporting resources and reserves data compatible with those already recommended by, for example, ESMA in reporting to financial markets, aligned with the CRIRSCO Template. It must be acknowledged that, to achieve EU-level data coverage across all Member States, some translation, redaction and harmonisation would be required by States and any centralised coordinating body.

A core principle is that the outputs must be open, compatible with proposed data and reporting protocols, and applicable across all States. There is a clear role for European geological bodies, such as EuroGeoSurveys and relevant public authorities, to build support and facilitate these objectives.

1.7.3.3 Funding

The remit of this study is to define a roadmap for harmonisation that can be brought into operation by 2020. It involves a range of actions, some of which are political or consensual; they take time to complete and are less affected by available funding. This is typical of standards development and legislative change. Other actions are effort-driven, that is, they could be completed at various rates depending on the amount of funding allocated to them. This is typical of work involving data synthesis and conversion, filtering, manual harmonisation and research.

With respect to political actions we make no assumptions about how these are funded.

With respect to effort-driven actions, there is clearly uncertainty on the priority Member States or their agents will put on this work, especially where compliance is not required. We assume Member States will voluntarily assign a moderate effort in line with perceived benefits, but not at a level disruptive to normal practice without a strong case for action.

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[22] 'EU level' is taken to mean supra-national, mutually agreed collaborative initiatives between consortia of Member States (preferably all, including sub-regions) that address the harmonisation objective.

[23] The term 'database' does not imply a single coherent managed data repository; it could entail multiple, multi-format, distributed, owner-managed data sets contributed and accessed via, for example, an INSPIRE-compliant data service.

What can be achieved with this effort we are unable to estimate due to the very different statuses of data provision, reporting formats and overall funding available in each Member State. The representatives of various geological surveys have, however, applied their judgement about the complexity of initiating and executing the various data projects proposed in the roadmap, which may be contingent on supporting actions, such as terminological convergence, for example.

Such projects have a natural minimum length to conceive and gather momentum. With supplementary financial support, timescales can be accelerated somewhat but, more importantly, the extent of data transformation handled can be extended. For example, if the targets of data harmonisation have been prioritised, more of the lower priority data could be transformed. If this is the case, the 2020 timescale is likely to be met.

All mechanisms for assisting the harmonisation process were considered, including:

- Voluntary funding by Member States.
- Funding from the Commission to each Member State.
- Use of network, innovation and research funding mechanisms such as Horizon 2020, including on-going and proposed initiatives.
- Voluntary contribution from private companies and data holders.

1.7.4 Vision and timescale

A harmonised statistical database is an explicit requirement of the EU's Raw Materials Initiative, which is part of the EU 2020 Flagship Initiative on a Resource Efficient Europe. We envisage an output that embodies the use of common standards and practices that would facilitate the exchange and exploitation of available geological data.

This database will complement other relevant datasets (e.g. those provided via ProMine, EuroGeoSource, GIS Central Europe, OneGeology Europe, Minerals4EU…) and integrate with data storage and delivery mechanisms within the context of existing Directives (INSPIRE, Directive 2007/2/EC) or the proposed (but not funded) European Geological Data Infrastructure (EGDI).

This can most feasibly be achieved for primary resources and reserves data. However, within the 2020 timescale, the system should at least manifest mining waste locations and inventories along with archive data on waste, and move towards a common system of reporting for secondary raw materials which is aligned to primary resources. Priority potential landfill resources should be included, although substantial work is needed to bring terminology into line with primary resources, most feasibly for industrial and mining wastes.

Because the focus of this study has been on what can be achieved via public authority reporting, it is likely that the first evolution of a statistical database will concentrate on collating an EU-level mineral assets overview, by State. Aggregated data from States would be made public, having first been through any necessary redaction process. (It might be expected that this data will contain inaccuracies, be incomplete or non-compliant with CRIRSCO-aligned reporting in the first instance.) Achieving such an outcome for raw materials statistical data is consistent with the Minerals4EU project objectives.

In time, the statistical database could accept data retrieved from public reporting to stock exchanges. This would almost certainly be CRIRSCO-aligned if it follows ESMA guidelines. However, the data wouldbe declared at the deposit or mine level. It would therefore be a different level of detail from public authority reporting, and would necessarily be only a

fractional – if detailed – view of a State's mineral assets. Forming a complete view will be a long process, and might best be integrated into parallel mineral and geological data capture systems.

Outlines for broad outcomes are presented within each of the materials sections covered in Parts 2, 3 and 4.

N.B. Within the Harmonisation Issue Analysis and Roadmap sections of this report, we refer to the 'harmonisation project'. This phrase is not intended to imply that there is an established remit, scope, plan and financial resources allocated to achieve data harmonisation, but rather describes – in the French sense – a concept, aspiration or movement around which the Member States can – on a voluntary basis – congregate and take stepwise actions as suggested in the Roadmap.

1.7.5 Consultation

Consultation within this study has been enacted through the following actions:

- Continual dialogue with the Commission client regarding the study content, interpretation of brief, inclusion of ongoing and emerging initiatives and testing of outputs.
- Engagement within the project consortium to identify key knowledge and contacts and to identify relevant practices from elsewhere, such as in private data companies.
- Assembling a 'Steering Group' representing stakeholders, data providers and related service providers in the raw materials domain who can review the interim reports and suggest corrections, additions or other improvements.
- Discussion with EU-level bodies such as Eurostat and the European Environment Agency (EEA) which have a brief to provided data access to communities of interest, often amalgamating and harmonising from Member State sources.
- Conducting three Stakeholder Meetings at key stages to expose the study to external review, gather feedback on findings, their implications and – importantly – test the feasibility and validity of the resulting roadmap as well as the metadata portal.

1.8 Geographical scope

This study relates to minerals and materials within the EU28 (listed in Table 7, current 1 July 2013). Neighbouring countries including accession and candidate states are included.

Table 7: Geographical scope of the study (European core)

EU 28				
Austria	Belgium	Bulgaria	Croatia	Cyprus
Czech Republic	Denmark	Estonia	Finland	France
Germany	Greece	Hungary	Ireland	Italy
Latvia	Lithuania	Luxembourg	Malta	Netherlands
Poland	Portugal	Romania	Slovakia	Slovenia
Spain	Sweden	United Kingdom		
Neighbouring Countries				
Albania	Belarus	Bosnia and Herzegovina	Greenland	Iceland
FYR Macedonia	Moldova	Montenegro	Norway	Serbia
Switzerland	Turkey	Ukraine		

In addition, the scope extended to determine any data held regarding overseas territories and dependencies of these states. A brief overview of their status is given below, and a full listing in section Annexe A.

1.8.1 Outermost regions

The outermost regions are nine regions of EU member states which are part of the EU.

- Portugal: Azores and Madeira.
- Spain: Canary Islands.
- France: French Guiana, Guadeloupe, Martinique, Mayotte, Réunion and Saint Martin.

According to the Treaty on the Functioning of the European Union, European Union law applies to these territories with possible derogations to take account of their "structural social and economic situation ... which is compounded by their remoteness, insularity, small size, difficult topography and climate, economic dependence on a few products, the permanence and combination of which severely restrain their development ...".

1.8.2 Overseas countries and territories

The overseas countries and territories (OCT) are twenty-five territories that have a special relationship with one of the member states of the EU: twelve with the United Kingdom, six with France, six with the Netherlands and one with Denmark. They are listed in Annex II acc. to Article 198 of the Treaty on the Functioning of the European Union and were invited to form association agreements with the EU and may opt into EU provisions on freedom of movement for workers (Article 202 (ex Article 186)) and freedom of establishment (Article 199(5) (ex Article 183(5))). They are not part of the EU, and EU law applies to them only insofar is necessary to implement the association agreements.

1.8.3 Marine environment

An exclusive economic zone (EEZ) is an area beyond and adjacent to the territorial sea, subject to the specific legal regime established in Part V of the United Nations Convention on the Law of the Sea under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by the relevant provisions of this Convention[24]. In the exclusive economic zone, the coastal State has sovereign rights over the exploration, exploitation, conservation and management of natural resources (living, or non-living), of the waters superjacent to the seabed and of the seabed and its subsoil, including other activities such as the production of energy from the water, currents and winds. The exclusive economic zone shall not extend beyond 200 nautical miles from the baseline from which the breadth of the territorial sea is measured. In colloquial usage, the term may include the continental shelf.

The following countries of the EU claim an Exclusive Economic Zone incorporating territorial waters registered with the UN:

- Cyprus (& Northern Cyprus (Turkey));
- Denmark (including Faroes and Greenland);

[24] United Nations Convention on the Law of the Sea of 10 December 1982, Part V-Exclusive Economic Zone and Part IV – Continental Shelf.

- France (including all overseas territories and dependencies);
- Germany[25];
- Greece;
- Norway;
- Poland;
- Portugal (including Azores and Madeira);
- Sweden; and
- United Kingdom (including all overseas territories and dependencies).

The Marine Geology Expert Group of EuroGeoSurveys undertook to distribute a survey - compiled by BGS - to its membership for a targeted understanding of the availability of marine resource data. Returns were received for Ireland, the Netherlands, Norway, Spain, Sweden and the Ukraine. Information on the UK was collated directly by the BGS Minventory study members. Country summaries include information received on marine mineral resources. Note that some respondents do not have registered EEZs; their returns relate to coastal waters.

From the above listed countries, Denmark, France, Poland, Sweden and the United Kingdom collect statistical data on offshore non-energy minerals. This is almost exclusively related to marine dredged sand and gravel. Norway only publishes analyses of offshore energy minerals[26]. These data are summarised in *Annexe B: Marine data suppliers*.

[25] Germany presents a good example of the interpretation of the Convention. It claims the 12 nm territorial sea and additionally the 200 nm EEZ. In the area of the North and Baltic Seas, the German EEZ is largely identical with the continental shelf, which is the sea floor extending 200 nm from the coastline. In the Baltic Sea, the EEZ is much smaller than in the North Sea because it is limited by the EEZs of neighbouring states (Denmark, Sweden, Poland…). See http://www.bsh.de/en/Marine_uses/Industry/Wind_farms/EEZ.jsp retrieved 5 November 2014.

[26] The Norwegian Petroleum Directorate manages complete seismic and well data collected in conjunction with the petroleum activities on the Norwegian Continental Shelf, most of which is made public on commercial terms. The observations register the geometries and properties of the subsoil, not limited to petroleum accumulations.

1.9 Scope of raw materials and stocks

1.9.1 Included raw materials

The following table lists the range of raw materials which have been surveyed under the scope of work. This list is taken from the materials specified by the Raw Materials Initiative (COM (2008) 699 final) on land and in marine environments.

Table 8: Raw materials (minerals) included within the survey of primary raw materials and the metadata portal

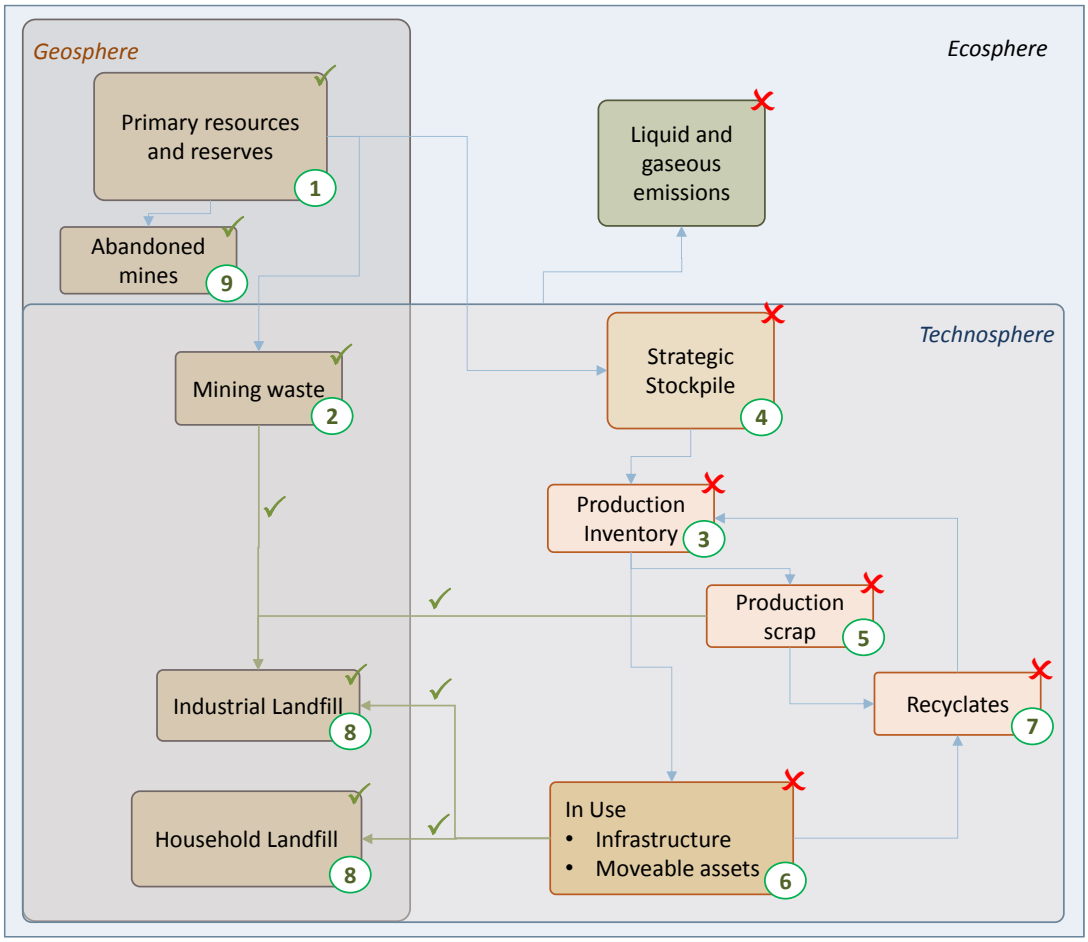
Metalliferous minerals				
Antimony	Bauxite	Cadmium	Chromium	Cobalt
Copper	Gallium	Gold	Indium	Iron Ore
Lead	Manganese	Molybdenum	Nickel	Niobium
Platinum Group Metals*	*Rare Earth Elements**	Silver	Tantalum	Tin
Titanium	Tungsten	Vanadium	Zinc	
Construction minerals				
Aggregates, sand & gravel	Aggregates, crushed rock	Building stone	Clay (e.g. brick clay)	Gypsum
Limestone / Dolomite				
Industrial minerals				
Baryte	Bentonite and Fuller's Earth	Diatomite	Graphite	Feldspar
Fluorspar	Kaolin	Lithium minerals	Magnesite	Mica
Potash	Talc			

*Note: *Platinum Group Metals include platinum, palladium, ruthenium, rhodium, iridium and osmium.*
*Note: **Rare earth elements include yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium and lutetium. Scandium is also included in this definition, but considered separately within the analysis.*

1.9.2 Included stocks

The brief of this study included primary raw materials, secondary raw materials and, as a scoping exercise, in-use materials. Of course, the entire geo- and techno-sphere contains innumerable stocks located – theoretically – at every user or processor of material. However, to focus the analysis, we refer to Figure 14 which summarises the major stocks and flows and indicates where effort has been directed in this study. Further explanation of terminology and justification of the scope follows together with supporting analysis.

Figure 14: Location of materials included in scope of project



Source: Oakdene Hollins

1.9.3 Primary raw materials

The major effort of this study has been directed at the metadata relevant to primary raw material statistics (resources and reserves). Primary raw materials is a widely understood term, but for clarity, for the purposes of this project, are defined as:

> *"Primary raw material is a natural inorganic or organic substance, such as metallic ores, industrial minerals, construction materials or energy fuels."*[27]

Since the remit of the current study embraces predominantly mineral resources, energy and agricultural primary raw materials were not in scope and therefore not evaluated. Primary raw materials arise within virgin ores and rocks, including the unexploited components of abandoned mines. Accordingly, this scope corresponds to the following elements of Figure 14:

[27] Adapted from the INSPIRE Directive, (2007/2/EC)

- Primary resources and reserves ①.
- Abandoned mines ⑨ (in respect of un-mined components).

Information collection and subsequent analysis was directed at all countries listed in Table 7, page 63.

Another dimension related to whether the mineral resources and reserves were located on land or in a marine environment (territorial waters). Whilst statistical data on marine resources is limited and diversely captured, we have assembled information on known providers. The Minventory metadata portal has been designed to cater for all these aspects.

1.9.4 Secondary raw materials

Although no formal definition exists, the concept of secondary raw materials has existed since at least 1979 within the decision to set up a Community research programme 'Adopting a multiannual research and development programme (1979 to 1982) for the European Economic Community in the field of the recycling of urban and industrial waste (secondary raw materials)'[28]. This document sets a precedent by placing secondary raw materials in the context of "urban and industrial wastes".

Since that time a number of Decisions, Opinions, Directives and Working Documents have used both the term secondary raw materials and secondary materials in similar contexts, so it is clearly the implication that these relate to waste materials that could be reused and reprocessed to generate recyclates (or 'products') of a secondary nature that could displace 'primary' raw materials, that is, virgin mineral deposits, petrochemicals and other sources. (Note that the scope of materials here goes beyond mineral resources.)

For example, the own-initiative Opinion of the European Economic and Social Committee (CCMI/078) refers to "Scrap iron and steel, non-ferrous scrap and other waste streams containing such metals, recycled paper, glass, and plastic waste...[and] non-ferrous metals can be found in the old mining residuals in the EU ore mining areas" in this context. As recently as 2014, the call for proposals and related activities under the 2014-15 work programmes under Horizon 2020 — the Framework Programme for Research and Innovation (2014-20) and under the Research and Training Programme of the European Atomic Energy Community (2014-18) complementing Horizon 2020[29] links secondary raw materials to 'urban mines'.

Questions posed to the Commission have queried the definition and application of the terms, but without definitive resolution. Examples are the Written Question No. 801/93 by Sir James Scott-Hopkins to the Commission 'Definition of secondary raw materials' (text not available online); and Written Question No. 1999/96 by Karin Riis-Jørgensen to the Commission 'Definition of secondary raw materials and waste' (Q1)[30], highlighting the absence of a definition of secondary raw materials within Directive 91/156/EEC.

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[28] 79/968/EEC: Council Decision of 12 November 1979 adopting a multiannual research and development programme (1979 to 1982) for the European Economic Community in the field of the recycling of urban and industrial waste (secondary raw materials); OJ L 293, 20.11.1979 p. 0019 - 0022

[29] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2110-waste-4c-2014.html; OJ C361/9 of 11 December 2013

[30] WRITTEN QUESTION No. 1999/96 by Karin RIIS-JØRGENSEN to the Commission. Definition of secondary raw materials and waste ; OJ C 385, 19.12.1996, p. 75

Annexe C: Secondary Raw Materials definition – terminology review presents a more comprehensive list of references and presents further the context of use of secondary raw materials and secondary materials as terms. It also outlines some of the uncertainties and ambiguities in their use which need resolution if they are to be used more formally.

The terms have utility in broadly describing the provenance and intent of waste (used materials and products) and derived reprocessed materials, but are not precise enough to cover the range of sources and applications which might be described more formally within legal, permitting and reporting frameworks.

Within the scope of this project, whilst acknowledging the potentially broad scope of secondary raw materials, a more limited perspective has been taken. These limitations are for pragmatic and utilitarian reasons. In essence, the study focuses on waste streams that have been consigned to waste within fixed, long-term, accumulating storage such as landfill, spoil heap or equivalent, rather than the dispersed, transient and relatively fast-moving production scraps and product-oriented wastes targeted by various End-of-Life Directives. Such accumulations are the less well-characterised elements and so offer greater opportunity for improvement of information provision in raw material resource and land use planning, a key objective of the study.

1.9.4.1 Proposed scope of secondary raw materials

Taking account of the intent derived from the previous uses of the term, a working definition of secondary raw materials is:

> *"Waste materials that have been identified for their potential for recycling or reprocessing to generate raw materials (potentially displacing the use of primary materials), for example: mining waste, manufacturing and processing waste, including scrap, and contents of landfill."*

With respect to Figure 14, the elements potentially covered by this are:

- Mining waste facilities. ②
- Landfill, municipal and industrial. ⑧
- Accumulations of processing wastes & scraps (at various points in the manufacturing process) and recyclables/recyclates[31]. ⑤ and ⑦

However, considering the salient features of the Minventory objective, namely to characterise significant stocks of geo-located materials (primary or otherwise) a subset of secondary raw materials has been examined in this study. As described above, only the long-lived, accumulated and hence permanently geo-located sources have been considered, namely mining wastes and landfill.

It should be noted that materials in Abandoned Mines ⑨ are not considered within the scope of secondary raw materials despite Abandoned Mines being in the scope of the Mining Waste Directive. This is because they are primarily stocks of unexploited and previously uneconomic primary raw materials. In reality, since most abandoned mines are historic, they do often have a legacy of poor environmental practices, perhaps involving mismanaged

[31] Recyclates are commonly understood to be the outputs from a recycling process i.e. the marketable products. (Recyclables are the inputs). E.g. UK's Defra: "Amendment to Environmental permitting (England & Wales) Regulations 2010 - new schedule for Materials Recycling Facilities (MRFs); Effect of measure: To provide mandatory measuring of Materials Recycling Facilities recyclate outputs.", into force 31 Jan 2014, as a result of EU regulation change.

waste handling, which does lead to ongoing environmental hazards. As such, hazard assessments under the MWD may have revealed such waste accumulations. Although they are captured within the mining wastes aspect of this study, it is not anticipated that they will present a significant source of secondary raw materials, but may in time be revealed as viable primary sources and hence are assumed to fall under the scope of primary raw materials.

With respect to Figure 14, the first two bulleted sources (②, ⑧) above are annotated with a tick to indicate that they have been considered in the surveys undertaken during the study and in the metadata portal. Those in the last bullet have not been considered although the sources quoted (⑤, ⑦) are valid within the terms of definition used. The reasons for this are outlined below. Note that this diagram is equivalent to one that appears in the UNEP report, *Metal Stocks in Society*[32], from which the equivalent circled numbers are taken. This report similarly examined what was publicly known about these stocks and our report draws on this analysis.

It is noted that certain flows i.e. arisings sent to municipal and industrial landfill are also ticked. This is a recognition that little stock data exists, but flow data is relatively prevalent and could be used by following projects to synthesise stock data, given a baseline inventory for landfills. It is also an addition to the scope agreed with the Commission at study mid-point.

A commentary of why these stocks and flows have been selected or not follows in Sections 1.9.4.2 and 1.9.4.3. Reference is made to other work undertaken to quantify stock levels and a quantitative assay of inventories of key metals (primarily) is presented in *Annexe D: Material stocks: a review*. **This analysis has limitations: specifically the partners have been unable to locate contemporaneous flow and directly related stock data that allows a similar calculation of turnover times for aggregates.**

1.9.4.2 Secondary raw materials surveyed in this work

Mining waste facilities ② and landfill waste facilities ⑧

Mining and landfilling activities have a long history in the EU and a large number of facilities, containing significant quantities of waste, are known to be present on European territory. For example, approximately 700 million tonnes of waste were generated from mining and quarrying activities in the EU-27 (i.e. pre 1 July 2013) and 900 million tonnes of waste were disposed into or onto land in 2010[33]. These mining and landfilling sources therefore form obvious potential sources of secondary raw materials, likely accounting for years of inventory at current rates of use, and have been **prime targets for the survey and characterisation of available statistical data**.

Wastes are highly regulated within the EU to protect both the environment and human health. All waste facilities require permits in order to operate; therefore, the location of such deposits is likely to be known by the competent authorities.

For the purpose of this project, data availability on landfill and mining wastes was studied. Initial research showed that no data is available on other secondary raw material resources.

[32] Graedel, T.E. et al. (2010) METAL STOCKS IN SOCIETY; Scientific Synthesis, UNEP/IPSRM, ISBN: 978-92-807-3082-1

[33] Eurostat Environmental Data Centre. Available at: http://epp.eurostat.ec.europa.eu/. [Accessed November 2013]

Landfilling of waste and mining waste facilities are strongly regulated within Europe (see Table 6, page 60) and there are existing reporting requirements on such activities. It is therefore possible to find useful information on these resources; however, as mentioned above, these have not been previously viewed as 'resources' and data reporting is not in line with primary raw materials reporting standards or classifications.

1.9.4.3 Secondary raw materials not surveyed in this work

Scrap ⑤ and recyclables[34]/recyclates ⑦

Recyclates are materials derived from waste but which have been treated in order to be recycled or reused (often entailing so-called old scrap). Production scrap is similar representing manufacturing waste which will be recycled, often simply by being re-introduced within the manufacturing process (commonly termed new scrap).

Both these classes are therefore within the scope of secondary raw materials.

All inventories on these classes of secondary raw materials are sparse and diffusely spread amongst many thousands of organisations. This study, through research into company reports and from working knowledge of the manufacturing and recycling sectors has assessed the order of magnitude of stock. For example, in-process stocks of copper at Boliden amounts to less than 14 days of consumption. Recycling and waste collection facilities maintain around 2-4 weeks' throughput since they often operate batch-wise. Other manufacturing stocks are likely to be of the same order of magnitude. It is probable, therefore, that systemic stocks in a particular material (excluding mined ores) are less than 3 months of overall consumption.

To place this in context, for copper this would equate to 4 million tonnes globally (2010), which is around 1% of the estimated total in-use quantity and 2.5% of estimated copper in landfill. (Figures derived from reports and tables of *Annexe D: Material stocks: a review*.)

A further estimation of these 'latent' quantities specifically for the EU is presented in Table 9.

Table 9: Estimates of stocks in use within the EU (2005)

Material	EU-15 consumption 2010	Max latent stock
Iron & steel	140 Mt	35 Mt
Base metals (Al, Cu, Pb, Zn)	15 Mt	3.5 Mt

Source: USGS (2008) 'The Global Flows of Metals and Minerals - Open-File Report 2008–1355'[35]

On this basis, and given that any stock data is private to individual companies with no obligation to disclose, and that they are in essence static volumes, we propose that these stocks are not significant compared to landfill and mining wastes, were incapable of survey within the available funding and timeframe of this study and thus **formed a low priority item for evaluation**.

1.9.4.4 Out of scope of secondary raw materials

[34] N.B. Before processing into recyclates, these secondary raw materials have the potential to be recycled and hence are termed recyclable. For the purpose of this work recyclates is taken to embrace both recyclates and recyclables held at reprocessing facilities.

[35] http://pubs.usgs.gov/of/2008/1355/pdf/ofr2008-1355.pdf viewed on 16 September 2014

Strategic and commercial stockpiles ④

Strategic and commercial stockpiles are quantities of materials held by governments or companies in order to overcome material shortages in defence of commercial or national interests. These may arise from geo-political issues, or rather shorter term market supply and demand constraints. The stocks may be present as unrefined ores or as refined metals (most likely) in warehouses. Since these are effectively virgin materials, they fall outside the scope of secondary raw materials. **Therefore they are not considered within this report**.

A limited number of national studies are available to assess the magnitude of both these factors. A short review - focussing on the US policy - indicates that critical material supply disruptions of between 2 and 4 years are accommodated. Although this does not imply total supply failure, this assumption can be used to set an upper bound on any stockpile in place i.e. inventories equating to up to 4 years of use may exist, probably as refined material. We conclude that **strategic stockpiles are therefore worthy of further attention to characterise elsewhere, although they are more akin to primary raw materials than secondary ones**. However, this was beyond the scope of this study.

In process materials ③

In process stocks, in contrast, are temporarily located in storage before being recycled or used. Companies do not consider these as reserves in the sense intended by this study, but as tolerated buffers of working capital to be minimised, commensurate with mitigation of supply chain and market risks. With respect to our definition of secondary raw materials, working inventories are not potential sources of raw materials since they are being actively exploited by companies in production, and not considered as wastes. **Therefore they are not considered within the scope of secondary raw materials.**

As context, this study, through a small amount of research into company reports and from working knowledge of the manufacturing and recycling sectors has assessed the order of magnitude of stock. For example, in-process stocks of copper at Boliden amounts to less than 14 days of consumption. (*Annexe D: Material stocks: a review*)

Commercial reserve data is published by major holders of metals, such as the London Metal Exchange (LME). LME holds physical stocks on behalf of suppliers and buyers in, amongst other metals, copper. Taking this as a benchmark, average holdings have been around 3% of annual production, equating to around 10 days of use. Other stockpiles estimate this at up to 40 days' inventory, but this is still low. We conclude that (except for some very exotic materials) **commercial stockpiles are of low interest compared to other stocks.**

Inventory of materials in use ('In-use Materials') ⑥

Inventories of materials in use have undergone limited analysis by a small number of academics. They include materials immobilised in infrastructure; and those embedded in more mobile and short-lived products, be they consumer, commercial or industrial. However, since they are not assigned as waste, they do not fall under the proposed definition of secondary raw materials.

Although a consideration of in-use stocks is not a core deliverable of this project, we have completed a brief analysis of data to place the stocks in context, **which forms Part 5 of this report**. In short, data is limited, synthetic and relates to high level assessment of large nations' or continental inventories. The amounts of some materials are substantial and further quantification is recommended.

1.9.4.5 Summary of inclusion/exclusions of secondary raw materials stocks

In summary of the above analysis it was decided that the greatest return of information would be obtained by concentrating on characterising:

- ② Mining Wastes (including Category A waste facilities), Part 3.
- ⑧ Landfill (municipal, industrial), Part 4.

Therefore, ot included in the report are

- ⑦ Recyclates/recyclables (low inventory).
- ③ In-Process Materials (not a secondary material).
- ④ Strategic Stockpiles (akin to a primary material).
- ⑤ Production scraps (reused or recycled promptly).

Included as a supplement

- ⑥ In-Use Materials (summary assessment), Part 5.

Part 2: Primary Raw Materials

2.1 Availability of data

Annexe G: Availability of resource and reserve data by country and primary mineral summarises the availability of resources and reserves data by country and primary mineral commodity. *Annexe G:* is not a tabular equivalent of data that appears in the portal; it is a working summary of the collected metadata. In particular it should be read in conjunction with the detailed commentaries in *Annexe I: Compiled country summaries* from which it is derived (see below).

N.B. In addition to resources and reserves data the same Phase 1 survey questionnaire polled for information regarding the availability of **'other data**' on primary minerals relevant to mineral resource evaluation. For the majority of countries '**other data**' represents the availability of statistical data for mineral production along with non-statistical data: for example spatial datasets such as mineral resource maps and mineral occurrence databases. In parallel with portal development and Commission feedback, this **'other data'** comprises a significant resource which can be reported under a number of parameters proposed for the portal as well as appearing within a commentary section under individual countries or in relation to specific minerals within a country. This section outlines a number of pertinent background issues related to data availability.

2.1.1 Confidentiality

The table presented in *Annexe G: Availability of resource and reserve data by country and primary* mineral is colour coded to indicate whether statistical data on resources and reserves are not confidential (green), confidential (red) or partially confidential (orange). Partial confidentiality generally means that data are considered confidential for a set period of time (as an example, reserves data for Croatia are confidential for a period of five years) or data at the individual deposit level is considered confidential (for example, Austria and Hungary). Although the data will not be released by the responsible authority, it does not mean the data is always unavailable as this can potentially be sourced from the annual reports and other published documents of publicly listed companies. Notes at the bottom of the table describe the various reasons (if received) as to why data are confidential. Further information regarding confidentiality of data is contained within the *data accessibility* section of the individual country summaries presented in *Annexe I: Compiled country summaries*.

From the responses received via the questionnaires it is apparent that the majority of statistical data on resources and reserves is not considered to be confidential when reported at the national scale. Generally data for metallic minerals are considered to be confidential by more countries than data for bulk minerals (aggregates, limestone etc.). This is a reflection of the larger number of deposits and bulk mineral operators within each country which enables data to be combined at a national scale in a manner that overcomes any concerns of commercial confidentiality. For metallic minerals the fewer number of mineral operators active in any country is likely to mean that data cannot be released at a national scale in some instances.

Practical processes to redact data may exist already within States and will be influenced by a range of considerations. Confidentiality can be motivated by the commercial sensitivity or

by the liability that may arise when reporting deterministically; aggregated data at the regional or state level is likely to be non-confidential as a result of the collation of data originating from a number of different mineral operators/companies.

2.1.2 Public and private obligations

With the exception of publicly traded companies (listed on a stock exchange), which automatically publish their exploration results, in the study team's experience very few companies spontaneously provide their data, mainly because of confidentiality. This compares to companies which are not publicly listed and which, therefore, will not face such an obligation. Such a situation will have an impact in those EU countries where there is no obligation on mineral companies to report resource and reserve statistics to relevant public authorities (e.g. those countries without a mining law or other relevant legislation, or those countries where it is no obligation via the mining law/legislation).

Public authorities wanting to obtain statistical data on resources and reserves in such countries will have to also rely on those available via stock exchange reports[36] or what can be elicited by encouragement to provide in the common good. This will affect the completeness of any national inventory, but it will be less of an issue for those EU countries where reporting of resource and reserve statistical data by companies to a relevant public authority is mandated through legislation (a mining law or relevant Act).

This issue is particularly pertinent when considering stock data related to wastes as will be discussed further later. For example, the resources and reserves estimates of operating and decommissioned mines are commonly confidential to the owners of such mines. Similarly, recyclate materials are generally owned by commercial operators not Member States because of their economic value. If such data is to be accessed for a future portal, issues of confidentiality and intellectual property will need to be addressed. In addition, dependent on the country context, there can be reduced obligations for smaller operators to report, which may affect some mineral classes more than others.

2.1.3 Consultation in relation to primary data issues

2.1.3.1 Consideration of privately held data (SNL Metals & Mining)

SNL, the private financial and geological information provider (a partner in this project), has produced an assessment of the issues in making data available by private companies (see *Annexe J: Data coverage from private sources*). This is primarily from its own perspective, but the issues raised will be generic. These have been taken forward to the roadmap. In the interim, SNL is considering under what circumstances private companies can be motivated to further contribute to a data portal.

Annexe J: lists materials covered by SNL; such metadata - if available by company - could be included in the portal as per country-per mineral- per data source links notes.

An interesting aspect reported by SNL concerns the provision of base data outsourced to and handled by private organisations. There is a cost associated with compiling these data, whether completed by government organisations or by private providers. It could be of interest to those which already do collect, collate and distribute statistics like state run

[36] Company reports will generally contain information on quantities appropriable by the company, not the quantities extracted and sold.

organisations to integrate with these. This type of operation is already taking place for example in the UNCTAD iron ore data which is regularly put out to tender but which is still published in the name of UNCTAD. In this way a portal could obtain access to data at a low cost and duplication of efforts would be avoided.

2.1.3.2 Marine data (Marine Geology Expert Group - EGS)

It is already known that much EEZ coastal survey work has been conducted yielding a great volume of knowledge of sand and aggregates in particular, although much of this information is not statistical. With the Commission's desire also to understand and collate information about marine mineral resources, further interrogation may be needed, although knowledge in this area is restricted to a few examples of e.g. deep sea nodule recovery. Given the sparse response to the Minventory Phase 1 survey with regard to minerals in the marine environment the project team contacted the chairman of the EGS Marine Expert Group for assistance.

The Marine Geology Expert Group of EuroGeoSurveys distributed a survey compiled by BGS to its membership for a targeted understanding of the availability of marine resource data. Returns were received for Ireland, the Netherlands, Norway, Spain, Sweden and the Ukraine. Information on the UK has been collated directly by the BGS Minventory project team members. The Minventory country summaries (Annexe I:) include information received on marine mineral resources.

With the exception of Norway (which only publishes analyses of offshore energy minerals)[37] all the above listed countries collect statistical data on offshore non-energy minerals. This is almost exclusively related to marine dredged sand and gravel for construction and beach re-charge.

The EU funded European Marine Observation and Data Network (EMODNET[38,39]) project created pilot studies that assembled fragmented and inaccessible marine data into interoperable, contiguous and publicly available datasets for whole maritime basins. Whilst no minerals-specific data are presented, web portals have been created for the following marine data themes, covering selected marine basins:

- digital bathymetry;
- chemistry and pollution;
- physical oceanography from fixed monitoring stations;
- marine geology[40];
- marine biodiversity; and

[37] The Norwegian Petroleum Directorate manages complete seismic and well data collected in conjunction with the petroleum activities on the Norwegian Continental Shelf, most of which is made public on commercial terms. The observations register the geometries and properties of the subsoil, not limited to petroleum accumulations.

[38] http://www.emodnet.eu/

[39] Further work on integrating available data on the marine environment and progressing EMODNET 2 is being undertaken through the auspices of EU Marine Knowledge 2020. EMODNET 2 is expanding the geographical scope of the work programme to include the White Sea, Barents Sea, the seas around Iceland and the Faroes, the Bay of Biscay and the Iberian Coast, the Western Mediterranean Sea (within EU waters), the Adriatic Sea, the Ionian Sea and the Central Mediterranean Sea (within EU waters), the Aegean-Levantine Sea (within EU waters – including the Turkish sector) and the Black Sea (Turkey, Romania, Bulgaria and Ukraine) as defined in the European Marine Strategy Framework Directive (MSFD).

[40] http://www.emodnet-geology.eu/

- seabed habitat mapping.

In addition, Work Package 7 of EMODnet-geology – which is coordinated by the Geological Survey of Ireland – is collecting data on marine minerals (both energy and non-energy).

Complementing the EMODNET project was the GeoSeas project (completed summer 2013). GeoSeas implemented an e-infrastructure of 26 marine geological and geophysical data centres, located in 17 European maritime countries and comprising 30 organisations across Europe. Through a web portal[41] users can locate and access EU-level, harmonised marine geological and geophysical datasets and derived data products.

GeoSeas itself links to a comprehensive public index of datasets and reports for the marine environment. The public index is available for all European and neighbouring countries (including major dependencies such as Guiana and New Caledonia). Numerous integrating initiatives are linked to this resource via the SeaDataNet initiative portal page[42].

SeaDataNet provides access to information via graphical and keyword database searches. Graphical views allow filtering by location and to some extent by mineralogy (such as metal nodules). The keywords allows screening to narrow topic to e.g. 'minerals', 'aggregates', 'nodules'. These resources, although referenced electronically, embrace a multitude of formats, some of which are hard copy to be purchased from agencies. They cannot be described as INSPIRE compliant, or to conform to any particular template or standard, except where they have been derived by an organisation, such as a State Survey, which conforms to the practices revealed in the primary raw materials survey.

SeaDataNet does provide a good model for a future indexation of topic information. Its key strength is the nomination of a single data collation body per State, and a powerful catalogue of relevant publications, albeit that mineral resources are a minor component. A future data portal project should consider how best to link to this resource, or learn its lessons.

Annexe B: Marine data suppliers, summarises the relevant data-holding organisations and any information received from the EGS survey. These contacts are derived from the organisational details held within the Geo-Seas project, and are listed by the 'collating agency' i.e. the one which amasses data of all marine types. Alternatives are noted where available. Other resources may exist within countries, but an extensive search was not possible with the funding available to Minventory. The collating source should, however, be able to point to additional sources.

2.2 Review of systems of reporting

Annexe H: Summary of requirement via a Mining Law or associated Act to provide resource and reserve data provides an overview of the systems of reporting and relevant laws in force. It shows, for example, that the process of collecting statistical data on mineral resources and reserves is far more structured for countries in Eastern Europe. The reason for this is the requirement to provide data to the relevant authority commonly forms part of the legislation on mining. Likewise, it is also a requirement to provide data in a format that

[41] http://www.geo-seas.eu/

[42] http://www.seadatanet.org/Metadata

complies with a national Reporting Code. National Reporting Codes often align to the international CRIRSCO Template. These and other systems of reporting are reviewed in detail in the following sections.

2.2.1 National and international Reporting Codes and Reporting Standards for mineral resources and reserves estimation

International systems of reporting for mineral reserves, mineral resources and exploration results have become a necessity due to the globalisation of the minerals industry. Effort has been made to introduce such systems in order to facilitate globally comparable reporting of mineral resources and reserves. In the international context there are two different approaches to such reporting:

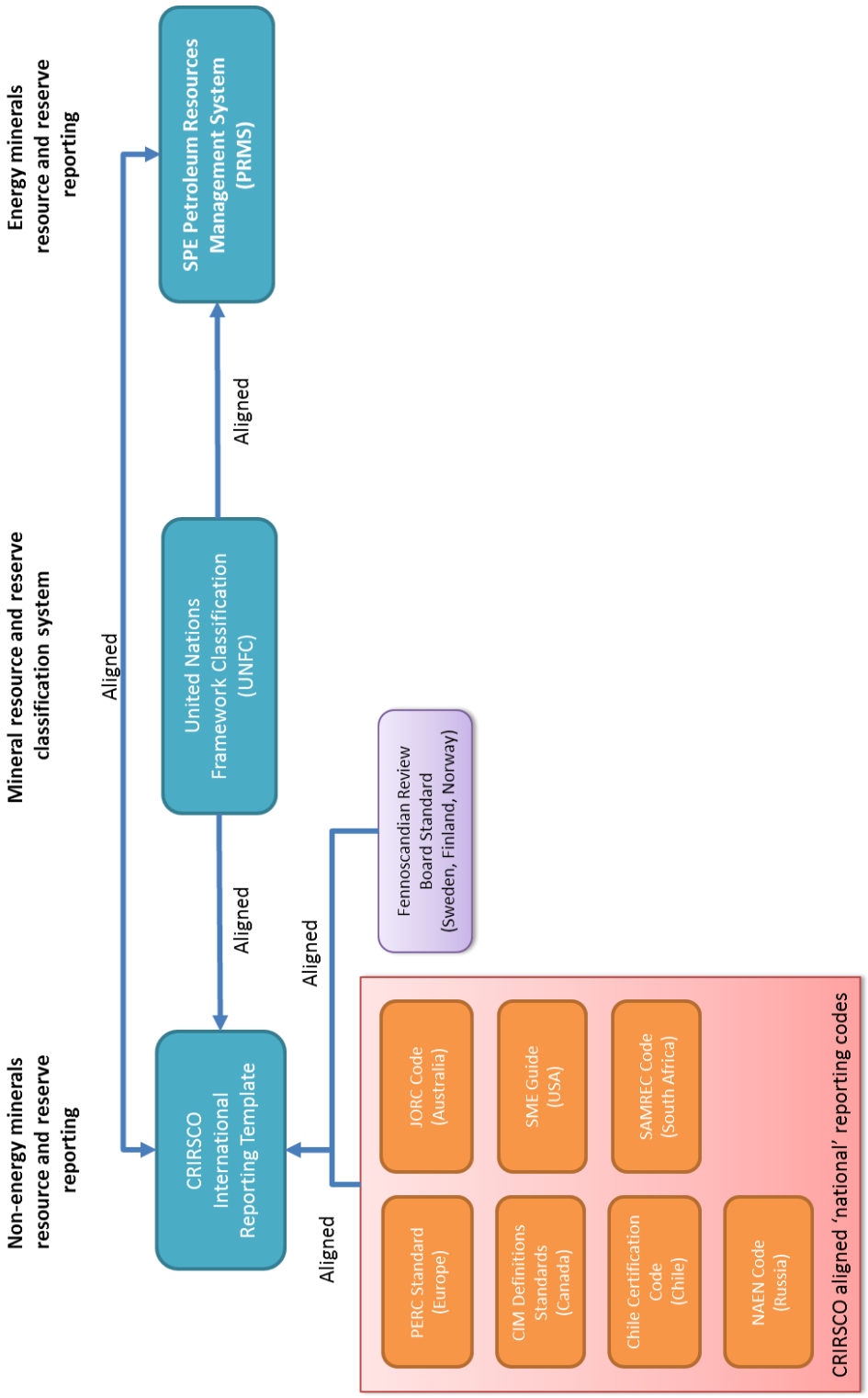
- The CRIRSCO Template: is a reporting template which is designed for companies reporting resource and reserve data to stock exchanges and other financial/regulatory authorities (public reporting). The CRIRSCO Template applies to all solid mineral resources and use of systems of reporting aligned with it is mandatory for mineral companies listed on most stock exchanges. CRIRSCO provides a set of full Reporting Standards and Reporting Codes through its member organisations in different jurisdictions.
- UNFC is a framework classification developed for fossil energy and mineral reserves and resources by the United Nations Economic Commission for Europe (UNECE) under a global mandate (ECOSOC, 2004) and endorsed by the 56 member states of the UNECE, including the EU member states. It has been designed to also meet, as far as possible, the needs of applications pertaining to energy and mineral studies, government resources management functions, corporate business processes and financial reporting. For solid minerals, CRIRSCO provides the commodity-specific specifications within UNFC.

UNFC has been developed in collaboration with CRIRSCO and SPE/PRMS (Society of Petroleum Engineers/Petroleum Resources Management System). All three are aligned systems of classification with corresponding bridging documents. What is shared are the definitions used within the systems. Therefore CRIRSCO and UNFC use the same definitions for solid mineral resources and reserves and likewise UNFC and SPE/PRMS use the same definitions for petroleum. A presentation on the Europa website outlines the history of their development[43].

The following section provides a summary of CRIRSCO and UNFC along with a description of aligned systems of reporting. Figure 15 summarises the relationship of CRIRSCO and UNFC with related systems of reporting.

[43] http://ec.europa.eu/enterprise/policies/raw-materials/files/docs/eu-us-henley_en.pdf

Figure 15: The CRIRSCO Template and UN Framework Classification and their relationship to selected aligned systems of reporting minerals resources and reserves data mentioned in the text



Source: British Geological Survey

Several national Reporting Codes are present across Europe and some of them are discussed in the following sections of this Chapter. However, the scope of the *Review of systems of reporting* undertaken was not to provide a comprehensive presentation of all systems in Europe, but only the most prominent[44].

2.2.2 The CRIRSCO Template

The **Committee for Mineral Reserves International Reporting Standards (CRIRSCO[45])** is an advisory body (without legal authority) set up to promote best practice in the international public reporting of mineral exploration results, mineral resources and mineral reserves. It relies on its constituent members to ensure regulatory and disciplinary oversight at a national or regional level. CRIRSCO members (NROs) include Australasia (JORC Code), Canada (CIM Code), Chile (Comisión Minera), South Africa (SAMREC Code), United States (SME Guide), Russia (NAEN Code) and Europe (PERC Reporting Standard). An International Reporting template (the CRIRSCO Template) was released in July 2006 and an update was published in 2013. This is advisory and intended to be used as a model for development of new systems of reporting in constituent countries. For this reason the CRIRSCO Template is used to indicate that CRIRSCO is a model for code development and does not constitute a 'Code' or 'Standard' with legal or other regulatory force.

Systems of reporting aligned to the CRIRSCO Template have securities exchange recognition (for example ESMA recommends the use of any of the seven CRIRSCO-aligned standards, but no others). Undiscovered mineral resources are expressed in the CRIRSCO Template through the definition of an *exploration target*, now adopted across all CRIRSCO-aligned systems of reporting. CRIRSCO aligned systems of reporting are organised according to the classification in Figure 16. Figure 5 sets out the framework for classifying tonnage and grade or quality estimates in order to reflect different levels of geological confidence and different degrees of technical and economic evaluation.

The validity of any estimates (at the operational level, not the public authority level) of mineral resources and mineral reserves comes down to the knowledge, experience and integrity of the Competent Person(s) or their equivalent e.g. Canada (Qualified Person) and Chile (Qualified Competent Person) collating the data, undertaking the evaluation and signing off on the statement.

A Competent Person is a minerals industry professional *(NRO Recognised Professional Organisations with enforceable disciplinary processes including the powers to suspend or expel a member[46])* with a minimum of five years' relevant experience in the style of mineralisation or type of deposit under consideration and in the activity which that person is undertaking. The key qualifier in the definition of a Competent Person is 'relevant'.

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[44] National systems of reporting are known to prevail in Albania, Austria, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, France (for legacy metallic ores and coal only), Germany (regional codes), Lithuania, Poland, Romania, Serbia, Slovakia and Slovenia.

[45] http://www.crirsco.com/

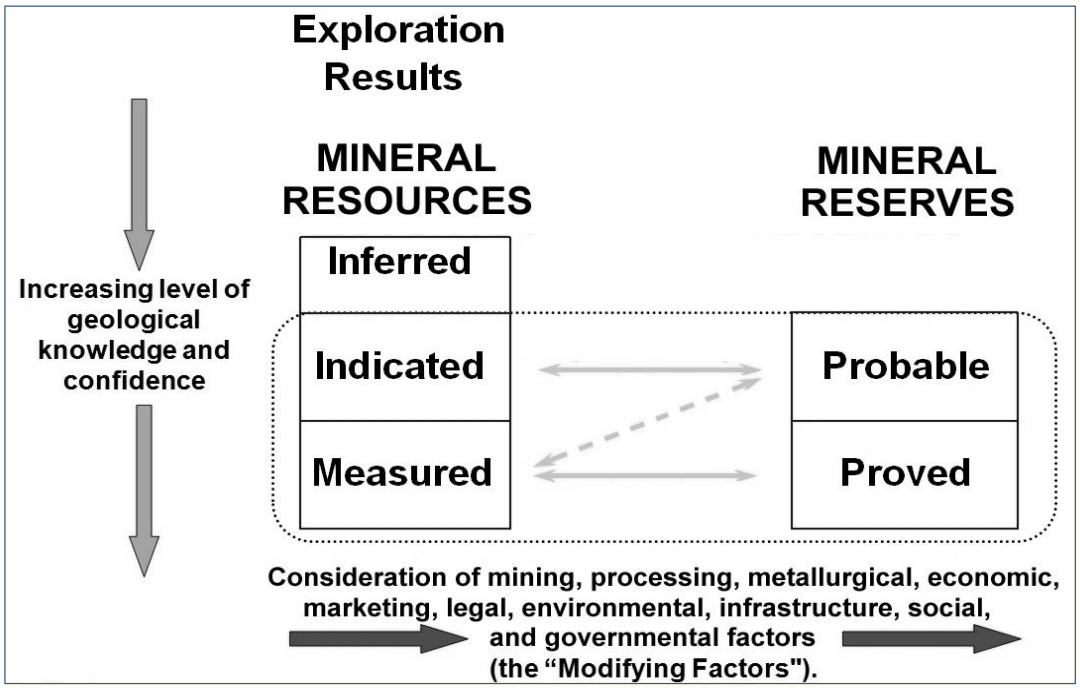
[46] Within Europe, there are currently several organisations which meet the requirements of 'Recognised Professional Organisation'. These include the four parent organisations of PERC (the European Federation of Geologists, the Geological Society of London, the Institute of Geologists of Ireland, and the Institute of Materials Minerals and Mining) and the Association of Engineering Institutions in Spain. A proposal has been made by which the Fennoscandian Review Board may also be recognised. The European Federation of Geologists itself represents 24 national geological associations. It is also open to other professional organisations and national professional registration authorities to obtain the necessary recognition.

Reporting mineral reserve estimates requires different disciplines to exploration results or mineral resources estimates. Furthermore, it is not always necessary for a Competent Person to have five years' experience in each and every type of deposit if that person has relevant experience in other deposit types. In cases where estimation of mineral resources is a team effort involving several technical disciplines, those participants with clear responsibility for a particular contribution should be identified.

Exploration results are precursors to mineral resources and often comprise point data such as drill-hole intercepts. According to the CRIRSCO Template, it is inappropriate to derive estimates of tonnage and grade or quality on early stage exploration results when the quantity of data available is generally insufficient, and a statement to that effect should be included with any report or release of information into the public domain.

Mineral resources are *in situ* estimates of tonnage and grade of mineralisation (also included in dumps and tailings) with "reasonable prospects of eventual economic extraction." They are not just mineralised rock but can be shown by preliminary technical and economic analysis to be likely to be mineable, treatable and saleable. The term *'reasonable prospects for eventual economic extraction'* implies a judgement (albeit preliminary) by the Competent Person. Interpretation of the word 'eventual' in this context may vary depending on the commodity or mineral involved. There is no designated time interval. Mineral Resources are subdivided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories (see Figure 16).

Figure 16: General relationship between exploration results, mineral resources and mineral reserves



Source: CRIRSCO

Within mineral resources, mineral reserves may be defined by the consideration and application of 'modifying factors' (CRIRSCO, 2013[47]). The modifying factors are considerations used to convert mineral resources to mineral reserves and vice versa. The relationship between mineral resources and mineral reserves and their subdivisions is generally expressed in terms of Figure 16. Mineral Reserves are a modified sub-set of the Indicated and Measured mineral resources. Geological estimates of mineral resources are converted into reserves by technical and economic investigations termed pre-feasibility and feasibility studies. These studies must address all of the modifying factors in order to demonstrate that at the time of reporting extraction could reasonably be justified (Weatherstone, 2008[48]). Use of systems of reporting based on the CRIRSCO Template requires that any changes in the modifying factors that affect the shift of characterisation between resources and reserves should be fully explained.

Portions of a mineral deposit that do not have reasonable prospects for eventual economic extraction must not be included in a mineral resource estimate. Areas that are of potential economic interest change with time as markets decline or expand, product specifications change, recovery technology is improved or more competitive sources become available.

The choice of the appropriate category of mineral resource depends upon the quantity, distribution and quality of data available and the level of confidence attached to the data by a Competent Person. An upgrade in the resource category from Inferred to Indicated represents the greatest step change, since confidence in the Inferred resource estimate is usually not sufficient to neither allow the appropriate application of technical and economic parameters nor enable a reliable evaluation of economic viability. The Indicated and Measured mineral resource categories, by contrast, imply sufficient confidence (i.e. geological framework, continuity and grade or quality) to support generalised mine design, mine planning, and/or economic studies.

Inferred resources are, therefore, not directly convertible into reserves and should not be used in any reserve estimation.

In differentiating between Indicated and Measured resources a Competent Person should consider the effect of any variation of the resource estimation. Thus for Measured mineral resources any variation in the estimate would be unlikely to significantly affect the potential economic viability whereas it could negatively impact on the Indicated resources.

Use of the term mineral reserves implies technical feasibility and economic viability (see glossary definition). The reference point at which reserves are defined is usually the point where the ore is delivered to the processing plant. A mineral reserve normally does not include allowances for losses that occur during beneficiation[49].

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[47] CRIRSCO (2013) INTERNATIONAL REPORTING TEMPLATE for the public reporting of EXPLORATION RESULTS, MINERAL RESOURCES AND MINERAL RESERVES, http://www.crirsco.com/templates/crirsco_international_reporting_template_2013.pdf (viewed 20 October 2014)

[48] Weatherstone, N., (2008) International standards for reporting of mineral resources and reserves –status, outlook and important issues. World Mining Congress and Expo 2008, 1–10.

[49] This is modified by the document bridging the CRIRSCO Template to the UNFC. *"For some commodities, e.g. coal, Mineral Reserves are quoted as saleable product (tonnage and quality). Otherwise, where processing is required to produce a saleable product, recovery or yield factors shall be provided."* This meets the need of financial analyses to know the qualities and quantities of sales. It ensures coherence with other statistical information relating to the stock and flows on extracted quantities in the economy generally.

A **Proved mineral reserve** is the economically mineable part of a Measured mineral resource and represents the highest confidence category of material available to a company both technically and economically. A **Probable mineral reserve** has a lower level of confidence and refers to the economically mineable part of the Indicated, and in some circumstances, a Measured mineral resource. Studies to at least Pre-Feasibility level will have been carried out to categorise the reserves.

Work has been undertaken by CRIRSCO and the Society of Petroleum Engineers to produce a bridging document that maps the relevant terminology of the CRIRSCO Reporting Template and the SPE/WPC/AAPG/SPEE[50] Petroleum Resource Management System.

2.2.3 UNFC

The **United Nations Framework Classification (UNFC[51])** for Fossil Energy and Mineral Resources (UN, 2010) is a global system of reporting developed under a mandate from the UN Economic and Social Council and serviced by the Expert Group on Resource Classification (EGRC)[52] of the United Nations Economic Commission for Europe (UNECE). UNECE is the UN regional Commission for North America, Europe (including all EEA member states), CIS countries, Turkey and Israel. The UNFC is not mandated by the UN but on consensus (both at the ECOSOC and UNECE levels) as a voluntary system of reporting. It is not enforced through an international treaty or similar legally binding instrument. UNFC is capable of meeting the requirements for application at national, industrial and institutional level, as well as to be successfully used for international communication and trans-national assessments. It should be emphasised that UNFC provides no guidance on data quality or validation, or on methods or formats of reporting.

Throughout the twentieth century many different systems of reporting were developed. With the globalisation of commodity trading there was a perceived need for a harmonised system. Development work on the UNFC commenced in 1992 and throughout the last decade the three-dimensional system of reporting that was devised has been progressively updated culminating with the release in 2013 of the UNFC-2009 classification framework definition together with specifications (secondary rules) and bridging documents to the CRIRSCO Template and the SPE/WPC/AAPG/SPEE Petroleum Resource Management System. This meets the fundamental requirements of relevance, materiality, reliability and comparability. Both the CRIRSCO and SPE professional communities have provided commodity specific specifications which have been incorporated within UNFC. The UNFC, therefore, is now a universally applicable scheme for classifying energy and non-energy mineral resources and reserves. Most importantly, it allows a common and necessary international understanding of these classifications which is clearly advantageous.

The CCOP EPPM Program Workshop on UNFC in February 2012 focussed on the alignment of UNFC with other systems of reporting, notably the CRIRSCO Template (and therefore all of the CRIRSCO-aligned systems of reporting (e.g. PERC, JORC etc., see section 2.2.2, page 80)), so that quantities can be estimated using current well-established approaches, which are

[50] Society of Petroleum Engineers, the World Petroleum Council, the American Association of Petroleum Geologists, and the Society of Petroleum Evaluation Engineers.

[51] http://www.unece.org/energy/se/reserves.html

[52] The European Commission D.G. Enterprise and Industry is represented on the Bureau of EGRC.

independent of commodity type, extraction technology and ambiguous terminology. UNFC-2009 was intentionally developed using simple generic definitions with the understanding that there would also be a requirement for specifications to ensure an appropriate level of consistency in application[53]. With respect to minerals it is not in competition with the CRIRSCO Template. The principal advantage offered by UNFC is that it can be used as a mapping and bridging tool; it can help to compare different systems of reporting objectively and used to harmonise data reported under Reporting Standards and Reporting Codes[54]).

A UNFC specifications document was endorsed by the UNECE member states in 2013. Specifications set out the secondary rules that are considered necessary to ensure an appropriate level of consistency in application of the UNFC classification. They provide additional instructions on how the framework definitions must be applied in specific circumstances including, where appropriate, commodity-specific rules. The UNECE Expert Group on Resource Classification (EGRC) considered the draft specifications for the UNFC following an extensive process involving a public hearing, and recommended to the UNECE member States to endorse them. With the specifications in place, UNFC-2009 is now ready for the first rounds of full scale application.

At the request of member States, the EGRC is currently assessing the applications of UNFC to recipient reservoirs (gas and CO_2 storage etc.) and to renewable energy. There is also an effort underway to address nuclear energy (minerals) as reported in the International Atomic Energy Agency (IAEA) 'Red Book' more specifically, a necessary step caused by the special circumstances that have governed the nuclear industry, although uranium mining companies already report their mineral resources and reserves using CRIRSCO-aligned systems of reporting. Such a broadening of the scope of application of the UNFC to, for example renewable energy, would maintain the aim of providing a consistent and overarching system of reporting that allows meaningful comparison between different resource extraction projects.

The United Nations Framework Classification for Mineral Reserves and Resources (UNFC-2009) is a generic project status based system in which quantities are classified on the basis of three fundamental criteria: economic and social viability (E), field project status and feasibility (F) and uncertainty, mostly related to geological knowledge (G) using a numerical coding scheme. Combinations of these criteria can be powerfully displayed and visualised in three dimensions or reduced to two dimensional presentations. Classification is done by use of categories and sub-categories. This same array also can be represented in a practical two-dimensional tabular version.

The E categories (which represent the strength of social and economic conditions including consideration of commodity prices and relevant legal, regulatory, environmental and contractual conditions as barriers to project implementation) cover the non-technical modifying factors. The F axis indicates the degree of maturity of exploration and commitments necessary to implement mining plans or development projects. This ranges from early exploration before a deposit is identified to extraction and sale of a commodity. The G axis is the level of confidence in the geological knowledge and potential recoverability.

[53] Blystad, P. 2012. UNFC 2009 - Application examples. UNFC.

[54] Griffiths, C. 2012. Stakeholder Requirements and developing specifications for the United Nations Framework Classification. UNFC Workshop, Bangkok, 9-10 February 2012.

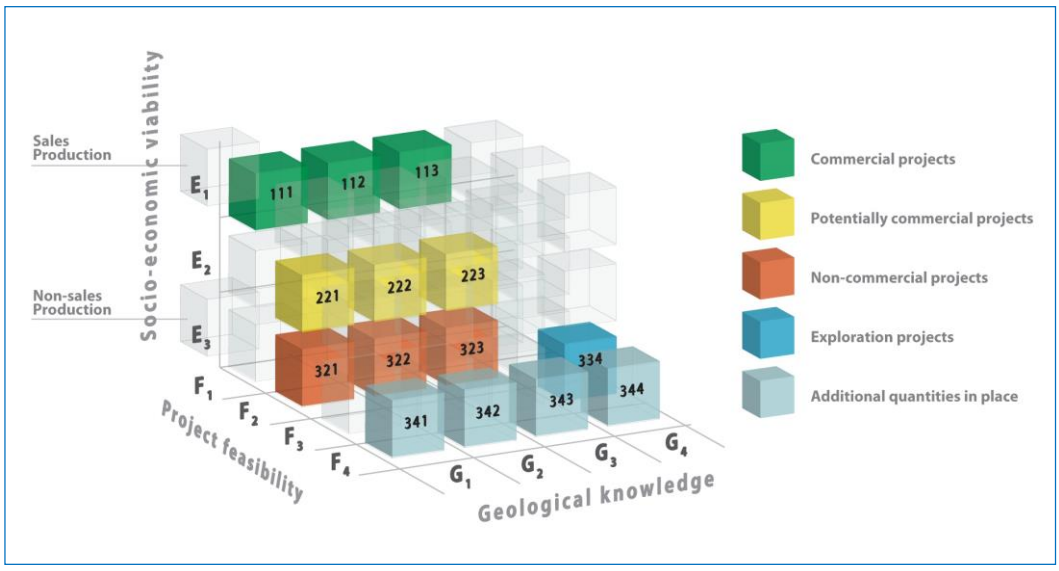
Categories and sub-categories are the building blocks of the UNFC and are combined to form classes. A class is uniquely defined by selecting a particular combination of category and sub-category (or groups of categories/sub-categories). Since the criteria are always quoted in the same sequence (E, F, G) the letters can be dispensed with and just the numbers retained, making the classification virtually language independent. Whilst there are no explicit restrictions on the possible combinations of E, F and G categories and sub-categories, only a limited number are generally applicable. E1, F1 and G1 are the highest ranked categories, so a designation Class 111 means that all the reported quantities have been satisfied.

Visualisation of the UNFC can be in 2D or 3D; for further clarity additional generic UNFC-2009 sub-classes are defined (Figure 17). Provision of subcategories allows further granularity. The UNFC aligns well with commonly used project and value chain management in industry.

With the exception of past production that may be measured, quantities are always estimated. There will be a degree of uncertainty associated with all estimates and this is conveyed as decreasing levels of confidence (high, moderate, low). Where relevant the amount of a commodity that may be recovered in the future is subdivided into quantities that are forecast to be sold and quantities that are forecast to be extracted but not sold.

Potentially recoverable resources are those that may be recovered in the future through projects that are contingent on one or more conditions yet to be fulfilled.

Figure 17: The UNFC-2009 categorisation and principal classes



Source: UNFC

The UNFC-2009 permits harmonisation of resource inventories that have collated data which has been reported using different systems of reporting. It can also be used to highlight changes that could be implemented to remove material differences. Thus it enables the various systems of reporting for both mineral and energy resources in use around the world to be aligned via bridging documents to a common base in order to:

- clarify similarities and differences between systems of reporting;
- enable comparisons between countries inventories; and
- better estimate the total world stocks of mineral commodities.

Whilst it is aligned to the CRIRSCO Template and, therefore, CRIRSCO Template based systems of reporting (PERC, JORC etc.), UNFC-2009 has a broader coverage than the CRIRSCO Template since it includes non-commercial material. However, the PERC Reporting Standard is currently being extended to include guidance for companies on reporting of such quantities if it should be required.

The success of the UNFC will depend on UN member states adopting it and/or recognition and acceptance by industry and the financial sector. However, it should be noted that currently UNFC is not recognised for use by minerals companies on any major stock exchange as an accepted international system of reporting.

Resource and reserve categories in the CRIRSCO Template, the international equivalent of the PERC (Europe), JORC (Australia), CIM (Canada) and other national systems of reporting have already been aligned to UNFC-2009 via bridging documents. This mapping has been tested by a set of case studies commissioned by EGRC[55], which concluded that the alignment of the main classes is straightforward, but some sub-classes may be problematic and considerations of data quality and consistency will require the need for Competent Person oversight.

The UNFC is envisaged as an umbrella classification system of reporting, which establishes a common platform for inter-conversion of information on resources and reserves whilst each country is able to maintain their own preferred Reporting Code or Reporting Standard. It provides:

1. A method available to governments and NGOs to assist in conversion of market data (also using the CRIRSCO Template based categories of their national Reporting Codes or other Reporting Standards into databases, mineral inventories, and broader statistical summaries); and
2. A mechanism for companies to use a standardised internal classification beyond the commercially reported CRIRSCO Template categories.
3. In light of the capability to harmonise resource inventories that have been developed using different systems of reporting and because it can be applied for reporting resource and reserve data regardless of what Code or Standard is adopted for commercial reporting at the deposit scale, the UNFC lends itself to utilisation within an EU-level database of mineral resources and reserves statistical data;
4. An opportunity to address extractive activities (for minerals and fossil energy) using common terms, thus avoiding interface issues where fossil energy is extracted using mining techniques and minerals are extracted using fluid (petroleum industry) techniques;
5. A numerically based classification which offers large communication benefits in multilingual environments. However, it does not eliminate the issue of needing to produce an initial glossary translating what those codes mean in text form within particular languages);

[55] Henley, S., 2014. Case study – application of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 to solid minerals; UNECE - ECE/ENERGY/GE.3/2014/4

Countries wishing to establish rigorous mineral resource reporting regimes may choose to use the UNFC categories which are already aligned to the CRIRSCO Template (which for Europe is embedded in the PERC Reporting Standard, for example) for deposit scale reporting. Currently the CRIRSCO Template systems of reporting (PERC, JORC etc.), are recognised by most important securities exchanges on which mineral companies' shares are traded. Through the bridging documents this also applies to the UNFC. UNFC includes additional categories (for example material that is currently uneconomic to extract) and may therefore be useful for alignment between general mineral studies, national resource management, industrial business process management and financial reporting/analyses. Like CRIRSCO, it retains the option to recognise contingencies in the economic domain that are holding back development projects. These are becoming more and more common in the EU. It also includes the options to account for non-sales production and losses required for the environmental agenda. Subdivision or aggregation of categories may be applied at the national or local level to meet specific needs arising, for instance, from national legislation. At present eleven European countries cooperate on establishing a common platform to share information by use of the UNFC and seven countries are using other classifications, most of which are CRIRSCO Template based reporting codes and thus compatible (aligned) with the UNFC, making the total 18 of the 41 countries surveyed.

2.2.3.1 The UNFC-2009 reference point

UNFC-2009[56] requires that a 'point-of-sale' reference point be used or that information on yield factors be provided in order to obtain point-of-sale estimates. This requirement reflects the dominant influence of the oil and gas sector on development and definition of UNFC.

The 'point-of-sale' products for solid minerals are much more diverse and varying extents of vertical integration between the mine and the market also complicate matters. Not having a standard reference point for materials will make comparability of estimates more difficult, and would certainly prevent any automated generation of summary resource and reserve data. A few examples may explain these complications.

Example 1 - Gold ore

Gold ore as delivered to a processing plant (the normal CRIRSCO reference point) can always be expressed in terms of tonnage and gold grade. However, the point-of-sale product after processing could be gold concentrate, or doré, or refined gold of different degrees of purity. Furthermore, changes in yield factors resulting in improvements in processing technology can very easily be applied to mill feed estimates, to produce estimates of gold that would be available for sale. The point-of-sale products, in contrast, already build in and hide the yield factors. In both cases, producing aggregated estimates is not straight forward.

Example 2 – Titanium

For titanium, the 'point-of-sale' product might be an ilmenite concentrate, or titanium dioxide of different grades, or titanium metal, and these again cannot easily be combined into aggregated figures. They also hide the very different costs of processing to generate the different products.

[56] UNECE Energy Series 42, Specification F, p.21

Example 3 – industrial and construction minerals

The problem is even more servere for industrial and construction minerals. For example a clay producer will often process clays to make a wide variety of bricks and tiles which are the saleable products, often blending materials derived from different quarries and with different physical and chemical properties. The properties of such blends are often nonlinear functions of the blend proportions, so there is no simple yield factor which can be estimated or reported. Sometimes the point-of-sale products will match industry-wide standards, but at other times they will be unique products, and will represent the result of complex processing in which it is not generally possible to define yield factors.

This issue is one of the remaining difficulties in bridging CRIRSCO to UNFC. The UNFC specifications[57] state that "where processing is required to produce a saleable product, recovery or yield factors shall be provided". In Europe, where the industrial and construction materials sector is of particular importance, many companies either cannot quote yield factors, or for commercial reasons, including protection of trade secrets, would strongly resist any requirement to do so.

2.2.4 PERC

The **Pan-European Reserves and Resources Reporting Committee (PERC)**[58] is the organisation responsible for setting standards for commercial reporting of exploration results, mineral resources and mineral reserves by companies listed on markets in Europe. The PERC Reporting Standard is the European equivalent of the Australasian JORC Code and similar systems of reporting in USA, Canada, South Africa, Chile and Russia. It is the successor to the former 1991 IMM Code and the 2001 Reporting Code. PERC is a constituent member of CRIRSCO and its Reporting Standard is fully aligned with the CRIRSCO Reporting Template. Although developed initially for public reporting on European Stock Exchange markets, use of the PERC Reporting Standard is not limited to EU territory; for example it is recognised for use on stock exchanges in Canada, Singapore and the Asia Pacific Exchange in Australia.

The PERC Reporting Standard[59] published on 17 December 2008 incorporated not only the new 'consensus' standards of the CRIRSCO Template but also some of the most useful features of other CRIRSCO-aligned reporting codes such as the version of Table 1 in the South African SAMREC Code[60] .

From 2006 to 7 March 2013 PERC operated as an informally constituted group but from 2013 onwards it has had a legal identity as a not-for-profit organisation based in Brussels by way of a formal relationship with its parent organisations (Institute of Materials, Mining and Metallurgy: IoM^3, the European Federation of Geologists: EFG, the Geological Society of London: GSL and the Institute of Geologists of Ireland: IGI).

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[57] UNECE Energy Series 42, Annex III, p.34

[58] http://www.vmine.net/perc/

[59] First published as the PERC Reporting Code the update was more correctly published as the PERC Reporting Standard to reflect the fact that it has not been explicitly referenced by or incorporated within the laws of a particular jurisdiction.

[60] Currently available at http://www.samcode.co.za/downloads/SAMREC2009.pdf [viewed on 5 January 2015]

An updated PERC Reporting Standard was published at the first AGM of the new committee in March 2013. Standard CRIRSCO definitions have been included. Other changes include:

1. tighter requirement to disclose any relationship between Competent Person and the company;
2. a simplified definition of a Competent Person;
3. RPOs listed in a new appendix;
4. clarification of rules for reporting stockpiles (for construction raw materials in particular) to avoid double-counting;
5. modifications for alignment with European Securities and Markets Authority (ESMA) rules (materiality etc.); and
6. inclusion of oil shales and oil sands (amended November 2013) and solution mining.

Guidelines are included for personal verification and site visits statement.

The PERC Reporting Standard covers all forms of solid minerals, including base and precious metals, gemstones, bulk commodities, aggregates, industrial minerals and energy minerals such as coal and uranium. PERC serves the minerals industry and its stakeholders[61] at national/regional level, and through CRIRSCO at an international level. The PERC Reporting Standard objective is to provide a minimum standard for commercial reporting. It also provides a systematic checklist of assessment criteria and guidelines to be used as a reference by those preparing reports on exploration results, mineral resources and mineral reserves. The checklist is not prescriptive.

The PERC Reporting Standard provides for a direct relationship between Indicated Mineral Resources and Probable Mineral Reserves and between Measured Mineral Resources and Proved Mineral Reserves as they require a comparable level of geological confidence (as presented in Figure 16).

2.2.5 Fennoscandian Review Board Standard

The Fennoscandian Review Board Standard (**FRB Standard**) is an independent set of rules that has been adopted by SveMin, FinnMin and Norsk Bergindustri to be applied in Sweden, Finland and Norway respectively.

It is based loosely on the first version of the CRIRSCO Template (July 2006) for the commercial reporting of exploration results, mineral resources and mineral reserves and in that respect it is similar to the PERC Reporting Standard, the JORC Code and the SAMREC Code since all these too are based on the CRIRSCO Template. The FRB Standard is subsidiary to national legislation. It is supplemented by a guide ("Guide for Implementing the Standards of Public Reporting of the Fennoscandian Review Board") detailing how the FRB Standard should be implemented. The 2012 version of the FRB guide usefully includes schematics to emphasise the difference between resources and reserves.

The FRB rules apply to companies that present commercial reports of exploration and survey results as well as feasibility studies and project assessments and were originally based on the Canadian National Instrument 43-101 developed in response to the Bre-X fraud in 2000. This was adopted by the OMX (Swedish stock exchange) and included in the listing rules. Finland joined in 2003, Norway in 2009, with Iceland and Greenland as potential members.

[61] See http://www.vmine.net/perc/members.asp for more details

The major goal of the FRB is to protect shareholders, investors and potential investors from incorrect, incomplete or misleading information. FRB rules may become part of the code of conduct of each organisation. Fennoscandian Review Board (FRB) designates Qualified Persons (QP) to operate in accordance with these rules.

The Swedish, Finnish and Norwegian association of companies (e.g. SveMin) appoint representatives to the FRB who in turn contract Qualified Persons. SveMin also monitors companies for their compliance. It is possible, however, for a company to list on the OMX without being a part of SveMin (as it is voluntary) but in effect companies want to be seen to be complying and all major companies are compliant.

A proposed route to merging the PERC Reporting Standard and FRB Standard was agreed in principle in March 2013. FRB is now formally represented on the PERC committee.

2.2.6 The Austrian classification of solid mineral deposits

In Austria, there is a legal requirement to survey mineral resources, but not to quantify either resources or reserves. However, there isa national code (ÖNORM G 1050, 1989) to be used when classifying mineral deposits. In ÖNORM G 1050 mineral deposits are classified on the basis of increasing geological certainty and increasing degree of economic viability. Information on geological certainty is provided via a numeric code which ranges from category 3 (tentative estimates) through 2 (preliminary estimates) to category 1 (reliable estimates). Category 1 deposits are subdivided into classes A, B and C representing increasing relative error limits in geological certainty (A±20, B±30, C±50).

Economic viability in ÖNORM G 1050 is indicated via a letter with mineral occurrences being indicated with O as a prefix and mineral deposits which are economic to extract now or in the foreseeable future being indicated with R as a prefix. Both economic categories (R and O) can be subdivided based on the level of economic knowledge as obtained via details on the geological nature of the deposit such as metal content or depth and thickness.

Using ÖNORM G 1050 the combination of geological certainty codes with the economic viability codes provides a clear indication of the class of deposit (and as such is analogous to UNFC). For example, R-1A-E is the highest class and represents a deposit which has been fully evaluated both geologically and economically whereas a mineral deposit which has undergone very limited geological and economic investigation would be classified as O-3-Z. Interestingly ÖNORM G 1050 also has a category that allows for the classification of mineral deposits which are purely of scientific interest.

2.2.7 The Russian NAEN Code and Russian State System

The **NAEN Code**: the Russian CRIRSCO-aligned Code for commercial reporting of exploration results, resources and reserves of solid minerals was adopted in 2011; it was developed by the Society of Experts on Mineral Resources (OERN, a component body of NAEN) in close co-operation with State Commission on Reserves (GKZ) and with members of CRIRSCO.

The NAEN Code is modelled very closely upon the CRIRSCO Template and is issued as a bilingual document in Russian and English. It has been updated to reflect new agreed definitions in the 2013 edition of the CRIRSCO Template. This reporting code is intended for use principally by Russian companies for independent estimation of their mineral assets, and listing on national and international stock exchanges.

The NAEN Code embraces all the reporting principles, terminology and definitions of the CRIRSCO Template whilst allowing for the Russian State system of subsoil (subsurface) use, management, classification and audit of solid minerals.

The Reporting Codes of several central and eastern European countries are based on the Russian State system and versions of this classification are still in use. Conversion of the Russian State classification categories into CRIRSCO-compatible NAEN Code categories required:

- alignment of exploration stages and resource classification;
- definition of resources and reserves (as separate terms);
- definition of technical & economic studies;
- how to allow for complexity of deposit geology; and
- Competent Person definitions in Russia and internationally.

The Russian Federation (RF) reporting code provides for quantitative estimates (in tonnage and grade) of mineralisation discovered by prospecting and regional exploration, and classifies them as "prognostic resources" of categories P2 and P3 (Figure 18). These are not valid for public reporting since they incorporate discovered or undiscovered mineralisation which should not be classified as mineral resources. The Inferred mineral resource category is approximately equivalent to the P1 category of 'prognostic resources'.

In RF reporting, the terms used to define reserve and resource categories are the same as in the NAEN Code. Reserves are distinguished by the completion of technical and economic studies in addition to exploration/ geological studies and acceptance by GKZ. Therefore resources may be economic on preliminary assessments (but remain out of the resource account balance because feasibility assessments have not completed or not yet submitted for GKZ approval). In this case they may be referred to as "operational resources" or "author's estimate of resources". Reserves on balance are reported only after GKZ approval.

CRIRSCO alignment at the resource level discounts (i) the interaction of resource estimation and technical/economic studies and (ii) the issue of deposit complexity.

Russian Federation reporting formally recognises specific exploration rules for each complexity class (C2, C1, B and A with increasing confidence). The amount of geological information required to allocate quantities to each category depends on the type of mineral and the structural complexity of the deposit.

The principle of deposit complexity quantified as the Proportion of Ore Mineral versus Homogeneity (King *et al*., 1980)[62] is well understood and is recognised informally in CRIRSCO.

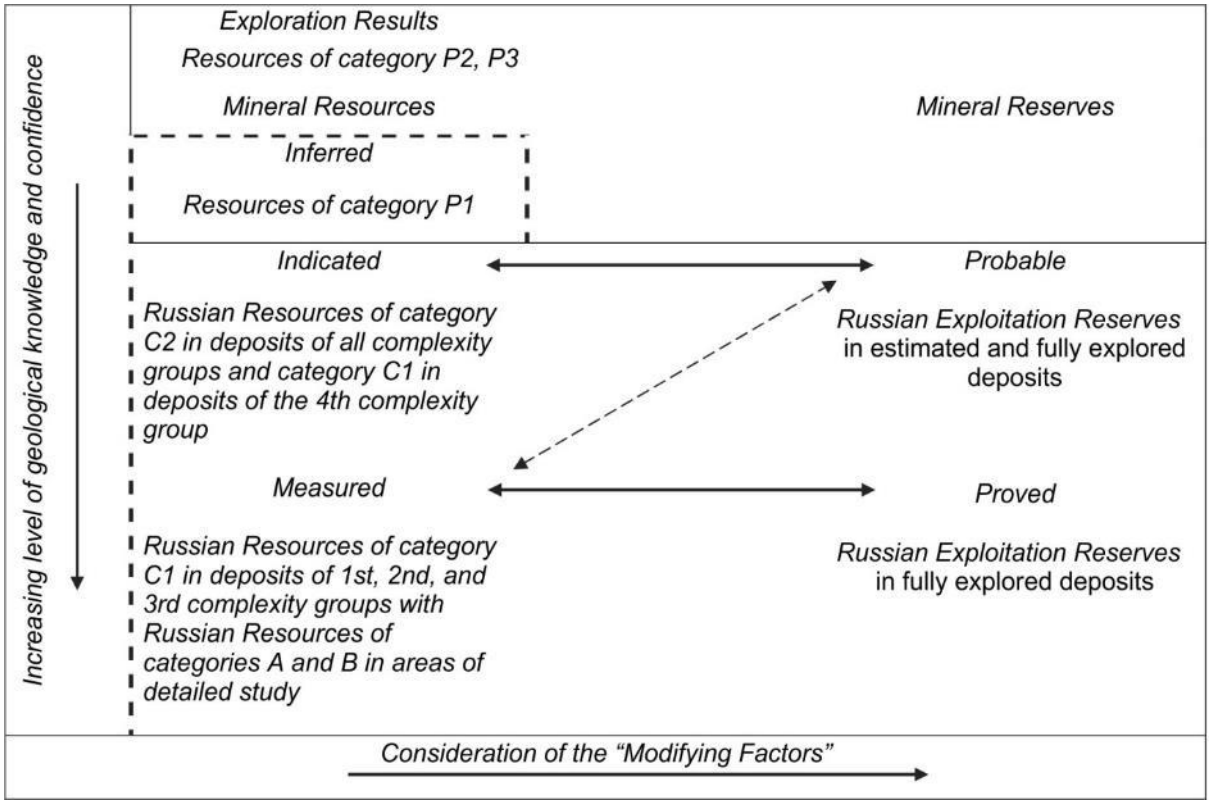
Exploration programmes (e.g. drill hole spacing, sample density, etc.) are adjusted to address complexity and this should be recognised and assessed by the Competent Person. Resource classification reflects uncertainty in grade/geology continuity whilst the reserve classification reflects uncertainty in economics. The maximum resource class allowable for a given deposit class can be applied at any point in the estimation/classification process.

In RF reporting mineral resources are subdivided in economic significance into two basic groups: balance (economic) and off-balance (potentially economic). 'Balance Russian

[62] King H., McMahon D. & Bujitor G. (1980) "A guide to the understanding of ore reserve estimation"

Resources', taking into account mining losses and dilution are expressed as 'Russian Exploitation Reserves'. Reserves on balance are reported only after GKZ approval. They can be used to estimate corresponding Mineral reserves categories in the NAEN Code which is aligned with CRIRSCO. 'Off-balance (marginal or potentially economic) Russian Resources' do not have analogues in the CRIRSCO Template and should not be included in Commercial Reporting. Resources out of account balance may be below the agreed cut-off grade, or metallurgically difficult to process, or inaccessible by current mining methods, etc.

Figure 18: Matching the Russian and CRIRSCO categories (modified after NAEN, 2011)



N.B. In practice this requires a professional and reasoned judgment of the Competent Person.

Guidelines have been developed jointly by GKZ and CRIRSCO, for conversion of NAEN based resource/reserves estimates in system reporting to CRIRSCO Template resource and reserves categories; these may be downloaded from the PERC website[63].

In June 2013 a Memorandum of Understanding was signed by the Authorities of Russia and Kazakhstan for the accession of Kazakhstan to the CRIRSCO Template; this was through the use of the NAEN Code and the Guidelines on Alignment of Russian minerals reporting standards and the CRIRSCO Template.

2.2.8 The Slovakian national Reporting Code

[63] www.percstandard.eu

In Slovakia, exploration and mining companies are under statutory obligation to report reserves of both reserved (exclusive) mineral deposits and deposits of non-reserved minerals (Mining Code (the SNR Act No.44/1988 Col. on mineral protection and use).

Reserves according to the stage of survey, knowledge of the deposition mode, quality, technological characteristics and mining conditions are classified into the following categories:

- Z-1 proved mineral reserves;
- Z-2 probable mineral reserves; and
- Z-3 supposed mineral reserves.

According to economic viability, reserves are classified in the following categories:

- Economic reserves.
- Potential economic reserves.

Economic reserves are considered as economically viable and existing technical and economic conditions allow for their current exploitation. *Potential economic reserves* are not considered as suitable candidates for exploitation at present, often due to the lack of suitable technical and economic conditions. They may, however, become exploitable in the future.

Even though the Slovakian Reporting Code does not include classes for mineral resources, the definition of *potential economic reserves*, namely reserves that are currently not recoverable, implies that these are mineral resources.

In addition, the Slovakian classification system includes the category of *prognostic resources*. These do not align to any of the mineral resources categories given by the CRIRSCO Template. Instead, they correspond to unverified resources based on geological assumptions and are comparable to the 'Reconnaissance Mineral Resource' category of the UNFC system.

2.2.9 National mineral inventories outside of Europe

The JORC Code, SME Reporting Guide, the PERC Reporting Standard, the CIM Standards and the SAMREC Code all provide minimum standards, recommendations and guidelines for commercial reporting of exploration results, mineral resources and mineral reserves in their respective jurisdictions. The main principles governing the operation and application of the JORC Code, SAMREC Code, and PERC Reporting Standard are transparency, materiality, and competence.

2.2.9.1 Australia

Australia has conducted an annual nation-wide assessment of identified mineral resources since 1975 which available in the on-line publication by Geoscience Australia under 'Australia's Identified Mineral Resources'[64]. Australia has utilised the JORC Code since 1989. The 2012 edition of the JORC Code prepared by the Joint Ore Reserves Committee of

[64] http://www.australianminesatlas.gov.au/aimr/index.jsp

AusIMM, AIG and MCA is available on-line[65]. All mineral resources in CRIRSCO/JORC-compliant reports must have 'reasonable prospects for economic extraction'. For a national inventory several JORC categories (Proved Reserves+ Probable Reserves+ Measured Resources+ Indicated Resources) are aggregated into a national reporting category: 'Economic Demonstrated Resources (EDR)'. It should be noted, however, that this aggregated estimate of Resources and Reserves is prohibited under all CRIRSCO-aligned systems of reporting standards because the numbers are not comparable (Reserves estimates include allowance for diluting material and mining losses). Inferred Resources and sub-economic resources are not included even though some of these will eventually be mined. National Inferred Resources are reported separately.

Obviously this is a snapshot of the current situation which changes with new discoveries (including extensions to known deposits). Furthermore, not all identified resources will be mined in the foreseeable future. EDR is considered to provide a reasonable and objective indication of what is likely to be available for mining in the next 25 years. A similar approach could be considered for Europe as the EDR is a key indicator for development of long term government policy. However, a direct implementation of the EDR should not be considered in Europe because of the lack of comparability of resources and reserves estimates: instead, two separate numbers should be used, Measured+Indicated Resources, and Proved+Probable Reserves. Further subdivision of EDR into short, intermediate and longer time frames is being trialled to reflect different levels of assurance of production. EDR 1 is equivalent to Proven and Probable Reserves; EDR 2 are Potential Medium-term Economic Resources which are equivalent to Measured and Indicated Mineral Resources in existing mines and undeveloped deposits where a positive feasibility study/development has been announced; whereas EDR 3 which comprises the same categories as EDR 2 is not underpinned by a positive feasibility study or consideration of mining. Total EDR will be a sum of these three categories. The emphasis is only on inherently economic/ commercial resources and is therefore more restrictive in its overall scope than the UNFC. While Australia has not adopted the UNFC the categories used should align with CRIRSCO and UNFC. For instance the UNFC Potentially Commercial sub-classes 'Development Pending' and 'Development on Hold' are comparable to EDR2 and EDR3 respectively (Lambert and Miezitis, 2012).

2.2.9.2 USA

The USA has two systems of reporting. SEC167 is the only code used by the US stock markets and refers to reserves only, not resources. The SME Guide was formulated to promulgate industry good practices and the mission of the U.S. Securities and Exchange Commission (U.S. SEC) which is to protect investors and maintain the integrity of the securities markets. It outlines the minimum standard for reporting exploration results, mineral resources and mineral reserves for public and private purposes. The SME Guide is CRIRSCO aligned and recognised on the Canadian and European stock markets. On a national level the USGS published 'Reserves' are comparable with Australian EDR for most commodities i.e. UNFC classes: 'Commercial Projects' and 'Possibly Commercial Projects'. These are not directly comparable with the more restrictive JORC term 'Reserves'.

N.B. U.S. Geological Survey's use of the term 'Reserve Base' defined as that part of an identified resource that meets specified minimum criteria related to current mining and

[65] http://www.jorc.docs/jorc_code2012.pdf

production practices (measured + indicate resource + parts of the resource that have a reasonable potential for becoming economically available) has been discontinued.

2.2.9.3 Canada

Canada publishes Reserves that are JORC equivalent in operating mines but these have a shorter term perspective on national resources i.e. UNFC Sub-class: 'Commercial projects in production'. Information on the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) definition standards is found at http://web.cim.org/standards/MenuPage.cfm?sections=177&menu=178

An update of *CIM Definition Standards for Mineral Resources and Mineral Reserves* has been undertaken in 2014 and the new version includes changes to maintain compatibility with National Instrument 43-101 (NI 43-101), and addresses industry, CSA (Canadian Securities Administrators), CRIRSCO and UN requests for clarification and guidance.

The classification 'reasonable prospects for economic extraction' implies a judgement by a Qualified Person (QP) – known as Competent Person (CP) elsewhere. The CSA-CIM has provided Best Practice Guidelines for Estimation of mineral resources and mineral reserves under Section 4: Geological interpretation and modelling, mining and economic requirements and Section 5: Mineral resource estimation. There is an on-going consultation process on proposed changes to the CIM definition standards.

2.2.10 Marine data reporting

As is the case for onshore, not all Member States mandate the publication of marine data. Only Sweden and the United Kingdom require this within legislation; in the UK, provision of data is, in fact, a requirement of a company's licence to operate. Likewise the requirement to use a national or international system of reporting is also variable:

- The Netherlands, Spain, Sweden: there is no requirement to use a national or international system of reporting.
- United Kingdom: PERC.
- Ukraine: Former Soviet Union and UNFC.
- Ireland: PERC / JORC.

None of the countries collect offshore mineral resources and reserves data for overseas territories.

2.3 Harmonisation issue analysis

2.3.1 Introduction and framework

Currently, there is no centralised EU initiative or organisation responsible for co-ordinating statistical data on raw material resources and reserves. A standardised and accurate statistical database providing a complete source of data on the geological resources and reserves of European countries has stand-alone value in directing material information users and mineral investors to robust sources of data. It is also essential for informing decision makers regarding materials security and for establishing mitigating strategies. Taken in

association with other data -such as geospatial and land use records - it would provide a valuable supplement for land use planning and future technology development policies.

Such a statistical database would represent one of the components for building a European Union Raw Materials Knowledge Base (EURMKB) targeted by the European Innovation Partnership on Raw Materials (EIP-RM, Action area n° II.8).

2.3.2 Identification of issues

Questionnaires were sent to stakeholders during the Phase 1 survey conducted up to mid-January 2014 (see *Annexe E: Metadata survey for primary materials*). We have analysed the responses to determine the current availability in Europe of resource and reserve data and have identified fundamental and reoccurring issues and bottlenecks, which are currently preventing data harmonisation and interoperability.

The harmonisation issue analysis performed on primary raw materials, led by BRGM with support from project partners, resulted in twelve major issues listed in Table 10, assessed under three topics:

- Policy, legislation and regulation.
- Data quality and comparability.
- Data infrastructure, provision and accessibility.

These three topics are related to the second pillar of the Raw Materials Initiative which aims at fostering sustainable supply of raw materials from European sources (COM(2008)0699). They are further defined in the Strategic Implementation Plan (SIP) of the EIP-RM under two priority areas of the non-technology pillar:

- II.A. Improving Europe's raw materials framework conditions;
- II.C. Knowledge, skills and raw materials flows.

2.3.3 Severity of issues

Having identified and categorised the harmonisation issues related to primary raw materials, their underlying causes and constraints have been investigated. Their severity and the expected time needed to resolve these issues have been assessed and options to bridge these gaps have been suggested, allowing us to determine the level of interoperability realistically achievable by 2020.

The severity of the harmonisation issue has been rated on a scale of 1 to 5 according to the judgement of the study team and feedback from participants in the Stakeholder Meetings and the steering group. They reflect the joint view of the assessment team. In arriving at this judgement, they have taken into account the following broad parameters, which may be more or less relevant to the issue under consideration:

- Stakeholder alignment

  This parameter takes account of the institutional barriers that are perceived to prevail in resolving issues. In particular, there are diverse established interests in play, not least that multiple bodies may be stakeholders in any decision to change legislation, policies or systems of reporting and data exchange.

  Stakeholder alignment can be more problematic where a large proportion of data is

held in private hands and is of a commercially sensitive nature. In such cases, the protocols for redacting such information for public use assume high importance.

- Volume of data to render available

  The quantity of data related to statistical knowledge is extensive; the implied activity required to render this available for open access should not be underestimated. Given that a number of States have no historic obligation to make data openly available, there would be a significant workload placed upon reporting authorities to establish processes and commit human and financial resources to the task. Such systems take time to establish and may compete with other priorities.

- Technical difficulty in creating solutions.

  This embraces a number of factors including:

  - The degree to which a diversity of systems of reporting resources and reserves apply between historic and recent data. That is, historic data may have not been subject to any particular system of reporting and, indeed, relevant data capable of evaluation under modern reporting codes or standards may not be present at all.
  - The capacity and capability to implement a quality control regime of checking and harmonisation in order to underwrite a credible and homogenous system of data both within and between publishing public authorities.
  - The complexity involved in establishing electronic data exchange systems compatible with any systems already in place within state public authorities, or indeed totally absent from authorities, and also compatible with European standards (INSPIRE Directive, EGDI-scope survey).

Owing to the limited information collected from the metadata survey on marine resources and on raw materials management in overseas territories (dependencies), this analysis primarily focuses on primary terrestrial resources belonging to European-based territories. Where available, the Minventory metadata portal points to non-statistical resources that can provide alternative views of materials availability and presence. This is discussed further in Section 2.1.3.2.

N.B. The following analysis does not include specific consideration of marine resources for which based on the outcome of the survey metadata is entirely limited to aggregates, sand and gravel. Possible adjuncts to primary raw materials such as mining wastes, or abandoned mines are dealt with under the sections on mining wastes.

Table 10: Major issues identified regarding to primary raw materials

Topic	Issues/Gaps
I. Policy, legislation and regulation	1. National mining law or minerals policy
	2. Legal requirement to provide resources/reserves data
	3. Terminology of primary RM and dedicated legislation
II. Data quality and comparability	1. Mandated use of a system of reporting
	2. Alignment of national systems of reporting with a widely accepted Standard or Code
	3. Process of harmonising data
	4. Data reliability

	5. Application of the INSPIRE Directive
III. Data infrastructure, provision and accessibility	1. Number of organisation(s) in charge of collecting and centralising data
	2. Data ownership and confidentiality
	3. Public access to open data
	4. Multilingual format of data

2.3.4 Policy, legislation and regulation related issues

Setting the correct framework conditions within the EU in order to foster sustainable supply of raw materials is one of the three pillars of the Raw Materials Initiative (COM(2008)0699). Improving Europe's minerals policy framework is also clearly identified as an action area in the Strategic Implementation Plan of the EIP-RM (Action area n° II-1).

2.3.4.1 Issue I.1: National mining laws or mineral policy

Context and description

National mining laws or minerals policies provide the fundamentals of raw materials management and advocacy as well as their regulatory framework. They also stand as key tools for land-use planning. However, the metadata survey conducted highlighted significant variability among countries covered by the study in terms both of their presence, their content and scope.

Impact

The absence of a national minerals policy results in a lack of a general framework to establish the conditions of resources and reserves data collection, processing, harmonisation, and management (including centralisation). Set in the context of Community materials policies and initiatives, such a framework would be a useful tool for Member States to coordinate their collection and harmonisation of data at a national level.

This gap occurrence among the 41 countries covered by the study is presented in Figure 19.

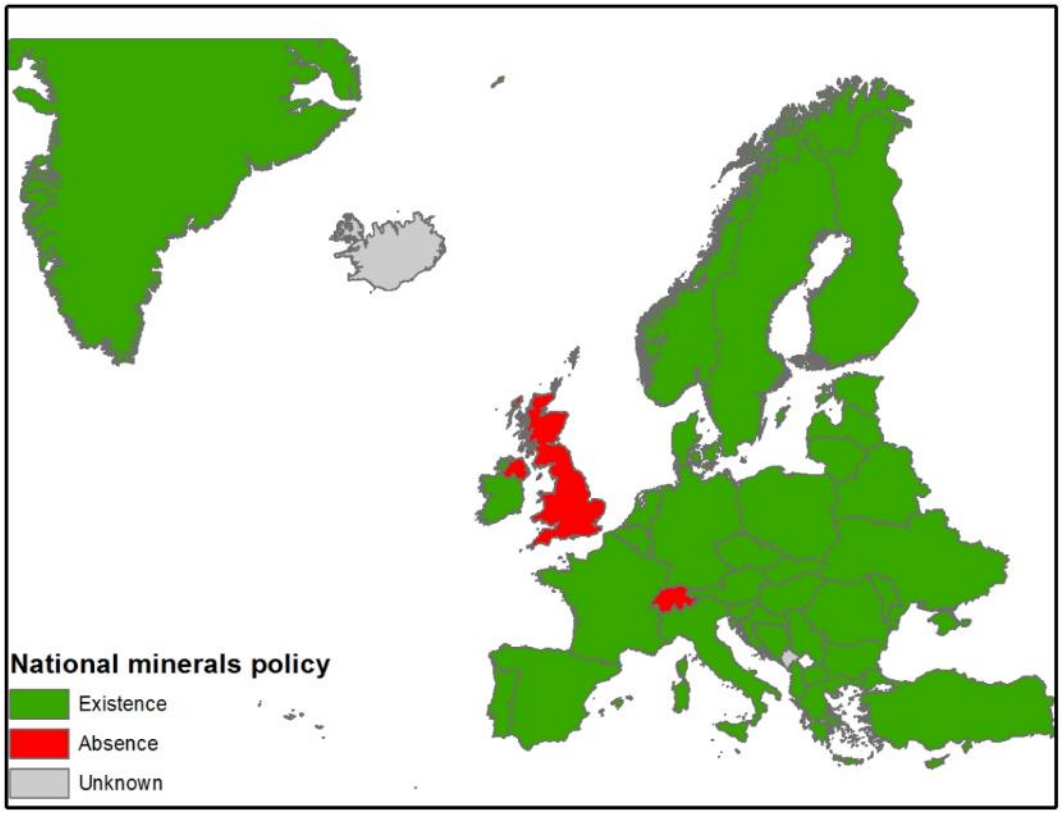
Case study

In Switzerland, the establishment of national legislation on raw materials is perceived as the key challenge to availability and harmonisation of mineral resource and reserve statistical data in their country.

In Belgium, a devolved State, with the exception of marine aggregates which are managed at the national level (Federal Service of Economy, Continental shelf service), primary raw materials are managed at the regional level (Flemish and Walloon governments). Each region has its own legislation and regulation framework. However, in combination, these comprise a national policy. Similar considerations apply to the implementation and collection of data related to mining waste policies.

In contrast, the UK has no such policies or obligations at the State or at the devolved nation level. There are no obligations to report resources or reserves data by companies or State agencies.

Figure 19: Issue I-1 occurrences among European countries covered by the project



Possible resolution timescale

The severity of this harmonisation issue has been assessed as 4/5 and the time needed to fully resolve this issue is beyond 2020 particularly if a legislative solution is envisaged.

N.B. It should be noted that a minerals policy formulated and adopted at EU level could achieve the same effect. However, one of the basic assumptions of this study is that any adoption of policies or associated legislation should be voluntary and, coincidentally, be more tailored to the circumstances of the Member State in question (which might actually be the barrier to the formulation of EU policy).

Severity	Time to resolve
4/5	> 2020

2.3.4.2 Issue I.2: Legal requirement to provide resources/reserves data

Context and description

National (or regional) minerals policies define procedures and requirements for resources and/or reserves data provision from companies to the public authority, and subsequently what is made available to the public. They should cover both historical data management and recently collected data from active exploration or mining companies, as well as both open (publicly available) data and confidential (commercial) data.

However, in nine countries, there is no legal requirement to provide resources/reserves data. Moreover, the time interval of reporting (or the frequency of updates) is not always precisely defined in national or regional mineral policies.

Data provision is one of the key targets of the EIP, as demonstrated in its SIP: "Information on exploration, mineral production, trade, reserves and resources should be standardised and systematically reported by EU and Member States, when information is available and without breaching competition rules" (Action area n° II.1).

Impact

Unless the national (or regional) mineral policies require it, provision of any data by companies to the public authority will be on a good will basis and, therefore, any national statistics compiled in this manner are likely to be incomplete. This lack of data prevents national inventory updates and completeness.

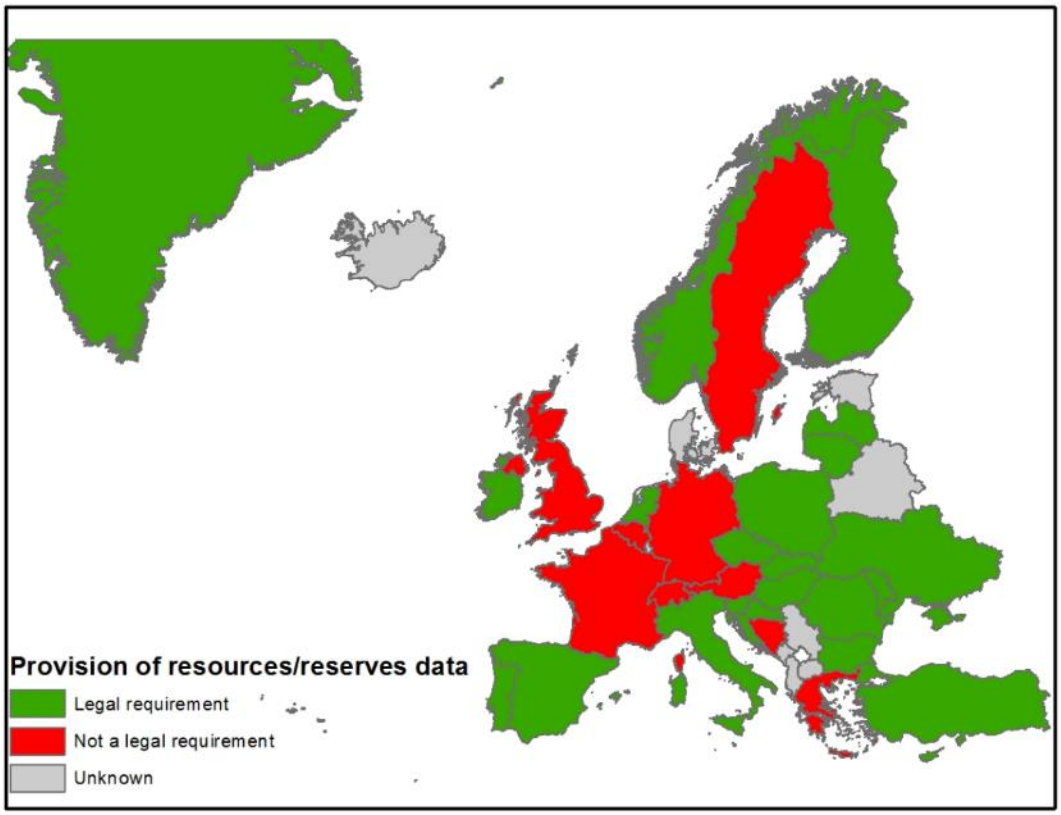
The occurrence of this issue amongst the 41 countries covered by the study is presented in Figure 20.

Case study

In Sweden, there is no requirement in national legislation or policy for the collection of data on primary raw material resources and reserves or other information.

Conversely, in Ireland, there is a legal requirement to provide resources and reserves data for 'scheduled minerals' (most metallic and industrial minerals) on the basis of specific requests submitted by persons or organisations, but not at a defined time interval.

Figure 20: Issue I-2 occurrences among European countries covered by the project



Possible resolution timescale

The severity of this issue has been assessed to 5/5 and the time needed to resolve this issue is beyond 2020 particularly if a legislative solution is envisaged.

Severity	Time to resolve
5/5	> 2020

2.3.4.3 Issue I.3: Terminology of primary raw materials and dedicated legislation

Context and description

National minerals policy sets the scope of raw materials interests. In some countries, distinct regulations and laws can be dedicated to specific raw materials. For example, 'quarry' (mainly construction materials) and 'mine' substances (mainly metallic minerals) and some industrial minerals are distinguished in the national legislation or policies of some jurisdictions. Onshore and offshore raw materials may also be separately managed. In each of these material or activity-specific domains, different – often historic – terminologies may be employed, most fundamentally in their use of resource and reserves terminology.

Note: this is a problem which extends to other raw materials sources, such as landfill.

Whilst the framing of minerals legislation is at the discretion of Member States, harmonisation at the EU level of definitions related to raw materials management (such as resources, reserves, mine, quarry, industrial minerals etc.) would be a highly valuable tool for Member State policy makers.

Impact

Variance in use of terms (such as resources and reserves definitions, data provision (format, frequency etc.), organisation mandated for data collection) both within and between States leads to disharmonised and unbalanced datasets for all primary raw materials at national and/or regional scale. This directly impacts the homogeneity of an EU-level statistical database on resources and reserves.

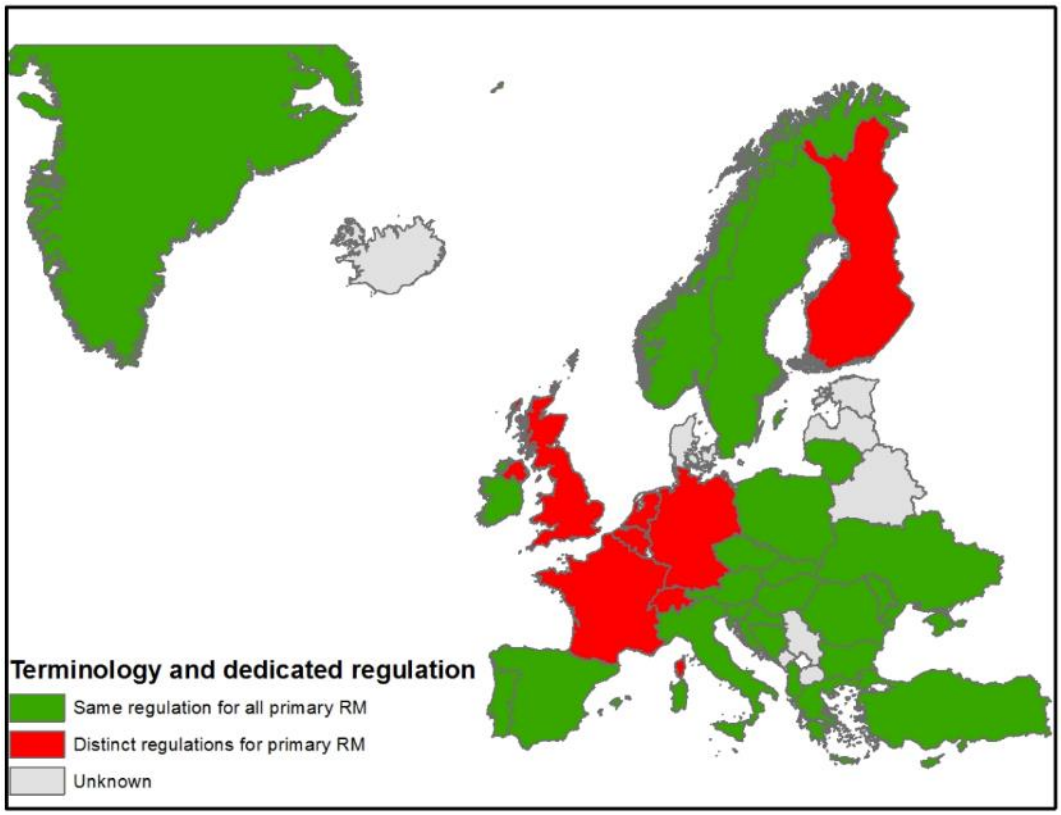
This occurrence of this issue among the 41 countries covered by the study is presented in Figure 21.

Case study

In France, legal distinction is made between 'mine' substances, which include metallic minerals, hydrocarbons (oil, gas, coal) and specific industrial minerals (salts, phosphates, fluorite, graphite), and 'quarry' substances which include construction materials and industrial minerals not in the scope of 'mine' substances.

The Mining Code is thus the legislation prevailing for 'mine' substances and the Environment Code applies to 'quarry' substances. Although it is currently being reviewed and updated, the French Mining Code makes no reference to either resources or reserves, whereas the Environmental Code refers to resources without providing any definition.

Figure 21: Issue I-3 occurrences among European countries covered by the project



Possible resolution timescale

Developing national and EU mineral reporting schemes (including reporting on reserves and resources) based on standard terminology is already an action identified in the SIP of the EIP-RM (action area n°II.1 Minerals policy framework[66]).

The severity of this issue has been assessed as 5/5 and the time needed to fully resolve this issue is beyond 2020.

Severity	Time to resolve
5/5	> 2020

[66] https://ec.europa.eu/eip/raw-materials/en/system/files/ged/1027%2020130723_SIP%20Part%20II%20complet.pdf

2.3.5 Data quality- and comparability-related issues

2.3.5.1 Issue II.1: Mandated use of a system of reporting

Context and description

Resources and reserves data reporting requirements (timeframe, format, system of reporting…) can be specified in national or regional minerals legislation or policies. The lack of mandatory requirements on reporting can lead to incomplete and heterogeneous datasets as no collation and harmonisation process at national level is specified. To enable the publication of national statistics under such conditions, additional effort in collating and harmonising data will be required by relevant public authorities.

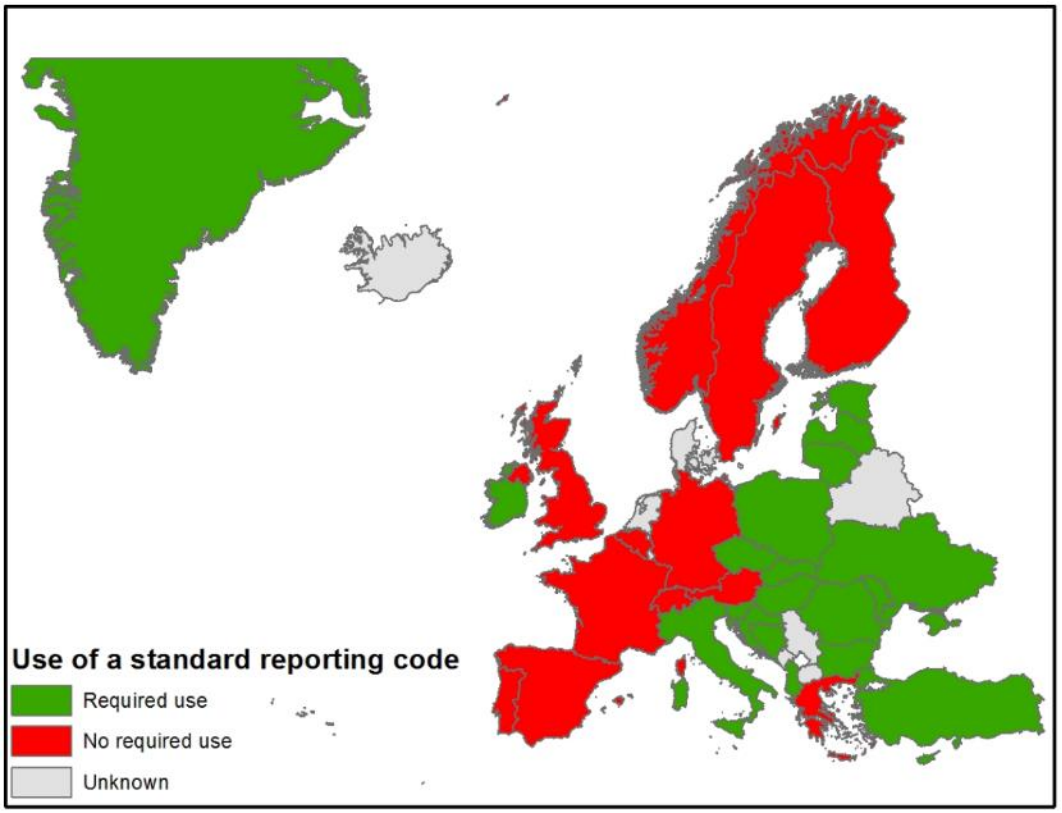
Impact

The absence of legislation or policies requiring use of a specific system of reporting can lead to severe issues both in terms of:

- harmonisation, at national level; and
- lack of data quality assurance and verification, which is provided by the use of a specific system of reporting (embracing methodologies to classify sub-categories of resources and reserves, analysis and checking by a national expert's judgement ('competent person')).

The occurrence of this issue among the 41 countries covered by the study is presented in Figure 22.

Figure 22: Issue II-1 occurrences among European countries covered by the project



Case study

In Austria, there is a legal requirement to survey mineral resources, but not to quantify either resources or reserves. However, a national system of reporting can occasionally be partially used (ÖNORM G 1050[67]). Although originally based on UNFC, this national system of reporting is no longer aligned with internationally used convention.

Possible resolution timescale

One can envisage a programme to develop a methodology allowing the transposition of historical and non-standardised data into an agreed system of reporting, although we foresee difficulties in reconciling diverse national content and practices. It should be noted that the real task in this endeavour is to transpose data in existing formats in individual Members States into a classification system agreed for use at EU-level i.e. harmonised at the EU level rather than the Member State. Harmonisation at the Member State level would be a good step for underpinning proposals to Member States for an EU-level classification system. However, the real commitment is to transpose from existing data formats directly to the agreed EU standard format, which may involve equivalent effort.

Accordingly, the severity of this issue has been assessed as 5/5 and the time needed to resolve this issue is beyond 2020 if a legislative solution is envisaged. (As noted above, this issue may be mitigated by voluntary actions to harmonise selected data directly to an agreed EU level standard, which represents a more practical route forward.

Severity	Time to resolve
5/5	> 2020

2.3.5.2 Issue II.2: Alignment of national systems of reporting to widely accepted codes and standards

Context and description

International reporting codes or standards provide key definitions and parameters for reporting resources and reserves data, but national equivalents can be peculiar to a State. Although commonly based on or aligned to widely accepted classification systems, such as the UNFC or the Soviet system, over time (i.e. when compiling historic data) they can increasingly diverge from these norms.

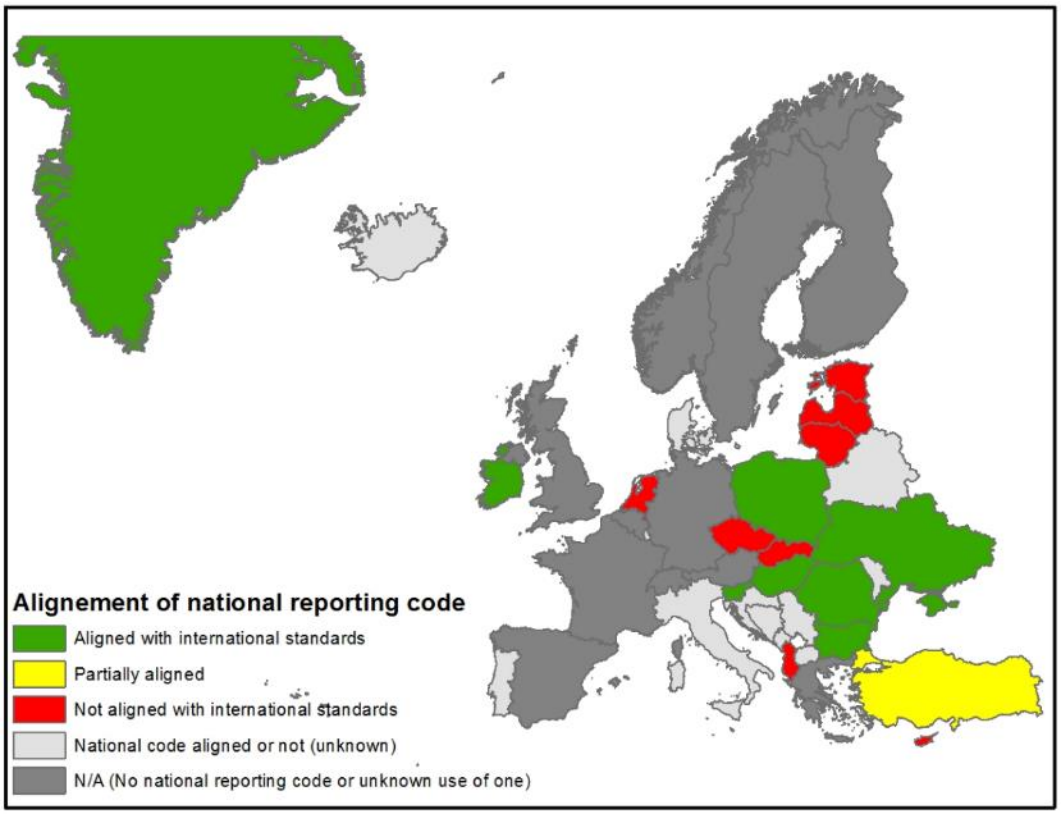
Impact

Independent and unaligned national systems of reporting resources and reserves data, relying on non-internationally-standardised definitions for resources and reserves and their classification, prevent comparability of data across countries, and thus their harmonisation and interoperability at the EU level.

The occurrence of this issue among the among the 41 countries covered by the study is presented in Figure 23.

[67] ÖNORM G 1050: Classification of deposits of solid mineral fuels - Austrian.. Standards Institute; FNA 097 Mining, 1 April 1989.

Figure 23: Issue II-2 occurrences among European countries covered by the project



Case study

The national classification system of the Slovak Republic applies to 'reserves of exclusive mineral deposits'. They are classified into the following three categories according to the stage of survey:

- Quality.
- Technological characteristics.
- Mining conditions.

These are further subdivided into a number of additional 'reserve' categories (see Figure 24). Since 1992, 'prognostic resources' are included.

The National classification system of Slovakia is not aligned with any international system of reporting. The following was reported in the Minventory Phase 1 survey questionnaire completed by the State Geological Institute of Dionýz Štúr:

> *"The term reserves as used, by contrast with the Slovak classification of mineral reserves, in standard international classifications represents only the parts of explored resources which are available for immediate extraction. All other registered parts are resources, not reserves, of a given mineral.* ***Reserves*** *in the Slovak classification of mineral reserves include* ***potentially economic reserves****, i.e. reserves which are currently not recoverable and which are, therefore,* ***potentially economic resources****." (Dr. Peter Baláž).*

However, in spite of its non-alignment, the Slovak classification demonstrates the benefits of delineating the prospective economical potential of raw materials. In particular, it highlights the dynamic nature of the partitioning of resource and reserve estimates depending on time and the economic background.

Figure 24: Reserves and 'resources' classification in the Slovak Republic.

	RESERVES			PROGNOSTIC RESOURCES	
	Z-1 Proved	Z-2 Probable	Z-3 Supposed	P_1 *	P_2 *
ECONOMIC					
POTENTIALLY ECONOMIC					

* *effective from 1992*

Geological reserves = all reserves in their original state without considering mining losses and dilution

Possible resolution timescale

A single widely accepted classification system of mineral resources and reserves should be encouraged and agreed for use by Member States. Potential candidates include the UNFC, the PERC Reporting Standard, the JORC Code and other CRIRSCO aligned systems of reporting.

Alignment with international standards is key to generating trust in data comparisons. As presented in the case study, national systems of reporting resources and reserves being used within Member States may not be aligned to international ones, but even so can demonstrate exemplary models for European practice, even if suitable bridging documents to, for example, UNFC or CRIRSCO are required.

Accordingly, the severity of this issue has been assessed as 3/5 and the time needed to resolve this issue is before 2020.

Severity	Time to resolve
3/5	< 2020

2.3.5.3 Issue II.3: Process of harmonising data

Context and description

The harmonisation of statistical data on resources and reserves can be implemented either at source by the primary data providers (e.g. industry) or centrally by public authorities (e.g. Geological Surveys). Harmonisation at source results in harmonised data at deposit level, whilst centrally controlled harmonisation procedures produce harmonised datasets at national level. Data harmonised at source require an additional step of harmonisation, namely data aggregation to enable the preparation of national statistics on resources and reserves. This is a task for designated public authorities.

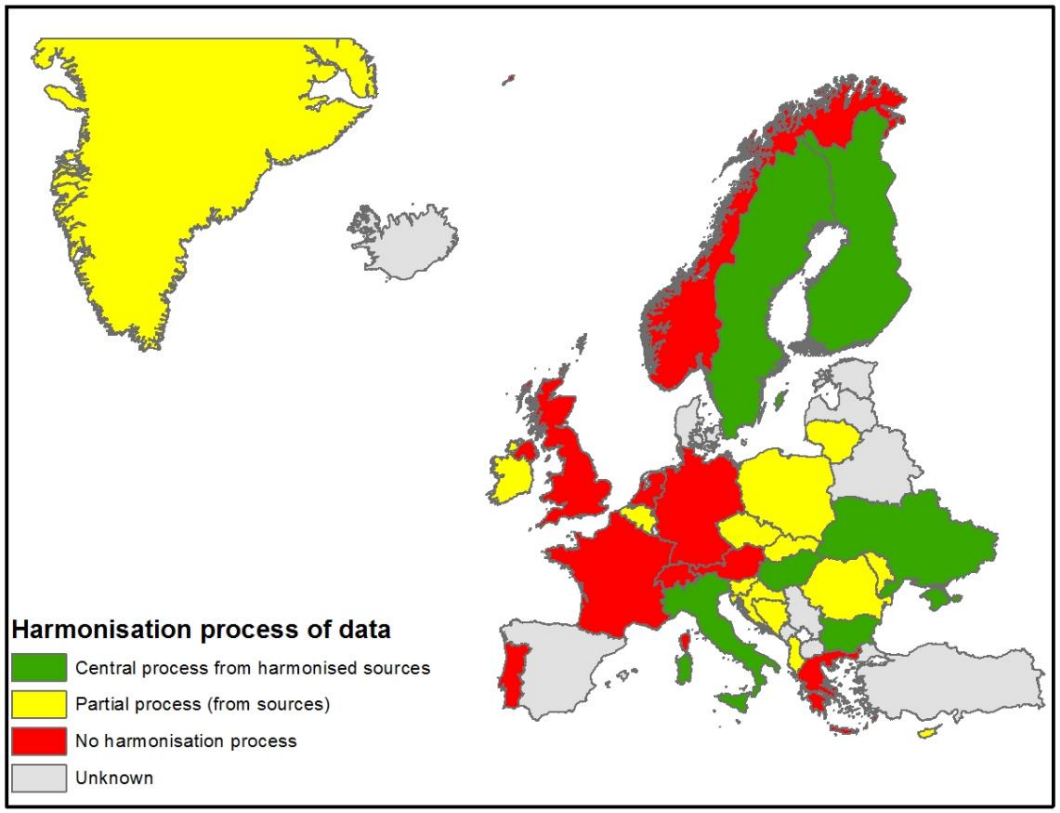
For either of the above options of harmonisation to be effective, a single classification system of resources and reserves should be encouraged for use at national or/and EU level. Harmonisation at national level by public authorities is seen as the most appropriate way forward.

Impact

A trusted, harmonised EU-level database relies on consistent, validated and comparable data from Member States. To achieve harmonisation at the European level, data should therefore be first harmonised at Member State level by conforming to an agreed EU level reporting system, using the encouraged/agreed EU level classification system.

This occurrence of harmonisation issues among the 41 countries covered by the study is presented in Figure 25.

Figure 25: Issue II-3 occurrences among European countries covered by the project



Case study

In Norway, each company decides whether to comply with a recognised international system of reporting. Supplied data are stored in the form they are provided by primary data providers (e.g. industry) and no harmonisation is currently undertaken by public authorities to transpose data to a single Reporting Code or Standard or to aggregate data at national level. Confidential data are not open to the public.

Possible resolution timescale

Three different categories of Member States have been identified, based on data availability and established harmonisation processes:

- Category 1: EU countries with no centralised data collation and harmonisation processes in place;
- Category 2: EU countries with centralised data collation processes, but no harmonisation procedures; and
- Category 3: EU countries with centralised data collation and harmonisation procedures at national level.

Countries that fall under Category 1 should firstly establish a data collation process at national level and after preliminary data evaluation attempt harmonisation using the agreed national and/or EU level classification system of mineral resources and reserves.

Countries in Category 2 tend to collect relevant data, but they are typically available in various formats (reporting codes and standards as used by primary data providers). Harmonisation in this instance should attempt to transpose data into the single agreed national or EU level classification system of mineral resources and reserves.

Countries of Category 3 already have established data collation and harmonisation procedures. For these countries to move towards EU-level harmonisation, existing datasets should be transposed to the agreed single EU-level classification system of mineral resources and reserves. In some cases, Category 3 countries are using national reporting codes that do not directly align to any widely accepted classification systems. Therefore, an additional step of aligning (or bridging) the national reporting code with the agreed classification system should be incorporated.

Any of the above proposed routes should rely on the expertise and commitment of public authorities and National Experts for undertaking the harmonisation tasks.

The severity of this issues will vary considerably across the EU, as discussed. Category 2 and 3 countries are expected to be able to resolve this issue quicker than Category 1 countries. An overall severity of 4/5 has been assigned to this issue with possible resolution across Europe beyond 2020. However, for many countries a resolution before 2020 is possible.

Severity	Time to resolve
4/5	> 2020

2.3.5.4 Issue II.4: Data reliability

Context and description

Resources and reserves data may come from many sources (companies, public national inventories, historical archives...) and from distinct periods of time. Integration into national inventories and subsequently, into an EU-level statistical database, and ensuring their reliability is a key challenge.

Indeed, resources estimation and reserves assessment are highly dependent on:

- **Interpretation** (geological and ore deposit models, grade continuity, estimation method).
- **Time** (level of knowledge, economical and technical parameters).
- **Consistency** of implementation of reporting codes or standards.

The degree of confidence to be assigned to a dataset first depends on the knowledge of the parameters used to estimate resources and reserves. Data reported using international systems of reporting provide the advantage of clearly defining all the parameters taken into account in the resources and reserves definition process. This allows:

- reliability of data, defined within a strict and standardised methodology; and
- the possibility of an easily feasible update of data, by modifying the parameters which need to be updated.

Conversely, historical data or, more generally, data which are not compliant with (or lacks a bridging document to) a national or international system of reporting, may have been reported in an imprecisely defined way (parameters taken into account, methodology used, amount of geological data analysed), which can thus impact the degree of confidence a public authority can attribute to the data when compiling a national inventory.

When compiling resources and reserves data into a national inventory, a public authority should establish a set of procedures to enable collation and harmonisation of data from numerous sources into a single national reported figure. These procedures will outline, for example, how to process data that is less reliable (as it is historic and/or does not meet the requirement of a national / international system of reporting). The presence of such procedures accompanied by the experience of the National Experts collating the data on behalf of the public authority, lend credibility to data contained in the national inventory. Therefore, for any EU-level statistical compilation the resources and reserves data provided from the national inventories of separate MS public authorities will by definition be seen as credible and reliable.

From the questionnaire surveys undertaken for this study, no established procedures were declared by respondents for establishing data reliability. However, the existence of such procedures was not specifically investigated as part of the research undertaken because it is assumed that data made available by public authorities represents the official national data for each country and are therefore inherently reliable. Likewise because public authorities are open to scrutiny they will by necessity have in place procedures for establishing data reliability or as a minimum be able to explain the process by which national resources and reserves data have been obtained.

Impact

Data reliability appears to be the fundamental purpose of an EU-level database, hosting trustable and harmonised data, and with appropriate, timely re-assessment of the distinction between resources and reserves. For any EU-level database to succeed it has to be assumed that data contributed by each participating public authority is both authoritative and reliable. This assumption will only be valid if public authorities have data collation and harmonisation procedures in place.

Possible resolution timescale

The severity of this issue has been assessed as 4/5 and the time needed to resolve this issue is beyond 2020.

Severity	Time to resolve
4/5	> 2020

2.3.5.5 Issue II.5: Application of the INSPIRE Directive

Context and description

Draft guidelines for INSPIRE data specifications on Mineral Resources were published in May 2012. They provide key tools and requirements for the interoperability of spatial datasets and the full extent of the Directive will become mandatory by the end of October 2018.

Resources and reserves data on primary raw materials always refer to spatially referenced places (mineral deposits), most of the time stored in national or regional GIS databases. Such information, if in the public domain, will fall under the INSPIRE Directive and will need to be published according to INSPIRE format.

Even if resource and reserve data is not generally made public at the deposit level, States may voluntarily publish redacted information related to State resources and reserves using the INSPIRE format. This use of the established infrastructure is encouraged by the Directive.

Impact

The INSPIRE data specification serves to highlight issues of interoperability of national GIS databases in the absence of a defined framework. INSPIRE becomes fully effective for all Annexes in October 2018. Therefore, all publicly available data will need to be published in a compliant format. However, there will be a task to convert or revise any previously non-compliant data for compatibility purposes, which may represent a big challenge.

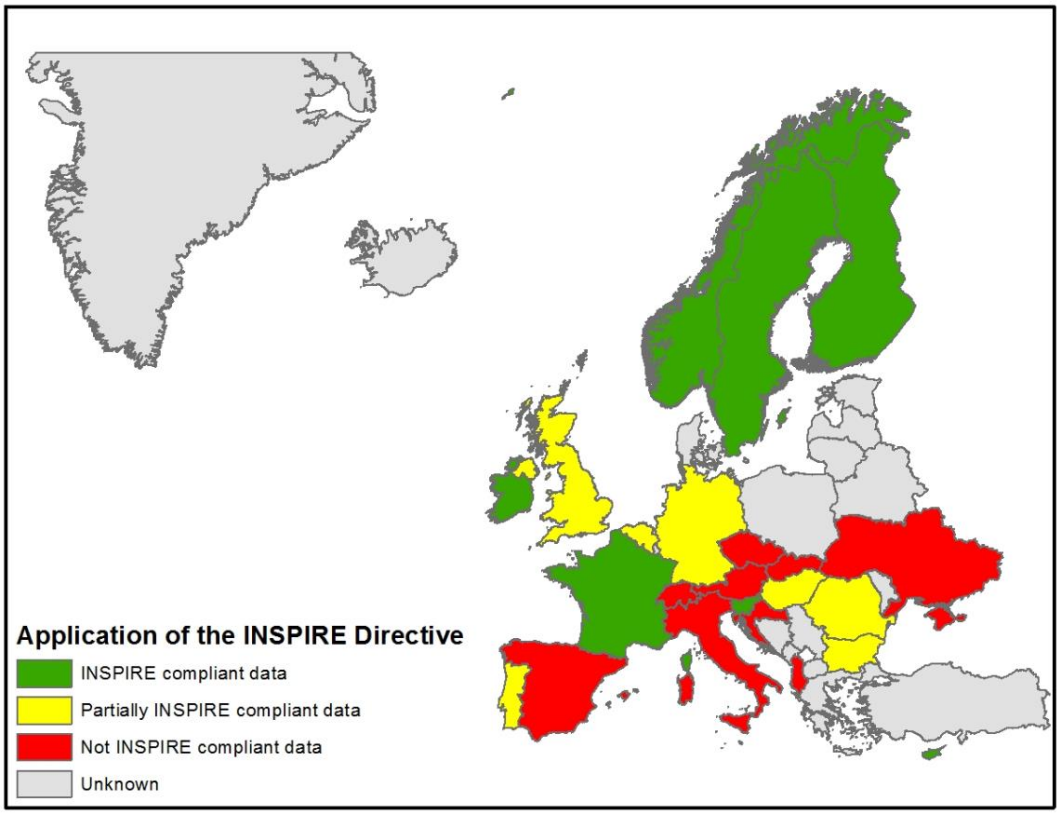
This occurrence of this issue the 41 countries covered by the study is presented in Figure 26**.**

It has already been stated that INSPIRE alone is insufficient to achieve the harmonisation objective because it does not specify a particular reporting standard. However, this aspect is covered elsewhere within the roadmap. A more pressing issue is to define in the near term, feasible and useful metadata that meets the needs of the EU Minerals Yearbook entry on resources and reserves; and to determine whether the minerals values listed within the INSPIRE field codes are sufficient to differentiate key minerals and elements of interest to the EU.

Case study

In Croatia, the national GIS Mineral Resources database (managed by the Geological Survey) is expected to be INSPIRE compliant in 2013-2015. In the questionnaire completed by the Croatian Geological Survey, the *"development of a unified mineral GIS and INSPIRE compliant database"* is perceived to be the key challenge to availability and harmonisation of mineral resource and reserve data in their country.

Figure 26: Issue II-5 occurrences among European countries covered by the project



Possible resolution timescale

Application of the INSPIRE Directive as a key tool for interoperability of geo-referenced datasets will become mandatory by 2018; this will happen irrespective of the Minventory study. The issues associated with INSPIRE principally relate to what is a minimum compatible dataset that might be provided in a comprehensive and cost-effective manner by all countries to fulfil the functions of a statistical data portal (as opposed to a 2D or 3D data portal). This clarification, along with the other issues related to comparable codes, standards and classifications will require further coordinating actions at a technical level, and also in regulating the application of data checking and validation across organisations. Such frameworks for action exist (for INSPIRE) or are planned (for Minerals4EU).

Accordingly, the severity of this issue has been assessed as 3/5 and the time needed to resolve this issue is before 2020.

Severity	Time to resolve

3/5	< 2020

2.3.6 Data infrastructure, provision and accessibility related issues

2.3.6.1 Issue III.1: Number of organisation(s) in charge of collecting and centralising data

Context and description

The data collection process is highly variable across countries surveyed. It can be devolved to different public authority organisations/departments at distinct levels (local/ regional/ national) and depending on raw materials.

Aggregation of data at a national level into a database would be a highly valuable tool as a precursor to merging or translating such databases into an EU-level 'knowledge base' (EURMKB presented in the SIP of the EIP-RM under action area n°II.8).

Impact

At national level, it appears difficult to aggregate and harmonise data held by several entities and possibly in distinct formats. The existence of multiple organisations responsible for data collection and storage within countries can highly impede the creation and maintenance of an EU-level database by multiplying the number of stakeholders involved. It can also lead to unbalanced datasets at the European level.

The occurrence of this issue among the 41 countries covered by the study is presented in Figure 27.

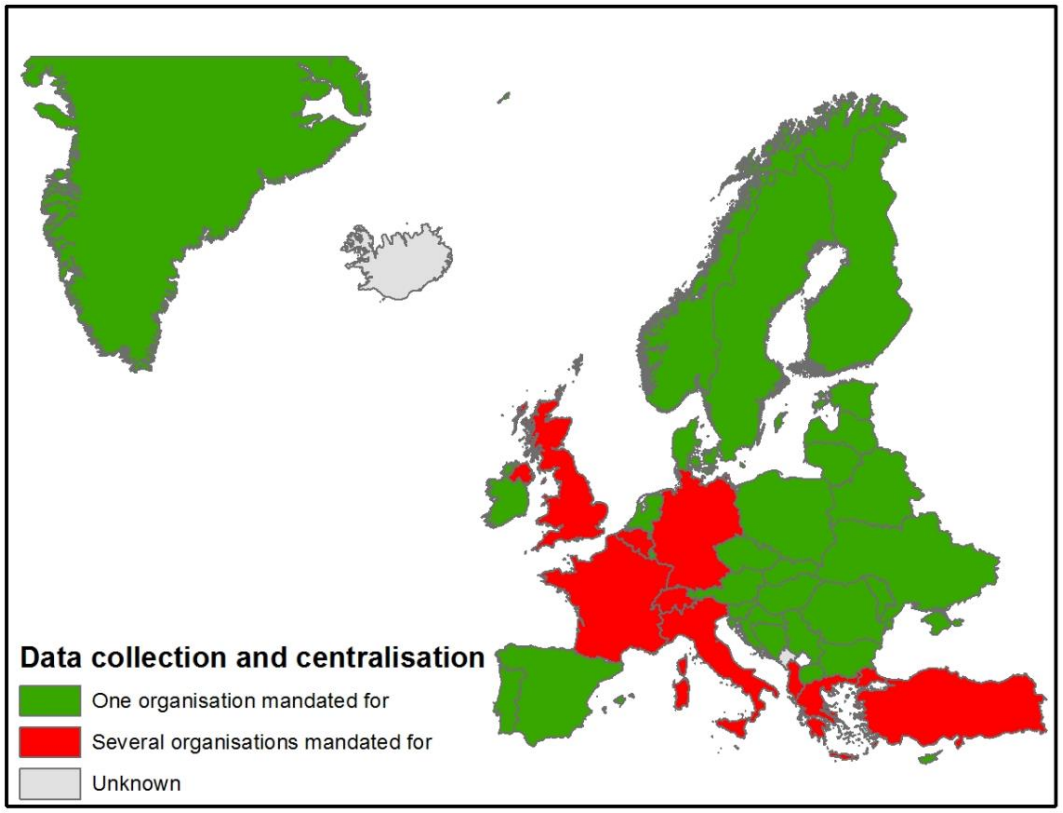
Case study

In Italy, statistical data on resources and reserves are locally and regionally collected; there is no national centralisation. Data is, therefore, available for all primary raw materials, sourced from regional mining databases, at a regional scale. There are 20 regions in Italy, which means 20 distinct databases:

> *"the collection of data at national level (industrial and metallic minerals) is hampered by the heterogeneity of regional databases" (ISPRA-Geological Survey of Italy).*

Currently ISPRA, in collaboration with ISTAT (Italian National Institute of Statistics), is arranging a national harmonised census of mining activities (quarries and mines) based on an international template. The census must be agreed with the Ministry of Economic Development (Directorate-General for mineral and energy resources).

Figure 27: Issue III-1 occurrences among European countries covered by the project



N.B. One organisation ± Geological survey

Possible resolution timescale

Because of the issues of possible inconsistency (and potential incompatibility) between different datasets held by several stakeholders, this harmonisation issue has been assessed as severe. However, a national structure in every Member State could be quite quickly nominated (if already existing), or created.

Accordingly, the severity of this issue has been assessed as 4/5 and the time needed to resolve this issue is before 2020.

Severity	Time to resolve
4/5	< 2020

2.3.6.2 Issue III.2: Data ownership and confidentiality

Context and description

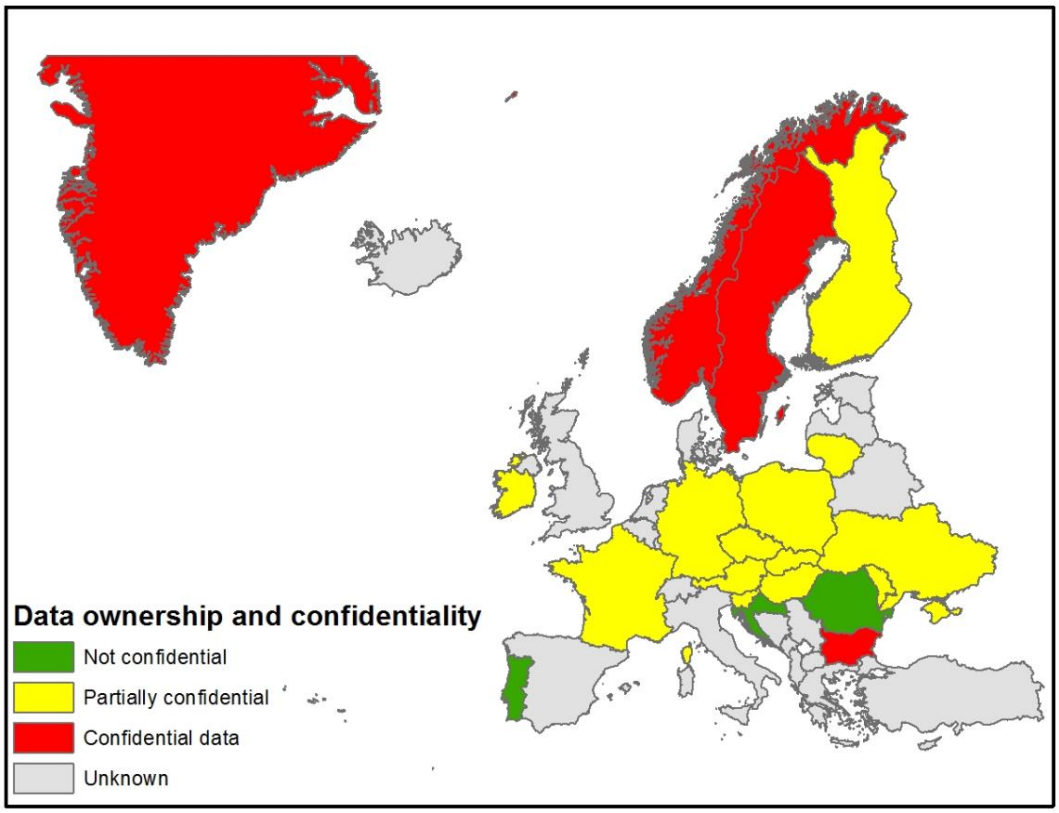
Data confidentiality status and requirements are variable among countries. In general, data collected using public funding (e.g. national inventories) are open data and freely available, whereas private companies own their data and keep them confidential for a period of time, which can be defined or not according to the national minerals policies.

Impact

A substantial amount of data is kept confidential and cannot readily be accessed to populate publicly accessible databases. This clearly represents a significant gap in the data available in every country.

The occurrence of this issue among the 41 countries covered by the study is presented in Figure 28.

Figure 28: Issue III-2 occurrences among European countries covered by the project



Case study

In Hungary, the centralised database includes resources and reserves data at deposit, local, regional and national level but data is publicly available only at national level. This offers two main benefits:

- a complete national database which also integrates data from private companies; and
- resolution of the data ownership and confidentiality issues (which remain concealed only at deposit scale).

Possible resolution timescale

Confidentiality issues limit the data which may be released from national databases. Because comprehensive data access is critical, this harmonisation issue has been jointly assessed as severe. (4/5) and the time needed to comprehensively resolve this issue is beyond 2020. However, redacted data summaries should be more practically achievable.

Severity	Time to resolve
4/5	> 2020

2.3.6.3 Issue III.3: Public access to open data

Context and description

Ease of data access is a clear need for a wide range of users (public, research/education organisations, and institutions). In addition to promoting national and/or regional mineral potential and thus attracting investors, dissemination of open data plays a very important role in establishing public awareness and acceptance. This has been clearly identified as an action in the SIP of the EIP-RM (action area n° II.3), quoting that “public awareness is the first step in facilitating the raw materials supply”.

Whilst generally freely available through web portals, public access to data can be:

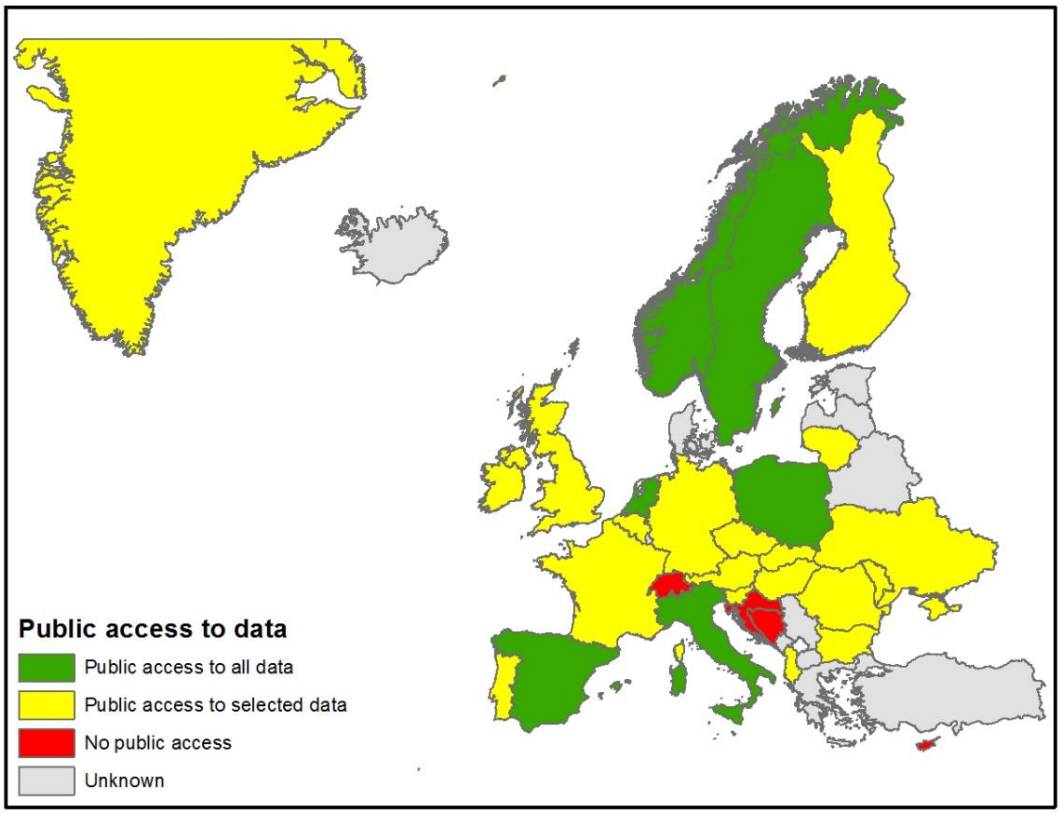
- restricted to selected data (recent or non-confidential data); and
- inhibited (because of a chargeable or non-instantaneous procedure for access).

Impact

Unavailability to the public of a whole dataset at the national level could lead to an incomplete EU-level database. However, as discussed in the previous section with the case study of Hungary, the public can have access to selected data, satisfying the commercial confidentiality issues of private operators. Meanwhile, the national statistical database itself remains complete. This is a critical factor in ensuring a representative European database as long as the data which is confidential at a national level can be collated at an EU level.

This occurrence of this issue among the the 41 countries covered by the study is presented in Figure 29.

Figure 29: Issue III-3 occurrences among European countries covered by the project



Case study

In Cyprus, resources and reserves data are stored in a national geo-database within a GIS. They are not directly available to the public but can be accessed via specific data requests and are chargeable.

In its completed questionnaire, the Geological Survey of Cyprus quoted a number of reasons for data not being available to the public. Where data are owned by a private company they can only be made available if the company's consent is given. For data compiled by the Geological Survey it will depend on the importance of the specific mineral and/or resource.

The Geological Survey of Cyprus perceives public availability of data as the key challenge for harmonisation of and access to mineral resource and reserve information in their country.

Possible resolution timescale

Public access to data, even at the deposit scale where data ownership issues can appear, should be promoted as a key tool to attract investors.

An interesting example is the Sigéom[68] web site developed by the Ministry of Natural Resources of Québec (Canada). In order to promote their mineral wealth and potential,

[68] http://sigeom.mrn.gouv.qc.ca/

almost all information can be freely accessed: resources and reserves, results from exploration work, description of drilling campaigns and results, prospective areas etc. Their investor-friendly policy may be one of the main reasons for the exploration rush from which they are benefiting.

Accordingly, the severity of this issue has been assessed as 3/5 and the time needed to resolve this issue is before 2020.

Severity	Time to resolve
3/5	< 2020

2.3.6.4 Issue III.4: Multilingual format of data

Context and description

Freely accessible data need to be understandable to all users. However, in many countries (11 of the 41 countries surveyed) resources and reserves data, as well as all associated information (reports, maps etc.) are only available in the national language. Added to this is the issue that the words used (for instance, in English) can have a variety of meanings.

Impact

Use of national languages in national databases and/or web portal presents difficulties in understanding some data for foreign users (and possibly some potential investors). It can also encourage and embed peculiarities in use of terminology and interpretation between nations which hinders harmonisation at EU level.

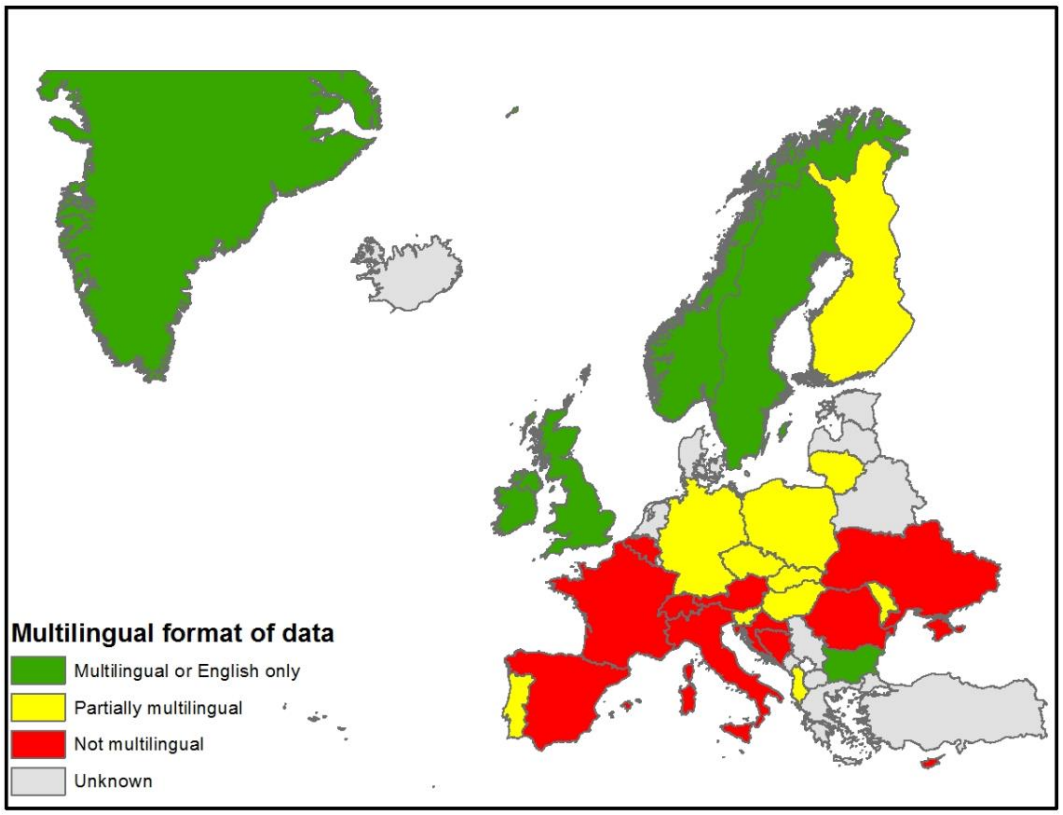
The occurrence of this issue among the 41 countries covered by the study is presented in Figure 30.

Case study

In Moldova, data centralised by the Agency for Geology and Natural Resources (AGeoM) are mostly in Moldovan or Russian, with very little information in English. Similar examples can be found in many countries of the southern and eastern parts of Europe.

Information may also be partially translated into English, such as in Portugal or Poland.

Figure 30: Issue III-4 occurrences among European countries covered by the project



Possible resolution timescale

This harmonisation issue has been assessed to be of mild to medium severity because it can be relatively quickly solved by translation of selected information; in addition, movement to a common system of reporting (with bridging documents from local standards) would remove terminological uncertainty.

Accordingly, the severity of this issue is considered as 2/5 and the time needed to resolve this issue is before 2020.

Severity	Time to resolve
2/5	< 2020

2.3.7 Synthesis of identified issues and indicative actions to resolve them

Twelve major harmonisation issues preventing data harmonisation and interoperability have been identified and classified according to their topic. Their frequency of occurrence is presented in Table 11.

Table 11: Synthesis of identified issues, severity and time needed to be resolved

Topic	Issues/Gaps	Frequency (/41 countries)				Severity (1-5)	Time to resolve
		✓	✘	❍	?		
Policy, legislation and regulation	I-1- National mining law/national minerals policy	37	2	0	2	4	> 2020
	I-2- Legal requirement to provide resources/reserves data	21	10	0	10	5	> 2020
	I-3- Terminology on primary RM and dedicated regulation	24	7	0	10	5	> 2020
Data quality and comparability	II-1- Required use of a reporting code	20	12	0	9	5	> 2020
	II-2- Alignment of national reporting code with international templates *(on 30 countries)*	8	9	1	12	3	< 2020
	II-3- Central harmonisation process of data	6	10	14	11	4	> 2020
	II-4- Data reliability	*INP*	*INP*	*INP*	*INP*	4	> 2020
	II-5- Application of the INSPIRE Directive	7	9	8	17	3	< 2020
Data infrastructure provision and accessibility	III-1- Several organisations in charge of collecting and centralising data *(exc. Geol Survey)*	30	9	0	2	4	< 2020
	III-2- Data ownership and confidentiality	4	3	13	21	4	> 2020
	III-3- Public access to data	6	4	19	12	3	< 2020
	III-4- Multilingual format of data *(or English)*	6	11	11	13	2	< 2020

Key: ✓: there is no issue; ✘: there is an issue; ❍: there is a partial issue; ?: unknown status.

INP: Indicator Not Present

In more detail, Table 12 below provides a summary country by country of gaps encountered. A colour code is used to highlight the percentage of the identified gaps which affect each country. For further clarification the table should be interpreted in the following manner:

- Issue II-2 directly derives from the answer to Issue II-1. If in a country there is no required use of a (national or not) system of reporting (presented as a cross in the table), the question of its alignment to international templates is no longer relevant. As a result, Issue II-2 will be marked as 'N/A' (following a cross in Issue II-1).
- Under Issue II-4, there are no declared procedures for establishing and/or reporting the currency, reliability or validity of data published by a public authority. Given that data published by a public authority represents official data for the country, it has been assumed that for many, if not all, public authorities such procedures will be in place. This gap is certainly strongly linked to the use of systems of reporting (Issue II-1), but is highly dependent on many parameters: the collection process of geological data, geological interpretation, level of geological knowledge, estimation method used to assess resources, economical parameters to assess reserves at the time of the survey, consistency of implementation of any system of reporting.

In summary, feedback from the presentation of the preliminary findings of the harmonisation issue analysis at Stakeholder Meeting 2 showed a strong consensus to focus on implementation of an **internationally recognised system of reporting resources and reserves data** to bridge several of the issues identified.

A standardised system of reporting presents many benefits:

- It sets clear **definitions** of resources and reserves as well as their categories (and sub-categories).
- It provides a **general framework and guidelines** for its implementation.
- It offers assurance of a minimum **standard of quality** (reliable data) as it is based on a set of underlying principles, rules and guidelines, as well as the expert's judgement of a 'competent person', who requires experience relevant to the subject of matter (ore deposit typology for example) and continuous training.
- It is a valuable tool to **attract investors**, even from abroad, as an internationally recognised system of reporting would be used, thus aiding comparability.

Table 12: Synthesis of identified gaps occurrences by country

	Policy, legislation and regulation			Data quality and comparability					Data infrastructure, provision and accessibility			
	I-1	I-2	I-3	II-1	II-2	II-3	II-4	II-5	III-1	III-2	III-3	III-4
EU 28 countries												
Austria	✓	×	✓	×	N/A	×	INP	×	✓	❍	❍	×
Belgium#	✓	×	×	×	N/A	❍	INP	❍	×	?	❍	×
Bulgaria	✓	✓	✓	✓	✓	✓	INP	❍	✓	✓	❍	✓
Croatia	✓	✓	✓	✓	?	❍	INP	×	✓	×	×	×
Cyprus	✓	✓	✓	✓	×	❍	INP	✓	✓	?	×	×
Czech Rep.	✓	✓	✓	✓	×	❍	INP	×	✓	❍	❍	❍
Denmark	✓	?	?	?	?	?	INP	?	✓	?	?	?
Estonia	✓	?	?	✓	×	?	INP	?	✓	?	?	?
Finland	✓	✓	×	×	N/A	✓	INP	✓	✓	❍	❍	❍
France	✓	×	×	×	N/A	×	INP	✓	×	❍	❍	×
Germany	✓	×	×	×	N/A	×	INP	❍	×	❍	❍	❍
Greece	✓	×	✓	×	N/A	×	INP	?	×	?	?	?
Hungary	✓	✓	✓	✓	✓	✓	INP	❍	✓	❍	❍	❍
Ireland	✓	✓	✓	✓	✓	❍	INP	✓	✓	❍	❍	✓
Italy	✓	✓	✓	✓	?	✓	INP	×	×	?	✓	×
Latvia	✓	✓	?	✓	×	?	INP	?	✓	?	?	?
Lithuania	✓	✓	✓	✓	×	❍	INP	?	✓	❍	❍	❍
Luxembourg	✓	?	?	?	?	?	INP	?	✓	?	?	?
Malta	✓	?	?	?	×	×	INP	?	✓	?	?	?
Netherlands	✓	✓	×	?	×	×	INP	❍	✓	?	✓	?
Poland	✓	✓	✓	✓	✓	❍	INP	?	✓	❍	✓	❍
Portugal	✓	✓	✓	×	?	×	INP	❍	✓	×	❍	❍
Romania	✓	✓	✓	✓	✓	❍	INP	❍	✓	×	❍	×
Slovakia	✓	✓	✓	✓	×	❍	INP	×	✓	❍	❍	❍
Slovenia	✓	✓	✓	✓	✓	❍	INP	✓	✓	❍	❍	❍
Spain	✓	✓	✓	×	N/A	?	INP	×	✓	?	✓	×
Sweden	✓	×	✓	×	N/A	✓	INP	✓	✓	✓	✓	✓
U.K.	×	×	×	×	N/A	×	INP	❍	×	?	❍	✓

 # Policies exist separately for Wallonia and Flanders which aggregately are taken to constitute a national policy.

/continued…

	Policy, legislation and regulation			*Data quality and comparability*					*Data infrastructure, provision and accessibility*			
	I-1	I-2	I-3	II-1	II-2	II-3	II-4	II-5	III-1	III-2	III-3	III-4
Additional European countries												
Albania	✓	?	✓	✓	×	❍	INP	×	×	?	❍	❍
Belarus	✓	?	?	?	?	?	INP	?	✓	?	?	?
Bosnia H.	✓	×	✓	✓	?	❍	INP	?	✓	?	×	×
Greenland	✓	✓	✓	✓	✓	❍	INP	?	✓	✓	❍	✓
Iceland	?	?	?	?	?	?	INP	?	?	?	?	?
FYR Macedonia	✓	?	?	?	?	?	INP	?	✓	?	?	?
Moldova	✓	✓	✓	✓	?	❍	INP	?	✓	❍	❍	❍
Montenegro	?	?	?	?	?	?	INP	?	?	?	?	?
Norway	✓	✓	✓	×	N/A	×	INP	✓	✓	✓	✓	✓
Serbia	✓	?	?	?	?	?	INP	?	✓	?	?	?
Switzerland	×	×	×	×	N/A	×	INP	×	×	?	×	×
Turkey	✓	✓	✓	✓	❍	?	INP	?	×	?	?	?
Ukraine	✓	✓	✓	✓	✓	✓	INP	×	✓	❍	❍	×

✓ Not an issue
× There is an issue
❍ Partial issue
? Unknown
N/A Not applicable
INP Indicator Not Present

< 25 % of identified issues
25 to 50 % of identified issues
50 to 75 % of identified issues
> 75 % of identified issues

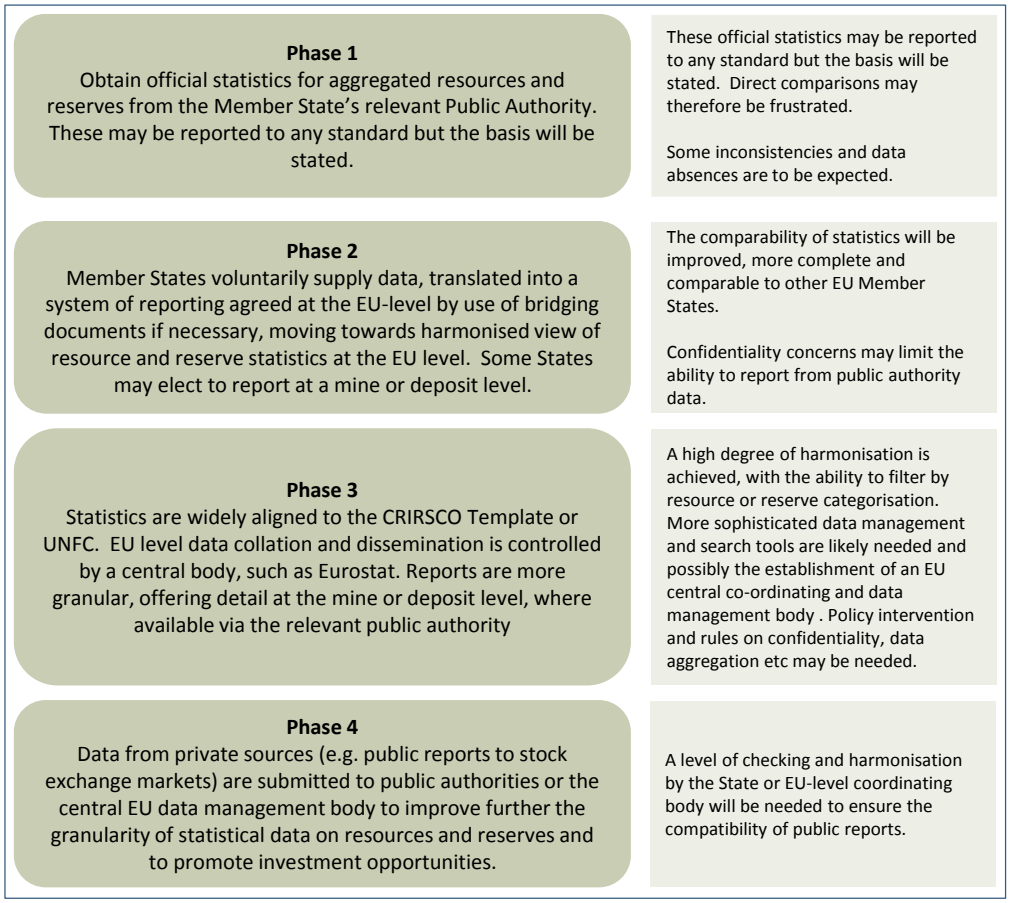
2.4 Primary raw materials roadmap

2.4.1 Outline evolution of the future harmonisation process

Section 1.6, page 58, described the broad objectives of the study. Since this section introduces the roadmap for primary raw materials, it is appropriate to outline further what the outputs of the study might mean in more substantive terms. Given that there are numerous components that must be assembled, involving Member States with different minerals policies, legislation, infrastructures and minerals endowments, the harmonisation objective is complex. Therefore a stepwise evolution is a practical response.

A number of parallel projects have been referred to, but of highest relevance is the FP7 Minerals4EU project which builds on the work of this study. One of its immediate objectives is to plan and implement the collation of raw materials statistical data (including resources and reserves) for publication in a European Minerals Yearbook. It is therefore clear that this objective is a first evolution of the harmonisation process. As a development of this, Figure 31 presents a possible phased approach to implementing harmonised data collection in line with an expanding scope.

Figure 31: Possible phased evolution towards a harmonised data system



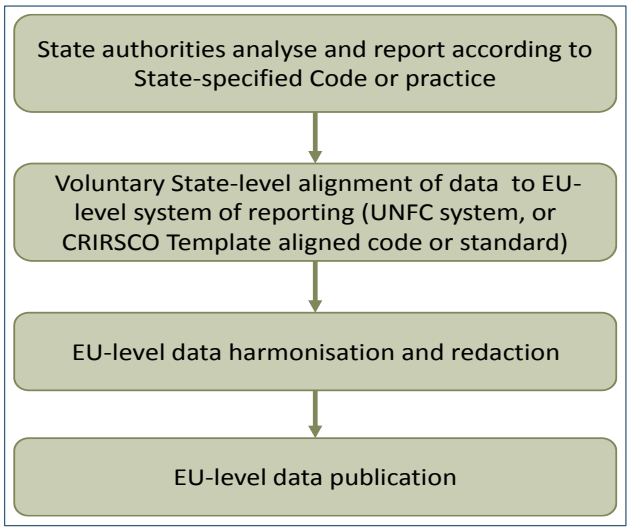
Source: Oakdene Hollins/BGS

Phase 1 envisages the basic output which is essentially the minerals yearbook for resources and reserves, a summary per country or by mineral. Phase 2, 3 and 4 envisage that data is

also available at a deposit, mine or project level and requires a database and query mechanism well beyond the ambitions of Phase 1, with increasing reliance on electronic access and centralised harmonisation and checking. Phase 4 specifically deals with the possible submission of data from private sources or their 3rd party data suppliers.

Figure 32 illustrates the proposed data transformation steps *en route* to EU-level publication.

Figure 32: Data flow for EU-level publication



A graphical representation of how these processes might be implemented within States operating to varying standards and publishing obligations is provided in Figure 33.

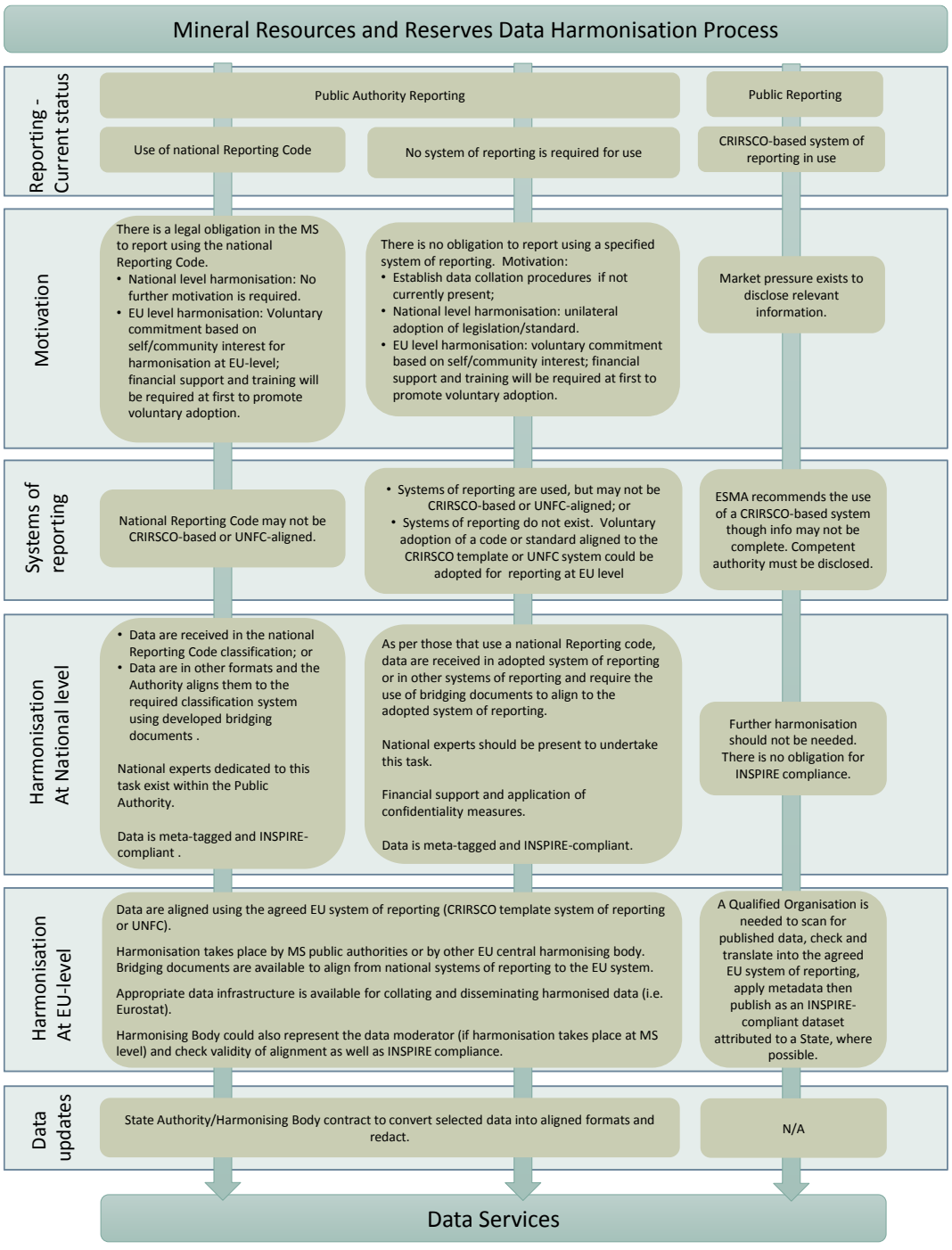
2.4.2 Summary timelines

Figure 34 summarises the assessment of the components that must be established taking into account the harmonisation issues identified in the previous phase. Broad timings and a general indication of the ramping up of activities is included. It also includes known milestones from related initiatives or directives. Clearly, relevant components of this roadmap must be compatible with those milestones if they aspire to similar objectives.

The diagram does not reference all the Harmonisation Issues raised in the analysis. As stated, each was reviewed for its criticality and whether it was indeed a logical prerequisite, or whether it would be addressed by subsidiarity to other proposed actions. For example, Issue I.1 revealed, in each Member State, the presence or absence of legislation in mining and minerals policy. Universal adoption of such legislation would indeed contribute to the Commission's desire for better long-term raw material resource and land use policy integrated across Europe and perhaps streamline permitting processes, but such an act is not necessary in respect of making statistical data widely available. A more important obligation is to motivate the voluntary release of the statistical data into the public domain.

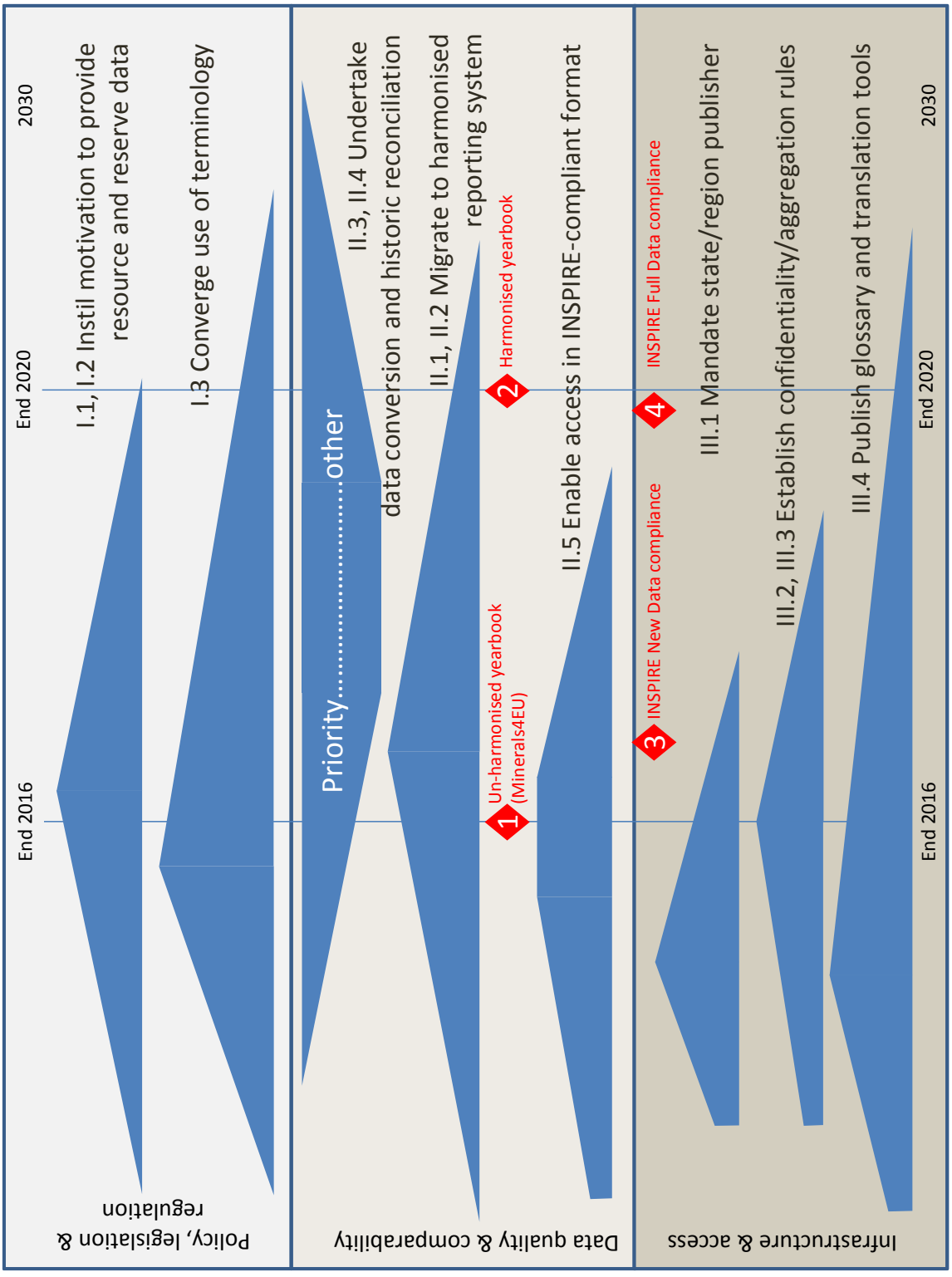
However, if such minerals legislation exists in, or is planned for a Member State, then it would be compatible with the current objective to add or include in that an obligation to publish statistical resource and reserves data to some level of detail and protocol. In this respect, the original issue I.1 has acquired subsidiarity to issue I.2.

Figure 33: Possible harmonisation pipeline



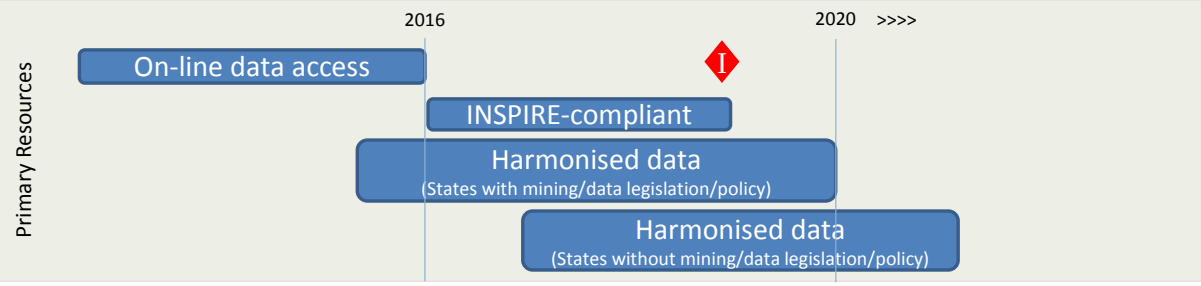
Source: Oakdene Hollins/BGS

Figure 34: Key actions in the Primary Raw Materials Roadmap



As a result of implementing the actions, the following outcomes are expected (Figure 35).

Figure 35: Broad outcomes targeted with achievement date



2.4.2.1 Prioritisation of actions

The following table indicates which actions arising from the primary raw materials issues analysis (Section 2.3) are easiest to achieve or which might be started earliest.

Table 13: Actions cast in order of start date and duration

Action Addressing	Start date/ Duration	Notes
I.1, I.2: Motivation to provide data	Soon/ Ongoing	Consensus building and stakeholder interest group recruitment can begin at once, as can links to other initiatives.
I.3: Terminology	Soon/ Short	Although full implementation in law in all States is a long term prospect, terminology established in this study and parallel initiatives could be published for voluntary adoption shortly.
II.4: Glossary and translation	Soon/ Prolonged	A glossary can be published relatively quickly (as per I.3), but translation tools may take longer.
II.5: INSPIRE compliance	Soon/ Prolonged	Progress on reporting can occur when terminology is agreed. Alignment of terminology with a particular system of reporting would follow. The INSPIRE implementation deadline assists in this. Attribute code changes may take some time.
III.1: National contact point	Medium/ Short	A national contact point can be nominated relatively quickly once commitment to the study objectives has been established.
III.2, III.3: Confidentiality rules	Medium/ Short	Once a contact point is established, discussion on confidentiality can commence.
II.3, II.4: Harmonise and convert	Medium-Long/ Lengthy	Work on harmonisation follows 'confidentiality' and will be short for 'aligned' States and more lengthy for others.
II.1, II.2: Migrate to EU-level reporting	Medium-Long/ Lengthy	EU-level reporting parallels harmonisation and conversion.

Start: Soon = as soon as possible; Medium = within 2-3 years; Long = >3 years
Duration: Ongoing = continuous activity; Short = 1-2 years; Prolonged = 2-5 years; Lengthy = >5 years

2.4.2.2 Expansion of actions

The actions outlined the roadmap depicted in Figure 34 are now expanded to reveal the suggested component actions, exemplifications of approach known in Member States, relationships to the original issues and other characterising features.

2.4.3 Actions on Issues I.1 & I.2: Establish motivation to provide data

2.4.3.1 Background

Setting the right framework conditions within the EU in order to foster sustainable supply of raw materials is one of the three pillars of the Raw Materials Initiative (COM (2008) 0699). Improving Europe's minerals policy framework is also clearly identified as an action area in the Strategic Implementation Plan of the EIP-RM (Action area n° II-1).

Constructing a coherent, harmonised minerals statistics database is critically dependent on Member States making available the data to populate it. On the positive side, the majority of European states (16 of the 28 of the EU) do have a minerals law and/or policy, and data disclosure obligations policies that oblige companies to report their resource and reserve data to the relevant public authority. This is summarised in Table 14.

Table 14: Frequency of mineral law/policy/data disclosure (from companies to the public authority) combinations amongst Member States

	Data Disclosure Obligation	No Data Disclosure Obligation
Minerals Law/Policy	16	11
No Minerals Law/Policy	0	1

Source: BGS survey of geological surveys
Note: Data may be disclosed voluntarily even in the absence of an obligation

It should be noted that these disclosure obligations on companies are distinct from the obligations on the Member State itself to release such data to the public. In general, there are sound commercial objections to publication of data at a deposit level at least on a temporary basis and, as a result, only six Member States have unconstrained publication policies and at least 18, partial or temporary restrictions. This issue is specifically discussed in Section 2.3.6.2, page 116, and actions proposed in Section 2.4.9, page 150.

2.4.3.2 Options for action

The issue of establishing a motivation to provide data, in combination with the data confidentiality issue, is undoubtedly the linchpin of the harmonisation objective. There are clear sensitivities in ensuring that any actions taken are voluntary, and pose little or no extra burden beyond what is currently undertaken, or implied by other EU-level actions for which there is already agreement or obligation to future action.

A number of States already have data disclosure obligations as indicated above. For those where no data disclosure obligation exists, there exists at least the possibility of modifying the prevailing minerals law or policy to incorporate this obligation. There is a moderately good possibility that this could be enacted by 2020. It should be noted that agreements between industry and public authorities for voluntary data disclosure may also be set.

Within the EU 28 there is only one Member State, the United Kingdom, which has neither an overarching national minerals law/policy or a corresponding data disclosure obligation for

resources and reserves statistical data. Of course, there are no instances where data must be disclosed in the absence of a mining law. A further complication in the UK is the devolution of nations within the State which have semi-independent legislative and agency responsibilities. Note that the regions of Belgium have separately installed such policies so, in total, can be perceived as possessing a national policy. However, for the UK, the likelihood of instituting a minerals policy and data disclosure obligation appears remote; other strategies will be necessary.

National policies can be influenced by related policies such as the INSPIRE Directive, which will be mandatory in 2018. Although INSPIRE relates to spatially-located data, statistical data could be brought within its remit by careful and cautious definition of the metadata required to establish the data portal conceived in the scope of this study. Clearly, there may need to be further phasing to allow for assimilation of historic obligations and confidentiality issues. However, if coupled with a national data disclosure policy, which may outline confidentiality and aggregation constraints and the role of government agencies such as the relevant geological surveys, it seems possible that INSPIRE could be used to provide some structure for data reporting obligations.

However, the Minventory primary raw materials roadmap does not consider EU-level Directives or Regulations that would mandate Member States to impose either mineral policies, reporting standards or reporting obligations (together known as 'codes') on their relevant ministries or agencies, in the primary raw materials domain. However, this means thatin a possible contribution to centralised reports, there is a disparity in the obligations on Member States and hence the tendency to participate without good reasons.

As a consequence it is necessary to examine a range of potential alternative and complementary actions targeting recruitment to the data provision process and the positions of individual Member States.

1. Establish a core panel of stakeholders who can strongly articulate the need for and benefits of a system to compile, harmonise and publish resource and reserve statistics across the EU.

Feature	Commentary
General	In the absence of an obligation to provide data, suppliers and owners of data will need a strong case for voluntary contribution to a resource and reserves statistical database. A key contributor to this is to build momentum for the usefulness of such a product. A core panel of key stakeholders should be assembled with the specific task of articulating a compelling case for the harmonisation objective and placing it in the context of related initiatives and drivers (including MWD, INSPIRE etc.). The composition of this group should include representatives of Geological Surveys, the professional bodies, EFG, EGS etc., and related initiatives such as Minerals4EU, ProMine, EMODNet etc. together with anticipated users of the data from both public and private domains. It will also be important to ensure that Member States that do not have legislation or mandatory aligned systems of reporting are represented. The primary initial output of this group will be to generate support and commitment to the process, increase the stakeholder base and – in support of the current Minerals4EU objective – obtain commitment to supply of information in the future and improvements to the data collection and harmonisation process.
Pros	✓ In the absence of mandatory obligations, a strongly articulated bottom-up movement will be needed to engender commitment. ✓ Inclusion of States without legislation and aligned systems of reporting is important so that their concerns can be directly addressed (being a major barrier to harmonisation).

	✓ In the absence of a legislative driver, a very strong user pull can influence State commitment voluntarily to action.
Cons	× A large committee may not be conducive to moving rapidly to solutions.

2. Undertake a broad communications and publicity exercise, based on the Minventory objective and using the outputs of related projects to maintain momentum.

Feature	Commentary
General	A broad range of communication events is necessary (including materials organised by the professional bodies) in order to demonstrate practical progress towards the harmonisation objective. The use of related projects, in particular Minerals4EU will be critical as this forms the Phase 1 output of the Minventory roadmap.
Pros	✓ Publicity and communication demonstrates activity and progress. ✓ Inclusion of concrete projects makes progress real and creates a focus for further discussion and action. ✓ Inclusion of users who have seen the study outputs and obtained benefits will offer useful support to the case.
Cons	× Publicity and communications can absorb much resource.

3. Establish working groups to examine general and State-specific barriers to implementation of the harmonisation objective

Feature	Commentary
General	From Table 14 it is clear that the majority of Member States do have a minerals law or policy in place. Of these almost two thirds also have an obligation to disclose minerals data albeit with the possibility of confidentiality constraints in place. In essence, nothing needs to be done in these States (but see later actions on terminology and standards). Targeted projects and working groups should be established and funded to explore the data reporting and harmonisation issues in much more detail, in particular for those States without aligned systems of reporting. Output of this would be: • A per country roadmap to harmonisation. • An assessment of the financial resources needed to accomplish this. • An assessment of the financial resources required to undertake harmonisation of historic materials for high priority raw materials.
Pros	✓ The actions would be made concrete for each State. ✓ A better view of costs associated with filling historic data gaps would be obtained.
Cons	× Any actions recommended would still be voluntary unless funded at EU level.

Given that voluntary actions often do not have a high uptake, an alternative is to consider contracting a private, third party data provider to maintain a resource and reserve database:

4. Fund centrally the provision of data by a third party (private data supplier).

Feature	Commentary
General	An interesting aspect reported by SNL concerns the provision of base data outsourced to and handled by private organisations. There is a cost associated with compiling these data, whether done by government organisations or by private providers; it could be of interest to those which already do collect, collate and distribute statistics like state run organisations to integrate with these. This type of operation is already taking place for example in the UNCTAD iron ore data which is regularly put out to tender but which is still published in the name of UNCTAD. In this way a portal or statistical yearbook could get access to data at a low cost and duplication of efforts would be avoided.
Pros	✓ Implementation could be very rapid. ✓ Not dependent on voluntary actions by Member States. ✓ Possibility of dual level data (public and paid for), which could increase data content possibility. N.B. This dual level model is also proposed in the EGDI data model.
Cons	× Risk of this becoming an 'open-ended' commitment to funding. × Funding might be diverted to activities not core to the Commission's remit. × The standards harmonisation issues still might not be fully addressed. × Possible conflicts of interest between public and private authorities.

A complementary approach would be to glean resource and reserve data from the submissions made to stock markets in prospectuses in support of investment. The ESMA guidelines encourage use of standard reporting codes which goes a long way to resolving harmonisation issues. In addition the prospectuses must state the 'competent authority' which has evaluated the mineral information contained. Such information would, of course, relate to individual prospects and not to total State statistics. They would therefore need assigning both to a Member State data inventory, be suitably translated and verified, and then reconciled with a State stock balance. A highly competent centralising authority would be needed for this. However, this approach might also be embedded in Option 4 above.

2.4.3.3 Recommendation

Establishing a motivation to provide data is a complex issue for which there is no single recommendation for action. A multi-action approach is necessary.

In addition, because some effort beyond the current remits of public authorities may be required, EU-level funding should be considered to support options 1-3 identified above.

Option 4 requires more investigation (see also Section 7.3, page 210).

2.4.3.4 Implementation overview

This action is a fundamental first step to cover raw materials management. Its link with other national policies related to land-use planning, for example, places this harmonisation issue as critical.

Time to resolve	2020 Status
> 2020	A fully legislative solution to this issue is unlikely before 2020.
<2020	Voluntary (partial) solutions could be adopted by the 12 outstanding States. The data might not, however, be fully harmonised. This is consistent with the Minerals4EU plan for data access by 2016#. It may be more feasible to target resources data rather than reserves since this generally has lower confidentiality issues.
<2020	Funding a private third party to maintain a public access database is feasible and could be put in place relatively easily. The access could be a mix of public and paid-for content which could offset the cost of central funding.

 # Data collection for Minerals4EU had not commenced at the time of writing, so a fixed approach was not available. However, it is likely that donation of data will be voluntary and based on mutual benefits.

2.4.4 Action on Issue I.3: Converge the use of terminology

2.4.4.1 Background

This study suggests that - at the very least - Member States should move to a common terminological basis when considering stocks of any material. This would entail enforcing a reservation on the application of the terms 'resource' and 'reserve' for example.

Even within Member States the application of terminology may be specific to a particular extractive mining application. For example, in France mining or quarrying legislation is applied on the basis of whether a mineral is assigned to one of the corresponding categories (e.g whether a mineral is categorised as a 'mine' substance (metallic/certain industrial minerals) or a 'quarry' substance (construction minerals/certain industrial minerals), see section 2.3.4.3). Different descriptors and assessment methods are applied within the legislation in these circumstances.

As noted previously, the content of national mineral laws are at the discretion of Member States. However, the harmonisation at the European level of definitions related to raw materials management (such as resources, reserves, mine, quarry, industrial minerals etc.) would be a highly valuable tool for Member State policy makers.

To some extent, terminology is embedded within international standards. In particular the CRIRSCO/UNFC-aligned standards lay down a well-defined basis for use of key terms related to the reporting of key minerals statistics. The definitions adopted within the glossary of this study are aligned with these uses and form a useful summary that should be disseminated more widely.

Those Member States that are already using CRIRSCO-aligned systems of reporting should have little difficulty in pursuing a standardised use of such terminology.

Those Member States that do not employ CRIRSCO-aligned systems of reporting might fall into three camps: those with systems that could be bridged with little effort; those requiring much effort; and those with no set systems who might require substantial effort.

2.4.4.2 Options for action

1. A first step would be to build consensus amongst key stakeholders in the geological community of practitioners and public authorities by publication of the Minventory glossary (N.B. This action is related to Action II.4).

Feature	Commentary
General	The current Minventory glossary should be circulated for comment amongst Geological Surveys, professional bodies and trade associations. Establishing awareness, knowledge and familiarity is a basic step. This is a low risk action.
Pros	✓ The geological community is already engaged in the issue of harmonisation via Minventory and other projects, has contributed to this study and is keen to progress.
Cons	None.

2. Another avenue is to use the INSPIRE geological metadata structure to define and consolidate a common terminology.

Feature	Commentary
General	This is a low risk action, although a broad community of interests will need to be involved to ensure all aspects of raw materials are covered.
Pros	✓ A similar approach has been used in the OneGeologyEurope project in respect of map data, thus setting a useful precedent.
Cons	× It may take some while to gain momentum for the review and revision of INSPIRE texts.

2.4.4.3 Recommendation

Both of the identified actions should be pursued.

2.4.4.4 Implementation overview

Common terminology, aligned to the named systems of reporting is an essential component of data comparability. Developing national and EU mineral reporting schemes (including reporting on resources and reserves) based on standard terminology is already an action identified in the SIP of the EIP-RM (action area n°II.1 Minerals policy framework).

Time to resolve	2020 Status
> 2020 *full* *By 2016 for bridging action*	Because full adoption of this measure would mean modification of existing legislation in States, a common legal framework is unlikely to be in place by 2020. A combination of EU-level definition and voluntary adoption, applied by the nominated State agency would be a good interim bridging measure. *This should be carried out by 2016 in order to provide a platform for future harmonisation developments and minimise divergence amongst Member States. A longer timescale would be needed if waste streams (mines, landfill) are included.*

2.4.5 Actions on Issue II.1 & II.2: Migrate to a harmonised EU-level system of reporting

2.4.5.1 Background: current reporting system features

There are a number of systems of reporting in use in Europe, including PERC and other CRIRSCO aligned codes and standards used by quoted minerals companies, the UN Framework Classification (UNFC), variants of the Russian state reporting system and National systems for collecting spatial and statistical data on minerals.

For the purposes of this and future projects, and the vision of the EC to create a European Minerals Yearbook, the migration to a harmonised reporting system within the EU for the reporting of primary raw material resources is desirable. This would allow collection and analysis of primary raw materials statistical data at the European level to provide the information necessary to monitor raw materials supply in Europe. None of the existing systems of reporting as they stand currently is suitable for adoption by Member States for public authority reporting on statistical data on resources and reserves without modifications:

- CRIRSCO-aligned reporting codes and standards relate to the public reporting of quoted companies and are recognised and included within stock exchange regulations and national laws in the jurisdictions in which they are accepted[69]. The classification system underlying them does not include some undiscovered and prospective classes that might be of interest in collecting data at Member State and EU level and there is only a general description of exploration targets. The companies which are bound to report in accordance with CRIRSCO-aligned codes and standards are specifically prohibited from making public reports and announcements regarding prospective and undiscovered classes and there are restrictions on what can be published in regard to exploration targets.

  Internal (as distinct from public) reporting and record keeping within companies that are required to report in this way normally follow the CRIRSCO principles in anticipation of future exploration and evaluation, bringing them into the 'reportable' categories. Therefore most such companies hold information on prospective and undiscovered classes and exploration targets as part of their own strategic planning and asset management.

- UNFC is a classification only and is supplementary to codes or standards for organising or reporting data (in particular, there is no requirement for reports to be in any particular format or for the input of a 'Competent' or 'Qualified' person in classifying resources and reserves and other classes of mineral deposit before reporting). Currently, it is not widely used anywhere in the world by solid minerals producers and could not be adopted as their sole system of reporting by quoted companies because that would put them outside their legal obligations.

  However, a number of Member States stipulate systems of reporting that are aligned to

[69] The known instances of CRIRSCO-aligned reporting standards relate to Czech Republic, Hungary and Ireland.

UNFC or are UNFC-like[70] (for example, by dint of similar approaches taken by the old Russian codes). It includes a range of prospective and undiscovered classes. Where the UNFC classes overlap with the CRIRSCO Template, there is a direct relationship between numbered UNFC classes and CRIRSCO definitions. The CRIRSCO Template has been adopted by UNFC as the specification for solid mineral categories[71].

- The Russian state (GKZ) system is a full reporting system and is widely used in Eastern and Central Europe as the basis for state inventory of mineral assets and their status. This system is not, however, recognised by international stock exchanges, and companies operating in countries where this system exists, and which need access to international markets, have to convert data to conform to the principles and definitions in the CRIRSCO Template. A conversion methodology (bridging document) is available, but the input of an experienced 'Competent' or 'Qualified' person is essential in undertaking this conversion.

- In the future, a numeric classification system, such as UNFC that loses the geological terminology and ambiguity of definitions on resources and reserves deriving from different Member States could enhance the collation and processing of data at EU level (for instance, by a central body like Eurostat).

- A bridging document between UNFC and the CRIRSCO template is available, but additional bridging documents may have to be produced to ensure alignment between national Reporting Codes and the agreed EU-level system of reporting.

2.4.5.2 EU-level reporting considerations

The following parameters should be taken into account when making a decision upon a suitable harmonised system of reporting to be used across Europe:

- The role of public reporting authorities (generally the State Geological Survey) is crucial. They represent key data providers to the current Minerals Yearbook and any evolution of it. The quality control role of staff in authorities undertaking the reporting task is different to that of the Competent Person within the data originators (for example, the mineral industry[72]). The latter is required to classify resources and reserves according to economic significance whereas staff in reporting authorities are required to assimilate information from data originators and to fit them in the agreed harmonised reporting system. This task may involve statistical analysis and interpretations, data aggregation, addressing confidentiality issues and others. Such a role demands a different level of competency and therefore training.
- There are several benefits associated with the use of an international system of reporting already embedded within industry and reporting authorities: Its use will introduce less bureaucracy associated with the migration of data to a harmonised

[70] UNFC-aligned: Bulgaria, Finland, Hungary & Ireland (by dint of being CRIRSCO-aligned), Romania, Sweden; UNFC-like: Czech Republic, Lithuania, Poland, Portugal, Slovenia.

[71] UNECE Energy Series 42, 2013, Annex III, p.31: A long-standing agreement is in place for CRIRSCO to provide the commodity-specific specifications for solid minerals.

[72] It is acknowledged that in some jurisdictions Geological Surveys may also be data originators or may otherwise have staff qualified as Competent Persons. The differentiation described here is merely to illustrate that different data processing roles exist in the data supply chain even if the personnel involved may be qualified in excess of the direct role in which they function and might indeed be licensed to perform all the roles. See also the glossary definition of National Expert.

reporting system; the parallel work required by a Competent Person in the data originator and the qualified staff in reporting authorities will be substantially reduced; and data agglomeration will be a less strenuous task. The same terminology and definitions will be employed across industry, reporting authorities at the EU and international level. The presentation of harmonised data using an international system of reporting may attract inwards investment as the data format will be familiar to mining companies and financial institutions around the world.

- Exploration targets and information on prospective and undiscovered deposits are seen as a desirable addition to the Minerals Yearbook. However, the reliability of such data is often questionable and their standardisation is not perceived a straightforward exercise.
- For Member States, where there are no stipulated systems of reporting, reporting authorities are required to make available financial resources and personnel to collect data from the private sector and convert them into a form compatible with the agreed harmonised system. This is a burden required to be assessed in more detail, but is expected to delay complete harmonisation of data beyond 2020.
- There are some legal considerations that should be borne in mind: publication of data from companies listed on major stock exchanges is restricted to categories as defined in the appropriate CRIRSCO-aligned reporting standard or code and subject to Competent Person authorisation. This precludes the use of UNFC 2009 despite the bridging specification between CRIRSCO and UNFC 2009.

2.4.5.3 Harmonised reporting vision

Again it is important to consider the near term and long-term objectives of the harmonisation project:

- In the near term, the objective is to produce a statement per-State per-mineral of the resources and reserves. This requires data disclosure as a priority. Achieving harmonisation of this data could be achieved using an agreed EU-level system of reporting, or a system that can map to it. Adoption of such a system would be an adequate basis for quality control in producing the statistical reporting element of the Minerals Yearbook, for example.
- In the longer term, with the objective of compiling the resource and reserve statistical database and summary figures from 'elemental' i.e. mine or deposit level reports, a finer gradation of status categories would be beneficial. This would include not only better detail within the resource and reserve categories, but also on the speculative or extrapolated resources which are not covered by the CRIRSCO Template. They are, however, covered by the UNFC. However, there are many issues to be addressed in making such data publicly available and which warrants a further project to examine.

Based on all the above, it becomes clear that modifications on existing systems of reporting are required in order to produce harmonised statistical data on mineral resources and reserves across Europe, which satisfies all the desirable elements of the Minerals Yearbook. The decision on whether a modified system is the way forward, or an existing system which can 'comfortably' achieve harmonisation without introducing too many obstacles should be made by Member States in consultation with their reporting authorities. In any case, the move towards a unified international harmonisation reporting system within Europe should be a voluntary adoption, as national rules and obligations will always be prioritised.

At this point we should reiterate that the ultimate purpose of the harmonised data structure is to provide a platform of data, supplied by State authorities, which permits evaluation of

the economic, social and geo-physical availability of mineral-based raw material resources in Europe by a range of stakeholders, not simply the geological community. Two points arise from this:

- It is not envisaged that companies will contribute directly to the database, but rather through submission via State authorities who will apply appropriate harmonisation and validation protocols. This obviates the concerns of the last bullet point in the previous section regarding the limitations of UNFC.
- UNFC 2009 reporting classifications offer a beneficial adjunct to a harmonised reporting system. They provide important project-oriented information that offers broad context to the resource and reserve information that has been submitted.

2.4.5.4 Options for action on promoting reporting in general

Regarding mandatory use of a system of reporting (Issue II.1), the Commission is not in favour of imposing any particular system upon Member States. (This option, if followed at all, will be voluntary because of perceived benefits and self-interest.)

The Commission could, however, take its own actions to promote the use of reporting standards:

1. Develop an EU-level reporting Template for use in reporting resource and reserve information extracting the salient features of the CRIRSCO Template and UNFC.

Feature	Commentary
General	Resources and reserves classification systems offer benefits in delineating resources of differing potentials in a dynamic manner. These appear to be key aspects of a single and structured framework for harmonised data reporting. A Reporting Template as described in the Harmonised Reporting Vision section should be assembled and deployed for resources and reserves reporting. This is not strictly necessary for the Phase 1 Yearbook entry for aggregated State-level statistics, but will certainly be necessary for mine or deposit level data which would beneficially be characterised using UNFC.
Pros	✓ The Commission will obtain a reporting format that is tailored to the needs of its anticipated users and beneficiaries. ✓ Drawing heavily on established systems of reporting will enable fast development using least controversial elements. ✓ An INSPIRE schema (or metadata structure) could be defined and published to encapsulate this information.
Cons	× Another system of reporting imposes a burden of learning.

2. Internally, use the terminology and key requirements of CRIRSCO/UNFC in its operations, and externally in its presentations, communications and publications, particularly in key products such as the Minerals4EU European Minerals Yearbook (resources and reserves data).

Feature	Commentary
General	This is a low risk action.
Pros	✓ The Commission will be leading by example, consistent with the recommendations of ESMA for reporting to the financial authorities, but translated to public authority reporting, and in building the EURMKB of the SIP of the EIP on Raw Materials. ✓ The action is consistent with the requirements of an EU-level harmonisation and publication body. ✓ In time, it will assist in building an acceptance of the normality of CRIRSCO-aligned systems of reporting in non-aligned Member States.
Cons	× Not all source materials the Commission may wish to use will themselves be harmonised for direct use in the near term.

3. Work with trade bodies and professional organisations to promote use of aligned systems of reporting and, (related to other actions), promote training in common and consistent application of resource and reserve classification, particularly in preparation for mandatory public authority reporting under INSPIRE.

Feature	Commentary
General	This is a low risk action. There are no substantive negative issues with this approach.
Pros	✓ The geological community is already engaged in the issue of harmonisation via Minventory and other projects, has contributed to this study and is keen to progress.
Cons	× Professional bodies may have low influence on Member State policy.

2.4.5.5 Options for action on promoting alignment of systems of reporting

Clearly, actions for promoting reporting in general should embed the concept of a CRIRSCO/UNFC-aligned system of reporting. However, there are further actions the Commission could take:

1. Strengthen the wording of the INSPIRE Directive under the geological and mineral themes to recommend a CRIRSCO/UNFC-aligned system of reporting in a similar manner to the section on energy resources.

Feature	Commentary
General	Note that this action is also mentioned within 2.4.7 Action on INSPIRE.
Pros	✓ There is a precedent within the energy resources theme for recommending PRMS.
Cons	× It may take some time to revise INSPIRE. × This may be perceived as a non-voluntary route to action.

2. Sponsor the development of bridging documents for Member States which employ national codes which are not aligned to CRIRSCO/UNFC.

Feature	Commentary
General	Country/standard-specific bridging documents have been developed for a number of national codes (such as NAEN) and have been published. Equivalents for States that are heavily tied to a historic system of reporting would be useful as a precursor to the harmonisation and conversion of historic data, and to assist publication of current data. (This assumes that States do not migrate to an already aligned system of reporting.)
Pros	✓ This is a follow-on action from Action on Issue II.1/2, Option 3, which sought to elucidate State-specific roadmaps. ✓ Bridging documents are a proven route to harmonisation. ✓ Actions can be owned and embedded at a State level.
Cons	× Creating bridging documents might be more laborious than adopting an aligned system! × Even if developed, the uptake of bridging documents would still require voluntary participation to implement.

2.4.5.6 Recommendation

It is feasible to recommend UNFC 2009 classifications and CRIRSCO-aligned systems of reporting as the framework to achieve harmonised EU-level resources and reserves reporting system.

The word 'system' is important as it embodies a number of caveats on how data is derived, validated and translated from State sources into the database:

- All submissions are made voluntarily by State authorities, vetted by them and with no obligation to change their underlying reporting Templates codes or standards, should they exist.
- However, data submitted into the harmonised system, must be translated according to a common terminological framework and established bridging protocols CRIRSCO/UNFC.
- The State authority is the arbiter of the provenance of the data supplied (which might already be robust if it has been supplied according to an aligned system of reporting and the actions of a Competent Person).
- Although the nominated State authority is responsible for verifying the provenance of the data, an overview of the process, consistency across States and publication at the European level will be carried out by an EU-level agent.
- All data placed in the public domain at the EU level is open data. Since this is a voluntary process, the State authority will determine what data may be published and what level of aggregation is sufficient to protect the interests of the data owner where relevant.
- Private companies may submit resource and reserve data for open publication at the European level, but this data must be freely surrendered to the State authority for verification and translation according to the above.

Financial resources will be required to carry out the above actions but their level has not been evaluated.

The full implementation of the roadmap also envisages an EU-level body which can apply suitable levels of cross-state harmonisation and redaction prior to publication, given input data from the national contact points. Such an information flow is illustrated in the next section. It should be noted that the EGDI project also proposes this function (which it names the European Geological Service).

2.4.5.7 Implementation overview

Voluntary adoption of an international system of reporting is recommended, and is compatible with concurrent actions in the European Securities and Markets Authority and Minerals4EU data collection efforts.

Time to resolve	2020 Status
<2020	For those Member States already applying a standard reporting template, National or otherwise, alignment should be possible by 2020.
<2020	For Member States with an unaligned national reporting standard or code, the development of bridging documents to aligned international systems of reporting (CRIRSCO/UNFC) is a feasible route to harmonisation, and should be possible before 2020.
>2020	However, States not already employing a reporting template might adopt CRIRSCO-aligned systems of reporting and undertake data conversion. This will require significant financial/personnel resources.
<2020?	Establishing an EU-level harmonisation, redaction and publishing body (perhaps an extension to an existing body) is one manifestation of this roadmap. It is also consistent with actions proposed by the EGDI project. The time to implement this is unknown, but coordination with EGDI implementation would be essential.

2.4.6 Action on Issues II.3 & II.4: Harmonise, convert and validate data

There is a widespread agreement amongst stakeholders surveyed in this study that harmonisation of data, aligned to an international system of reporting, would be beneficial and should be fostered. There were repeated examples of such processes being in place; usefulness of central harmonisation process from already standardised data was repeatedly quoted by questionnaire respondents in the survey:

> *"All data must be reported using the national standard, therefore there is no requirement to harmonise data from different sources." quote.*

This action considers two aspects raised within the survey: The harmonisation of data received from different sources; and the validation of the data received from both public authorities and third parties, such as private companies.

- **Harmonisation:** Survey respondents quoted the benefits of a harmonisation process, which is almost always associated with the use of a reporting code, national or otherwise. Such a process is only present in whole or partial form in 10 and 5 of the 28 Member States respectively; is definitely absent from 4; and was undeclared in the remaining 9. However, even where there is no process, respondents supported the fostering of such processes.
- **Validation:** The second aspect concerns validation of the conformance of data submitted to the State public authority with its specified reporting standard or code. Whilst this was not explicitly covered within the survey, it is known through other

comments received to be important. As far as public authority reporting is concerned, it is assumed for those with systems of reporting in place that quality control mechanisms (involving Competent Persons and National Experts) are in place[73]. Especially important is the requirement to periodically re-assess historic data related to resource and reserve estimates since these are dependent on changing economic factors.

2.4.6.1 Options for action

For both aspects, the involvement of staff from reporting authorities with the right skills and qualifications is needed to assimilate, analyse and interpret data received. As stated in II.1 and II.2, this role is crucial in producing harmonised data.

In tandem with the adoption of aligned systems of reporting, we suggest a centralised process whereby newly submitted data is rendered in a form compatible with end-use needs. One such process needs to occur at the Member State level since this is the repository of local knowledge of mineral resources. This process will require the National Experts with authority, knowledge and skills to carry out the necessary checks and conversions. For new data, this can be integrated into other harmonisation processes and coordinated by the nominated data publisher (See Action III.1).

- **Convert existing data**
  The issue of existing data is more problematic and entails a complicated and resource-intensive effort to review, check, convert and systematically publish data. Without a better assessment of what this burden means for individual States, it is hard to say whether this can be achieved by 2020, but it appears unlikely, especially for States without an existing reporting standard.

- **Selective data conversion**
  At the third Stakeholder Meeting, delegates were generally of the opinion that a more selective view of historic data conversion should be adopted relevant to immediate data needs. For example, identifying which historic data capture is a priority could accelerate the process nearer to 2020. It should be acknowledged, however, that historic data forms the major component of knowledge available on resources and reserves compared to that which might more recently have been generated under potentially harmonised systems or even published under INSPIRE. Financial resources would likely need to be made available to Geological Surveys to perform this task.

- **Establish an EU-level harmonisation body**
  We suggest that a professional body, which would have the task of ensuring a globally based commonality of approach across publishing bodies, be established. Having this overview, would also put it in a good position to manage other knowledge based tasks related to other aspects of geological spatial data. Such a body would likely need to be composed of qualified geologists and be properly constituted and funded (see Figure 36)

[73] It should be noted however, that even in States where a reporting code or standard is not specified, these structures may still exist. This can be as a result of the need for the data providers to be accredited for compliance with reporting to the financial markets (public reporting) under stipulated systems of reporting. Therefore, it is highly unlikely that in the EU, there are any routes to public authority reporting that do not have an adequate quality controlled system of reporting.

A small-scale precedent for this approach (in respect of collation and harmonisation of newly generated information only) is provided by Minerals4EU, which is collecting data en route to publishing a European Minerals Yearbook. Generation of data is still in the hands of the Member States, since detailed local knowledge and background understanding will be critical to obtaining meaningful and balanced reporting. The central body will provide a certain level of checking to validate assumptions and query outlying responses, and to assess whether practices are being instituted evenly across Member States.

The remit of this body could potentially include these tasks (but which are not currently within the remit envisaged by Minerals4EU):

- Monitoring, auditing and validating the application of standards across Member States including the registration of Competent Persons and assuring that they are reasonably aligned.
- Undertaking conversion of historic data on behalf of Geological Surveys, especially those that have no set standards or are not CRIRSCO-aligned.
- Ensuring periodic review of stock levels[74], time-limited and confidential data.
- Ensuring periodic review of UNFC-coded information in respect of its economic viability in particular.
- Overseeing the creation and implementation of INSPIRE metadata structure relevant to a European (primary) resource 'data portal'.
- Acting as a librarian of common platform applications which use the INSPIRE-compliant data and data series.

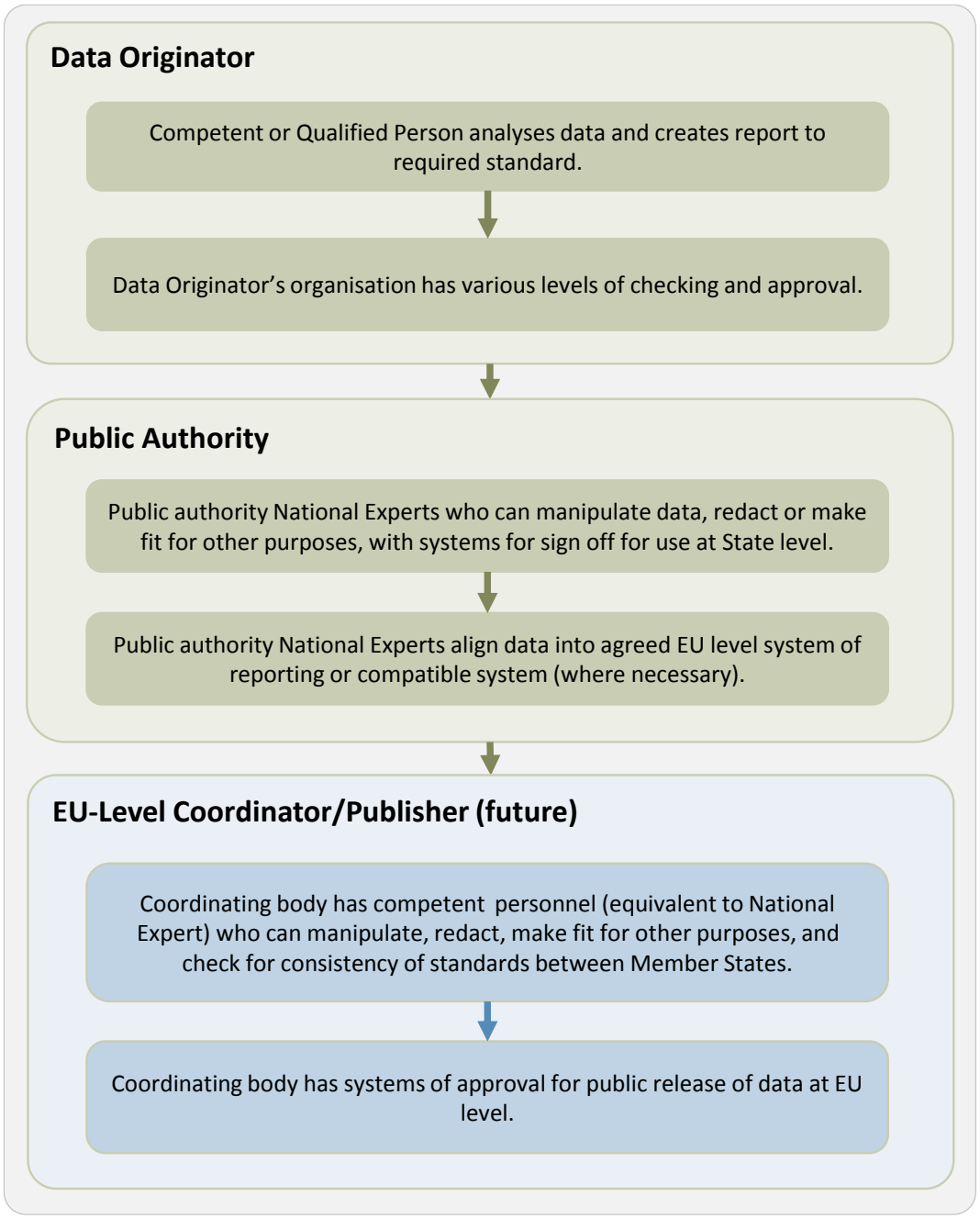
2.4.6.2 Implementation overview

These actions presume that the common reporting code is implemented.

Time to resolve	2020 Status
<2020	For States with a reporting code the 2020 target could be achieved.
>2020	The validation and harmonisation of existing data will extend beyond 2020 for States with a heavy burden of review.
<2020?	An oversight body seems feasible following the limited example of Minerals4EU experience. The previous section raised the possibility of an EU-level harmonisation body (also raised in the EGDI study in the form of a European Geological Service). Establishing fully operational systematic review and publication processes may not be fully implemented, depending on the detailed scope of this body and the division of responsibilities with Member State publishing bodies. *However, significant progress could be made before 2020.*

[74] As an example, in Slovenia, available reserves are determined by deducting the mined quantities from a beginning reserve level. However, every 5 years the companies are required to directly determine and report the available resources and reserves to the data collecting authority. Other countries may have other methods for determining such movements, if only to take account of price movements.

Figure 36: Levels of data Quality Assurance and control



2.4.7 Action on Issue II.5: Publish data in INSPIRE-compliant format

2.4.7.1 Background

The INSPIRE Directive 2007/2/EC assists strongly in the objectives of this study. Two milestones are particularly relevant in setting out this roadmap. The first of these concerned the 4 February 2013 deadline for the publication of new or extensively restructured datasets related to Annexe 1 to the Directive; and the second of these concerns the 4th February 2018 deadline of for the publication of pre-existing and still in use datasets related to Annexe 1 to the Directive.

A few states have started to make geological and minerals-related data available under INSPIRE[75] with other data available on State agency websites. Such disclosures are made in line with the obligation only to report existing data, but they set a clear precedent for compliance with publication of public data within defined protocols. Table 15 provides a snapshot of the number of datasets entered into INSPIRE at the time of writing under the geo-scientific theme.

Table 15: Submissions of geo-spatial datasets and series under the geo-scientific theme

Country	#	Country	#	Country	#	Country	#
Austria	6	Estonia	2	Luxembourg	1	Romania	2
Belgium	70	Finland	17	Netherlands	36	Slovakia	75
Croatia	1	France	671	Norway	23	Spain	518
Czech	29	Germany	1257	Poland	14	Sweden	28
Denmark	12	Iceland	14	Portugal	118	United Kingdom	509
EU	51						

Source: INSPIRE website, 2 March 2014

The experience of consortium members is that the INSPIRE metadata structure in this area does not map perfectly to the needs of the geological community. However, the INSPIRE protocol, which does, in fact, permit schematic extensions to cope with particular datasets. The 21 October 2013 amendment Regulation 1253/2013 to the Directive recognises this deficiency in the original Directive and makes specific provision for extension under point (4) of the rubric and Article 6 (1)c. The difficulty of defining and agreeing these schemas will be determined to some extent by the ambition of the Commission in respect of statistical data exchange.

One extension that has been considered is the inclusion of the UNFC. The Mineral Resource schema extension (MineralResourceExtension) possesses 'UNFClassification' as a data type, although the range of allowable values has not yet been specified. The Resource and Reserve category types exist within the core 'MineralResources schema' and may take values corresponding to the CRIRSCO matrix of Figure 16, page 81.

An outstanding issue is how the INSPIRE-compliant data is accessed and presented. That is, what IT infrastructure will present the applications and access to the data in a structured manner? There are a number of other data platforms in construction that could take on this challenge to integrate with other geological datasets. This aspect has not been considered in great detail, but it is a critical component of exploitation requiring wider discussion.

[75] http://inspire-geoportal.ec.europa.eu/discovery/

2.4.7.2 Options for action

The application of the INSPIRE Directive as a key tool for interoperability of spatial datasets will come fully into effect by the end of October 2018; this will happen irrespective of this study.

The issues around INSPIRE relate more to what is a minimum compatible dataset that might be provided in a comprehensive and cost-effective manner by all countries to fulfil the functions of a statistical data portal (as opposed to a 2D or 3D data portal).

1. Establish a technical committee to review whether the INSPIRE mineral codes are appropriate for the statistics reporting task.
   This clarification should be taken in tandem with recommendations within the landfill and mining wastes section to review the LoW codes.

7. As already described within Actions on Issues II.1 and II.2, it is suggested that the INSPIRE Directive could be adjusted to recommend specifically a CRIRSCO-aligned system of reporting. Since this is a recommendation, it doesn't constitute an obligation to comply, but it does strengthen the background commitment to a harmonised standard.

2.4.7.3 Recommendation

There is only one recommendation in this section.

2.4.7.4 Implementation overview

This aspect considers only that data is available and interoperable, not necessarily harmonised. For example Minerals4EU plans to make data available by 2016, but not necessarily in a harmonised form.

Time to resolve	2020 Status
<2020	By the end of 2018 the INSPIRE Directive will come fully into force. It is feasible, though challenging that metadata could be agreed within that timescale to achieve a functional interoperability of State-published datasets.

2.4.8 Action on Issue III.1: Member States establish a national contact point for collecting and centralising resources data

2.4.8.1 Background

A national contact point will ensure consistency of approach in bridging between different systems of reporting resources and reserves data and coordination with any centralising agency or data dissemination portal manager. Having such a contact does not mean that there is only one data provider. For example, there may be multiple agencies charged with different aspects of materials supply, such as in France where one agency deals with aggregate-related mines and another deals with metallic minerals and fossil fuels.

Neither does this necessarily mean a single data publisher per country. This process is sensitive to the fact that several Member States have highly devolved constituencies, some of which are in flux. For example the German Länder, Belgian Wallonia and Flanders and UK

Nations exert various degrees of autonomy in some agency functions. This should be respected in the data management infrastructure.

In a future where all raw materials data (primary and secondary) is collated, a single body would lead to a consistency in harmonisation of all stock-related data, and possibly also flow data, though this is not within the remit of this study. These other stocks are generally reported by different agencies. The value of harmonising reporting of all stocks of interest through the same body (per administrative region) needs further consideration.

2.4.8.2 Options for action

1. Engage state Geological Surveys as the central collation agencies.

Feature	Commentary
General	According to discussion during Stakeholder Meeting 1 and some answers received via survey questionnaires (Spain, for instance), stakeholders were receptive to the notion of mandating state Geological Surveys as sole organisations in charge of collecting and harmonising minerals related data on a national basis. They would then be responsible for the management of the national database on primary raw materials.
Pros	✓ Since the focus of the harmonisation objective is minerals, Geological Survey are the most obvious target for the coordination role. It is clear that they have the skills and knowledge to underpin a consistent approach in bridging between systems of reporting and in coordinating with any EU-level body. ✓ A precedent in this area is the National coordinating body concept implemented in EMODNET amongst marine data agencies and research organisations.
Cons	× Many Geological Surveys are devolved from MS ministries and have independent budgets associated with strict remits. They may not have the autonomy or financial/personnel resources to take on the suggested role or remit. × If their remit is extended beyond primary raw materials, they may not have the skill set, knowledge or financial/personnel resources to support the function.

2. Another option could be to mandate one Ministry per State for collation and harmonisation, but recognise that some states have devolved sub-regions that may report separately.

Feature	Commentary
General	This is a variant on Option 1 and, for some Member States, may be indistinguishable depending on the distribution of authority and agency.
Pros	✓ Ministries are most likely to have the authority and financial/personnel resources to adopt and implement actions and to engage other relevant ministries and agencies in the cause of data harmonisation. They are also the responsible bodies in the ownership of State data. ✓ Ministries are also used to dealing with EU-level bodies, such as Eurostat, to regularly provide State statistics. They commonly participate in the political processes necessary to achieve Community collaborative policies and actions.
Cons	× A small number of Member States have devolved regions of more or less autonomy. This can entail responsibility for geological data. For example, in Germany, although a certain amount of collation and collective activity is coordinated through BGR (German 'geological survey'), responsibility for minerals policy and surveying is at the level of the Länder whose cooperation is certainly required for a comprehensive German response. The situation is less pronounced but also exists in the UK and Belgium. × Ministries themselves may not have the technical depth of minerals competence necessary to perform necessary checks and data harmonisation. × If their remit is extended beyond their core remit, they may not have the skill set, knowledge or financial/personnel resources to support the function.

3. A default option is that the task of reporting resources and reserves data remains distributed amongst a number of organisations.

Feature	Commentary
General	
Pros	✓ Dedicated agencies or ministries will clearly have their own specialisms which will offer benefits in detailed understanding of the various topics, primary raw materials, mining wastes or landfill, for example. This could simplify the process of harmonisation at the EU level. ✓ It may be quicker to engage individual agencies, per topic, in the collation and harmonisation task. (Separating the topics may allow quick wins to be obtained in the primary raw materials domain.) Considering a far future integrated reporting system, combining both functions within a single topic-related body would be a better option.
Cons	× There will be a larger effort required to engage various agencies and induct them to the purpose of the study especially if they are on different timescales.

2.4.8.3 Recommendation

- This study recommends that the Member States nominate a competent body as the coordination point for primary raw materials data collation, verification, redaction and harmonisation at the State level. This could be any ministry or executive agency charged with the collation and publication of minerals data. Since the primary focus of the study is primary raw materials, in many cases this might be the national Geological Survey. They would also adapt easily, by extension, to the issue of characterisation of mining wastes. The example of EMODNET (for marine resources) provides adequate evidence that a single entity can represent a diverse and distributed community of data providers.
- The issue of how this works in devolved Member States needs further exploration.

2.4.8.4 Implementation overview

The experience with other resource related initiatives, such as EMODNET for marine resources (including geology), suggests that the nomination of a 'collation body' is not a serious problem.

Time to resolve	2020 Status
<<2020	The assignment of a single body per State to be the harmoniser and gatekeeper of data (even if not the data owner) should be feasible well before 2020. Some political difficulties are anticipated for the most devolved and federated Member States. However, to do so, resources should be made available in terms of finance and personnel. Continuity should be ensured in supporting such initiatives in the long term.

2.4.9 Action on Issues III.2 & III.3: Establish confidentiality and data aggregation rules enabling publication

2.4.9.1 Background

This section considers concerted action on two issues related to general access to data that impact on its availability. These are:

- Confidentiality protocols which provide a disincentive to public authorities to release data that might be redacted if rules were in place.
- Removing barriers to the submission, collation and publication of such data in a form that is easily accessible to the public (users).

Public access to data has clear benefits in attracting investment despite possible data ownership issues, particularly when reporting at the deposit scale. An interesting example is the Sigéom[76] web site developed by the Ministry of Natural Resources of Québec (Canada). In order to promote their mineral wealth and potential, almost all information can be freely accessed: resources and reserves data, results from exploration work, description of drilling campaigns and results, prospective areas etc. Their investor-friendly policy may be one of the main reasons for the exploration rush from which they are benefiting.

The INSPIRE Directive obliges the systematic publication of prescribed data which would already enter the public domain. However, there may be over-riding considerations of commercial confidentiality and competition law which could stifle this. Member States, trade associations or individual companies will all be sensitive to the fact that disclosure of data - particularly when linked to commercial activities - may be prejudicial to investor, company and Member State interests. Any confidentiality and data aggregation protocol, whether legislative or sector-inspired, will therefore need to consider how information may be redacted for release to the public. A precedent for this has been established by Eurostat and is described in Option 2 below.

2.4.9.2 Options for action

Data confidentiality could be tackled in a number of ways:

1. Member States continue to apply their own confidentiality protocols to redact data for public disclosure (default option).

Feature	Commentary
General	In this approach Member States would apply their own confidentiality and redaction rules to any data to be released publicly. The Publishing Authority would also be responsible for translating public data into the INSPIRE compliant format and publish using a schema appropriate to the granularity of the data i.e. as national aggregated data or as mine/deposit reports. Suitable caveats to the data will be provided.
Pros	✓ Very little change to existing procedures would be required, allowing a fast start to the data collection and centralisation (if not harmonisation) process. ✓ Little discussion would be needed to obtain commitment since each Member State would have confidence in its own protocols and their implementation.
Cons	× There may be disparities, inconsistencies and even unfairness between the different protocols which might prejudice the interests of some Member States or their data providers.

[76] http://sigeom.mrn.gouv.qc.ca/

	× The amount of data that could be made available might be sub-optimal; redaction at the EU-level might permit inclusion of more data, with protection of confidentiality, even if it is at a more aggregated level than the single State level. × The case where a Member State is not mandated to publicly report is not addressed (although, technically, confidentiality is only an issue where they do have to report).
Variants	Within this there could be other options which could tackle these concerns. For example, the base case described above implies that redaction rules are applied to the data before release at the EU level. The EU-level publisher receives only the data which the Member State would be publishing currently under its publication rules. However, an alternative would be that the redaction rules are applied at the EU level. There would be no effect on what data is published, but the EU-level database would be more complete for internal Commission – as opposed to public - use. It would also permit the consistent centralised update of confidential data which has only a finite redaction period. Accordingly, this should be seen as a parallel activity to activities 2.4.3 and 2.4.8.

2. A common policy is devised and agreed under the auspices of a competent, relevant and experienced EU-level institutional body (this could be the same operator who would provide EU-level harmonisation and quality control).

Feature	Commentary
General	To avoid data ownership and confidentiality issues, data could be aggregated at regional or national level. This would guarantee the completeness of national inventories, and thus of European inventories. The benchmark here is that of Eurostat which takes the definition of confidential data from EU Regulation 223/2009 on European statistics: *"…data which allow statistical units to be identified, either directly or indirectly thereby disclosing individual information."* Besides normal protocols preventing either direct or indirect access to an individual's data, a Statistical Disclosure Control policy[77] exists to protect the interests of all entities (otherwise known as units) to reduce the risk that statistical units are identified when the statistical data is being published.' Two techniques used are: • **tabular data protection** – for aggregate information on respondents presented in tables (using suppression, rounding and interval publication) • **microdata protection** – for information on statistical units (using local suppression, sampling, global recoding, top and bottom coding, rounding, rank swapping and micro-aggregation).
Pros	✓ A strong precedent for this process has been set by Eurostat in many other aspects of statistical reporting across the EU. The establishment of common rules by this route should be acceptable to all Member States. ✓ A centralising body could also police and manage moratoriums on data publication in a consistent way across the EU.
Cons	× There will be a significant induction period to establish rules and put them in operation.
Variants	This issue of access and freedom to reuse information has been extensively examined by the FP7 EGDI project; it has proposed a two-tier license system which could differentiate 'free' and 'paid for' content[78], which might – in the longer term – attract more commercial content, particularly at the mine or deposit level. Such policies also have relevance for 'Action on I.1/I.2: Establish motivation to provide data'. The learning from EGDI should be integrated into any data portal.

[77] http://epp.eurostat.ec.europa.eu/portal/page/portal/research_methodology/statistical_confidentiality

[78] Refer to the EGDI output from Work Package 2, 'D 5.2 Report on regulation and policies' at http://www.egdi-scope.eu/wp-content/uploads/2014/07/D5.2-Regulation-and-Policies.pdf (viewed on 16 October 2014)

3. Encourage only the publication of resource data.

Feature	Commentary
General	This should only be considered as a back-up tactic.
Pros	✓ Resources data is less sensitive than reserves data, especially when associated with a project proposal from a mining company. ✓ Resources data might also be more abundant.
Cons	× Because resources have a lower quality of knowledge and economic evaluation, they have less value as publicly available planning information, providing only a partial picture of mineral assets.

2.4.9.3 Recommendation

- In the first instance, we suggest that for the Phase 1 Minerals Yearbook, Member States simply apply their national redaction policies. This is a pragmatic approach to the problem, given the exploratory nature of the Phase 1 survey.
- In the light of a review of the results of the Phase 1 survey, it is likely that some harmonisation of confidentiality rules will be seen as beneficial. A study should be initiated to investigate this with a view to moving towards Option 2, with a set of common rules and a centralised data publication function. However, this is a voluntary action to be agreed with the nominated State Publishing Authority (see Section 2.4.8, page 147) and its controlling ministry, if appropriate.
- There is therefore also a task to establish such common confidentiality rules although they could be based on those already operated by Eurostat and as described above. Such rules are already in place for the disclosure of production data. For example, the British Geological Survey (BGS) provides a useful case study of such practices in operation.
- The possible development of a data portal should be closely integrated with any future data infrastructure actions arising from the EGDI project, which has examined a number of legal issues associated with data ownership

2.4.9.4 Implementation overview

Time to resolve	2020 Status
<<2020	Few political and institutional sensitivities are anticipated in adopting this, given practices already employed in production reporting and in other economic datasets made available via Eurostat. Full implementation by 2020 is anticipated.

2.4.10 Action on Issue III.4: Publish glossary and translation tools

2.4.10.1 Background

A glossary of terms is necessary in order that an informed debate on scope, standards and processes may proceed without terminological confusion or obfuscation. Minventory has established a basic glossary of terms which will be published with the final report and online with the metadata portal. This glossary will no doubt need to evolve as the level of complexity increases, as the concept of the data portal develops and, more basically, as Member States seek to harmonise the general use of language within their legislation and policies.

At the metadata level this issue is not relevant, since a common basic terminology can be established by utilising both the Minventory glossary and the language employed in widely used systems of reporting. Further, since we are considering statistical data related to a finite list of minerals and metadata, once a common glossary is established and published, there should be no confusion.

The issue of native language arises when considering access to historic textual materials in electronic form, an issue already apparent in the construction of the Minventory Portal. The increasing availability of on-line translation tools will assist the conversion of text-based materials. However, the nominated publisher of the data should be charged with working with the supplying body to ensure that as accurate a translation as possible is obtained.

2.4.10.2 Options for action

The following possibilities are apparent:

1. Use the Minventory glossary as a basis for a term set, possibly with further consultative evolution and translation into core EU languages.

Feature	Commentary
General	--
Pros	✓ A number of minerals-related initiatives have expended considerable effort on getting agreement on commonly used terminology used in the statistics of primary and secondary raw materials. A basis for common usage could therefore be published relatively quickly based on these terms, the most common of which appear in the Glossary of this report ✓ The language is already aligned to that of, for example, the CRIRSCO Template, although it does not replace the detailed descriptions within the template, or those of the classifications of the UNFC.
Cons	× The glossary may need further development with other than the geological communities in order to produce harmonised definitions that could be applied, for example, to landfill resources. × It has not been translated into other EU languages, although this might be relatively simply achieved with small effort, given that CRIRSCO, UNFC et al. have similarly been developed in an international context.

2. Use a pre-existing glossary, for example by abstracting coherent sets of terminology from other systems of reporting such as CRIRSCO, PERC and the UNFC

Feature	Commentary
General	--
Pros	✓ The multilingual glossary developed for the Promine project provides definitions in English, French, Spanish and German; it could be adapted and extended for the harmonisation objective. From the systems of reporting perspective, the UNFC has resolved this issue by using numerical codes rather than words. The meanings of the codes are explained at length in order to achieve precision, and are translated.
Cons	× Minventory already borrows definitions from the CRIRSCO Template, and placed them in the context of the harmonisation objective. It also goes beyond the narrow remit of the prevailing standards.

3. As an adjunct, encourage Member States to voluntarily translate key documents from their national mineral exploration and permitting legislation.

Feature	Commentary
General	This would be particularly beneficial for Member States that do not have a prescribed system of reporting whose one that is not aligned to CRIRSCO.
Pros	✓ In the near term this would assist in bridging between non-aligned systems of reporting, and would assist the creation of formal bridging documents, if needed, in the longer term.
Cons	× This may require some EU-level funding to facilitate.

The option of developing a new glossary from scratch has been discounted as this would be perverse; the Minventory glossary has already been developed in consultation with many of the stakeholders in the geology and minerals field, so starting again would be wasteful.

2.4.10.3 Recommendation

- The Minventory glossary should be published as a basis for use of terms in the harmonisation context. It already appeals to the terms used in the recommended systems of reporting i.e. CRIRSCO-aligned for key definitions such as resources and reserves.
- A vision for the database of statistical data is that it is available in all languages of the EU in the manner of the OneGeologyEurope portal, particularly when linking to non-statistical data or text additions. Encouraging Member States to translate sufficient information of national mineral potential and raw materials framework (e.g. permitting procedure, stakeholders responsible for RM management) is one of the actions proposed in the SIP of the EIP-RM (action area n°II.1).

2.4.10.4 Implementation overview

Time to resolve	2020 Status
<<2020	Publish a glossary of terms relevant to the minerals domain. This may be achieved relatively quickly due to the work conducted in this study and parallel initiatives.
<2020	Encourage Member States to voluntarily translate key documents from their national mineral exploration and permitting legislation, particularly for those not aligned to the CRIRSCO Template. Some form of financial support may be required to facilitate and accelerate this.
>2020	N.B. A long tail is anticipated if terminology is to be embedded within State legislation, and especially for those countries (e.g. the UK) where no such legislation exists. Conversion of historic data will demand significant financial/personnel resources although some of this effort may already appear in Actions on II.3 and II.4.

2.5 Primary raw materials: Recommendations for future work

An interesting aspect reported by SNL concerns the provision of base data outsourced to and handled by private organisations. There is a cost associated with compiling these data, whether done by government organisations or by private providers; it could be of interest to those which already do collect, collate and distribute statistics like state run organisations to integrate with these.

This type of operation is already taking place for example in the UNCTAD iron ore data which is regularly put out to tender but which is still published in the name of UNCTAD. In this way a portal could get access to data at a low cost and duplication of effort would be avoided.

In the area of marine minerals, it is known that the International Seabed Authority (ISA[79]) is collecting data on world marine deposits. Further investigations should be undertaken to asses how this data or its sources could be integrated into the Minventory database concept.

[79] http://www.mapserver.isa.org.jm/GIS/

Part 3: Mining Wastes

3.1 Availability of data

3.1.1 Background

In the EU, wastes deriving from the extraction and refining industries are regulated under the Mining Waste Directive (2006/21/EC)[80]. In this Directive, extractive waste is described as:

> *"waste resulting from the prospecting, extraction, treatment and storage of mineral resources and the working of quarries but does not cover:*
>
> - waste which does not directly result from such activities;
> - waste which results from offshore activities; and
> - injection/re-injection of groundwater as defined by the Directive 2000/60/EC."

Extractive waste includes waste rock, which is unused extraction product, and mine tailings, which are defined in the Mining Waste Directive (MWD) as:

> *"waste solids or slurries that remain after the treatment of minerals by separation processes (e.g. crushing, grinding, size-sorting, flotation and other physico‑chemical techniques) to remove the valuable minerals from the less valuable rock".*

According to Eurostat statistics, the mining and quarrying industry produced 671,810,000 tonnes of waste in 2010, in the EU-27[81]. This is equivalent to around 30% of the total waste generated in the same countries. Mining waste is a substantial part of secondary raw materials and has a potential for becoming a mineral resource. This is particularly true for older facilities where previous technologies may have not been able to recover certain materials that may now be recoverable due to advances in processing technologies.

The MWD does not specifically refer to secondary raw materials and excludes 'waste resulting from offshore' activities. It is principally focussed on 'waste management' to reduce the environmental and socio-economic impacts of extraction and processing of mineral resources, rather than the recovery of secondary raw materials or determining their stocks. However, some of the data requirements set out in this Directive may provide useful information in determining resource availability and may be an appropriate starting point data gathering relevant to the raw materials database.

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[80] Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC

[81] Bookmark to Eurostat query: http://appsso.eurostat.ec.europa.eu/nui/show.do?query=BOOKMARK_DS-063379_QID_-14B8FCE6_UID_-3F171EB0&layout=TIME,C,X,0;GEO,L,Y,0;UNIT,L,Z,0;HAZARD,L,Z,1;NACE_R2,L,Z,2;WASTE,L,Z,3;INDICATORS,C,Z,4;&zSelection=DS-063379INDICATORS,OBS_FLAG;DS-063379WASTE,TOTAL;DS-063379NACE_R2,B;DS-063379UNIT,KG_HAB;DS-063379HAZARD,TOTAL;&rankName1=TIME_1_0_0_0&rankName2=HAZARD_1_2_-1_2&rankName3=WASTE_1_2_-1_2&rankName4=NACE-R2_1_2_-1_2&rankName5=INDICATORS_1_2_-1_2&rankName6=UNIT_1_2_-1_2&rankName7=GEO_1_2_0_1&sortR=CUSTOM_-1_FIRST&pprRK=FIRST&pprSO=CUSTOM&ppcRK=FIRST&ppcSO=ASC&sortC=ASC_-1_FIRST&rStp=&cStp=&rDCh=&cDCh=&rDM=true&cDM=true&footnes=false&empty=false&wai=false&time_mode=ROLLING&lang=EN&cfo=%23%23%23%2C%23%23%23.%23%23%23 valid at 4 September 2014

3.1.2 Reporting under the Mining Waste Directive

In the EU, wastes deriving from the extraction and refining industries are regulated under the Mining Waste Directive (2006/21/EC and subsequent amendments and additions). The objective of this legislation is in respect of Safety, Health and Environmental impacts of mines, closed and abandoned mining waste facilities and various above or below ground storages of material in diverse states of production, not necessarily to the resource potential. However, some reporting requirements present within this Directive may supply data relevant to secondary raw materials.

An exemption from reporting is allowed if the facility can be classified as an inert waste facility, as might generally be the case for quarries of construction minerals and where other physical hazards (such as slumping) are absent or unlikely.

Although referred to in the Directive, a definition of 'closed' and 'abandoned' waste facilities is not supplied. A working definition has been assumed as follows:

- A **closed waste facility** is one where mining activity has ceased, there is an identified owner or licensee and operations have been terminated in accordance with former licences or regulations.
- An **abandoned waste facility** is one where operations have ceased but without an identified former owner/licensee and/or not having been closed in a regulated manner.

This distinction has had little impact on the survey response detail.

3.1.2.1 General reporting requirements

Reports on the progress of implementation of the Directive are required three-yearly, with the first report due by 1 February 2012, covering the operating period 1 May 2008 to 30 April 2011.

The Directive (Article 7(5)) requires reporting to the Community statistical authorities of statistical information held within permits on request, excluding commercially confidential aspects. The Directive has not stipulated any fixed schedule and, as far as we are aware, no request for information has been sent to Member States.

Broadly speaking, the Directive does not require regular reporting for facilities that stopped accepting waste before 1 May 2006, or which effectively closed by 31 December 2010. (Note that this does not exempt operators from discharging after-life duties of care, financial bonds and other stability monitoring (Article 24(4)).) However, these facilities should have been notified to the Commission by 1 August 2008.

The initial implementation of the Directive requires Member States to have produced an assessment of the hazards or otherwise of waste facilities, operating or closed. In effect, where implemented, most Member States have sought to identify amongst known closed or abandoned mines, those which fall into the 'A-waste' category (see below), or which present a potential or ongoing hazard under related chemical health and environmental criteria. Some of these have been volunteered to the Commission and are available as tabulated in Table 16 below.

3.1.2.2 'A-Waste' facilities

As the primary objective of the legislation is to prevent harm to the environment and human health, the first phase of assessment has been a requirement to assess the general hazards across operating and closed mines. Of paramount importance is the identification of 'A-waste' facilities (strictly 'Category A Waste Facilities'), classified as such by virtue of their content of threshold levels of classified hazardous and dangerous substances or preparations, or which might through failure or mal-operation give rise to a major accident. Therefore, even if the substance of the waste comprises an inert substance, it might still be deemed an 'A-waste facility' by nature of its physical or geo-technical risks.

3.1.2.3 Extractive wastes from operating facilities

The Directive outlines the requirements for managing waste resulting from extraction, treatment and storage of mineral resources and working quarries; it requires mining waste facilities to possess a permit in order to operate and covers all physical forms: tips, heaps, leach heaps, lagoons, and void in-fills.

These permits must include details on the identity of the operator, location and a waste management plan, which in turn must contain details on the characterisation of the waste and statement of the estimated total quantities of extractive waste to be handled during the operational phase. Technical requirements for the waste characterisation can be found in the Annex of Commission Decision 2009/358/EC. This must include: nature of deposit, including mineralised rocks or rock-bearing mineralisation; quantity of waste; and waste classification according to the European List of Waste.

It is a requirement that data regarding these permits are made available to the competent national and Community statistical authorities where requested for statistical purposes. This information, however, could not be located at the time of writing. The survey in relation to mining wastes contains questions regarding the availability of this information to the public.

3.1.2.4 Extractive wastes at closed and abandoned mines

The Directive also calls for inventories of closed waste facilities to be drawn up and periodically updated. However, under Article 20, it is only required that this inventory contains information on sites which are or may become a significant threat to the environment or human health. Inventories will therefore not provide a full overview of such facilities. A guidance document for a risk-based pre-selection protocol for the inventory is available to Member States[82]. Under this Directive, Member States were required to make such inventories publicly available by 1 May 2012.

The exception to this is where a closed mine is intended to be re-opened, whereupon re-permitting is required following the conditions laid down within the Directive for newly permitted mines.

As far as this study is concerned, only mines which have a waste facility attached that is also abandoned or closed are of interest. The residual, unexploited mineral resources of such mines fall into the category of primary raw materials.

[82] Stanley *et al.* (2011), Guidance Document For A Risk-Based Pre-Selection Protocol For The Inventory Of Closed Waste Facilities As Required By Article 20 Of Directive 2006/21/EC

3.1.2.5 Data released under the Directive

We have identified the reporting agencies for Member States and have reviewed their submissions under the Directive. Our work in this area is summarised in Table 16, the reporting authorities and any information reported on the characterisation of the resources have been documented. The reporting varies considerably between member states and as such the inventories are unlikely to provide a European overview of the resource potential of mining wastes.

The survey focusing on mining waste that has been distributed to competent authorities asking for further information regarding the availability of data on mining waste deposits. The results of this survey will be we used with the information shown in Table 16 to provide a complete overview on mining waste data availability.

Table 16: State legislation related to mining wastes

Country	Reporting Authority	Legislation	Inventory Found?	Characterisation of resource	Language
Austria	Federal Ministry of Agriculture, Forestry, Environment and Water Management	Mining Waste Act Federal Law Gazette I No. 115/2009	No	Unknown	Unknown
Belgium	Flanders: The Public Waste Agency (OVAM) Walloon: Directorate of Agriculture, Natural Resources and Environment – Department of Soil and Waste	Flanders: Vlarem (Flemish environmental regulations) Wallon: 18 décembre 2008 - Décret relatif à la gestion des déchets de l'industrie extractive (1) (M.B. 21.01.2009)	No Yes	Unknown No	Unknown French
Bulgaria	Ministry of Environment and Water, Directorate Management of Waste and Soul Protection; Ministry of Economy and Energy	Regulation on specific requirements for the management of mining waste (Official Gazette, br.10/06.02.2009g)	No	Unknown	Unknown
Croatia	Croatian Environmental Agency	Ordinance on waste management of the exploration and exploitation of mineral resources (128/08)	No	Unknown	Unknown
Cyprus	Ministry of Agriculture, Natural Resources and Environment	Waste Management of Extractive Industry Law (N.82 (I) / 2009)	Yes	No	Greek
Czech Republic	Czech Geological Survey	Act No.157/2009 Coll. on the management of mining waste	Yes	Major contaminants listed	English and Czech

Country	Reporting Authority	Legislation	Inventory Found?	Characterisation of resource	Language
Denmark	Danish Nature Agency	Executive Order No. 1150 of 28.11.2012	Yes	No closed or abandoned waste facilities as defined in the Directive	--
Estonia	Estonian Ministry of the Environment	Kaevandamisjäätmete käitlemise kord RT I, 11.11.2010, 1	Yes	Some details of minerals recovered	Estonian
Finland	The Finnish Environment Institute and Statistics	Government Decree on extractive waste 190/2013	Yes	Detail of mined minerals	Finnish
France	Agency for Environment and Energy Management	Decree of 19 April 2010 on the management of waste from extractive industries NOR: DEVP1010260A	In Progress	Details of mined minerals	French
Germany	Federal Ministry of Economics and Technology (consulting with Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)	Federal Mining Act of 13 August 1980 (Federal Law Gazette I p 1310), last amended by Article 4, paragraph 71 of the Law of 7 August 2013 (Federal Law Gazette I p 3154)	No	Unknown	Unknown
Greece	Ministry of Environment, Energy and Climate Change	Joint Ministerial Decision (JMD) 39624/2209/E103/2009 (Government Gazette, Series II, No 2076/2009) which incorporated Directive 2006/21/EC on the management of waste extractive industries; and Law 4014/2011 (Government Gazette, Series I, No 209/2011) for the "Environmental authorisation for works and activities... and other provisions " within the competence of the Ministry of Environment.	Yes	Unknown	Greek
Hungary	Hungarian Office for Mining and Geology, Department of Metal Resources	14/2008. (April 3) GKM management of mining waste	Yes	No	Hungarian and English

Country	Reporting Authority	Legislation	Inventory Found?	Characterisation of resource	Language
Ireland	Environmental Protection Agency (EPA), Central Statistics Office (SCO)	Waste Management (Management of Waste from the Extractive Industries) Regulations 2009 (SI No 566 of 2009)	Yes	Details of minerals recovered	English
Italy	National Institute of Environmental Protection (ISPRA)	Decreto Legislativo 30 Maggio 2008, n. 117, Implementation of Directive 2006/21/EC on the management of waste from extractive industries and amending Directive 2004/35/EC	Yes	Detail of mined minerals	Italian
Latvia	Ministry of Environmental Protection and Regional Development	Cabinet of Ministers Regulations No. 470 of 21 June 2011 "Mining Waste Management Procedure"	No	Unknown	Unknown
Lithuania	Ministry of Environmental Protection	Law of the Underground (1995)	No	Unknown	Unknown
Luxem-bourg	?	Loi du 26 novembre 2008 concernant la gestion des déchets de l'industrie extractive	No	Unknown	Unknown
Malta	Malta Environment and Planning Authority	Waste management (management of waste from Extractive industries and backfilling) Regulations L.N. 318 of 2010	No	Unknown	Unknown
Nether-lands	State Supervision of Mines, Ministry of Economic Affairs	Decision on mining waste management Stb. 2008, 182 (and amendments)	No	Unknown	Unknown
Poland	State Mining Authority	ACT of 27 September 2013 on amendments to the Act – geological and mining law and th certain other Acts amending Act of 9 June 2011 Geological and Mining Law	No	Unknown	Unknown

Country	Reporting Authority	Legislation	Inventory Found?	Characterisation of resource	Language
Portugal	Direção Geral de Energia e Geologia (DGEG)	Decreto-Lei n.º 31/2013 of 22 Feb 2013, replacing Decreto-Lei n.º 10/2010, law establishing the legal regime that is subject to waste management holdings of mineral deposits and mineral masses - mining waste	Yes	Details on minerals, includes abandoned mines	Portuguese
Romania	Ministry of Environment, MinstryMinistry of Economy, National Agency for Mineral Reserves.	Resolution no. 856 of 13 August 2008 the management of waste from extractive industries	Yes	No	Romanian
Slovakia	Slovak Environmental Agency and Statistical Office of the Slovak Rep.	ACT of 4 November 2008 on the management of waste from extractive industries	Yes	No	Slovakian
Slovenia	Ministry of Agriculture and the Environment	Decree on management of waste from the extractive industries (OJ RS, No. 43/08, 30/11)	No	Unknown	Unknown
Spain	Spanish Ministry of Industry, Energy and Tourism	Royal Decree 777/2012 amending Royal Decree 975/2009 on the Management of Wastes from Extractive Industries	Yes	No	Spanish
Sweden	Swedish Environmental Protection Agency	Regulation (2013:319) on extractive waste	Yes	No	Swedish
United Kingdom	England: Environment Agency Wales: Natural Wales	Environmental Permitting (England and Wales) Regulations 2009	Yes Yes	England and Wales: Classified by coal or metalliferous	English
	Northern Ireland Planning Portal	Northern Ireland: The Planning (Management of Waste from Extractive Industries) Regulations (Northern Ireland) 2010	Yes	?	
	Scotland: Scottish Environment Protection Agency	Management of extractive waste (Scotland) regulations 2010	No	No	

No requirements are set in the MWD as to what should be contained in inventories. As mentioned above, a guidance document for the risk-based tool which can be used to determine which facilities pose a risk to human health and the environment is available, but this does not give any information on whether mineral details should be provided.

The waste management plans of operating facilities must report data on waste according to the European List of Waste (see section 4.3.1). Our results show that inventories which contain details on the minerals waste do not do this according to such codings. Minerals characterisation is reported in terms of metallic content or mineral extracted since this is more directly related to the hazard potential and the known activity.

Status

Note that Table 16 was based on following the guidance of the Commission to review information published under the MWD on the Europa web-site. The Europa site publishes links to some of the Member States' own sites. We found a number of these links to be broken and others led only to generic agency sites. A minority led directly to pages that referred to the topic in question.

Accordingly, the analysis has been augmented where possible by web-searching. This too is incomplete, to some extent due to language issues, but often because the materials, we suspect, have not been made publicly available.

We located reports for 19 jurisdictions (including French survey in progress) out of a total of 32. (Here a jurisdiction includes the separate administrative regions of Belgium and Nations of the UK). It is known that most but not all hazard assessments have been made. For example, Scotland's assessment was only put out to tender in early 2014.

Given this response two more avenues of research were opened to supplement this:

- In March 2014, a report into the management of contaminated land in Europe was published. Led by the Austrian Environment Agency, this provides a periodic update on progress to remediate historic and present liabilities, some of which is funded under the EIONET initiative. Whilst not exclusively related to mining activity, it is recognised as a major contributor to surface and near-surface toxicity issues. The report's authors have released national contacts who have received the mining waste survey.
- On our behalf, Eurostat contacted the representatives on the Technical Advisory Committee of the Mining Waste Directive review committee inviting State participation in the Minventory Survey. A limited number of responses were received

3.1.3 Neighbouring country mining waste legislation

Neighbouring countries have no obligations under the Mining Waste Directive. Accordingly, internet research has been undertaken to establish how mining wastes are managed in these countries. Table 17 summarises the extent of information that has been found.

Table 17: Mining waste data in neighbouring countries

Country	Comments	Link to mining waste data
Albania	No information found	No link found
Belarus	No information found	No link found
Bosnia & Herzegovina	No information found	No link found
Greenland	Subject to Greenland Parliament Act no. 7 of December 7, 2009, on mineral resources and mineral resource activities (the Mineral Resources Act) with amendments from Greenland Parliament Act No. 26 of December 18 2012. (Permitted by the Mineral Licence and Safety Authority.)	No link found
FYR Macedonia	Law on mineral resources (Official Gazette of The Republic of Macedonia no 24/2007). According to the Waste Strategy, little or no information is available on closed or abandoned sites and their environmental impact. An inventory of 16 major 'hotspots' with regards to environmental impacts has been created.	http://www.moepp.gov.mk/WBStorage/Files/Waste%20Management%20Strategy%20of%20the%20RM%202008-2020.pdf
Moldova	No information found	No link found
Montenegro	No information found	No link found
Norway	No information found	No link found
Serbia	The Law of Mining and Geology Exploration (The Official Gazette RS N°88/2011) refers to the implementation of the EU Mining Waste Directive.	No link found
Switzerland	No mining activities are present at date, no information on old or abandoned mining waste facilities.	http://www.swissworld.org/en/environment/waste_management/hazardous_waste/
Turkey	Technical Assistance for Mining Waste Management Project (Service Contract TR 0802.05-02/001) in Turkey is a project co-financed by the European Union and the Republic of Turkey with the aim of compiling a risk-based inventory of closed and abandoned mining waste facilities. The project was due to be completed in April 2014.	http://miningwastemanagement.org/?page_id=9
Ukraine	No information found	No link found

3.1.4 Other sources: Pecomines

The PECOMINES project[83] was carried out by the EU JRC in 2004. The aim of this study was to involve Pre-Accession countries[84] in an EU research action on the environmental impact of mining waste. One of the specific objectives of this study was to compile an inventory of mining waste sites in Pre-Accession countries in relation to sensitive catchment areas. At the time of publication the Mining Waste Directive had not been finalised and the countries on which the report focuses were not yet members of the EU and therefore would not have been affected by this.

The problems presented at the time were very similar to those experienced today:

> *'Lack of information is not the fundamental problem, but available data are often scattered (different responsibilities and/or ownership), are heterogeneous and lack standardisation in terms of parameterisation, formats and geographical reference systems'.* [85]

Hence, the aim of the study was to harmonise such data and present this in a geographical system compatible with other databases.

Data was collected from existing databases and harmonised through the PECOMINES questionnaire. In doing so for Candidate Countries, the study wanted to prove that such project was feasible and that it could be extended to the rest of Europe.

3.2 Review of systems of reporting

3.2.1 Mining waste from operating facilities

The data available on mining waste shown above are not reported using international standards. The waste characterisation addendum (2009/360/EC) to the Mining Waste Directive requires facilities to report on the waste being treated or stored in terms of the EU List of Wastes (2000/532/EC), including hazardous properties. This and details on the geological background of the deposit should also be included in the Waste Management Plans, but no specific assay or reporting standard is stipulated.

The legislation obliges Member States to identify and handle appropriately A-waste facilities in site management plans.

If mining wastes are moved off-site to a waste handling facility, they are treated as wastes under the LFD and must be assigned a waste code from the List of Wastes in accordance with normal consignment procedures.

In summary, mining waste held either on site in waste facilities of operating mines, or sent off-site for disposal, is characterised equivalently to the procedures described in the Landfill

[83] More information available at: http://viso.jrc.ec.europa.eu/pecomines_ext/main.html

[84] Pre-accession countries at the time of publication: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia

[85] JRC (2004), Options For Compiling An Inventory Of Mining Europe mining Waste Sites Throughout Europe

section of this report. This does, however, reveal a certain disjoint in characterisation: Whilst materials are held temporarily, most likely in prospect of further processing or extraction, they are subject to a mineralogical classification; once designated as a waste for treatment or long term storage they obtain the looser waste classification of the List of Wastes. As a result, useful materials inventory knowledge may be being lost.

3.2.2 Closed and abandoned mines

3.2.2.1 MWD assessment process

Within this section of the project, the main interest in closed and abandoned mines is in respect of any associated designated mining wastes located on the sites in question. (This is distinct from the instances where such sites have unexploited mineral resources, which would fall in any case under the examination of Primary Raw Materials.) For many historic sites, under former lax control regimes, partitioning and control of wastes was not effected or recorded. Nevertheless, the legacy of such wastes could be of economic and environmental significance today. The environmental and health impact falls within the scope of Mining Waste Directive.

Inventories of closed and abandoned facilities exist in at least the 19 States/Regions for which we were able to locate data. It is highly likely that most States have generated equivalent inventories during their hazard assessment process. However, the MWD-driven process has inevitably focussed on sites of prime or immediate concern, so that the best information is restricted to a much smaller sub-set of the entire inventory.

With regard to the procedure employed by Member States to assess the hazards arising from waste inventories under the MWD, there is no stipulation in the legislation on how to do this. Accordingly, States have devised their own procedures, which take similar approaches, but may result in different emphasis of site characterisation driven by availability of historic data on former operations, layout, subsequent remediation or other factors.

For example, the England, Wales[86] and Northern Ireland[87] approach has employed a hazard evaluation technique based on 'source, pathway and receptor linkage' to narrow a total inventory of over 100,000 sites down to around 100 in three stages. There has been no differentiation of closed or abandoned mines or of mining wastes, spoils, tailings, ponds etc. because the technique instead audited contaminant levels in potentially affected aquifers and waterways. There is little likelihood of establishing this differentiation without further detailed site inspection.

On the other hand, Croatia has maintained better records and has a more recent mining legacy, so has been able to provide differentiation along the lines of ponds and tailings, whilst still employing a triage approach to hazard assessment. It also has an on-going inventory of wastes at operating sites, though this has not been verified.

It should be remembered also that the purpose of the assessment has been to identify hazards, not to quantify resources. The submissions therefore say little about potential

[86] http://cdn.environment-agency.gov.uk/LIT_6797_7d390c.pdf

[87] http://www.planningni.gov.uk/index/advice/advice_apply/advice_special_studies/mining_waste_directive-2.htm

stocks on a site by site basis. However, the UK survey did estimate the overall mining waste stock by totalling production records and using a ratio of spoil to useful product, yielding a figure of several billion tonnes.

In France, BRGM is currently carrying out a more rigorous survey of its abandoned mines which will include resource potentials. We await the results of this exercise.

3.2.2.2 Waste codings

Inventories of closed and abandoned mining waste facilities do not make use of the European Waste Catalogue or other conventions but report waste characterisation in terms of mineral extracted or metal content. They are thus more akin to the assay of primary ores. (For the purposes of MWD reporting, however, some aggregation into mineral classes (constructional, energy, industrial and metalliferous) may have occurred in public documents, though the source materials are likely to retain the original detail.)

As reported under primary raw materials, the PERC Reporting Standard does cover 'Reporting of .....Stockpiles, Dumps and Tailings'. Similarly, the UNFC described in Section 2.2.3 is entirely capable of describing either abandoned mine facilities or waste dumps at any level of characterisation along the Environmental, Financial and Geotechnical axes.

It is therefore feasible to consider that mining wastes and abandoned facilities could be integrated into the same reporting structures, data harmonisation mechanisms and meta/data portal as primary raw materials. It needs to be recognised, however, that the state of knowledge around these assets is much lower or held confidentially in the hands of operators or asset investors.

3.3 Harmonisation issue analysis

Table 18 shows the issues identified through the analysis of mining waste inventories. Because the information available on mining wastes - especially abandoned mines - is so much less structured than for primary raw materials, the identification of issues is far less quantified. The tabulated issues are relevant if data regarding mining wastes is to be transformed into a format harmonised with the primary resource information. Given the state of knowledge, it is clear that this is a far prospect that most likely does not fit the 2020 timescale, and may not be desirable or necessary for all mining wastes. However, the actions to a large extent mirror those of the primary resources and so are outlined to the degree possible.

In this section some terminology has been borrowed from the primary raw materials domain. However, this does not imply that there is currently an accepted analogy between systems or practices in information handling, reporting and quality control. Rather it is used to show the broad similarity of issues arising, even though the details may substantially different, and to provide an analogy for systems that may be parallel even if not compatible in future.

Table 18: Issues identified for mining waste data

Topic	Issues/Gaps	Comment
I. Policy, legislation and regulation	1. National mining waste legislation for non-EU member states	Lack of legislation on mining wastes in non-EU member stats
	2. Legal requirement to provide resources/reserves data	Lack of reporting requirements in non-EU member states
II. Data quality and comparability	1. Required use of a system of reporting	No standard reporting requirements for inventories leads to non-comparability of inventories
	2. Availability and appropriateness of international standards	No international standards currently in use
III. Data infrastructure, provision and accessibility	1. Availability of data	Inventories could not be found for all countries
	2. Public access to data	Only inventories are available to the public, other information regarding resources is not publicly available
	3. Multilingual format of data	Data mostly only available in country's language

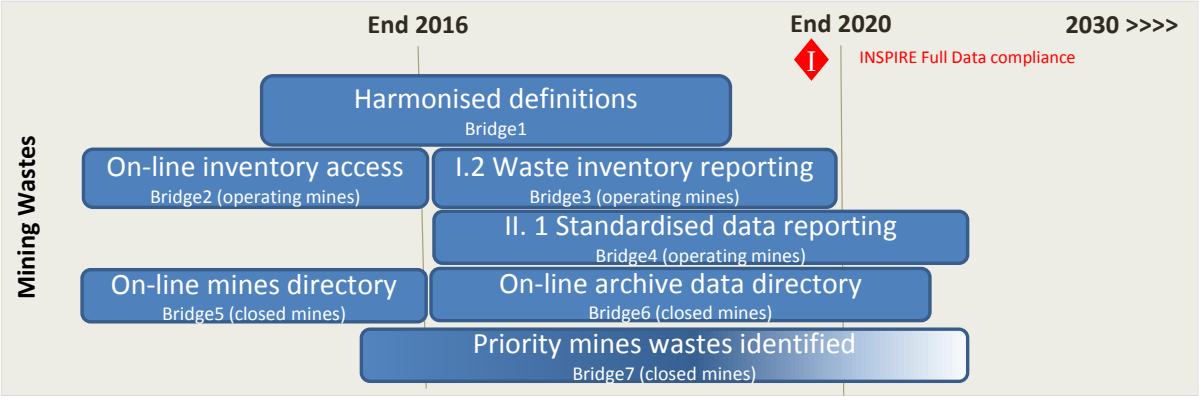
An example is in the use of 'reporting standards'. As described in the primary raw materials section, this term is well understood, describing processes leading to reporting of resources and reserves, by accredited mineralogical experts, in a quality system, to agreed classifications. In this domain, the process is well defined, but standards may be at variance between States or jurisdictions, as are their differing obligations on companies to report or publicly disclose.

In the waste domain 'reporting standards' have very different characteristics: There are no internationally agreed systems of prospecting, analysing and reporting the 'resource' associated with waste facilities. On the other hand, the characterisation of materials entering such facilities is subject to 'Reporting Codes' common across all EU as mandated under Directives already described. Information on source, composition and flow is made public (under disclosure rules) at EU level and often within Member States. The issues faced by both domains in harmonisation are – to a large extent – complementary.

3.4 Mining waste roadmap

3.4.1 Overview

Figure 37: Outcome-oriented view of roadmap



3.4.2 Bridging actions

Because the nature and quantity of mining waste resources is not well defined, the issues of Table 18 should not be immediately and indiscriminately addressed. We suggest that more basic actions should be taken which permit better sight of available data and enable some judgements on the value of putting in place more detailed and harmonised protocols. However, some of the actions do impinge on the issues identified in the table. Their implementation may follow on from actions taken in respect of primary raw materials, particularly as the nature of mining wastes is so similar to them.

The Bridging Actions can be summarised as:

- Bridge1: establish terminology for mining wastes
- Bridge2: create operating mine waste facility directory
- Bridge3: harness MWD for operating mine waste reporting
- Bridge4: standardise operating mine waste inventory reporting
- Bridge5: create a closed mine waste facility directory
- Bridge6: create a closed mine historic archive directory
- Bridge7: identify high interest closed mine waste deposits

3.4.2.1 Commence work on defining terminology and reporting

Table 19: Bridging actions in respect of mining waste terminology and reporting

#	Aspect	Description	Timing
Bridge1	**Action**	Clarify and harmonise definitions across primary materials and mining wastes.	Complete prior to 2018.
	Comment	Harmonisation of terminology between primary resources and mining wastes will be useful, not least as a platform for the possible description of both within the same harmonised reporting system (See later **Action on Issue II.1 on reporting codes**.) Terminological definition could be published in a revision to the MWD and/or the CRIRSCO Template. However, it may be quicker and easier to generate Best Available Technique or other guidance that might be adopted voluntarily.	

3.4.2.2 Operating mines

Table 20: Bridging actions in respect of mining waste from operating mines

#	Aspect	Commentary	Timing
Bridge2	**Action**	Ensure that lists of operating mines, their main minerals, waste facility descriptions and their locations are publicly available.	Complete prior to 2016.
	Comment	Waste plans are obliged under the MWD. Much of this information is already available through the known permitting authorities within Member States. Since it includes a spatial aspect, it could be mandated through INSPIRE. (See later **Action on Issue I.2 on provision of data**.)	
Bridge3	**Action**	Utilise the MWD to periodically report the total material inventory in wastes on operating sites	Feasible by 2020.
	Comment	The waste management plan obliged by the MWD includes both an assessment of the underlying ore body and the waste generated. The MWD already includes an obligation to provide data to the Commission 'as requested' so a framework for reporting already exists. This is already carried out in a number of States so good practice models exist which could be copied. Aggregation may be required if the information is to be made publicly available, but this require further examination.	
Bridge4	**Action**	Standardise the inventory reporting to align to an approved reporting standard.	Feasible largely by 2020.
	Comment	In the interim, the default data provision format is as specified in 2009/360/EC, the technical requirements for waste characterisation, completing Directive 2006/21/EC.	

3.4.2.3 Abandoned and closed mines

These aspects are combined since most Member States do not differentiate the two in their reporting. It is also likely that, in many cases, the information related to these sites will be of poorer quality that that related to operating sites, in extent, completeness, standardisation and multiplicity of formats. However, they have been the subject of the recent WMD hazard assessment exercise, which likely means significant sites have been identified.

Table 21: Bridging actions in respect of waste from abandoned and closed mines

#	Aspect	Description	Timing
Bridge5	**Action**	Ensure that lists of closed and abandoned mines, their main minerals, and their locations are publicly available. Where available, type of facility, analysis and volume could be provided.	Complete prior to 2018.
	Comment	This information should already have been collated during the process of implementation of the MWD. Since it includes a spatial aspect, it could be mandated through INSPIRE. Under MWD, many Member States have taken an approach that identifies only the most hazardous closed facilities. This list may not overlap if the criteria are based on resource potential, so it is likely that a full list would be delayed until further site inspection (for example) had taken place. (See later **Action on Issue I.2 on provision of data**.)	
Bridge6	**Action**	Create and publish a directory of historic and archive materials held by Member States in relation to closed and abandoned mines. This would assist in locating information on significant waste resources at a later date.	Feasible largely by 2020.
	Comment	This directory could include maps and other data as well as statistical information. It is not anticipated that this will be made available on line. Article 20 of the MWD obliges Member States to produce an inventory of high hazard closed and abandoned sites. Therefore, the proposed action goes well beyond this, relating both to information collated during the assessment process or other materials not used. In addition, since some Member States can count such sites in the many thousands, a process of prioritisation would be needed, possibly involving re-examination of the data or sites themselves (see action **Bridge7**, below). This might be undertaken voluntarily by Member States, but it is more likely that the exercise will need to be sponsored in order that a common approach is adopted across the EU.	
Bridge7	**Action**	Review the process employed to identify high hazard waste sites under the MWD to identify the most significant potential waste deposits based on current key and critical mineral lists.	Feasible largely by 2020.
	Comment	Since much of the background has been completed, this could be a relatively rapid process. It could generate information similar to that obtained under **Bridge2**, but of lower quality. It is possible that this class of data already falls under the scope of INSPIRE if it is 'spatial' data and so an obligation to publish would already exist. An EU-level project could be initiated (like Minerals4EU) to undertake a per-country review of high potential sites.	

3.4.3 Roadmap detail

3.4.3.1 Action on Issue I.1: Mining Waste legislation outside EU

Neighbouring countries may be motivated to participate voluntarily through self-interest. However, they should be encouraged in any case to participate in European initiatives, an action that will be relatively straightforward for countries that have aligned themselves to European waste and/or mining legislation. Possible actions include:

- Inviting participation in all events, communications, thematic calls and projects related to the harmonisation objective.
- Holding best practice seminars where learning of practices and processes from neighbouring countries could contribute.
- Inviting participation (as observers or otherwise) in the INSPIRE and MWD technical committees.
- Sponsor projects to assess – in the manner of the MWD assessment – the joint resource and hazard potential of mining waste facilities and sites in neighbouring countries. Such a co-funding approach was taken in Turkey. This might be linked to the adoption of aligned mining waste policy, legislation or practice in the country.

These actions should promote inclusiveness and may indirectly influence increased future alignment either in legislation or waste/mining agency practices as has been the case in Bosnia and Herzegovina.

3.4.3.2 Action on Issue I.2: Encourage provision of 'resource' and 'reserve' data

The Mining Waste Directive obliges operators and regulators to have in place plans for characterisation of waste and its hazards from operating mines, and for taking remedial actions. A framework therefore exists for systematic identification, logging, characterisation and estimation of mining waste resources. As for closed mines, current reporting requirements do not oblige regular assessment of the resource accumulations from waste, though this would be a relatively simple – and possibly not controversial – extension to the remit of the legislation. Possible actions include:

- Adaptation of the Mining Waste Directive to institute collection and reporting of mineral resources held in operating mining waste facilities (and landfill holding consigned mining wastes – see Landfill actions). INSPIRE schema already exist in respect of Landfill and Production Facilities as well as the mineralogical schema of Annexes III.6 and III.8, which might be used to report (possibly with adaptation).

  N.B. The MWD does include a provision for the Commission to request reports periodically from Member States, but it does not appear to have been invoked. The proposed action seems to be a valid use of the Article in question.

- A related and contingent action concerns how these 'resources' are characterised, and has a number of aspects:

  - Obtaining Member State agreement on the definition of 'resources' and 'reserves' in this context (but see **Action Bridge1** above and **Action on Issue II.1b**, below); in the short term, all assessments would have the status of resources dues to economic viability or state of knowledge.
  - Determining whether the List of Waste codes (used for reporting waste, mining or landfill) are appropriate and sufficiently detailed for reporting mineral resources.

It should be noted that questions have been raised within the primary raw materials section as to the sufficiency of the current inspire minerals code lists, so this issue should be examined in parallel.

Of course, this does not preclude that a voluntary publication approach could be taken as might already happen in some Member States, and as it does often with waste flow data.

3.4.3.3 Action on Issue II.1a: Implement reporting of mining waste

A more immediately tractable issue is that of data reporting codes and standards. To a large extent, this aspect mirrors the practices and recommendations of primary materials.

Clearly, wastes form a less well characterised and less economically via resource than primary resources. That is only to be expected from depleted, denatured and perhaps inaccessible materials. The question arises as to how to best reflect this uncertainty within the reporting.

UNFC 2009 as well as PERC allow the reporting of potentially economic material found in mining waste. An example using the UNFC 2009 classification system is given in Table 22.

Table 22: Roadmap - implementing a harmonised classification for mining wastes using UNFC as an example

Aspect	Notes
Mining waste projects	It is useful to take as a point of departure that fundamentally the UNFC is a classification of projects. Thinking in those terms would distribute the quantities among the E and the F categories, depending on the status of the recovery projects.
Mining wastes with no project	If no project can be envisioned, categories E3.3, F4 would be used. Distribution among the G categories would be determined by the information on the wastes and on the tailings and the anticipated recovery processes of the projects.

Source: UNFC - Steering Group representative

It is anticipated that in cases where minerals in mining waste present a high economic potential and their recovery is assumed realistic, then quantitative figures may be added to the overall resources and reserves evaluation. These might then represent the figures provided to National bodies. At Member State level, for the purposes of satisfying sustainability objectives and gaining a good understanding of the quantities and spatial distribution of materials, the source of a material (i.e. tailings, the earth crust, stockpiles etc.) should become identifiable.

None of the systems of reporting available have as a primary objective the reporting of resources from mining waste, therefore a revised or new reporting system may be required that is able to account for key characteristics of mining waste, such as source, economic potential, recovery prospective, heterogeneity etc. Mining waste inventories are already available in most European countries and if a revised and standardised template became available that reports resources of potentially recoverable minerals, then this could represent the most suitable route to harmonised data.

- The subject matter of this issue falls predominantly within the domain of the Mining Waste Directive. It therefore suggested that a technical committee associated with the monitoring and revision of the Directive is established to lead on the development of a reporting standard. This would clearly call upon the related expertise of the general

geological community, PERC and CRIRSCO committees, DG Environment and Eurostat as bridges to the established implementers of the waste codifications and any revision that might happen in parallel.

- Implementation of the standard should be voluntary, but could be motivated by clauses of the MWD requiring ad hoc (but unspecified) reporting.

3.4.3.4 Action on Issue II.1b: Implement reporting of abandoned mines

Similar to reporting mining waste data, systems that could accommodate reporting of resources from abandoned or/and closed mines include UNFC 2009 and PERC. An example using UNFC 2009 is given in Table 23.

Table 23: Roadmap - implementing a harmonised classification for abandoned mines using UNFC as an example

Aspect	Notes
UNFC coded mines	Assume that the mine has been operated by using the UNFC all along, it will have quantities distributed in the various classes prior to abandonment. The abandonment decision will shift quantities categorised as E1 to either E2 or E3.3, depending on how the mine was abandoned and on what grounds. If it is a temporary abandonment caused by changes in the economic and social frameworks, including market prices, they may qualify for E2. If it is a permanent and irreversible abandonment, they may qualify for E3.3. The abandonment decision will also shift the F categories. Quantities in category F1 at abandonment will shift to either F2.2, F2.3, F3 or F4 depending on the status of a reopening project. The G categories should not be affected.
Non-UNFC coded mines	Most if not all mines abandoned now will not have been operated using the UNFC. The challenge will then be to distribute quantities among the G categories. This will need to be governed by the information available to the assessor at the time of categorisation. If no records exist, the quantities may be categorised as G4. When a full set of records exist, the quantities should be categorised in accordance with the UNFC, its specifications and the UNFC-CRIRSCO bridging document.
Caveats	There is a detail here to be aware of. The UNFC is primarily classifying sales quantities in order to be coherent with other economic statistics and financial information. The CRIRSCO Template does not have the same strong emphasis on this, except for reserves where the Bridging Document clarifies that information necessary to calculate sales quantities shall be provided when the E1,F1 categories are used. Quantities to be produced but not sold are categorised in E3.1 and measured (quantity and quality) or estimated at the non-sales reference point, past which they could be found in the tailings or mining wastes depending on circumstances.

Source: UNFC - Steering Group representative

As in the case of mining waste, inventories for abandoned and closed mine sites exist in most European countries and it may be more appropriate to produce a standard template and revise the content of these data sources, rather than use systems of reporting where their primary role is not to address abandoned and closed mines.

However, notwithstanding the principles outlined above, it is important to remember that in general each project classification needs to be considered on its own individual merits and

any general guidance must be viewed as a representation of the principles rather than specific advice.

This Action should be seen as a follow-on from the bridging actions **Bridge4** and **Bridge5** which would establish a directory of priority mining waste sites and a crude assessment of some basic parameters.

Any further action under this heading would be contingent on an assessment of the prospects and mineralogical importance of such sites, whether data existed already and could be made public, or what effort would need to be expended to better characterise the sites in question. If these indicated further detail would benefit the EU, further assessment work would be needed.

- Prospecting and reporting projects could be sponsored by the EU for priority sites, but only upon receipt of the survey, inventory and prioritisation assessment (i.e. the closed/abandoned site baseline).
- Reporting should be recommended if not mandated in a CRIRSCO/UNFC-aligned manner and INSPIRE compliant.

3.4.3.5 Action on Issue III.2: Permit public access to data

In line with other data types, a prime consideration for operating mines are potential commercial confidentiality issues.

- Further consideration of the public access issues related to data from operating mines is required. Some form of aggregation or redaction could be appropriate (as described in the primary raw materials section). In general, however, because of the environmental and health implications, and generally non-commercial nature of waste accumulations, public access considerations should be much lower than with primary resources.

A possible undesirable consequence of better access to information is the risk of stimulating illegal extraction. This already happens in some countries for some minerals. The price for this may be an increased burden in diligence and policing.

3.4.3.6 Action on Issue III.3: Enable translation

As is the case of primary raw materials, a glossary of terms is necessary in order that an informed debate on scope, standards and processes may proceed without terminological confusion or obfuscation. Action on this aspect has been proposed within **Bridge1** (defining terminology).

Once basic metadata has been defined and translated the multi-lingual aspect is no longer relevant for structured statistical data. This is also described within the primary raw materials actions.

The issue of native language arises when considering access to historic textual materials in electronic form, an issue already apparent in the construction of the Minventory Portal. The increasing availability of on-line translation tools will assist the conversion of text-based materials, but this will not assist translation of non-electronic archive materials.

- The nominated publisher of the data should be charged with working with the supplying body to ensure that as accurate a translation as possible is obtained for relevant, supplementary non-statistical archive materials that need to be made public.

Some EU-level funding may be required once priority waste sites have been identified on a per-State of per-region basis.

3.5 Mining waste: Recommendations for further work

From the preceding sections, it is clear that there are some fundamental questions to be asked in this domain in respect of collating, deriving and publishing (at least) resource estimates. To a large extent, the actions broadly adopt a moderate staged approach which acknowledges that the balance of input effort and output value is difficult to judge. The actions propose simple steps, preferably easy wins, to improve basic knowledge as a platform for more detailed work.

It is possible therefore, that the whole suite of bridging actions could be taken as a bundle, in an EU-level (or pan-European) project in the manner of the work package of Minerals4EU which is assessing minerals stocks. The project remit would be to obtain an EU-level overall mineral asset assessment; a by-country view of mining wastes; and to prioritise, and recommend where further investigation efforts should be placed taking account of current mineral resource concerns within the EU.

This would be a precursor to the main roadmap actions.

Part 4: Landfill Stocks & Flows

4.1 Background

Landfilling of waste in the EU is regulated by the Waste Framework Directive (WFD)[88] and the Landfill Directive (LFD)[89]. The latter defines landfills as:

> *"A waste disposal site for the deposit of the waste onto or into land (i.e. underground), including:*
>
> - internal waste disposal sites (i.e. landfill where a producer of waste is carrying out its own waste disposal at the place of production), and
> - a permanent site (i.e. more than one year) which is used for temporary storage of waste,
>
> *but excluding:*
>
> - facilities where waste is unloaded in order to permit its preparation for further transport for recovery, treatment or disposal elsewhere, and
> - storage of waste prior to recovery or treatment for a period less than three years as a general rule,
> - storage of waste prior to disposal for a period less than one year."

A landfill is therefore an underground deposit where wastes have been stored for longer than a year. The landfilling of wastes has changed significantly over time, with different types of wastes being deposited in landfill in different periods of time and in different regions. Many of these changes have been driven by evolving waste legislation and increasing environmental concern over the use of such practices, but also because of changes in technology and material usage.

Before the introduction of the LFD, the mixing of hazardous, non-hazardous and inert waste was permitted. Furthermore, there were no limits as to what could be landfilled at a European level, although many countries had already imposed landfill restrictions. Another change of particular interest is the increase in recycling targets within the European Union. As Europe becomes a recycling society, fewer and fewer valuable resources will be landfilled. In contrast, older landfills will contain materials such as metals which are more commonly recycled nowadays. Therefore, older landfills are more likely to generate interest as secondary materials stocks resources.

Unlike primary raw materials and possibly mining wastes, landfill deposits contain more diverse and sparse resources as different types of wastes (and products in which they are embedded) are mixed and landfilled in the same deposits. Moreover, different cells within landfill will also vary in composition as these may have been filled at different times, with some landfills having been active over a long period of time.

[88] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

[89] Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste

Similarly to the Mining Waste Directive, the principal objective of LFD and the Waste Framework Directive (Directive 2008/98/EC on waste) (WFD), is to protect the environment and human health. These also focus on research efficiency, the prevention of waste as well as the reuse and recycling of materials. The WFD explains when waste ceases to be waste and becomes a secondary raw material (so-called end-of-waste criteria), and how to distinguish between waste and by-products. It does not provide a definition of secondary raw materials, nor does it focus on landfill deposit as material sources.

Of peripheral interest to the current concern with Landfill are the Aquatic[90] and Groundwater[91] Protection Directives. Whilst these do not directly consider the inventories associated with landfill, they do concern their management in respect of environment protection and obligations to report, and may therefore provide some framework for extended reporting of landfill characteristics, although this is far removed from their intent.

4.1.1 Landfill mining

Landfills have historically been perceived as waste deposits and not resources. However, an increasing interest is being shown in landfill mining. The first landfill mining project took place in Israel in 1953 and over 60 projects have been reported in the literature since then[92]. To date, landfill mining has primarily been used for post-closure management issues such as mitigating pollution concerns and reclaiming landfill space.

Procedures have been developed to reclaim valuable materials and to provide energy from waste from plastics found in landfills[93]. Separation techniques for enhanced landfill mining are available and proven in practice. But a pre-requisite of any landfill mining metals recovery project, is to estimate the composition of the site[94]. Such studies may provide useful inventories of the materials found in landfill sites; those seen to date are characterised as studies commissioned by a particular State region or one-off academic or commercial investigations.

A recent study[92] on landfill mining reviewed 60 such projects and determined the average waste composition for those sites for which data was available; this is shown in Table 24. Landfill mining projects, however, require data on specific sites in order to justify the feasibility of such project.

In 2008, KU Leuven, Group Machiels, VITO, Hasselt University and other Belgium companies formed a consortium with the aim of developing enhanced landfill mining[95]. This is the first landfill mining project being undertaken primarily for resource and energy recovery

[90] Council Directive 76/464/EEC of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community. Directive as last amended by Directive 2000/60/EC.

[91] Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances. Directive as amended by Directive 91/692/EEC (OJ L 377, 31.12.1991, p. 48).

[92] Zero Waste Scotland (2013), Feasibility and Viability of Landfill Mining and Reclamation in Scotland

[93] Landfill mining: A critical review of two decades of research, J Krook et al, Waste Management 32 (2012) 513–520

[94] Enhanced Landfill Mining in view of multiple resource recovery: a critical review, Jones, P.T., *et al.*, Journal of Cleaner Production, 2012.

[95] http://www.elfm.eu/en/ELFMConsortium.aspx accessed 11.03.2013

purposes. The consortium are about to commence the first full-scale Landfill Mining project in the province of Limburg.

The project was initiated in 2007, and resource recovery is expected to start by 2017. Composition of the site has been characterised using a combination of waste log book data and excavation samples[94], yielding an estimate of 15 million tons of waste. The project is budgeted at €230m over 20 years and plans to reclaim 35% of the waste for materials recycling, 60% as fuel for a 75-100 MW plant and the remaining 5% as residual waste. Other European countries exploring the possibilities of enhanced landfill mining include Germany, Austria, Sweden and the Baltic Sea Region[96].

Table 24: Average landfill composition

Waste Type	Average Composition, including soil (%)
Plastic	4.6
Paper and Cardboard	5.3
Glass	1.1
Total metals	2.0 (1.7% ferrous, 0.1% aluminium, 0.1% non-ferrous; 0.1% other)
Organic	5.30
Wood	3.6
Leather	1.6
Textile	1.6
Construction and demolition waste	9.0
Stones	2.5
Other	5.8
Non Municipal Solid Waste	0.3
Inert	2.6

Source: Van Vossen and Prent, (2011), Feasibility study – Sustainable material and energy recovery from landfills in Europe. Proceedings of the Thirteenth International Waste Management and Landfill Symposium, Sardinia 2011.

The data of Table 24 could be used to estimate the resource potential of all landfill in Europe. However, it should be used with extreme caution for the following reasons:

- Type of landfill surveyed will impact on the mix of materials revealed, particularly a difference between "industrial" and "household" varieties. It is assumed that hazardous waste facilities have not been assayed.
- The age of the landfill will affect the composition because certain fractions will decay over time.
- The age and country of the landfill will affect the composition because of the evolution of waste composition over time (reflecting societal use of materials in products) and because of local policies in the balance of recycling, incineration and landfill which will denude landfill of priority materials later in life.
- Not least the prospecting technique must account for the temporal and geographical variations anticipated in these cases.

The documents quoted earlier in this section reference over 60 previous analyses of landfill site compositions and will reflect the above factors. A systematic attempt to assess landfill

[96] Closing the life cycle of landfills – Landfill mining in the Baltic Sea region for future, A. Bhatnagar, F. Kaczala, M. Kriipsalu, M. Hogland, W. Hogland, Linnaeus ECO-TECH Kalmar Sweden, 2012.

resources across the EU will need to take account of all such detail and – superimposed on this – some probabilistic assessment of the likelihood or practicality of exploiting any particular landfill. This task should not be underestimated; large estimation margins will be apparent. Wuppertal Institute reports that different estimation methods have yielded resource mass estimates that vary by a factor of up to five.

4.1.2 Waste flows

Although the primary target of this study is metadata related to stocks of raw materials and wastes, it also includes a discretionary element related to flows of waste. There is abundant information on waste flows with substantial aggregated national data mandatorily published by Eurostat (see later, Section 4.3 which deals with how this data is characterised).

Of some interest are Directives that mandate the specialised treatment of particular wastes that must be diverted from landfill to achieve stated targets for recovery and recycling. The scope of this legislation include vehicles, WEEE, batteries, tyres and others, a full list of which (relevant to the current scope) is provided in Table 6, page 60. All these provide a regulatory and monitoring context for evaluating, to some extent, materials, products, and their compositions flowing towards waste treatment and landfill as a last resort; what may or may not be landfilled; and what reporting requirements are placed on Member States. For example, it can be seen that a particular Eurostat waste category is 'discarded vehicles'. Member States must report total discarded tonnages, re-use, recovery and recycling rates. Similar considerations apply to other target products and materials.

As stated, these statistics deal only with flows not stocks, for which there are no obligated reporting requirements. Of course, the residual from all recovery and re-use activities should represent what is sent to landfill. The statistics therefore have some utility, when integrated over time, of offering a view of landfill inventory at least in an incremental sense.

4.2 Availability of data

It has already been described that data regarding landfill is reported in the form of waste flows and not inventories. In particular, the Waste Statistics Regulation only requires waste flows to be reported. In this section we report on research into publicly available data on both waste flows and landfill deposits to investigate the availability of such data.

The major European database on waste is hosted by Eurostat's Environmental Data Centre on Waste[97]. EU-28 countries are required to report waste data as stipulated by the Waste Framework Directive and the protocol of Regulation (EC) No 2150/2002 (and amendments) on waste statistics. Iceland, Norway, Switzerland, Liechtenstein (via Switzerland), FYR Macedonia, Serbia, Turkey and Bosnia & Herzegovina also report to Eurostat on waste data.

The waste data regulations aim to create a common framework on the collection and reporting of waste data within all European countries. This legislation sets out the

[97] Available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/database

methodology for collection as well as the data requirements. Guidance is available on waste categorisation and collection[98].

The data requirements set out in these regulations are shown Table 25. Member states must report the number of hazardous, non-hazardous and inert landfills present in their territory and the total landfill remaining capacity. The number of deposits is information for the database; however, there is no requirement for countries to report on the content on these deposits.

Table 25: Waste Data Regulations reporting requirements

Dataset	Stage	Description and breakdown	Regional level
1	Generation	Waste generation by: • 19 waste producing activities: 18 industries, households • 51 waste categories	National
2	Treatment	Waste treatment by: • treatment types • 51 waste categories	National
3	Treatment and infrastructure	Number/capacity of recovery/disposal facilities by: • treatment 4 types	NUTS 2
	Coverage of collection scheme	Percentage of population covered by a collection scheme for household and similar waste	National

As previously mentioned, Member States have to report on the flows of waste into landfill. In relation to these regulations, this is reported as waste being treated by 'landfilling', where landfilling includes treatment codes D1, D5 and D12 from Annex II of the WFD. These are defined as:

> *"D1: Deposit into or onto land (e.g. landfill, etc.)*
>
> *D5: Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.)*
>
> *D12: Permanent storage (e.g. emplacement of containers in a mine, etc.)."*

Waste flows are reported in terms of treatment, economic activity from which it is generated, and type of waste. (This waste coding is very different from characterisation for primary raw materials.) The basis for waste coding is the EWC-Stat nomenclature shown in Annex I and II of the 'Waste Framework Directive'[99]. These are not the same as the European Waste Catalogue codes which must be used for administrative activities such as permitting and which are used by most countries to collect waste data. (Note that some countries collect their waste data in EWC-Stat format, but this is a minority.)

(Annex III of the regulation and a guidance document provided by Eurostat show the European Waste Catalogue codes can be converted into EWC-Stat codes[98]. A simplified view

[98] Eurostat (2013), Manual on waste statistics; Eurostat (2010), Guidance on classification of waste according to EWC-Stat categories

[99] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

of the difference between the two codings is that the EWC List of Wastes (LoW)[100] is oriented towards the sector of arising, whereas the EWC-Stat is oriented towards the type of waste material. EWC-Stat may therefore aggregate a number of sub-codes from different LoW chapters (See Section 4.3).)

In the context of this project, codes exist for the reporting of a range elemental and chemical entities and are particularly relevant to industrial wastes. Construction and domestic waste, however, falls under much less specific categorisations which hide compositional detail. It should be noted that this coding is applied only in the context of arisings, as is not generally applied to existing inventories, especially landfill. It does, however, provide a rational basis for future characterisation efforts, and should therefore be taken into account in the Harmonisation issue analysis and subsequent roadmap.

In addition to the Eurostat database, research was undertaken to investigate whether additional data regarding waste flow or landfill inventories was available; the results of this preliminary analysis are shown in *Annexe Q: Landfill & waste data availability.*

Obtaining such data is generally not a straightforward task as these are published in the countries' language, on different websites depending on which authority is in charge of data, in databases or annual waste reports. The information displayed in the annexe may therefore not be complete. A database illustrating where such data can be found would provide a helpful tool.

The results of this research show that, although some countries publish a list of operating landfills on their territory, few countries provide details on the landfill sites. The most detailed databases include information on total landfill capacity and amounts of waste deposited in specific sites. In no case did we find a characterisation of the resources present at the waste sites.

A further survey was distributed to obtain data on landfill inventories and waste flows from the competent authorities in these countries. The results have been used alongside the findings shown in *Annexe Q: Landfill & waste data availability* to better analyse the availability of such data.

Although data on waste characterisation for landfills is not available, data on waste flows could be used to estimate the content of landfills. In order to do this, compositional data of the waste generated in the local area and during a specific time period would be required. This method must take into account the fact that landfill waste degrades over time and therefore composition will have transformed since the waste was deposited. Nevertheless, these estimates could serve as a pre-selection tool for further landfill investigation.

[100] (2000/532/EC) Commission Decision of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste (notified under document number C(2000) 1147)

4.3 Review of reporting standards

4.3.1 European Waste Catalogue

In the European Union, waste arisings are categorised according to the European Waste Catalogue[101], also known as the List of Wastes (LoW). The list is used for administrative purposes such as permitting and the supervision of waste movements: For example, the 'Mining Waste Directive' requires waste facilities to classify waste according to these codes in their waste management plans. Most countries also publish their own waste statistics according to these codes.

The LoW comprises 839 waste types sub-divided into 20 chapters (see *Annexe L: Top level (2 digit) waste codes*), principally according the economic sector from which the waste is generated. The wastes are described by six-digit codes and can fall under three categories: absolute non-hazardous, absolute hazardous and mirror entries. Absolute entries are hazardous or non-hazardous by virtue of the process through which they were generated, irrespective of composition. Mirror entries can be hazardous or non-hazardous, depending on their composition.

Wastes are considered to be hazardous if they contain one or more of the hazardous properties described in Annex III of the Waste Framework Directive. Examples of such codes are shown in *Annexe L: Top level (2 digit) waste codes*. Note that starred (*) codes represent hazardous wastes and chapter 19 represents wastes 'from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use'.

The LoW is currently under review in order to align the hazardous properties to the Classification, Labelling & Packaging Regulations[102] (CLP).

Member states of the European Union are required by the Waste Statistics Regulation to report on waste according to the statistical waste nomenclature EWC-Stat. These codes are a substance-oriented aggregation of the wastes defined by LoW. This is necessary in order for waste statistics on generation and treatment to be comparable across the whole of the EU. The Waste Statistics Regulations do not, however, require EWC-Stat codes to be used for data collection. In fact, most countries use the LoW codes to characterise waste, which are then converted into the EWC-Stat code according to Annex III of the statistics regulations. Guidance on how to do this is provided by the 'Guidance on classification of waste according to EWC-Stat categories' document[98].

[101] Commission Decision of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste

[102] Regulation (EC) No 1272/2008 of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006

4.3.2 End of Waste criteria

End of Waste criteria have been developed to permit – under defined conditions – materials designated as waste to be reclassified as virgin or near virgin materials. Most prominent examples occur in the metals markets due to their durability, relative ease of recovery and resilience to simple clean-up operations. To date, only a procedure for iron, steel and aluminium scrap[103] is published, with further criteria for copper scrap metal, recovered paper, glass cullet, plastics and biodegradable waste and compost planned. State level work on developing EoW criteria has progressed with varying degrees of interest: some countries, such as the UK, have been proactive in developing suitable standards, and Quality Protocols for several materials: PFA, flat glass, aggregates from inert waste, gypsum etc. Other countries, such as Italy, have been more active in adopting the criteria.

In general, it appears that these standards appear on an ad hoc basis where they can assist in lubricating markets. However, they do not translate into the reporting of inventories, only the quality of materials flowing through them.

4.3.3 Landfill 'quality'

We have located no widely adopted standards for reporting of landfill quality, though Bosnia & Herzegovina refers to the ASME method of sampling. In fact this standard - ASTM D5231 - 92(2008), Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste - refers to the sampling procedure for determining the composition of municipal solid waste prior to sorting or disposal. It is therefore relevant to waste flows, not to landfill. It does not prescribe the categories into which waste should be analysed.

In any case, it takes deference to the EU's own method of waste classification based on the LoW as already noted (see below). Differences are likely to arise due to the physical sampling processes and the physical collection processes, causing, for example, varying levels of fines.

The only practical guidance on landfill comes from 'Landfill mining: A critical review of two decades of research', (Krook et al., 2011)[104]. However, in contrast to the basis of Table 24, this process involves the excavation of closed sites with the over-burden of soil etc. Accordingly:

> *"Typically, municipal landfills consist of about 50–60 weight percent of a soil-type material (cover material and heavily degraded waste), 20–30 weight percent combustibles (e.g. plastic, paper and wood), 10 weight percent inorganic materials (e.g. concrete, stones and glass) and a few weight percent of metals (mainly ferrous metal). This is often the case even when considering landfills situated in totally different parts of the world… Several studies, therefore, also stress the potential for resource recovery, both in terms of recycling of earth construction materials and metals, and energy recovery of combustibles... The presence of hazardous waste in the deposits has generally been found to be low, often comprising far less than one weight percent. Most of the waste composition*

[103] Council Regulation (EU) No 333/2011 of 31 March 2011 establishing criteria determining when certain types of scrap metal cease to be waste under Directive 2008/98/EC of the European Parliament and of the Council; OJ L 94, 08.04.2011, p. 2–11

[104] Krook, J. et al (2011) Landfill mining: A critical review of two decades of research, Waste Management, Volume 32, Issue 3, March 2012, Pages 513–520

studies also address environmental and safety issues, although primarily as a sub-topic. Emphasis has been on local risks related to the excavation of landfills, i.e. leaching of hazardous substances, slope stability issues and risks for formation of explosive and poisonous gases ..."

In summary, however, it cannot be claimed that a landfill reporting standard exists in the manner understood by geological surveys in the context of primary raw materials. That is, there is no universal terminology akin to – or equivalent to – 'resources and reserves'; there are no reporting templates in the manner of CRIRSCO; or indeed, beneath that, accepted methods of surveying and prospecting landfill.

Therefore, any robust, systematic assessment of landfill stocks and compositions will require the development of a reporting standard, most beneficially aligned to the UNFC, but also backed by a set of practical surveying techniques, analytical methods, material composition codes and validation by competent persons or authorities in the field of landfill and wastes or equivalent.

Whether techniques used in geological exploration can be applied, and equivalent assay skills exploited, is a question for further debate. A further question arises as to what classifications akin to mineralogy in primary raw material reporting would be useful and relevant: LoW codes, some development thereof, or a (new) elemental basis.

4.4 Harmonisation issue analysis

4.4.1 Context

Through survey work, this study supports the existing belief that public knowledge of the resource potential of landfill inventories is vanishingly low and certainly not recorded or reported to any code, standard or protocol. By this we mean that there is no systematic collection and assessment of metrics that would indicate the stocks of particular materials within a landfill, operating or closed. This is not to say that components of a system required to assess these stock levels do not exist, rather it is that they are either not all present, or a sound method of synthesising them on a periodic basis is not in place.

For the purposes of this study, we take as a basis that the objective of the Commission is to be able to locate, characterise and evaluate the resource potential of landfill of various sorts within the EU. In the long term, priority industrial landfill resources could be inventoried, assessed and characterised, harmonised with primary materials. Characterisation of household waste landfills is well beyond 2020 due to:

- often poor historic knowledge of in-flow compositions and hence potential; and
- the increasing diversion of recoverable materials pre landfill, often stipulated by the End-of-Life Directives, for example.

4.4.2 Prioritisation by type of landfill

All wastes are not the same. In particular, landfill partitions broadly along the lines of household waste and industrial waste.

- Household waste includes predominantly wastes from households, but can include household-like wastes from commercial operations, mainly retail i.e. municipal wastes.
- Industrial wastes include the products of industrial processes, including relocated mining wastes; there may be segregation for hazardous and stabilised wastes, or inert wastes such as construction materials.

The List of Waste (LoW) codes demonstrate that industrial wastes are characterised more along the lines of primary ores because they are tracked through from the sectors from which they are sourced. The alignment is far from perfect, being best for major, primary metal processing (aluminium, iron, steel…) but hiding detail of most other metals of interest within generic waste categorisations.

Household wastes, on the other hand, are only marginally aligned to primary materials, most notably in ferrous and non-ferrous metals and inert/aggregate classes. The other basic fractions bear little correspondence to primary material classifications. However, the various waste and end-of-life directives provide a strong motivation to separate useful 'secondary materials' before residuals are sent to landfill. Economically sustainable recovery systems are present in most Member States.

Because of this emphasis on recovery from wastes, especially the highest value fractions, it is likely that greatest benefit will be obtained by concentrating on Industrial landfill as being less developed and probably more accessible. This was the view of stakeholders consulted in workshops and in peer review.

4.4.3 Background practices

The following observations are apparent by analysis of the survey responses.

- Regarding landfill, to support current directives on waste management it is certain that the location of landfill sites are well known within the EU 28, recorded and permitted at either a local, regional or national level. Because of this spatial element, landfill related information should fall under the INSPIRE Directive and obligations to publish might be established.
- It is also known what is currently entering landfill both in volumetric terms and in its characterisation by the universal application of the List of Waste codes (or EWC) within Member States at the point of disposal. Therefore, the accumulation of inventory from the point of application of the codes could be established annually by combination with the flow data.
- Putting aside the issue of how to estimate the historic inventory of landfill, closed or operating, the landfill and waste area is therefore relatively well-equipped with a data infrastructure and reporting obligations that would underpin an annual inventory statement.
- In this respect landfill displays complementary issues to the primary raw materials domain: data collection obligations and structures are universal (for flows, not stocks), but the equivalent resource and reserve systems of reporting for landfill stocks are absent.

4.4.4 Learning from landfill mining

Landfill mining projects require site specific data to justify the feasibility of such projects. However, the data on landfill waste characterisation is available only for a limited number of one-off evaluations. It is a point raised by mining representatives that such exploration and assay for a primary resource would be carried out by a private operator at their own risk; but it is notable that few such private investments in exploring landfill sites have been carried out, despite their locations being known absolutely. A number of factors may have led to this, but one is likely to be an absence of coherent information on the volumes, tonnages and approximate compositions of landfills.

Nevertheless, the information obtained from over 60 landfill mining projects[105] does provide some basis for estimation of resources across the entire stock, and specific methods of assay for landfills of the highest economically and feasibly exploited kind.

4.4.5 Synthesis of identified issues

Table 26 presents the issues and gaps identified with respect to landfill stocks.

Table 26: Issues identified for landfill

Topic	Issues/Gaps	Comment
I. Policy, legislation and regulation	1. Legal requirement to provide information on landfill sites.	No EU requirement to provide information on landfill sites other than number of sites.
II. Data quality and comparability	1. Reporting code does not reflect resource composition.	EWC-Stat and European Waste Catalogue codes do not describe the composition of resources present in landfill.
	2. Availability and appropriateness of international standards.	No international standards currently in use (European Waste Catalogue is only used in the EU and voluntarily by neighbouring states).
III. Data infrastructure, provision and accessibility	1. Number of organisation(s) in charge of collecting and centralizing data.	With the exception of Eurostat data, other waste data is collected by a number of competent authorities and can be difficult to find.
	2. Multilingual format of data.	With the exception of Eurostat, data mostly only available in country's language.
	3. Data format.	With the exception of Eurostat, data are available in different formats, mainly reports.

Source: BGS Survey of waste data providers, Oakdene Hollins research

Whilst many of the issues are the same as for primary raw materials or mining wastes, the emphasis is distinctly different. As described in Section 4.4.3, the issues with primary materials relate to the obligations to publish data, and ensuring that published figures are

[105] See report Ricardo-AEA (2013) Feasibility and Viability of Landfill Mining and Reclamation in Scotland, for Zero Waste Scotland, available at http://www.zerowastescotland.org.uk/sites/files/zws/Feasability%20and%20Viability%20of%20LFMR%20Scotland%20190413_0.pdf, (viewed on 5 September 2014)

comparable and consistently calculated; the materials concerned are relatively simple and their composition is consistently characterised.

On the other hand, the flows of waste are very well characterised in the sense of being described by published codes, well located and with obligations to report. The issues relate more specifically to the following aspects:

- Relating the LoW codes to equivalent minerals or elements of interest.
- Estimating and reporting the resource potential of landfill as an accumulation of flows over time in a consistent and meaningful way which will aid decision making.

The framing of this roadmap requires a better definition of the resource groups of interest. Primary raw materials and mine-related wastes can be clearly presented in terms of the minerals listed in the scope of the study. However, most other assessments of landfill composition, limited though they are, have largely been couched in terms of the key characteristics of household waste (organics, plastic, wood…etc.) not in terms of minerals or identifiable elements, apart from ferrous metals (iron). An early assessment of whether a harmonised compositional classification for primary raw materials, mining waste and landfill is therefore essential in order to guide possibly complex reassessments of codings across INSPIRE, EWC and EWC-Stat.

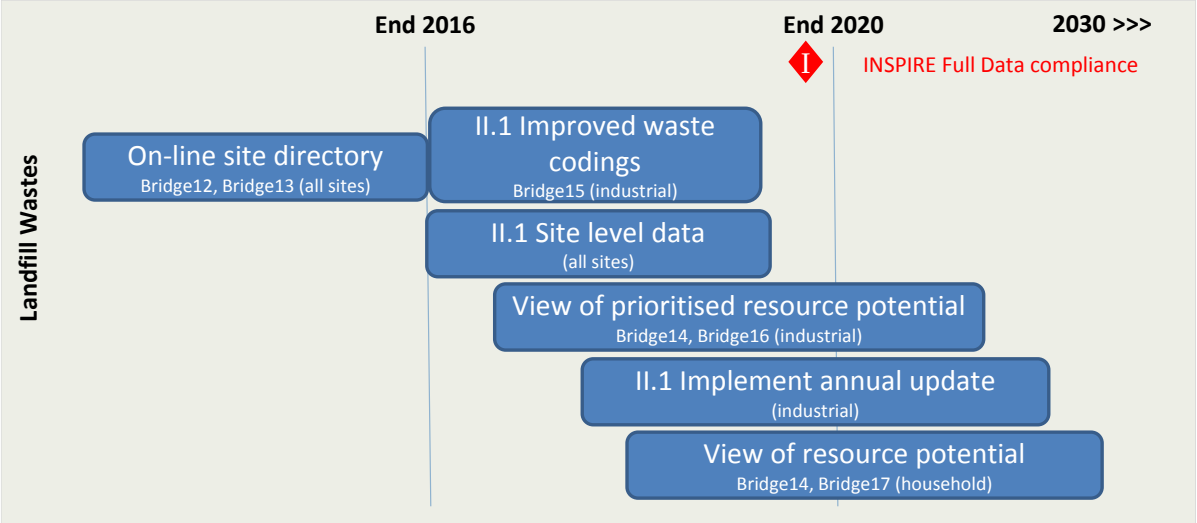
There is more optimism with regard to industrial landfill, since these are likely to comprise denuded, semi- or fully processed residues from mining, chemical and process industries. These can be described in elemental terms, even if they are not currently. Here there is a disjoint between the language of the geological community, and the material codes of the waste community, which have only gross detail under Chapter 01 (Mining). If the emphasis is to be placed on industrial landfill, an improved waste characterisation scheme will be needed in future, possibly involving elemental or mineralogical assay at disposal (see first bridging action below).

The waste flow data reveals full compliance with reporting to Eurostat using the EWC codes. However, it is much less common to find the underlying information either at the Member State's authority's website, or with the level of detail that would be useful for the harmonisation objective. For example, there is generally good availability of basic data (location, capacity, type) of landfill themselves, but little structured information related to inventory. One caveat here is that often landfill and waste services are contracted out to private companies, so there can be a reluctance to make public site-level information beyond basic characterisation.

4.5 Landfill waste roadmap

4.5.1 Overview

Figure 38: Outcome-oriented view of roadmap



4.5.2 Landfill waste: Bridging actions

Similarly to mining wastes, we suggest that a range of basic actions should be taken which permit better sight of available data and support some judgements on the value of putting in place more detailed and harmonised protocols. However, some of the actions in this phase do directly address some issues identified in the Harmonisation Issues Analysis of Table 26.

4.5.2.1 Defining terminology

Table 27: Bridging actions in respect of landfill terminology

#	Aspect	Description	Timing
Bridge11	**Action**	Clarify and harmonise definitions of key terms across primary and secondary raw materials, of which the most notable constituents are landfill and mining waste.	Complete prior to 2018.
	Comment	This would be useful, not least as a platform for the possible description of all within the same harmonised reporting system, and for ensuring compatibility of use with a classification framework such as UNFC. (See later Action II.1 on systems of reporting.) Terminological definition could be promoted by Eurostat, but will benefit from action and support from a multitude of interested parties representing the different materials domains.	

4.5.2.2 Publish a directory of operating and closed sites

Table 28: Bridging actions in respect of landfill site directories

#	Aspect	Description	Timing
Bridge12	**Action**	For all types of landfill, publish a directory of sites and locations as a minimum.	Available by 2016.
	Comment	In effect, all Member States have lists of waste sites although they may not necessarily be held at a national level. (If such lists did not exist, it would be difficult to fulfil reporting obligations under the Landfill and Waste Framework Directives; there is in fact full compliance with these. These lists might not be public, but they could be made so without major issue. In some countries (e.g. UK) they are also published by third parties for sale. Because of the spatial aspect, site location data might be compulsory under INSPIRE. A number of governments already publish site location and characterisation data under open access rules. Ax III.6 or III.11. (For example the UK Environment Agency publishes location data for all historic landfill at http://data.gov.uk/harvest/gemini-object/8d48678b-96f6-4d1e-a6a5-cdf1cdbcda94; a local authority has published its operating site locations under INSPIRE at http://data.gov.uk/dataset/authorised-landfills)	
Bridge13	**Action**	Make available a directory of archive materials related to landfill, with a priority on industrial landfill.	Beyond 2020
	Comment	In practice, this means an extension to Action Bridge12, releasing metadata (to be defined) regarding the sites and where it can be found in a similar manner to the current study. However, this would by being published in a distributed fashion by responsible authorities, but with the datasets indexed by a central authority. Because much landfill data is held by local or regional authorities a coordinating effort by States will be necessary to carry this out.	

4.5.2.3 Undertake gross assessment of European landfill potential

Table 29: Bridging actions in respect of landfill potential

#	Aspect	Description	Timing
Bridge14	**Action**	Commission an EU-level project to broadly assess the potential of landfill, by material and type across Europe.	Complete by 2018.
	Comment	The purpose of this is to place the potential of resources in landfill in better context and therefore determine the need for further, more detailed examination in the actions described below. A suggested method is provided in Annexe R: Supplement	

4.5.2.4 Examine and (possibly) modify waste reporting codes

Table 30: Bridging actions in respect of landfill waste codes

#	Aspect	Description	Timing
Bridge15	**Action**	Examine how waste codings could be modified to better identify wastes containing materials and minerals of high interest.	Complete by 2020.
	Comment	This action relates largely to industrial wastes including mining wastes. The current (LoW) waste codes are inadequate to properly identify materials in waste. Although they highlight ferrous and aluminium wastes, they are not suitable to pinpoint the wide range of mineral wastes, metallic wastes, and chemical intermediates of potential value. This would be a necessary precursor to a future system of ongoing inventory tracking. A preliminary assessment of the LoW codes suggests 10-20% are of interest but need further expansion to be of use. Priority should be directed at the industrial landfill including mining wastes, which should reduce the size of the task. The task should also be accelerated.	

4.5.2.5 Industrial landfill

This study suggests that priority be placed on determining the potential of industrial landfills. Primarily they are the recipients of residues from chemical and manufacturing process, but may contain a minor portion of wastes from primary extraction and refining processes. The wastes therefore include more complex chemical and mineral mixtures that have not, to date, been the target of the simple material segregation processes used for product-oriented wastes.

Industrial landfill represents a largely unexplored resource potential. Putting inert landfill aside, chemical waste landfills often represent an ongoing liability; often they have not been built over or become subsumed within developments that can hamper exploitation. They are therefore more likely to be exploitable since they already have an industrial status.

Table 31: Bridging actions in respect of industrial landfill

#	Aspect	Description	Timing
Bridge16	**Action**	Undertake a systematic but broad review of landfills to identify those of potentially high value because of size or known content.	Beyond 2020
	Comment	Although a number of States do record the annual volume of landfill, there is no systematic approach to characterising the waste. Evaluating potential would require an approach to that used to evaluate mining waste hazard under MWD: Firstly identifying major types of landfill (inert, mining wastes, industrial, hazardous), key wastes, and their sizes; and, secondly, for a 'high potential' subset, evalua ting deposits and volumes over time and assessing material resource potential. This is likely to require EU level funding to define a methodology and to enable per-country assessments.	

4.5.2.6 Household landfill

Research suggests that although landfill volumes are large, their resource potential is highly uncertain and declining. A large factor in lowering the potential is the fact that many closed facilities have been remediated to create a social amenity, or built over rendering them

inaccessible. However, a large number still remain in operation and could be sources of secondary materials.

Household landfill has been explored to a limited extent. No two sites are the same, so generalisations are hard to make. It is unlikely that household landfill can, up to 2020, be characterised on the same basis as primary resources or even mining wastes.

Table 32: Bridging actions in respect of household landfill

#	Aspect	Commentary	Timing
Bridge17	**Action**	Identify from the published directory of household landfill sites those which have the highest feasibility for landfill mining based on simple criteria such as accessibility, scale, type and pertinent site historic knowledge.	Feasible before 2020.
	Comment	Although a number of States do record the annual volume of landfill, there is no systematic approach to characterising the waste. It is therefore likely that time-averaged waste estimates per country will need to be used. An important aspect is whether the site - open or closed - has any possibility or mining, free of leaching hazard, accessibility or civic amenity value. An assessment of the overall potential of landfills has been conducted in the UK using such a method. This is likely to require EU level funding to define a methodology to enable per-country assessments.	

4.5.3 Roadmap detail

The general feedback from the Stakeholder Meetings is that household landfill should take a lower priority for action than either industrial landfill or mining wastes. This is apart from those actions which are common to all categories, such as harmonisation of terminology, or sub-sets of terminology.

4.5.3.1 Action on Issue I.1: Encourage publication of waste data by site

The bridging action Bridge12 proposed that Member States - as a minimum - publish their site directories. A further step would be to publish arisings data at a site level. Currently, however, national reporting and indeed EU level reporting does not require this level of detail. Methods to estimate for base-lining and incrementally updating resource levels will require transparent data at the site level. Supplying this data should not be a large burden if the INSPIRE Directive would already oblige publication of such data seeing as landfills are covered by the schema of Annex III. However, as with primary raw materials and mining wastes, it is not clear whether INSPIRE relates to statistical data as opposed to spatial data; if not, then provision of data will be a voluntary act.

4.5.3.2 Action on Issue II.1: Adapt waste codings

This was considered in the bridging action Bridge14 in respect of industrial landfill: Consider changes to waste coding criteria to enable better operation of future waste reporting according to metals, metal derivative and other wastes of significance.

A brief examination of the LoW codes suggest that about 10% of them warrant further examination as representing streams of potential further interest from a materials perspective. However, the LoW codes are a relatively blunt instrument to record composition detail. Therefore a more detailed examination should take place to determine

whether refinement of the codes is justified. This should be taken in conjunction with the development of a reporting standard for mining and landfill wastes since both rely on the same coding; further, from a materials point of view, both would benefit from a better alignment with primary raw materials reporting which has a greater emphasis on composition.

This roadmap does not include any plan to adapt waste codings for household waste, largely because materials and products of interest are already being segregated, partially driven by specific waste Directives that embrace material conservation as well as environmental concerns. Landfills will be assessed as one-off projects or as suggested in this roadmap.

4.5.3.3 Action on Issue II.2: Apply reporting standards

No international standards apply in respect of waste. In Europe, the Waste Catalogue is the definitive list. However, the state of the art with landfill assessment is that there are no generally accepted methods for reporting 'resources' in the manner of primary materials.

Accordingly, we suggest that this action be integrated with that proposed in Section 3.4.3.3, (Action on Issue II.1a), page 173). There are such commonalities in the use of the waste codings and the stakeholders are the same.

4.5.3.4 Action on Issue III.1: Nominate a national contact point for resources data

Typically Member States have a diversity of organisations who may be accumulating landfill data, either because of a regional devolution of responsibility, or because they handle different forms of waste or landfill.

As is the suggestion for primary materials, the nomination of a single State authority responsible for landfill waste and inventory information management would be beneficial to the harmonisation objective. The authority would ensure that the data was held at sufficient level of detail to enable the analyses and stock change reports suggested here to be carried out. They would also be responsible for commissioning the periodic re-assessment of inventory.

A key consideration, as described in Section 2.4.8, page 147, is whether there is a single authority which handles the processing of all information from its elemental level; or whether this is best kept at a thematic level i.e. for primary raw materials, for mining waste, closed mines and landfill.

- The recommendation is that the responsibility for data collation, processing, meta-tagging and rendering into reporting/INSPIRE-compliant format is retained with the current bodies, but a single national contact point is nominated to perform the ultimate rendition to EU level. This is the model used for EMODNet. In the longer term, following the recommendation for primary raw materials, this would preferably be one of the Geological Surveys as the holder of expertise in 'mine-able resources' of all descriptions.

4.5.3.5 Action on Issues III.2 & III.3: Enable translation

As is the case of primary raw materials and more relevantly, mining waste, a glossary of terms is necessary in order that an informed debate on scope, standards and processes may proceed without terminological confusion or obfuscation. Action on this aspect has been proposed within **Bridge11** (defining terminology).

Once basic metadata has been defined and translated the multi-lingual aspect is no longer relevant for structured statistical data. This is also described within the primary raw materials actions.

The issue of native language arises when considering access to historic textual materials in electronic form, an issue already apparent in the construction of the Minventory Portal. The increasing availability of on-line translation tools will assist the conversion of text-based materials, but this will not assist translation of non-electronic archive materials.

- The nominated national contact point should be charged with working with the supplying body to ensure that as accurate a translation as possible is obtained for relevant, supplementary non-statistical archive materials that need to be made public. Some EU-level funding may be required once priority waste sites have been identified on a per-State or per-region basis.

4.6 Landfill: recommendations for future work

From the preceding sections, it is clear that there are some fundamental questions to be asked in this domain in respect of collating, deriving and publishing (at least) resource estimates. (To an even greater extent than is the case with mining wastes, which at least may lean on the terminology of minerals reporting, is important to define what 'landfill resources' means in an analogous, coherent manner.)

To a large extent, the actions arising broadly adopt a moderate and cautious staged approach which acknowledges that the balance of input effort and output value is difficult to judge at this early stage. The actions propose simple steps, preferably easy wins, to improve basic knowledge as a basis for more detailed work.

- It is highly recommended that this approach is followed to avoid misplaced effort, expense and diversion from higher value activities.

It is possible to consider the whole suite of bridging actions as a bundle which creates a platform of terminology, basic information access, waste codification and crude evaluation of landfill resource potential.

- It would be appropriate to consider an EU-level (or pan-European) project in the manner of the work package of Minerals4EU which is assessing minerals stocks. The project remit would be to recommend revision to waste classification; obtain an EU-level overall landfill asset assessment; a by-country view of landfill wastes; and to prioritise, and recommend where further investigation efforts should be placed taking account of current mineral resource concerns within the EU.
- A second related technical project would be to devise an analogue of the minerals reporting standard which would embrace the process for surveying and prospecting landfill sites to obtain a stated level of confidence in landfill content, composition and overall assets (equivalent to the CRIRSCO reserves/resource delineation); proposing a mapping to UNFC would be in scope.

This would be a precursor to the main roadmap actions.

Part 5: In-use Materials

5.1 Background

This study is largely concerned with elucidating open data related to primary ores and, as far as is possible, mining and landfill wastes. The team also volunteered to examine the state of knowledge of in-use stocks, namely:

> *"Stocks of elements or compounds embedded in products still in use: consumer goods, industrial products and infrastructure." (project working definition)*

Aspects of these stocks are reported here, but in substantially lower detail than other stock types.

The continued and increasing use of metals in applications in society, from aluminium in airplanes to rare earths in lighting has led to a corresponding increasing societal stock of in-use metals in products. Quantifying this stock of metals is far from trivial due to the wide range of applications and their dispersed nature. Consequently, estimations of in-use metal stocks are not comparable to estimates of metal stocks in the lithosphere.

We located no state level information on this topic by searching and indeed the survey respondents offered no response. This reflects the findings of previous researchers in the field. In spite of this, several academic estimations of the per-capita in-use stock are available for a range of economically important metals: copper, iron, lead, aluminium and zinc have been identified[106]. Notably, Graedel et al. at Yale are leading exponents of the evaluation of these, having completed flow and stock assessments of copper, zinc, chromium, lead, iron, nickel, silver and stainless steel, comprising cycle characterisation for all countries using significant amounts of these materials: nine world regions including Europe, North America, and Asia, and the planet as a whole. Target studies of a few states and cities have also been accomplished, together with specialised studies on tin, cobalt, tungsten and aluminium.

Although these studies do not, in total, allow an analysis of European metal stocks at state level, they can be used to provide a guide to the per-capita stocks of some bulk metals in Europe. For example, Table 33 summarises estimates of societal stocks of major bulk metals. These are complicated syntheses of highly distributed products and materials, involving much estimation based on disparate data sources of mixed provenance. There are no standards of reporting, and only some of it comes from public authorities. It is therefore not surprising that no links to state level data providers exist.

The findings from a study on copper are presented in *Annexe S: The example of copper in use.*

[106] In-Use Stocks of Metals: Status and Implications, M. G. Gerst, T. E. Graedel, Environmental Science & Technology, Vol. 42, p 7038, 2008.

Table 33: Summary of in-use metal stock estimates for major bulk metals

Metal	Global per capita stock (kg)	Developed countries per capita stock (kg)	Countries/regions studied	Number of estimates
Aluminium	80	350-500	World, Europe, UK, Japan, USA, China, Connecticut USA.	9
Copper	35-55	140-300	World, North America, Western Europe, USA, Sweden, Japan, Switzerland, Australia, Steiermark Austria, Connecticut USA, Stockholm Sweden, Cape Town South Africa, Sydney Australia, Bejing China, New Haven USA.	34
Iron	2200	7000-14000	World, USA, Japan, China, Steiermark Austria, Connecticut USA, Kitikyushu Japan, Beiking China, New Haven USA	13
Lead	8	20-150	World, Africa, Asia, Commonwealth of Independent States, European Union, USA, Netherlands, France, India, Italy, Japan, UK, Stockholm Sweden, Vienna Austria	20
Zinc	-	80-200	World, USA, Japan, Australia, Steirnmark Austria, Stockholm Sweden, Cape Town South Africa, Sydney Australia	14

Source: (Graedel, 2010)[107]

5.2 In-use stocks in perspective

The reports of *Annexe T: Key publications on in-use resources* are limited to a small number of historically important bulk materials of manufacturing significance and by necessity represent an accumulation based on products of well-established technologies. Assessments of stocks of materials of current significance are much sparser. In many cases these materials, whilst precious, are not used in bulk, but rather because their presence at even small concentrations confers exceptional function to a complex assembly. For example, rare earth minerals manifest in a range of electronic, magnetic, catalytic and optical applications. They become highly distributed in a multitude of products which makes their retrieval problematic though no less critical than bulk materials.

On the other hand, their use can be assigned to a number of classes whose products, once waste, attract treatment under a range of directives such as batteries, Waste Electrical and Electronic Equipment and End of Life Vehicles. Whilst these may have been put in place for reasons other than material criticality, their presence is an enabler of more materials-oriented policy which could ensure - as a minimum - that collection of these materials occurs, even if the recovery technologies and economics are not yet in place and aligned.

As starting point, a materials systems analysis of the materials in the scope of this study should be conducted across Europe to determine the societal stocks. Given the global

[107] Graedel, T.E. et al. (2010) METAL STOCKS IN SOCIETY; Scientific Synthesis, UNEP/IPSRM, ISBN: 978-92-807-3082-1

nature of the products involved, and the distantly prospective nature of the resource, it is not clear whether a Member State-level analysis would be required. For sure, however, there will need to be a consideration of the growth, decline and longevity of the applications since these will determine the accumulation, level and depletion.

Like landfill, since stock data is not held by Member States, a synthesis based on a historic assessment will be needed. Future updates can be handled by adjustment of this baseline by use of market and waste flow data. This presumes that waste flow data targets accurately the materials of interest in well-characterised products and that 'losses' intentional or otherwise are under control. As an example, for the UK's Waste and Resources Action Programme, Oakdene Hollins completed an assessment of the fate of critical materials in EEE in the UK. This work highlighted accumulation or depletion of materials, an activity that dominates for some, an example being the rate at which neodymium (in magnets) is being created in the push for wind power. A careful mapping of materials, applications, products and flows will be necessary to ensure that a useful congruence of flow data exists within the national or EU-level systems of reporting.

5.3 In-use stocks: Recommendations for future work

- The amounts of some materials in-use are substantial and further quantification for other materials within the scope of this study is recommended. Previous work is limited to a few base and ferrous metals, largely in circulation since the start of industrialisation. A better understanding of 'high tech', rare and precious metals would be beneficial, most usefully integrated with materials system flow analysis to create a dynamic model of changes.

Part 6: Portal & Yearbook

6.1 Output: metadata portal

A concrete output of this study is a directory portal which provides a simple reference document identifying State data holders, the types of data they hold, relevant legislation and standards, confidentiality and access issues, and links to data sources where feasible. The purpose of this is to enable a rapid screening by users of who holds what information with a more direct route to the data itself.

In this concept, the portal has a straightforward interface of its own with basic metadata search, filtering and sorting facilities. The corresponding underlying data-structure reflects this and follows the structure of the metadata gathered during the survey plus any embellishments later specified by the Commission before and after testing of the preliminary portal.

6.1.1 Process

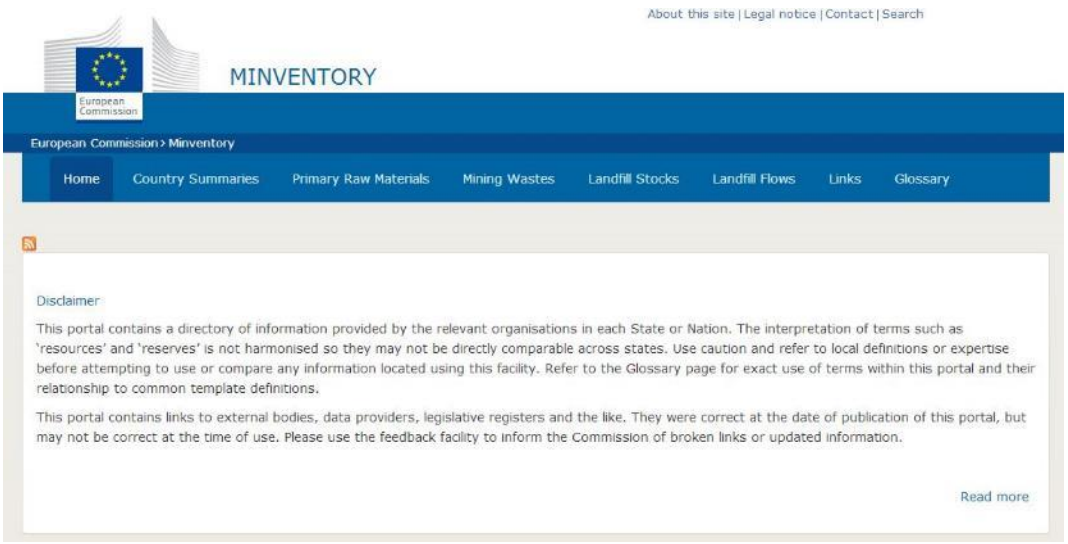
Portal function and content has been through several iterations involving:

- Initial concepts developed by the project team, centring on which information would be displayed. As a priority, these first aspects only considered the primary materials aspects.
- A review by the Commission which added a certain number of other metadata tags. (This impacted on the need for more survey work with original data suppliers).
- A survey of potential users by BRGM to determine needs of such a data portal.
- Creation of a prototype portal that was revealed to the Commission for review in October 2013, and was the subject of discussion and debate at the second Stakeholder Meeting in November 2013. A great deal of feedback was obtained from both this session and the third Stakeholder Meeting in April 2014. (These are documented in *Annexe U: Stakeholder meetings*)
- Subsequent development to include Mining waste, Landfill and Waste Flows metadata and to commence coding in the Europa environment.
- Presentation of a near-final portal at the third Stakeholder Meeting.

The main page of the portal provides three functions:

- Access to sub-pages covering Country Summaries, Primary Materials, Mining waste, Landfill and Waste Flow tables, Links, Glossary and Contacts.
- A graphical interface comprising a map of Europe to enable fast click-through to individual Country Summaries as well as a drop-down list.
- Conveys important caveats concerning the source, language and use of the metadata.

Figure 39: Minventory home page



The following graphic shows a typical Country Summary. This is a text description of facets of the State's approach to minerals data covering:

- Data collection
- Harmonisation and standardisation
- Data access
- Mining waste data availability, standards, reporting, agencies
- Landfill and arisings data availability, standards, reporting, agencies
- Marine data occurrence
- Overseas territory mineral data sources
- Additional information: for example links to 2D, 3D maps

Note that this is rich information summarised from the surveys and web searches and can include multiple links to sites or resources mentioned in the text, particularly non-statistical ones such as maps, or reports or other portals. It should be noted that the content related to primary materials, standards and access is as-given by the State Authority (generally the Geological Survey), but ratified also by the state representative on the Raw Materials Supply Group.

Figure 40: Current Country Summary page

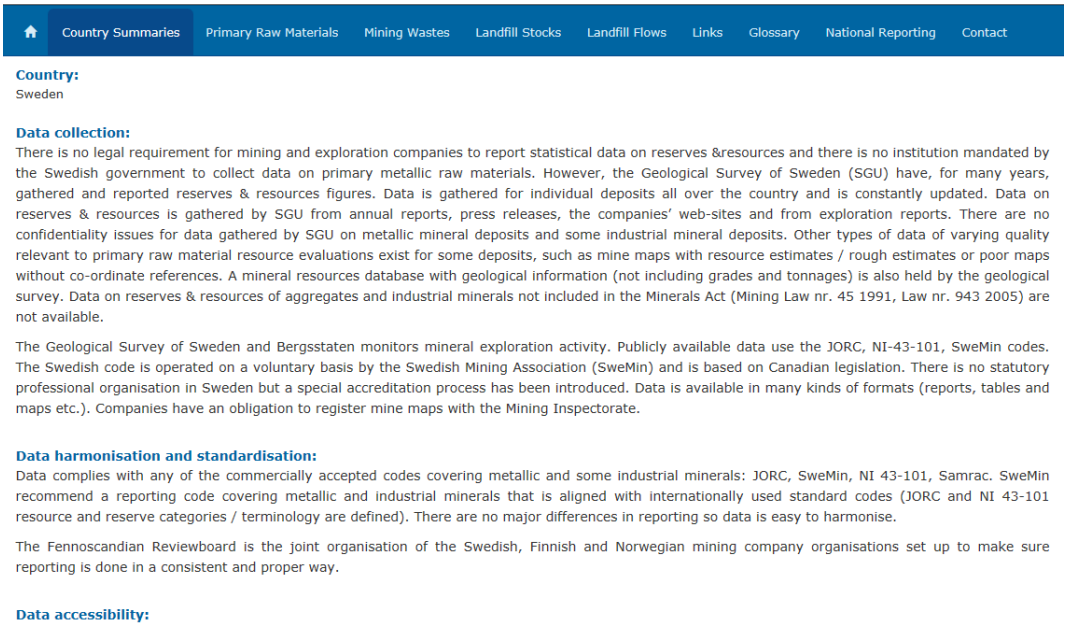


Figure 41: Portal primary raw materials page

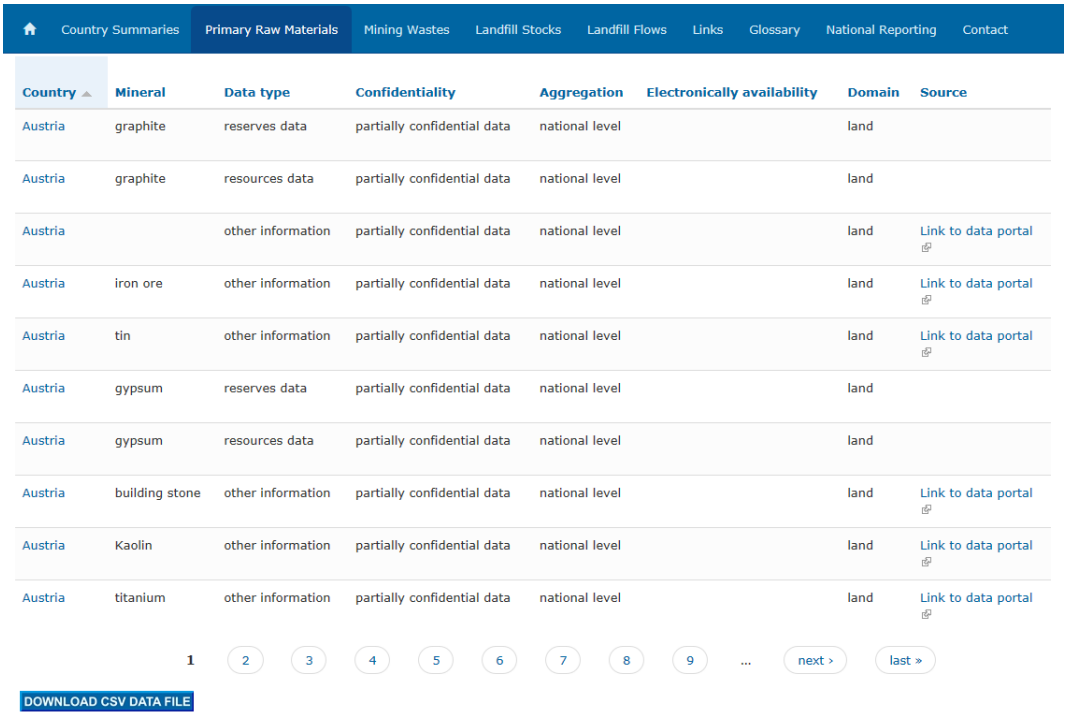
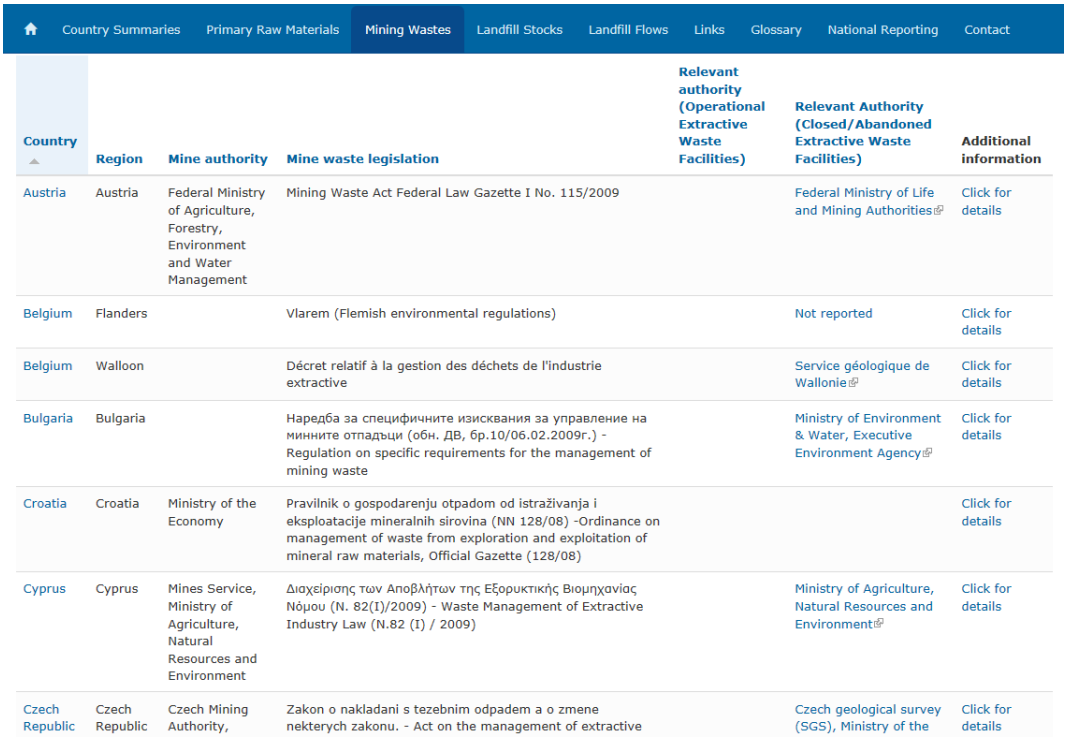


Figure 42: Portal mining wastes page



Country Summaries | Primary Raw Materials | Mining Wastes | Landfill Stocks | Landfill Flows | Links | Glossary | National Reporting | Contact

Country	Region	Mine authority	Mine waste legislation	Relevant authority (Operational Extractive Waste Facilities)	Relevant Authority (Closed/Abandoned Extractive Waste Facilities)	Additional information
Austria	Austria	Federal Ministry of Agriculture, Forestry, Environment and Water Management	Mining Waste Act Federal Law Gazette I No. 115/2009		Federal Ministry of Life and Mining Authorities	Click for details
Belgium	Flanders		Vlarem (Flemish environmental regulations)		Not reported	Click for details
Belgium	Walloon		Décret relatif à la gestion des déchets de l'industrie extractive		Service géologique de Wallonie	Click for details
Bulgaria	Bulgaria		Наредба за специфичните изисквания за управление на минните отпадъци (обн. ДВ, бр.10/06.02.2009г.) - Regulation on specific requirements for the management of mining waste		Ministry of Environment & Water, Executive Environment Agency	Click for details
Croatia	Croatia	Ministry of the Economy	Pravilnik o gospodarenju otpadom od istraživanja i eksploatacije mineralnih sirovina (NN 128/08) -Ordinance on management of waste from exploration and exploitation of mineral raw materials, Official Gazette (128/08)			Click for details
Cyprus	Cyprus	Mines Service, Ministry of Agriculture, Natural Resources and Environment	Διαχείρισης των Αποβλήτων της Εξορυκτικής Βιομηχανίας Νόμου (Ν. 82(Ι)/2009) - Waste Management of Extractive Industry Law (N.82 (I) / 2009)		Ministry of Agriculture, Natural Resources and Environment	Click for details
Czech Republic	Czech Republic	Czech Mining Authority,	Zakon o nakladani s tezebnim odpadem a o zmene nekterych zakonu. - Act on the management of extractive		Czech geological survey (SGS), Ministry of the	Click for details

6.1.1.1 Portal coding standards

The Minventory portal has been constructed in the Drupal coding language, employing standard EC templates. These principles and requirements are outlined within the Providers Guide http://ec.europa.eu/ipg/ and further described by communications from the Commission during the course of the project

6.1.2 Maintenance and support

At the moment, it is the sole intention that the portal will be transferred into the Commission's Europa domain. It will be owned and maintained by the Commission, or any agents that they might choose to engage. Security, access and roles have been designed to enable this.

The portal has been created using metadata and links correct at the time of writing. It is a reality that the metadata may change, links may be broken and the identity of national agencies will mutate over time. In the experience of the project team, up to 10% of information in a database may go out of date each year. To maintain currency of the information we consider steps that could be put in place to address this.

6.1.2.1 A reactive user update form

The simplest method is to include in the portal a method for users to submit corrections, additions and other updates to the administrators. This feature will already be built in as a launch feature as a means of ensuring information can be corrected in its first iteration. It will be important that respondents supply sufficient information to identify themselves, their affiliation and their credentials in respect of authority to change information.

6.1.2.2 A periodic review and update

On a regular schedule, Commission staff or an agent thereof could be contracted to review the information on the portal and check the veracity of names and links. The suggested frequencies for updates are:

- Annually: weblinks
- Biennially: (meta)data content

A more rigorous task would be to repeat the various surveys especially in respect of the primary raw materials data, coverage of marine or land environments and non-statistical data.

6.1.2.3 Active portal management

One option open to the Commission is to periodically consider attaching some or all maintenance roles to a relevant, ongoing project. This could also ensure that it reflects current metadata needs, which may evolve over time.

The potential future development of the portal is discussed further in Section 7.3.3, page 211.

6.2 Output: yearbook specification (resources and reserves)

6.2.1 Commission requirements

One of the aims of the Minventory project, via the roadmap development, was to identify what hurdles need to be overcome and which data gaps filled in order to produce an EU-level database of statistical data on mineral resources and reserves of non-energy non-agricultural raw materials. Information on the roadmap has been presented in Sections 2.4, 3.4 and 4.5 (for primary raw materials, mining waste and landfills respectively).

6.2.2 Developing an EU-level database of statistical information

In order to develop an EU-level database containing such statistical information, thought has to be given to the following points:

1. How will statistical data on resources and reserves become available and harmonised at the European level?
2. How will the final data be structured to produce an EU-level database?
3. How such a database be maintained in the future.

Bullet point 1 has been discussed in the previous sections of this report and suggestions have been given in the roadmap. With regards to bullet points 2 and 3, different approaches are available and they are currently being investigated by the Mineral Intelligence Network for Europe project (Minerals4EU). Minerals4EU started work on 1 September 2013 and will run for 2 years. Its overall aim is to create a network structure that will enable the delivery of a European Minerals Yearbook, a knowledge data platform and foresight studies. (These will be demonstrators of the principle, but do not have Commission support to provide a permanent service in this respect.)

6.2.3 Relationship to Minventory

Minerals4EU has already been, and will continue to be, informed by the work undertaken and findings of the Minventory study. The project teams have overlapping membership so have engaged in informal and formal communications regarding how the findings of Minventory affect the approach or expectations of Minerals4EU. A number of points are relevant:

The basic data collected during the surveys has been formatted and transmitted to Minerals4EU for the purposes of:

- Understanding e.g. minerals coverage within countries.
- Listing data owners or providers to accelerate data discovery.
- Revealing where data is unlikely to be found.
- Understanding State-level data confidentiality and aggregation issues.

The Harmonisation Issues Analysis informs expectations around the standards to which statistics may be reported within Member States, and the level of detail that is likely to be made public. This permits a common understanding to be shared around the differing qualities of data available, and assessment of the size of the task in moving to a more harmonised system. Such an assessment is an important piece of knowledge for any future centralising body charged with the harmonisation task.

In the first instance, using the known contacts from Minventory, it can be expected that a first survey for statistics on resources and reserves in Member States will yield a variety of information which will not be harmonised at EU level. The varying reporting standards employed means that data may not be harmonised even within a State, let alone at the EU level.

The output of the survey – the Yearbook entry – will be in the first instance a tabulated set of resources and reserves, by mineral, by State (or region), with annotation of the prevailing standard employed.
Contribution of Member State data will be a voluntary process dependent on the goodwill and self-interest of those operating within and aligned to the Minerals4EU project.

6.2.4 Status and plan

Work package 4 (WP4), within the Minerals4EU project, is tasked with developing the European Minerals Yearbook. The European Minerals Yearbook will contain statistical data and related information for each country of Europe. For the purposes of the Yearbook, the term 'Europe' includes all Project Partner countries, EU Member States and EU candidate or potential candidate countries; a total of 40 nations. The data types to be incorporated in the Yearbook include mineral resources and reserves data (amongst others) for primary minerals and available information relating to secondary materials such as mining waste, landfill waste, recyclates and in-use materials.

The Minerals4EU project is in the process of gathering data across Europe through a survey questionnaire. The questionnaire was informed by the findings of the Minventory study. It requests the provision of quantitative data per commodity (for metals, industrial minerals and construction minerals) and it also requires information on the employed system of reporting (code/standard and resource/reserve type and average grade). Information from the Minventory project, such as data providers and data sources identified is being used to progress with the task of data gathering on resources and reserves.

Discussions have taken place between individuals working on the Minventory and Minerals4EU projects relating to the availability of information on mining waste and landfill waste. As a result of these discussions, the Minerals4EU project will first examine data from online sources, such as the Eurostat database and other national databases prior to developing a more specific survey to address gaps in data and additional detailed information on secondary materials. The Wuppertal Institute, one of the Minerals4EU partners, will take the lead with regards to recyclates and materials in use and will provide information on a much smaller group of commodities.

Data and information collected via the Minerals4EU surveys will be collated and used to produce the European Minerals Yearbook. The structure of the European Minerals Yearbook will be determined by the survey outcomes and the available data. The Yearbook will be presented online through the Minerals4EU portal. Information on mineral resources and reserves should be presented by country and, if possible, by commodity although harmonisation issues may prevent the latter. Key information, such as the system of reporting in use and the data aggregation level should be included. Information on secondary raw materials should also be presented by country and, if possible, by waste category or the 'list of waste' codes which are commonly used across Europe to report figures on waste.

Harmonisation issues are expected to become apparent during the collation of data collected by the Minerals4EU surveys. However, in the first instance the Minerals4EU WP4 team have decided to present the resources and reserves data in the form they are provided because resolving these harmonisation issues may take some time.

Consideration needs to be given as to how the Yearbook will be maintained and updated following its first publication. Various projects have proposed a permanent EU-level geological body, for which this would be an obvious responsibility. However, no such venture has been sanctioned or funded. The periodic update of this element of a Yearbook could equally be linked to the development of the portal discussed in Section 7.3.3, page 211, and to any maintenance of the data and metadata within it; or as a stand-alone contracted exercise.

6.2.5 Evolution

As stated above, the development of the Yearbook incorporating resources and reserves data parallels the recommendations of Minventory, and builds upon its metadata and pointers to information sources. Naturally, this knowledge of the relative state of alignment with international systems of reporting (especially the CRIRSCO Template) and obligation per Member State to collect and make public minerals information tempers the expectations of what might be achieved in the near term. Accordingly, the data collection process for Minerals4EU targets an evolution of scope, depth and harmonisation outlined in Figure 31, page 125. More specifically, the outputs described in Phase 1 of that figure are the goal. In effect this represents a baseline of the current state of play with respect to minerals statistics and there is no expectation that it will be perfect or complete.

Feedback obtained during the Minerals4EU project should be fed back into the Roadmap to refine approaches adopted in moving through later phases of the evolution.

It must be remembered that Minerals4EU is a funded project with a finite life. It does not represent a permanent solution to the ongoing task of collecting minerals resources and reserves data either for State-aggregate publication on an annual basis; or continuously as

mine or project level data within a database. The requirements and candidate bodies and processes to manage these tasks in future are expanded within Section 7.3, page 210.

Part 7: Diligence

7.1 Consultation with interested parties

7.1.1 Portal users and potential data suppliers

In considering the functionality and metadata content of the Minventory portal, BRGM carried out a consultation of potential users in June 2013. This is in addition to comments received directly from the Commission in respect of the prototype released at the end of September 2013. Comments received were considered and implemented where practical, allowing for any constraints of the Europa coding environment. Further comment from users was provided by the participants of the second and third Stakeholder Meetings, records of which may be found in *Annexe U: Stakeholder meetings*.

7.1.2 Minerals4EU

The Minventory study which is tasked with collecting metadata regarding the availability of mineral resource and reserve data within the EU. A component of the Minerals4EU FP7 project, which started in September 2013, is to collect actual mineral resource and reserve data. The two projects are highly complementary and there is there is a clear requirement for coordination and collaboration between the two in order to ensure transfer of knowledge and information. This has been facilitated by the involvement of similar partners in both projects. For example both BGS and BGR are common to the two projects, and there has been discussion between Wuppertal Institute and the consortium regarding the treatment of 'secondary' resources and synthetic approaches to data collection. We expect this to form a key component of the final work phase, delivered out of sight.

7.1.3 SNL, Marine Geology Expert Group, USGS

SNL has produced a summary overview of the role, capability and attitude of private sector data holders in relation to making available metadata and data. This has been covered more fully within *Part 2: Primary Materials* and within *Part 7: Diligence.*

7.1.4 Marine Geology Expert Group of EuroGeoSurveys

There has been a consultation with the membership of EGS conducted by Henry Vallius of the Geological Survey of Finland (GTK). This was to fill the obvious lack of knowledge of structured marine data within the (predominantly) on-shore-focussed geological surveys. With respect to marine data, we fully expect that the portal will point to supplementary sources although these may offer limited coverage of minerals and a predominant focus on aggregates and sand.

7.1.5 Unites States Geological Survey

USGS has contributed through representation on the Steering Group.

7.1.6 EEA, Eurostat and JRC

Three major European institutional bodies have been identified as potentially having a large interest in this project:

- The European Environment Agency
- Eurostat
- JRC (ISPRA).

We have approached these bodies to inform them of the current study, determining their current interests and activities and inviting them to remain in close contact with the Minventory study team during the further development phases. The following sub-section includes a brief overview of the responses received.

7.1.6.1 European Environment Agency

Examination of the EEA's website reveals that the collection of waste and resource data and the effects of other anthropogenic activities are of current interest.

In the area of wastes, the EEA compiles and publishes a wide range of data related to waste generation, collection, recycling and recovery across nation states, although this is very much in respect of throughputs. The EEA's sustainable consumption and production group leads the agency's work on waste. Activities are implemented through cooperation with the EEA's Topic Centre on Sustainable Consumption and Production (ETC/SCP[108]) and in collaboration with EEA's country network, Eionet[109]. Eionet also coordinates the collection of land use data, and by this demonstrates a model for assimilation and data processing that could usefully inform the action plan arising from implementation of the Minventory roadmap (Figure 43).

7.1.6.2 Eurostat

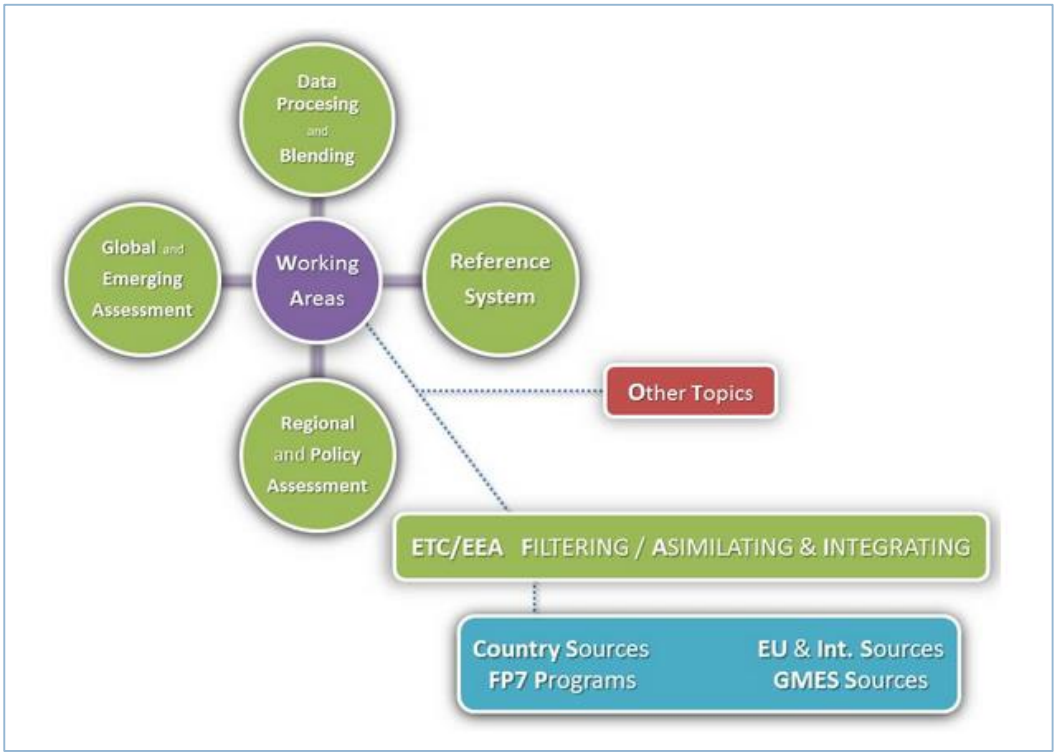
Eurostat is currently setting-up a data centre on natural resources, as well as a resource efficiency scoreboard to monitor the Europe 2020 Resource Efficiency Flagship Initiative with an appropriate set of indicators. (Eurostat is collecting waste data; it has hosted the Environmental Data Centre on Waste since 2008[110].) There is therefore significant potential to consider the Centre as an EU-level central data aggregation facility as described within the roadmap. Clearly there are concerns over any expansion of the role of Eurostat without appropriate funding, but estimation of this is beyond the scope of the Minventory study.

[108] http://scp.eionet.europa.eu/

[109] http://www.eionet.europa.eu/

[110] http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/introduction

Figure 43: Eionet/EEA integrated land use data assimilation system



Source: Eionet (http://sia.eionet.europa.eu/)

7.1.6.3 JRC (ISPRA)

In the framework of building the European Spatial Data Infrastructure (legally binding activity - INSPIRE - EU Directive http://inspire.jrc.ec.europa.eu/) one of the 34 INSPIRE data themes dealt with mineral resources, but other themes related to waste and mining facilities are relevant. Thematic Working Groups for each data theme, consisting of teams of experts selected by the EC, worked for more than three years on developing a data specification for each theme. During the study a data specification was developed for mineral resources.

The results of the expert work are presented as:

- Legally binding requirements - Amendment to the EC Regulation on interoperability of spatial datasets and services (the status is that the Amendment was unanimously accepted by all member states and now it follows the EU formal scrutiny circle - it is was officially published in December 2013).
- Technical guidelines in addition to the requirements; also of expert recommendations, best practices etc. that should help Member States to implement the legal requirements.

The common data models (the most important part of the data specifications) include also use of common terminology (e.g. code lists) also for the classification of reserves, resources and mineral endowments.

There are therefore numerous aspects of INSPIRE related to the objective of Minventory. A simplified summary of the proposed actions arising from INSPIRE is available in the Technical

Guidelines version 3.0 rc3 (also downloadable from the INSPIRE website) where experts (mainly from the EU Geological Survey organisations) presented proposals for a common model that all Member States should follow in the field of mineral resources (embedded within Annexe III). This and other Annexes are also relevant to the landfill and mining waste themes.

INSPIRE forms a key component of the Minventory roadmap and underlying data structure related to a future common access portal or query system and has been more fully covered within Section 1.5.3, page 49 and the Roadmap.

7.2 Steering group feedback

The study established a Steering Group to ensure that a wide selection of stakeholders, data holders, topic experts and potential roadmap implementers was included. The stakeholders were largely oriented towards the primary raw materials domain reflecting the initial balance of the study objectives and their organisational affiliations are listed in Table 34.

Specific requirements of the Steering Group role were:

- To point to other data holders and stakeholders.
- To provide checks and balances on the background analysis.
- To validate understanding of state of knowledge and data management processes.
- To assess feasibility of the proposed roadmap and actions.
- To review reports and comment in line with the above objectives.

Table 34: Steering Group representation

Person	Organisation
Owen Herod	Industrial Minerals Association (IMA-Europe)
Johannes Drielsma	Euromines
Jim O'Brien	European Aggregates Association (UEPG)
Henry Vallius	Marine Geology Expert Group of EuroGeoSurveys
Nikolaos Arvanitidis	Mineral Resources Expert Group of EuroGeoSurveys
Nikolaos Arvanitidis	European Technology Platform on Sustainable Mineral Resources
Isabel Fernandez	European Federation of Geologists
Sigurd Heiberg	United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources (UNFC)
Henning Wilts, Dominic Wittmer	Wuppertal Institute for Climate, Environment and Energy GmbH
Christian Heidorn	Eurostat
Eddie bailey, Stephen Henley	PERC Committee
Greg Fernette	US Geological Survey

As noted above, the representation was weighted towards primary raw materials; where it was clear that substantive input from practitioners and researchers in the field of secondary raw materials was required, these were contacted on an ad hoc basis and invited to comment directly or invited to the Stakeholder Meetings.

7.3 Future work topics arising

7.3.1 Primary and secondary raw materials

Each of the sections in this report dedicated to the components of primary and secondary raw materials contains a concluding element which discusses areas of uncertainty which would benefit from further research; or proposals for 'top-down' action which do not fall neatly into the 'bottom-up' approach of the Minventory roadmap. These 'top-down' actions describe actions which bundle a number of 'scoping' or 'bridging' requirements, which are particularly relevant for the under-developed areas of mining waste and landfill. Specific actions are proposed within those sections.

This study has concentrated on actions that could be taken voluntarily by Member States within the context of existing Directives and policies. Although there has been some consideration of the relative processes and interests of public authorities and private companies, how the latter might be engaged has not been a major component of the roadmap. However, data from private companies is a valid alternative source that could be explored to complement data from the public authority route.

In considering this, it needs to be borne in mind that, on the whole private companies are dealing with information on specific projects or deposits, which necessarily means that any EU-level data infrastructure must be capable of accepting inputs at this elemental level. (The roadmap proposes that initially only State-level aggregate data is handled.) That aside, the public reporting route at least has the benefit that – in Europe – ESMA recommends a CRIRSCO-aligned system of reporting, thus overcoming some issues of harmonisation.

- Two possible routes to public data acquisition should be explored:
    - Scanning and acquiring public data reported to financial authorities. This data will still need a competent person review to check its validity. In addition, the amount of such data available may not be as great as expected, in the opinion of the project team. This task might be accomplished voluntarily by Member States, or financed as an EU-level project.
    - Contracting a third party geological information service to operate an EU level database facility. This would be undertaken for a fee, and would include harmonisation services, with the possibility also of both free and paid-for content. For example, SNL already manages such a service as described in Section 2.5. This might, in fact, be a faster route to an accessible, validated EU-level data system, if data confidentiality concerns by Member States can be met.

7.3.2 Strategic and commercial stockpiles

Strategic stocks are generally those stocks maintain by specific governments to guard national interests in the use of or access to a particular material. For example, there is currently much publicity over the US national helium stockpile in Texas which is being sold off in the face of an apparent under-production of this valuable and scarce gas. On the whole, however, strategic stocks are driven by consideration of vulnerability in the event of military conflict.

The latest US (2013) assessment accounts for the implications on the supply of over 70 materials in a range of scenarios. These materials cover the majority of metalliferous and industrial minerals in the scope of this study. For the purposes of a crude magnitude

assessment, the word 'stockpile' encompasses bespoke inventories, government and commercial as well as other captive sources. The US considers a disruption of supply both domestic and imported over a period of 4 years. Simply put, the maximum stockpile would be around 4 years of supply, though this grossly over-estimates its actual forecasts. Nevertheless, it does indicate that the scale of strategic inventories for some materials could extend to this level.

The circumstances of the US are, of course, particular to its own situation. It possesses significant domestic production of certain minerals, metals and materials which provide a buffer. A comparable analysis across EU states would yield similar insights but with substantial differences in detail. These would reflect the mineral availability, production capacity, political views on resource vulnerability and assessments of external or internal disruption. These would likely form a less coherent set of inputs than in the case of the US.

Although it has not been established that stockpiles are in general a strategic issue for Member States[111], a further assessment of the state of strategic and commercial stockpiles would be beneficial within the objectives of the Minventory study.

7.3.3 Portal and data reporting infrastructure

The section (Part 6: Portal & Yearbook) on the portal has described the current web-based output of the Minventory study which meets immediate demands of providing a directory listing known owners and sources of primary and secondary raw material statistical data, with characterising metadata.

The portal has been designed and built using Commission templates and scripts, with the required roles and permissions for editing, maintaining, developing and signing off content modifications. Ownership has been transferred to the Commission for hosting and support within its own europa.eu domain.

The question arises as to how this portal could or ought to develop to match the aspirations of the roadmap considering that it currently only handles metadata and links to the hosts or owners of actual data, but not the data itself.

Some basic options are:

1. The Commission retains the metadata portal within its domain and develops it further to add data access functionality.
2. The Commission retains the metadata portal but develops separately a dedicated data access system.
3. The Commission retains the metadata portal, but a third party establishes and operates a data access system. This system might have a scope beyond resources and reserves data.

Other variants are possible as well, including detail of whether the Commission builds and maintains or outsources to another party. For the purposes of this study, these variants do not need to be discussed. The following sections describe these options and their alignment to the roadmap and to selected other projects that are current and relevant. Options may

[111] RPA (2012) Stockpiling of Non-energy Raw Materials, for DG Enterprise & Industry, found no Member State had a policy for strategic stockpiling on non-energy, non-agricultural materials, even of the 'Critical 14'. A consultation suggested that there was a preference for holding any stockpiles within commercial systems such as those operated through the London Metals Exchange.

be contingent on initiatives that have been proposed but not endorsed, but this is made clear in the text.

7.3.3.1 Option 1: The Commission extends the metadata portal

The near-term goal of the harmonisation objective is to support the development of a Minerals Yearbook for resources and reserves. This study has provided a platform of metadata and data source links that will be carried forward by the Minerals4EU project to create a first edition of a European Minerals Yearbook as described in section 6.2, page 202.

In its simplest form, the format of the Yearbook is a statement of resources and reserves, by mineral, by country or region, with a validity date and associated system of reporting together with explanatory notes.

In short, the current metadata portal could be extended to include such reports of resources and reserves aligned to the Minerals4EU output for the corresponding section of the European Minerals Yearbook. This could be achieved (but with limited database search functionality) by extension of the minerals tables to report resources and reserves assets per State or region, together with the other metadata listed above.

Pros

- ✓ This is the simplest evolution imaginable, and likely relative low cost to implement.
- ✓ It would not require a high degree of geological knowledge to populate and maintain.
- ✓ It is compatible with Minerals4EU output objectives.
- ✓ It would likely meet the needs of those seeking access to high level resources and reserves data.
- ✓ Complete control would remain with the Commission.

Cons

- × Only very simple sorting, filtering and searching would be possible since the data structure is relatively flat in database terms and not built for complex queries.
- × As conceived, only a single point in time dataset could be accommodated (i.e. the latest data from whatever country); there would be no function to roll back or review historic changes in data.
- × Extending to deposit level information would be beyond the capability of the portal.
- × The problem of data acquisition, verification and updating remains; the Commission would likely wish contract a third party to periodically obtain latest data from Member States.

7.3.3.2 Option 2: The Commission hosts a dedicated data access system

The rationale for this option is that the ambition for data harmonisation lies beyond the immediate outputs of a yearbook i.e. a summary tabulation of resources and reserves. The harmonisation parameters considered within this study cater for resources and reserves data being provided at a deposit, mine or project level. A data portal providing access to data with these characteristics requires a radical change of structure compared to the current metadata portal.

Evolution of the metadata portal in this way is unlikely to be an easy or cost-effective option. Those who would be interested in the detail of deposits or projects (planners, investors?) are a different community of interest from those interested in the summary statistical data (strategists). It would be likely that – internally – the portal would need separate data

structures for the two tasks. This is because the summary statistics are simple numbers imposed 'top down' whereas the deposit level portal could only build such statistics from the bottom up and then only if complete mineralogical coverage and data release is available.

Therefore, for the purposes of this option, it is presented as a separate portal dedicated to the capture of detailed data, even if it uses a common interface to the summary statistics portal.

Pros

- ✓ In conjunction with the summary statistics portal, it would meet the needs of all stakeholders identified in the Minventory study.
- ✓ It partitions the two issues of summary statistics and detailed estimates of individual stocks.
- ✓ Complete control would remain with the Commission.

Cons

- × This is a more expensive option requiring significant design and coding to implement features such as time-dependent values and UNFC codes together with filters and aggregation facilities (such as the customisable pivot tables available within Eurostat).
- × The problem of data acquisition, verification and updating remains; in addition, there may be a greater burden of harmonisation (at least in the short term) depending on what provisions are made in the data collection and harmonisation stage.
- × Whereas the summary data can be obtained periodically by request, deposit level data will arise continuously without the knowledge of the Commission. Obtaining buy-in for Member States to volunteer such data will be a significant task.
- × Significant thought will need to be put in to manage issues of confidentiality and access; primarily this applies to the data supplied and who is permitted to view it. More sophisticated access rights may need to be set up and managed.

7.3.3.3 Option 3: Outsourcing the data portal

It should be noted that this option could cover both the summary statistics and deposit level data aspects of the long-term harmonisation objective, but would not be able to avoid the technical database issues associated with their different characteristics which makes merging their two functions complicated.

Various permutations are possible using outsourcing. An extreme option is that all aspects of portal and metadata portal are outsourced. However, since the Commission has expressed the wish to own, host and maintain the metadata portal, this option will not be considered further.

Option 3a: The summary statistics data portal is outsourced

The technical content of the summary statistics data portal has been described in Option 1. In effect, it becomes the data repository for a historic European Yearbook of resources and reserves. It would be functionally separate from the metadata portal but contain similar metadata. However, it would be purpose built to handle time-based submissions so that historic views of stock evolution could be gained. More sophisticated filtering and collation facilities than is possible in the metadata portal design could be accommodated.

Pros

- ✓ Development and maintenance in a non-Commission web environment may be more rapid and less dependent on Commission architecture.
- ✓ The task could be integrated with a service to generate or update the yearbook data.
- ✓ The Commission would be freed of having a resource allocated to the IT and mineralogical data overview tasks.

Cons

- × Some element of control may be lost by the Commission, both in directing the data portal and in reputational risk.
- × National bodies may be reluctant to relinquish control of their data.
- × There may be divergence between the metadata portal and the data portal over time; there may be some effort to coordinate the two.
- × Bringing the database back in-house may be problematic.

Commentary

It should be noted that this is the model Minerals4EU is pursuing independent of the actions taken following the Minventory study. Minerals4EU envisages a data portal as described above, but extended across multiple stock types. It will incorporate links to the Minventory portal to facilitate users in locating data owners etc. Yearbook data for minerals resources and reserves is one component of the planned system. It should be noted that Minerals4EU is a project of finite life is therefore simply exemplary of a solution, but is not itself a permanent one.

Option 3b: The full data portal is outsourced

This option embraces all permutations in which the task of creating and maintaining an 'elemental' bottom-up database based on deposit level data is outsourced. That is the full data portal might also incorporate the summary statistics aspect if not handled by the Commission or another third party.

The features of this data portal will be the same as those described in Option 2.

Pros

- ✓ Development and maintenance in a non-Commission web environment may be more rapid and less dependent on Commission architecture.
- ✓ The task could be integrated with a service to generate or update the yearbook data (if that function is incorporated).
- ✓ The Commission would be freed of having a resource allocated to the IT and mineralogical data overview tasks.

Cons

- × Some element of control may be lost by the Commission, both in directing the data portal and in reputational risk, and to a greater extent that Option 3a.
- × There may be divergence between the metadata portal and the data portal over time; there may be some effort to coordinate the two.
- × Bringing the database back in-house may be even more problematic than Option 3a.
- × The very real task of gathering and harmonising data from Member States or private sources is not addressed unless the same party carries out these tasks.

- The contracted agent may not have the same congregating power as the Commission in obtaining cooperation from Member States.

Commentary

It is noted that the construction of a data portal to fulfil the above tasks is a relatively straightforward exercise once metadata requirements are known. It is likely that the more difficult task is in creating the systems and processes that permit Member States to submit data, appropriately redacted and meta-tagged, harmonised to an EU agreed standard, classified accordingly and passing through a quality control at EU level before entry into the system. This entire sequence might be conducted by a single body (or consortium) with suitably qualified personnel; or the intermediate data collation, harmonisation and validation stage could be a separate body.

These issues are briefly discussed in the next section.

7.3.3.4 Integrated data collection, harmonisation and publication

As described, a data portal is the last stage of publication for public access. The bulk of this report has been concerned with analysing the barriers to reaching this point and the actions that might be taken by various parties to achieve data harmonisation at the EU level to overcome them.

These actions occur all the way along the data supply chain. Ideally all Member States would move to a CRIRSCO-aligned reporting standard which would enable easy translation between the agreed EU level format using bridging documents. A minority are in this position, but a realistic proposition is the remainder will not move, but will voluntarily translate data into an agreed EU level standard, perhaps embedded within INSPIRE.

This process may be imperfect, especially in the early years of implementation, so an EU-level harmonisation process seems sensible prior to publication.

A number of options have been mooted regarding bodies which might conduct these EU level tasks and perhaps also carry out data portal functions described in Option 3. Most prominent amongst these are:

- Eurostat.
- European Environment Agency.
- JRC
- One or more State Geological Services.
- A private company which manages mineralogical data.
- A hybrid solution.
- European Geological Data Infrastructure project (EGDI).

Eurostat

It should be noted that Eurostat has not been tasked or resourced to enact any of the actions described in this report or to adopt any data management roles.

Eurostat clearly has great expertise in the management of Member State data across many domains of interest. It has well-established processes for data collection and checking, and managing confidentiality issues (which are referred to in this report as an essential part of resources and reserves statistics handling.) It has the infrastructure – personnel and IT – to

support large scale information handling with high credibility and low risk to the reputation of the Commission.

Eurostat already provides access to harmonised data for waste flow data, one of the secondary raw materials streams covered in this study. In addition, as described in section 7.1.6.2, it is also setting-up a data centre on natural resources, as well as a resource efficiency scoreboard to monitor the Europe 2020 Resource Efficiency Flagship Initiative. It is therefore operating in a zone of interest to the minerals statistics data harmonisation exercise.

What may be absent from Eurostat is the capability of performing the EU-level harmonisation specifically related to minerals reporting. It would need to either develop such a capability in-house, or ally with another body.

European Environment Agency

The European Environment Agency already compiles and publishes data related to secondary raw materials, and so would bring competence in this domain.

Its role could be expanded to embrace the primary raw materials domain also, though some extra competence in this filed may be required (e.g. by collaboration with a Geological Survey).

Its relationship to the Topic Centre on Sustainable Consumption and Production may provide a model for collaborations with other parties or consortia that could tackle primary raw materials issues and data analogously.

JRC

The Commission's Joint Research Centre is a permanent body with diverse knowledge and interests related to materials. For example, ISPRA, critical materials; Petten and ISPRA jointly assess the EIP; and Seville covers waste and end-of-waste topics. It is possibly that JRC could create a centre of expertise related to minerals statistics since it touches a number of themes raised by Minventory and has a track record of running EU-level programmes. Partnership or assistance from other bodies such as a Geological Survey would be required in order to carry out harmonisation activities.

State Geological Survey

Geological Surveys are strong candidates for the harmonisation and publication role since they have in-depth subject knowledge, and maintain systems for data analysis, reporting and redaction at a national level.

A strong candidate for this could be one of the former Eastern Block Member States which have a legacy of good data standards, management and alignment to international systems of reporting.

However, they may lack strength in secondary raw materials and technical infrastructure necessary to maintain large quantities of data at an EU level. (For example, BRGM and BGS have more competence in this regard.) In addition there may be issues of trust and independence in assigning such a role to a single Survey.

Private Company

A private minerals data supplier would likely have knowledge and systems in place to publish and maintain data. It would also be free of political interests of individual Member States, thus establishing a degree of independence. It might also be able to tap into the investment and mining sectors to more rapidly access a catalogue of data, although this may involve some cost. SNL has established, however, that such a model can work commercially, with some data being made public and more detailed or sensitive data being available at a charge. In this respect, the system would not be free to use, but may satisfy the needs for different levels of detail by different users, and be a commercially self-sustaining venture.

The issue of required financial/personnel resources to harmonise a back-catalogue of data would remain, however.

A hybrid solution

It is apparent from the above that no one single organisations possesses the full range of knowledge, financial/personnel resources and competence to alone carry out the full range of data harmonisation and publication activities across all key materials. One solution to this would be to consider hybrid solutions – collaborations – between complementary partners. For example:

- European Environment Agency + Geological Survey
- Private company + geological Survey

A fuller analysis of candidates, their strengths and weaknesses is required.

EGDI ('European Geological Service')

It should also be noted that EGDI is a scoping study that has mapped possible architectures directly related to enabling the types of outputs foreseen in this study in terms of data management, harmonisation and redaction at State and EU level for all geological data; and conceptual database systems for its dissemination. The majority of issues raised in this study have been tackled comprehensively within the EGDI project and are summarised within the Work Package 1, Deliverable D1.3[112], and in detail for each issue within other work package reports. However, this study has to date not received a funded mandate to implement any of its proposals into an operating system.

The EGDI scoping study has been performed in the full knowledge of the desired outputs from a range of past and current minerals and geology-related projects including Minerals4EU, and its proposals take the ambition of a Minerals Yearbook for resources and reserves statistics into account. To complement the technical infrastructure, it also proposes the creation of an EU-level 'geological service' that would – amongst other tasks – carry out harmonisation activities. (Note this is most relevant for developments beyond the summary statistics/yearbook aspects of harmonisation.)

[112] EGDI D1.3, 'Implementation Plan for the European Geological Data Infrastructure (EGDI)' at http://www.egdi-scope.eu/wp-content/uploads/2014/07/D1.3-EGDI-Implementation-Plan-v200614-final.pdf (viewed on 17 October 2014)

In addition, an EU-level body would also ensure that periodic updates that arose from – for example – expiration of confidentiality time limits, triggered the appropriate review action at Member State or EU level.

(EGDI's proposals are made with joint consideration of other pertinent issues such as data ownership and licensing; the constitution of a possible EU level data processing and harmonising unit (a 'European geological service'); and governance. Given these parallel considerations, proposing a technical and organisational solution for resource and reserve statistics is not sensible. Since the Mineral4EU thematic outputs, which includes the Phase 1 roadmap from this project, is built into the scope of EGDI, it would seem most sensible to feed the requirements of Minventory into the future development of EGDI rather than form a stand-alone decision. However, this does not impact on the Phase 1 proposal to create a non-electronic database publication of current resource and reserve knowledge in the EU.)

Any reference to the possibilities arising from EGDI is, however, speculative and merely illustrative that the processes have been explored, that the issues involved in setting up such a system are known and are relevant even in the more limited context of minerals resources and reserves statistics.

Annexe A: Overseas territories

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Member states and sovereign territories		Application of EU law?	EU citizenship?	Authority	Link	Key resources
Denmark, except:		Yes	Yes			
	Greenland	Minimal (OCT)	Yes	This country is an autonomous state, but is recorded independently as a Neighbouring Territory in the portal.		
	Faroe Islands	No	No	Ministry of Trade and Industry	http://vmr.fo/Default.aspx?ID=10234	None recorded
Finland, except:		Yes	Yes			
	Åland Islands	With exemptions	Yes	Statistics & research Alund	http://www.asub.ax/start.con?iLan=2	None recorded
France (Metropolitan), except:		Yes	Yes			
	French Guiana	With exemptions (OMR)	Yes	Bureau de recherche géologique et minière de la Guyane	http://gisguyane.brgm.fr/index.htm	Gold; surveyed for aluminium, boron, barium, chromium, copper, iron, nickel, lead, PGMs, potassium, silicon, strontium, tin, titanium, vanadium, zinc, zirconium etc.
	Guadeloupe	With exemptions (OMR)	Yes	Refer to BRGM	http://www.brgm.fr/content/guadeloupe-cartographie-ressources-geologiques	None recorded
	Martinique	With exemptions (OMR)	Yes	Refer to BRGM	http://www.brgm.fr/content/martinique	None recorded
	Réunion	With exemptions (OMR)	Yes	Refer to BRGM	http://www.brgm.fr/content/reunion	None recorded
	Mayotte	With exemptions (OMR)	Yes	Refer to BRGM	http://www.brgm.fr/content/mayotte	None recorded

Member states and sovereign territories		Application of EU law?	EU citizenship?	Authority	Link	Key resources
	Saint Martin	With exemptions (OMR)	Yes	Community of Saint Martin	http://www.com-saint-martin.fr/Economie/Pages/default.aspx	None recorded
	Saint Barthélemy	Minimal (OCT)	Yes	Community of Saint Bartholemew	http://www.comstbarth.fr/index.aspx	Salt (sea)
	Saint Pierre and Miquelon	Minimal (OCT)	Yes	Refer to BRGM	http://www.brgm.fr	None recorded
	Wallis and Futuna	Minimal (OCT)	Yes	Prefecture of the Isles of Wallis & Futuna	http://www.wallis-et-futuna.pref.gouv.fr/	None recorded
	French Polynesia	Minimal (OCT)	Yes	Refer to BRGM	http://www.brgm.fr	Cobalt
	New Caledonia	Minimal (OCT)	Yes	ISEE, New Caledonia Institute de la statistique et des études économiques	http://www.isee.nc/	Nickel
	French Southern and Antarctic Lands	Minimal (OCT)	Yes	French Polar Institute	http://www.institut-polaire.fr/	None recorded
	Clipperton Island	Minimal	Yes	Refer to BRGM	http://www.brgm.fr	Phosphorous (guano)
Germany, except:		Yes	Yes			
	Büsingen am Hochrhein	Yes	Yes	Trivial community	None	None recorded
	Helgoland	Yes	Yes	Trivial community	None	None recorded
Greece, except:		Yes	Yes			
	Mount Athos	Yes	Yes	Religious reserve; development unlikely	None	None recorded
Italy, except:		Yes	Yes			
	Livigno	Yes	Yes	Trivial community	None	None recorded
	Campione d'Italia	Yes	Yes	Trivial community	None	None recorded
Netherlands, except:		Yes	Yes			
	Bonaire	Minimal (OCT)	Yes	The Public Entity Bonaire	http://www.bonairegov.nl/nl/omgeving/natuur-en-milieu	Salt (sea)
	Saba	Minimal (OCT)	Yes	The Public Entity Saba	http://www.sabagov.nl/index.php?start=4	None recorded

Member states and sovereign territories		Application of EU law?	EU citizenship?	Authority	Link	Key resources
	Sint Eustatius	Minimal (OCT)	Yes	Unknown	Unknown	Unknown
	Curaçao	Minimal (OCT)	Yes	Ministry of Economic Development	http://www.gobiernu.cw/web/site.nsf/web/E75CCA27FA17BE7F0425785C006ECC29?opendocument&language=nederlands	None recorded
	Sint Maarten	Minimal (OCT)	Yes	Unknown	Unknown	Unknown
	Aruba	Minimal (OCT)	Yes	Aruba Government department of Nature and Environment	http://www.overheid.aw/index.asp?nmoduleid=19&wgid=6&sc=0&spagetype=21&nPageID=109&nCMSPageType=1	gold, phosphate
Portugal, except:		Yes	Yes			
	Azores	With exemptions (OMR)	Yes	Regional Department of Natural Resources	http://www.azores.gov.pt/Portal/pt/entidades/srrn/?lang=pt	None recorded
	Madeira	With exemptions (OMR)	Yes	Regional directorate of Trade, Industry and Energy	http://drcie.gov-madeira.pt/drcie/	None recorded
Spain, except		Yes	Yes			
	Canary Islands	With exemptions (OMR)	Yes	Department of Industry and Energy	http://www.gobcan.es/es/temas/industria_energia/index.html	None recorded
	Ceuta	With exemptions	Yes	Trivial community	None	None recorded
	Melilla	With exemptions	Yes	Trivial community	None	None recorded
United Kingdom, except:		Yes	Yes			
	Gibraltar	With exemptions	Yes	Government of Gibraltar	https://www.gibraltar.gov.gi	None recorded
	Akrotiri and Dhekelia	Minimal	No	No development permitted by consitution; military base.	None	None recorded

Member states and sovereign territories		Application of EU law?	EU citizenship?	Authority	Link	Key resources
	Saint Helena, Ascension and Tristan da Cunha	Minimal (OCT)	Yes	Island Governments	http://www.saintthelena.gov.sh/ http://www.ascension-island.gov.ac/ http://www.tristandc.com/	None recorded
	Falkland Islands	Minimal (OCT)	Yes	Falkland Islands Government	http://www.falklands.gov.fk/self-sufficiency/commercial-sectors/oil/	Oil
	South Georgia and the South Sandwich Islands	Minimal (OCT)	Yes	Via British Foreign & Commonwealth Office	http://www.fco.gov.uk	None recorded
	British Antarctic Territory	Minimal (OCT)	Yes	Via British Foreign & Commonwealth Office	http://www.fco.gov.uk	None recorded
	Bermuda	Minimal (OCT)	Yes	Government of Bermuda Department of Statistics	http://www.govsubportal.com/research-statistics/environment	Aggregates
	Cayman Islands	Minimal (OCT)	Yes	Via British Foreign & Commonwealth Office	http://www.fco.gov.uk	None recorded
	Anguilla	Minimal (OCT)	Yes	Government of Anguilla Department of Statistics	http://www.gov.ai/statistics.php	None recorded
	Montserrat	Minimal (OCT)	Yes	Montserrat Economic Development Unit	http://www.devunit.gov.ms/?http://montserrat.search.co.tt	Sand, aggregates
	British Virgin Islands	Minimal (OCT)	Yes	Ministry of Natural Resources and Labour	http://www.bvi.gov.vg/ministries/ministry-natural-resources-and-labour	None recorded
	Turks and Caicos Islands	Minimal (OCT)	Yes	Government of the Turks & Caicos Islands, Lands Division	http://www.gov.tc/landsdivision/?q=about-us	None recorded
	British Indian Ocean Territory	Minimal (OCT)	Yes	Via British Foreign & Commonwealth Office	http://www.fco.gov.uk	None recorded
	Pitcairn Islands	Minimal (OCT)	Yes	Government of Pitcairn	http://pitcairn.pn/	None recorded
	Isle of Man	Partial	Partial	The Government of the Isle of Man, Department of Infrastructure	http://www.gov.im/about-the-government/departments/infrastructure/	Sand, aggregates
	Guernsey, with dependencies of	Partial	Partial	States of Guernsey, Environment department	http://www.gov.gg/article/1711/Environment	None recorded

Member states and sovereign territories		Application of EU law?	EU citizenship?	Authority	Link	Key resources
	Alderney, Herm and Sark					
	Jersey	Partial	Partial	Statistics Unit, Chief Minister's Department	http://www.gov.je/pages/contacts.aspx?contactId=152	None recorded

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Annexe B: Marine data suppliers

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This is a list of European marine data collating authorities. They are the 'collating authorities' as recorded on the geo-seas.eu database of EMODNET contacts. They may not have primary expertise in geological resources.

Country	Data Publishing Authority	Survey Response	Notes
EU28			
Austria	-	-	Landlocked country.
Belgium	Continental Shelf Service – Federal Public Service Economy	Yes	The Continental Shelf Service of the Federal Public Service Economy manages the extraction of marine granulates on the Belgian part of the North sea.
Bulgaria	Not available	No	Marine mineral mining activities are not taking place in Bulgaria[113]. No further information was received from Member State.
Croatia	Mining Directorate of the Ministry of Economics.	No	Resources and reserves data for sand and gravel and salt from the marine environment are available from the formally Croatian register of mining exploration fields verified by the Mining Directorate of the Ministry of Economics.
Cyprus	Not available	Yes	Data for offshore/ marine minerals are not collected.
Czech Republic	-	-	Landlocked country.
Denmark	Danish Nature Agency with support from the Danish Coastal Authority and the Geological Survey of Denmark.	No[114]	The Danish Nature Agency are responsible for collection and publishing data on marine resources.
Estonia	Ministry of the Environment	Partially[115]	Reserves data for marine sand are available.
Finland	Geological Survey of Finland, GTK	Yes	Statistical data on resources and reserves are not collected by GTK. Other types of data, such as offshore mineral resources maps, information on marine sand and gravel deposits, samples and others are available.
France	IFREMER / IDM/SISMER http://www.ifremer.fr/sismer/	Yes	(Systèmes d'Informations Scientifiques pour la Mer.) Collaborates with BRGM, Centre de Données Géophysiques (CDG) / CNRS - Université de Strasbourg and SHOM (Service Hydrographique et Oceanographique de la Marine).
Germany	Not available.	Yes	Statistical data are not collected at a national level. The State Geological Survey of Mecklenburg-Western Pomerania collects data on primary raw materials from the marine environment. Other types of data, such as offhore mineral resources maps on the occurrence of sand and gravel or sand suitable for sluicing (coast protection) were

[113] https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Bulgaria_cf.pdf

[114] Some information was received through personal communication.

[115] Comments on the status of resources and reserves data on marine minerals were provided in the relevant Country Summary. A completed survey questionnaire was not provided by Estonia.

Country	Data Publishing Authority	Survey Response	Notes
			created by the Geo-Scientific Potential of the German North Sea (Geopotenzial Deutsche Nordsee (GPDN)).
Greece	Not available	Yes	No data on marine minerals are collected in Greece.
Hungary	-	-	Landlocked country.
Ireland	Department of Communications Energy and Natural Resources (DCENR) with devolved responsibility to the Geological Survey of Ireland (GSI)	Yes	The Geological Survey of Ireland (GSI) under the Department of Communications Energy and Natural Resources (DCENR) hosts Infomar – Irelands National Seabed Mapping Programme. Exploration and Mining Division (EMD) also under DCENR is responsible for the application of the Minerals Development Act to minerals exploration and development.
Italy	Not available	Yes	Data on marine minerals are not collected.
Latvia	Not available	No	No information received from Member State.
Lithuania	Not available	Yes	Data on marine minerals are not collected.
Luxembourg	-	-	Landlocked country
Malta	Not available	No	Data on marine minerals are not collected.
Netherlands	Ministry of Economic Affairs; Ministry of Infrastructure and the Environment with devolved responsibility to the Geological Survey of the Netherlands, TNO	Yes	Statistical data on offshore minerals, such as gravel, sand, clays, shells, and salt are collected in the Netherlands. Data are collected on variable time intervals. Additional information, such as mineral resource maps for sand and gravel have been produced by the Geological Survey of the Netherlands.
Poland	Polish Geological Institute-National Research Institute (PGI-NRI)	Yes	Data is collected by the Polish Geological Institute-National Research Institute (PGI-NRI) for the offshore/marine environment for sand and gravel.
Portugal	Not available	Yes	Data on marine minerals are not collected.
Romania	Not available	No	Information has not been provided from Member State.
Slovakia	-	-	Landlocked country.
Slovenia	Not available	Yes	Data on marine minerals are not collected.
Spain	Geological Survey of Spain, IGME	Yes	Statistical data is available by law to various levels of aggregation (but subject to some confidentiality constraints) as well as resource maps, reports and publications.
Sweden	Ministry of Enterprise, Energy and Communications with devolved responsibility to the Geological Survey of Sweden.	Yes	Marine minerals in Sweden include sand and gravel and data is available at a national scale. Statistical data is collected on an ad-hoc basis.
United Kingdom	The Crown Estate	Yes	Limited statistics are publically available on a regional basis and are published jointly by The Crown Estate and the British Marine Aggregate Producers Association. The British Geological Survey analyses data in this domain, though it is not always the data owner or publisher. Materials of interest are generally limited to construction aggregates (sand and gravel) and sand (for beach nourishment).
Additional EU countries			
Albania	Not available	No	No information received on the status of marine minerals. The eMODnet data collating centre is Polytechnic University of

Country	Data Publishing Authority	Survey Response	Notes
			Tirana - Institute of GeoSciences, Energy, Water and Environment (IGEWE - PUT).
Belarus	-	-	Landlocked country.
Bosnia and Herzegovina	-	-	Landlocked country.
Greenland	Not available	No	No information received from State
Republic of Macedonia	-	-	Landlocked country.
Moldova	-	-	Landlocked country.
Montenegro	Unknown	No	No information received from State
Norway	Not available	No	No data are collected for the offshore/marine environment except for near-shore sand/gravel production.
Serbia	-	-	Landlocked country.
Switzerland	-	-	Landlocked country.
Turkey	Unknown	No	No information received from State.
Ukraine	Ministry of Ecology and Natural Resources of Ukraine with devolved responsibility to the State Geological and Subsurface Survey of Ukraine (SGSSU)	Yes	Statistical data on resources and reserves from the marine/offshore environment are available for construction and energy minerals. Data are collected annually and are available at the national scale.

Source: http://seadatanet.maris2.nl/v_edmo/welcome.asp & Minventory/EFG marine survey

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Annexe C: Secondary Raw Materials definition – terminology review

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A literature review of European documents and reports was undertaken to assess whether a common definition for secondary raw materials was present. A number of communications, opinions, directives, regulations and decisions contain the terms secondary raw materials and secondary materials almost interchangeably. However, no well-defined or universal definition of 'secondary raw materials' could be found.

Table 35 summarises the results of the literature review and the context of secondary raw materials and secondary materials terms.

Table 35: Definitions of secondary raw materials

Source type	Commentary
COM documents	
(C1) COM (2005) 0666 **Taking sustainable use of resources forward: A Thematic Strategy on the prevention and recycling of waste**	In Annex I, section 1, the text refers to the need to "amend the definition of waste, but that it is necessary to clarify when a waste ceases to be a waste (and becomes a new or secondary raw material)".
(C2) COM(2008) 0699 final **The raw materials initiative — meeting our critical needs for growth and jobs in Europe**	The term **secondary raw materials** is quoted in the context of the availability and use of scrap for recycling.
(C3) COM (2011) 0025 **Tackling the challenges in commodity markets and on raw materials**	In section "5.4 Boosting resource efficiency…", the term **secondary raw materials** is quoted in the context of 'urban mining' (the process of extracting useful materials from urban waste). Later it talks of promoting "the use of secondary raw materials in products".
(C4) COM (2014) 0398 final **Towards a circular economy: A zero waste programme for Europe**	In section "2.1 Designing and innovating for a circular economy", design solutions are proposed including: "creating markets for **secondary raw materials** (recyclates)…" In the context of the circular economy (section "2.3 Harnessing action by business…"), the text relates that "…**secondary materials** markets need to be developed", but does not define **secondary raw materials**.
Directives, Regulations & Decisions	
(D1) 79/968/EEC: Council Decision of 12 November 1979 adopting a multiannual research and development programme (1979 to 1982) for the European Economic Community in the field of the recycling of urban and industrial waste (secondary raw materials) **OJ L 293, 20.11.1979 p. 0019 - 0022**	By exemplification in the title and in Article 3, refers to **secondary raw materials** as "urban and industrial waste". However, the context is not as clear in other sections as to whether the scope excludes the products of recycling (recyclates).

(D2) 91/679/EEC: Council Decision of 19 December 1991 adopting the work programme for the implementation of the specific programme of research and technological development in the field of industrial and materials technologies (1991 to 1994) **OJ L 375, 31.12.1991, p. 18–32**	Under section "1.2 Recycling", refers to **secondary materials** in the context of "…used non-ferrous metals arising from industrial activities.", and "…**secondary materials** before recycling, re-use or controlled disposal."
(D3) 98/562/EC: Commission Decision of 29 September 1998 on the statistical surveillance within the Community of exports of secondary copper raw materials (notified under document number C(1998) 2739) (Text with EEA relevance) **OJ L 271, 8.10.1998, p. 34–38**	The Decision lists various materials falling under the scheme (related to tariffs on imports) and includes various forms of scrap copper. In point 6 it implies a distinction of **secondary (copper) raw materials** and refined copper, placing the former as a recyclable feedstock.
(D4) Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste **OJ L 190, 12.7.2006, p.1**	In Point 22, **secondary materials** are referenced in the context of standards in the recycling and reprocessing activities.
(D5) 2009/607/EC: Commission Decision of 9 July 2009 establishing the ecological criteria for the award of the Community eco-label to hard coverings (Notified under document C(2009) 5613) (Text with EEA relevance) **OJ L 208, 12.8.2009, p. 21–38**	In the context of Criterion "5.2 recovery of waste…", the application is asked to report "…information about the re-use…of waste and **secondary materials** in the production of new products." However, the term is not defined in the associated User Manual. A query placed by this study to the Competent Body (ISPRA) which prepared the criteria and user manual reveals that they interpret **secondary materials** as by-products, which is at odds with the Waste Directive.
(D6) EFTA Surveillance Authority Decision No 500/08/COL of 16 July 2008 amending, for the sixty-fifth time, the procedural and substantive rules in the field of State aid by introducing a new chapter on State aid for environmental protection **OJ L 144, 10.6.2010, p. 1–35**	In section "1.5.8 |Aid for waste management", in the context of incentives to reach environmental targets, the text states: "…the normal functioning of **secondary materials** markets should not be distorted" without further definition.
Questions and opinions	
(Q1) WRITTEN QUESTION No. 1999/96 by Karin RIIS-JØRGENSEN to the Commission. Definition of secondary raw materials and waste **OJ C 385, 19.12.1996, p. 75**	The inquiry highlighted the absence of a definition of **secondary raw materials** within Directive 91/156/EEC. Commission response: "The notion of '**secondary raw materials**', although mentioned in Article 3.1(b)(i) of Directive 75/442/EEC, as amended by Directive 91/156/EEC, is not defined by this Directive."

	The response goes on to mention certain recyclate streams in the context of **secondary raw materials**. It acknowledges that discussion and agreement on the topic has not concluded.
(Q2) WRITTEN QUESTION P-1645/99 by Alexander de Roo (Verts/ALE) to the Commission. Compliance with the wild birds directive - sludge dump off Uitdam (Netherlands). **OJ C 170E , 20.6.2000, p. 61–62**	The question concerns the reuse of dredging waste by conversion to "building materials and **secondary materials**."
(Q3) Opinion of the European Economic and Social Committee on the Non-energy mining industry in Europe **OJ C 27, 3.2.2009, p. 82–87**	In section "6. Resource efficiency", the Opinion recommends: "fostering the use of **secondary materials** in line with sustainable development" without further definition.
(Q4) Opinion of the European Economic and Social Committee on 'Access to secondary raw materials (scrap, iron, recycled paper, etc.)' ***OJ C 107, 06.04.2011, p. 1–6***	No formal definition of **secondary raw materials** is provided; however, the document clearly describes them in the context of the recycling of waste and collected scraps, including that which may be imported or exported, for virgin substitution. Materials listed are: Scrap iron and steel, non-ferrous scrap and other waste streams containing such metals, recycled paper, glass, and plastic waste. Mention is also made to 'non-ferrous metals can be found in the old mining residuals in the EU ore mining areas'. There is some confusion over the scope of the term as the title of the paper itself refers to mixtures of *recyclable* and *recycled* materials.
(Q5) Question for written answer E-003757/13 to the Commission on 'Reclassification of excavation waste from public works' **Nikos Chrysogelos (Verts/ALE), (3 April 2013)** **OJ C 19E , 22.1.2014, p. 1–627**	The question concerned **secondary materials** "obtained from processing excavation, construction and demolition waste".
(Q6) Opinion of the European Economic and Social Committee on 'Incentivising the growth potential of the European beer industry' (own-initiative opinion) **OJ C 67, 6.3.2014, p. 27–31**	In section "5. Contributing to environmental sustainability goals", the document relates actions "…leading to a reduced use of natural materials…and consistently reusing **secondary materials** from the brewing process" without further definition. It also uses the term **secondary products** which one may infer are equivalent to **by-products**.
Working papers and reports	
(W1) EU JRC report (2008), 'End of Waste Criteria, methodology and case studies'	**Secondary raw materials** are not clearly defined but the report refers to secondary materials / products as wastes which have been treated for

http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2619	recycling. It refers to secondary materials as both recyclable and recycled elements.
(W2) COMMISSION STAFF WORKING PAPER Analysis associated with the Roadmap to a Resource Efficient Europe Part I (similarly, Part II) **SEC/2011/1067 final**	**Secondary materials** are expressed in the context of the waste hierarchy and resource efficiency, implying a recycling activity.
(W3) COMMISSION STAFF WORKING PAPER, European Commission (2012), accompanying the Commission's document Making Raw Materials available for Europe's future well-being - proposal for a European Innovation Partnership on Raw materials	No formal definition is provided; however, document clearly refers to the recycling of waste. This document also makes reference of recovering mining wastes but not within the context of **secondary raw materials**.
(W4) COMMISSION STAFF WORKING DOCUMENT Industrial Performance Scoreboard and Report on Member States' Competitiveness Performance and Policies - Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A Stronger European Industry for Growth and Economic Recovery Industrial Policy Communication Update **SWD/2012/0298 final**	Under section "3.3.3 Sustainable industrial policy", in the context of Waste Acts the text states "Czech industry has a particular interest in [**secondary materials**] given their importance for Czech industry. With respect to recycling and waste related to construction material, good results have been achieved in the Czech Republic with approximately 86 % of construction and demolition waste being re-used."
(W5) COMMISSION STAFF WORKING DOCUMENT On the implementation of the Raw Materials Initiative Accompanying the document Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions on the review of the list of critical raw materials for the EU and the implementation of the Raw Materials Initiative **SWD/2014/0171 final**	Refers to **secondary materials** under the topic heading "5.2 Recycling" and "5.5 Research" in the context of waste recovery and inventory of such materials (and cross-referencing the current project, Minventory).

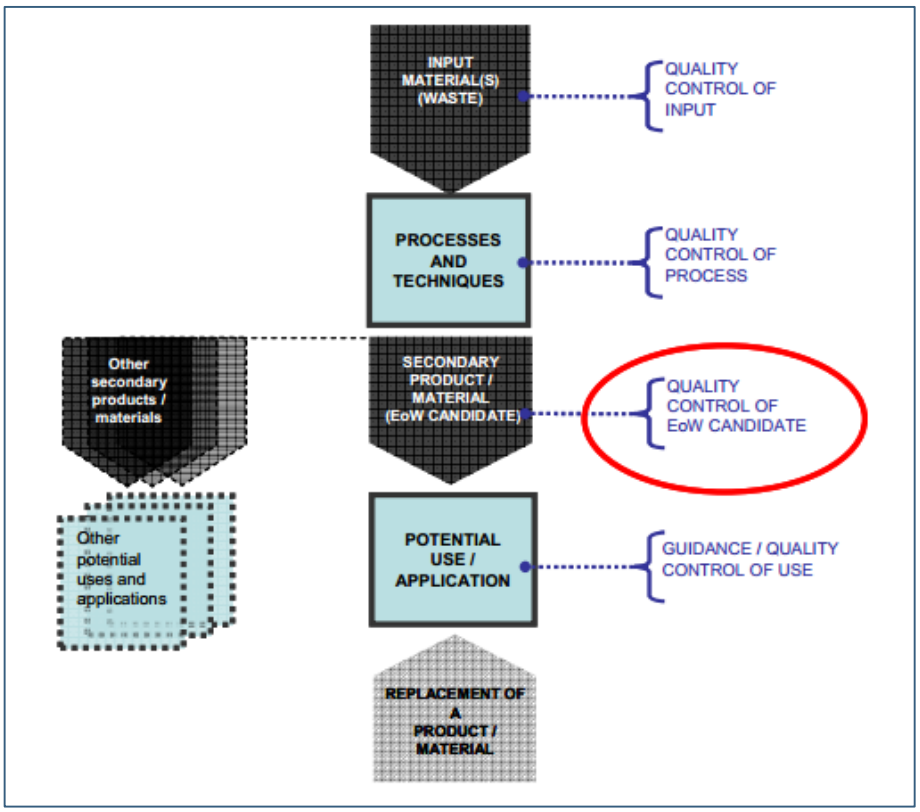
In no case was a clear definition of 'secondary raw materials' or 'secondary materials' provided, although there was much contextual placement of the terms. Both the European Innovation Partnership on Raw Materials (Table, C2)[116] and the Roadmap to a Resource Efficient Europe (W2)[117] refer to secondary raw materials; however, neither of these communications define what is meant by this term.

[116] COM(2008) 0699 final, The raw materials initiative — meeting our critical needs for growth and jobs in Europe

[117] SEC/2011/1067 final, COMMISSION STAFF WORKING PAPER Analysis associated with the Roadmap to a Resource Efficient Europe Part I (similarly, Part II)

The European Economic and Social Committee opinion on access to secondary raw materials (Q4)[118] lists a number of materials considered to be secondary raw materials: scrap iron and steel, non-ferrous scrap and other waste streams containing such metals, recycled paper, glass, plastic waste. It is not clear whether it is the waste itself or the treated waste to be defined as secondary raw material. A JRC study (W1)[119] provides an overview: as shown in Figure 44; secondary products/materials are wastes which have already been treated and are ready to be recycled (although the word 'recycled' itself implies further processing).

Figure 44: Process for waste to reach End-of-Waste status



Source: EU JRC (2008), End of Waste Criteria

In none of these documents are landfills mentioned within the context of secondary raw materials, although they are embraced by the concept of urban mines, a term used elsewhere (C3)[120]. Whereas mining wastes and abandoned mines are included within the

[118] Opinion of the European Economic and Social Committee on 'Access to secondary raw materials (scrap, iron, recycled paper, etc.)'; OJ C 107, 06.04.2011, p. 1–6

[119] EU JRC report (2008), 'End of Waste Criteria, methodology and case studies'; http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2619

[120] COM (2011) 0025; 'Tackling the challenges in commodity markets and on raw materials'

discussion of resource efficiency, there are limited references to them in the context of secondary raw materials, the Opinion document (Q4) [121] being one.

Brief history

Although no formal definition exists, the concept of secondary raw materials has existed since at least 1979 within the decision to set up a Community research programme 'Adopting a multiannual research and development programme (1979 to 1982) for the European Economic Community in the field of the recycling of urban and industrial waste (secondary raw materials)' [122]. This document sets a precedent by placing secondary raw materials in the context of "urban and industrial wastes".

Since that time a number of Decisions, Opinions, Directives and Working Documents have used both the term secondary raw materials and secondary materials in similar contexts, so it is clearly the implication that these relate to waste materials that could be reused and reprocessed to generate recyclates (or 'products') of a secondary nature that could displace 'primary' raw materials, that is, virgin ores, petrochemicals and other sources. (Note that the scope of materials here goes beyond mineral resources.)

For example, the own-initiative Opinion of the European Economic and Social Committee (CCMI/078) refers to "Scrap iron and steel, non-ferrous scrap and other waste streams containing such metals, recycled paper, glass, and plastic waste...[and] non-ferrous metals can be found in the old mining residuals in the EU ore mining areas" in this context. As recently as 2014, the call for proposals and related activities under the 2014-15 work programmes under Horizon 2020 — the Framework Programme for Research and Innovation (2014-20) and under the Research and Training Programme of the European Atomic Energy Community (2014-18) complementing Horizon 2020[123] links secondary raw materials to 'urban mines'.

Questions posed to the Commission have queried the definition and application of the terms, but without definitive resolution. Examples are the Written Question No. 801/93 by Sir James Scott-Hopkins to the Commission 'Definition of secondary raw materials' (text not available online); and Written Question No. 1999/96 by Karin Riis-Jørgensen to the Commission 'Definition of secondary raw materials and waste' (Q1)[124], highlighting the absence of a definition of secondary raw materials within Directive 91/156/EEC.

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[121] Opinion of the European Economic and Social Committee on 'Access to secondary raw materials (scrap, iron, recycled paper, etc.)'; OJ C 107, 06.04.2011, p. 1–6

[122] 79/968/EEC: Council Decision of 12 November 1979 adopting a multiannual research and development programme (1979 to 1982) for the European Economic Community in the field of the recycling of urban and industrial waste (secondary raw materials); OJ L 293, 20.11.1979 p. 0019 - 0022

[123] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2110-waste-4c-2014.html; OJ C361/9 of 11 December 2013

[124] WRITTEN QUESTION No. 1999/96 by Karin RIIS-JØRGENSEN to the Commission. Definition of secondary raw materials and waste ; OJ C 385, 19.12.1996, p. 75

Discussion

Despite a formal definition not being supplied, a number of complexities and ambiguities in the use of secondary (raw) materials terms has been found. These should be resolved if they are to be used more widely.

- It is not clear whether secondary raw materials relates to wastes that could be reprocessed and refined, potentially to produce virgin displacements (the inputs, so called recyclables); but also to the products of such a reprocessing operation (the outputs, so-called recyclates).
- The terms secondary raw materials and secondary materials are used interchangeably to describe the inputs and outputs described above. However, the majority of references have the implication that secondary raw materials are the waste inputs to recycling and reprocessing; and the secondary materials are the refined outputs, equivalent to first-use materials. A standardisation on this interpretation would assist.
- Assuming secondary raw materials means unprocessed wastes, the scope implied is very wide. It is not clear how this definition will interact with the Waste Framework Directive, whether it embraces all scraps of production intended for recycling, or just those consigned as waste, for example.
- Assuming secondary materials means reprocessed wastes fit for sale as virgin (primary-derived) material displacement, it is a moot point as to whether this distinction can be usefully made for many processes. It may be sensible in the application of, for example, End of Waste Criteria, where simple sorting and segregation of bulk materials is possible; but it has little meaning if secondary raw materials are co-mingled with primary raw materials within chemical or smelting processes to produce refined metals or plastics, for example. How primary and secondary distinctions should be made are then problematic.
- The terms are used largely in the context of material flows (although again, there is no differentiation between flows and accumulations e.g. in mining wastes), whereas the current study concerns itself with stocks and inventories. Because a flow is significant it does not imply that there is a corresponding stock of significance. The term secondary raw materials might have higher utility if it were confined to consideration of significant recoverable or recyclable stocks, as has been the approach in this study.

Implications

The terms Secondary (Raw) Materials therefore have utility in broadly describing the provenance and intent of used and reprocessed materials, but are not precise enough to cover the range of sources and applications which might be described more formally within legal, permitting and reporting frameworks.

Within the scope of this project, whilst acknowledging the potentially broad scope of secondary raw materials, a more limited perspective has been taken. These limitations are for pragmatic and utilitarian reasons. In essence, the study focused on waste streams that have been consigned to waste within long-term, accumulating storage such as landfill, spoil heap or equivalent, rather than the transient and relatively fast-moving production scraps and product-oriented wastes targeted by various End-of-Life Directives. Such accumulations are the less well-characterised elements and so offer greater opportunity for improvement of information provision in land use planning, a key objective of the study.

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Annexe D: Material stocks: a review

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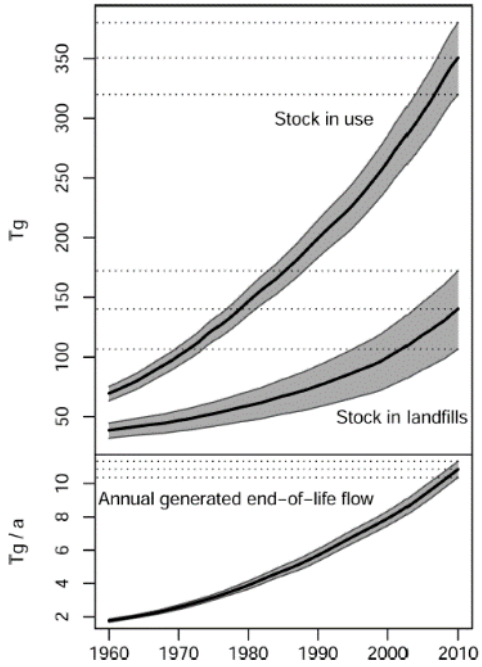
Overview

Most estimates of stocks appear suggest that - after primary raw materials - landfill and stocks in use dominate the secondary materials landscape. This does not mean that significant resources of materials of interest to this study are either present, accessible or economically recoverable at this time.

As context, a synthetic analysis of 27 EU countries conducted by BRGM, estimated that landfill mass was of the order of 245 billion tonnes in 2003, projected to rise to 280 billion in 2010 under a 'prevention' waste management scenario and medium growth. Compositional estimates suggest that 2.5 billion tonnes of metals and 4.6 billion tonnes of mining waste appear within this. Glass and inert materials dominate the total, accounting for over 75%.

A good indicator of the relative stocks of metals is provided by Glöser et al.'s 2013 report analysing global copper flows. Figure 45, taken from the report, which takes a dynamic approach to modelling arisings and accumulations, summarises the relative position of landfill and in-use stocks for copper.

Figure 45: Estimates of global copper stocks and EoL flows according to Glöser et al.



Source: Glöser S., Soulier M., Tercero-Espinoza, L.A. (2013) Dynamic Analysis of Global Copper Flows. Global Stocks, Postconsumer Material Flows, Recycling Indicators, and Uncertainty Evaluation. In Environ. Sci. Technol. 2013, 47, 6564−6572 [dx.doi.org/10.1021/es400069b]

Accumulated tailings from mining (over the past century) are estimated to be around 100 Tg (100 Mt). Material losses to tailings during mining, milling, and flotation occur before the copper enters the human technosphere as metal. However, there is generally a good match between historic production, landfill and stocks in use.

There is more on this topic in Part 5: In-use materials.

Landfill stocks

The UNEP report of Graedel et al[125] (Section 4.8 p 20) states:

> *"Little information is available on the amount and location of metals in landfills. We are aware of only two estimates: for iron in U.S. landfills (850 Tg Fe; Müller et al., 2006), and for copper in global landfills (225 Tg Cu; Kapur, 2004). These amounts are relatively large, but the material in landfills is widely dispersed and resides in discarded products rather than ores. There are no instances of any significance where metal has been recovered from landfill stocks. In the case of materials whose use is increasingly regulated (e. g. mercury and cadmium), the landfill stock may, over time, exceed the stock in use."*

In respect of aligning inventories according to the three groups of metals, industrial minerals and construction minerals, this is likely to be possible when considering mining, processing and A-wastes. However, there are significant issues when considering landfill wastes because they are repositories, in general, of defunct products. Similarly, in respect of in-use stocks, inventories of materials awaiting processing will not be presented as equivalents of the minerals (or more likely metals) of interest, but rather as stockpiles of products, which are complex aggregates of metals and plastics, critical or otherwise. Presentation along the lines of the simple classes envisaged will therefore be difficult other than for the most basic of metals and construction materials. Indeed, if such products were capable of being characterised in this way, the information would be most helpful already in preventing them from entering landfill.

A pragmatic approach to this issue will be to identify where landfill has been characterised on a material basis. For example, some historic aggregate inventory has been made of UK landfill, although not driven down to the critical material categories of interest to this study. Similar work has also been conducted in the US and The Netherlands, using a synthetic time slice approach, aggregating waste arising composition and flow data.

Stocks in tailings

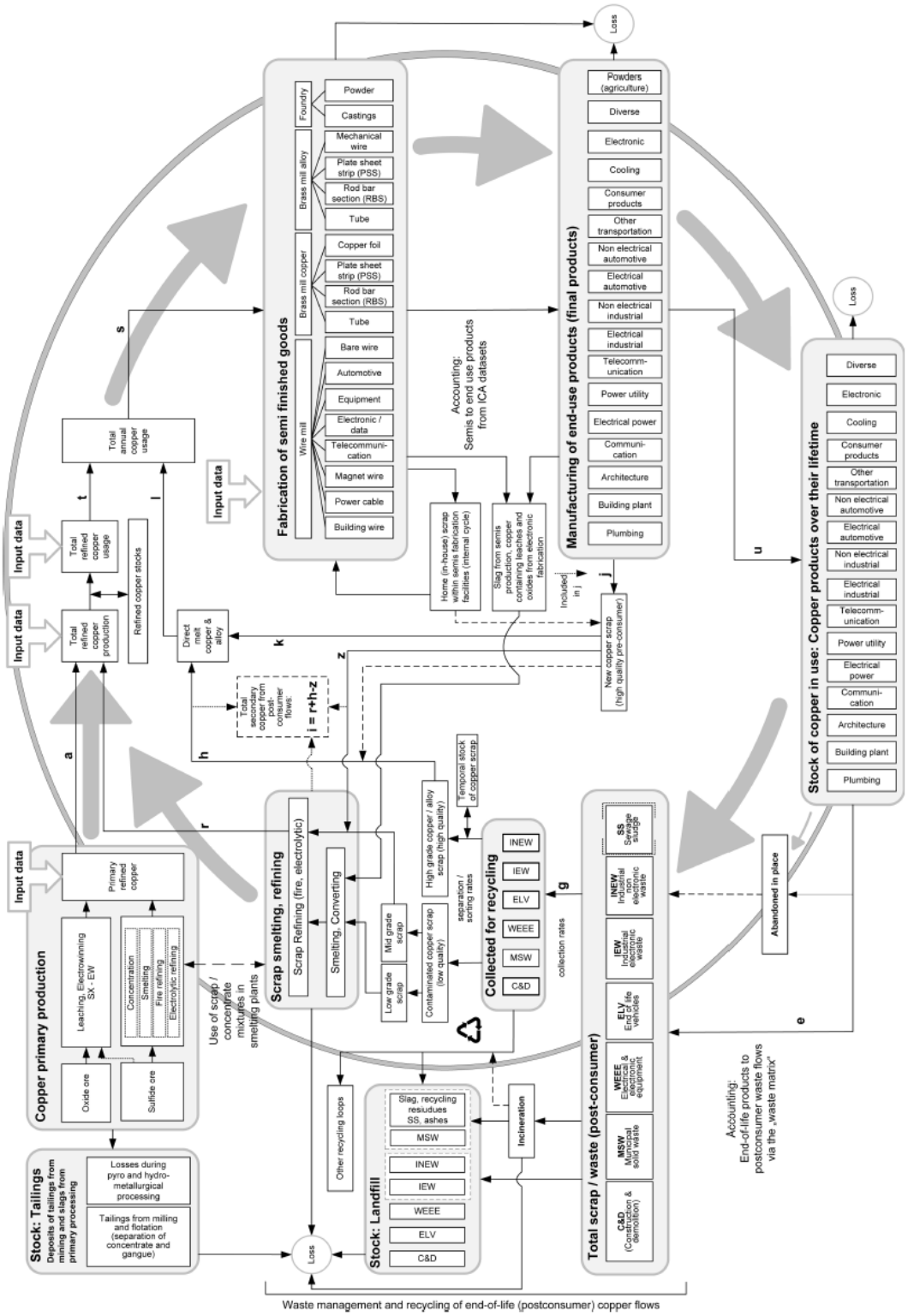
From UNEP report (Section 4.3 p 20):

> *"The metal contents of tailings are highly dependent on the efficiency of the separation process applied to the ore that was mined. Modern mines measure the metals concentrations in tailings discards, but the information is generally proprietary. We know of no stock estimates at levels higher than individual processing facilities."*

As an example of a quantified metal, we quote form an examination of copper flows by Glöser et al (2013). This flow and stock metal estimates that copper in tailings amounts to around 100 Tg, or 100 Mt. This has some significance when compared to the annual extraction rate of 16 Mt per year.

[125] Graedel, T.E. et al. (2010) METAL STOCKS IN SOCIETY; Scientific Synthesis, UNEP/IPSRM, ISBN: 978-92-807-3082-1

Figure 46: Dynamic map of copper stocks and flows



Source: Glösser et al. (2013) [dx.doi.org/10.1021/es400069b]

Metal recyclates

Metals are the most important reusable resources and their relative ease of recovery and re-usable nature contributes to their sustainability. Because of their almost infinite recyclability, metals can be considered another form of 'Reserve'. The recycling of minerals, unlike metals, is not widely practical. However, the demand for virgin minerals can be reduced by recycling the corresponding extracted elements or compounds. Recycling is a major contributor to the supply of many metals and provides environmental benefits of energy savings and reduced waste. Recycling practices vary substantially among metal industries and a wide variety of descriptive terms have evolved to describe scrap generated by diverse industrial processes.

The material flow of recycled metal commodities in the United States has been documented in a series of reports published by the US Geological Survey (Sibley, 2006-11[126]). Scrap is generally categorised as 'new' from pre-consumer sources i.e. mainly from industrial processing and 'old' post-consumer sources once the product comes to the end of its useful life. Scrap metals are commonly divided into ferrous and non-ferrous metals. Worldwide the scrap metal recycling industry has developed sets of specifications and grading system to ensure consistent quality for a given grade of metal scrap. The three most widely used specifications are the Scrap Specifications Circular (U.S. Institute of Scrap Recycling Industries Inc.), the European Classification for Non-Ferrous Scrap Metals and the Standard Classification for Non-Ferrous Scrap Metals (U.S. National Association of Secondary Materials Industries Inc.). These specifications generally set minimum and maximum contents of stated metal impurities.

Specifications and standard classifications for ferrous metal scrap exist at all levels: International, European, national, as well as between individual companies. For marketing and trading, standards and specifications are needed not only to set the price but also to be used as reference for classification and quality control. European Ferrous Recovery & Recycling Federation (EFR) and European Confederation of Iron and Steel Industries (EUROFER) developed the European Steel Scrap Specification. The European Commission's recent decision that iron, steel and aluminium scrap should be classed as 'product' and not as waste has released the industry from waste-related red tape. 'End-of-Waste' criteria are set out in Council Regulation (EU) No 333/2011. In practice this will mean that in order to be classified as a product, post-consumer waste aluminium, iron and steel will be required to undergo a recovery operation, and meet the purity level set out in the regulation.

The United Nations Environment Programme (UNEP) recently released a report on recycling rates of metals prepared by the Working Group on Global Metal Flows of the International Resource Panel (UNEP, 2011[127]). This report brings together published recycling estimates for 60 metals and provides "group consensus" estimates for a small selection of metals. Fairly mature recycling systems (technology, logistics, and scrap availability) exist for most ferrous, non-ferrous and precious metals but systems for specialty metals / metalloids are largely missing (Tercero Espinoza, 2012[128]).

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[126] Sibley, S.F., ed. 2006-11. Flow studies for recycling metal commodities in the United States. U.S. Geological Survey Circular 1196-A-Z-AA. http://pubs.usgs.gov/circ1196/ accessed via http://minerals.usgs.gov/minerals/pubs/commodity/recycle/

[127] UNEP (2011) Recycling Rates of Metals – A Status Report, A Report of the Working Group on the Global Metal Flows to the International Resource Panel. Graedel, T.E.; Allwood, J.; Birat, J.-P.; Reck, B.K.; Sibley, S.F.; Sonnemann, G.; Buchert, M.; Hagelüken, C.

[128] Tercero Espinoza, L.A. 2012.The contribution of recycling to the supply of metals and minerals. POLINARES working paper No. 20.

Strategic and in-process stocks

For metal resources at least we believe that there are no mandatory systems in place in any EU state to formally record stocks described above. The only exception to this might be for certain strategic and commercially important metals where there is an interest in either maintaining some view of availability for market transparency; or because there is a national interest in monitoring stock levels. Stock turnover rates have been assessed by reference to public data on production and inventory. These are presented in Table 37 and Table 36.

Turnover rates lie in the range 3 to 150 days but, globally, generally stand at around 30 to 40 days. This is minute compared to the decades of capacity in discovered ore bodies.

A similar analysis for construction materials could not be conducted because official inventory level data could not be found in reputable sources such as USGS.

Table 36: Production, inventory and stock turnover time for construction materials

Material	Aspect	2009	2010	2011	2012	2013
Crushed Stone (US)	Production [Mt][129]	1160	1160	1160	1170	1200
	Inventory [kt]	N/A	N/A	N/A	N/A	N/A
	Turnover [days' stock]	--	--	--	--	--
Sand & Gravel (US)	Production [Mt]	N/A	N/A	N/A	816	N/A
	Inventory [kt]	N/A	N/A	N/A	N/A	N/A
	Turnover [days' stock]	--	--	--	--	--

[129] http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mcs-2014-stonc.pdf

Table 37: Production, inventory and stock turnover time for metal resources

Metal	Aspect	2009	2010	2011	2012	2013
Lead	Production [kt][130]	9242	9850	10598	10212	10593
	Inventory [kt] Global[131]	350	425	600	600	600
	Turnover [days' stock]	14	16	21	21	21
	Inventory [kt] LME[132]	75	180	320	350	200
	Turnover [days' stock]	3	7	11	13	7
Zinc	Production [kt][130]	11281	12896	13080	12526	13138
	Inventory [kt] Global[131]	1100	1350	1750	1800	2100
	Turnover [days' stock]	36	38	49	52	58
	Inventory [kt] LME[133]	320	580	890	1000	1100
	Turnover [days' stock]	10	16	25	29	31
Nickel	Production [kt][134]	1315	1440	1610	1761	
	Inventory [kt] Global[135]	110	140	110	110	180
	Turnover [days' stock]	31	35	25	23	--
Aluminium	Production [kt][136]	37706	42353	45789	47787	49714
	Inventory [kt] Global[137]	2467	2352	2558	2356	2234
	Turnover [days' stock]	24	20	20	18	16
	Inventory [kt] LME[138]	4300	4500	4500	4800	5200
	Turnover [days' stock]	42	39	36	37	38
Copper (US)	Production [kt]	1110	1060	992	962	960
	Inventory [kt] Global	434	384	409	236	270
	Turnover [days' stock]	143	132	150	90	103
Copper (Global)	Production [kt]					16000
	Inventory [kt] LME	280	480	470	250	610
	Turnover [days' stock]	--	--	--	--	14

Sources: As detailed in links
Note: Production & inventory may include recycled materials

[130] http://www.ilzsg.org/static/statistics.aspx?from=1

[131] http://www.ilzsg.org/static/stocksandprices.aspx?from=1

[132] http://www.kitcometals.com/charts/lead_historical_large.html#lmestocks_5years

[133] http://www.kitcometals.com/charts/zinc_historical_large.html#lmestocks_5years

[134] http://www.insg.org/stats.aspx

[135] http://www.kitcometals.com/charts/nickel_historical_large.html#lmestocks_5years

[136] http://www.world-aluminium.org/statistics/primary-aluminium-production/

[137] http://www.world-aluminium.org/publications/#822

[138] http://www.kitcometals.com/charts/aluminum_historical_large.html#lmestocks_5years

Annexe E: Metadata survey for primary materials

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C1 Approach to task

Following provision of summary information for those countries who are project partners (as reported in the Inception Report) the current phase of work widened the scope to include the principal national data providers in each country of the EU and neighbours (Table 38). Primarily these were geological surveys and/or relevant ministries. A questionnaire (*Annexe F: Stakeholder survey documents*) was produced which contained questions under three headings:

1. the process of ***data collection;***
2. ***data harmonisation*** and the ***use of standards;*** and
3. ***data accessibility***.

To accompany the questionnaire a description of the purpose of the study and a glossary of terms and their definitions was also produced. These documents were distributed to the project partners for onward distribution to countries they were responsible for. The questionnaire was supplemented by a pre-questionnaire which requested a text overview of each country's approach to the above questions. This would form the core of the country summary, and were typically received in advance of the questionnaire responses.

The response rate and status for both these aspects is recorded in the following table (where Q'aire = questionnaire and Sum = Country Summary).

Table 38: Response/status of questionnaire and country summary

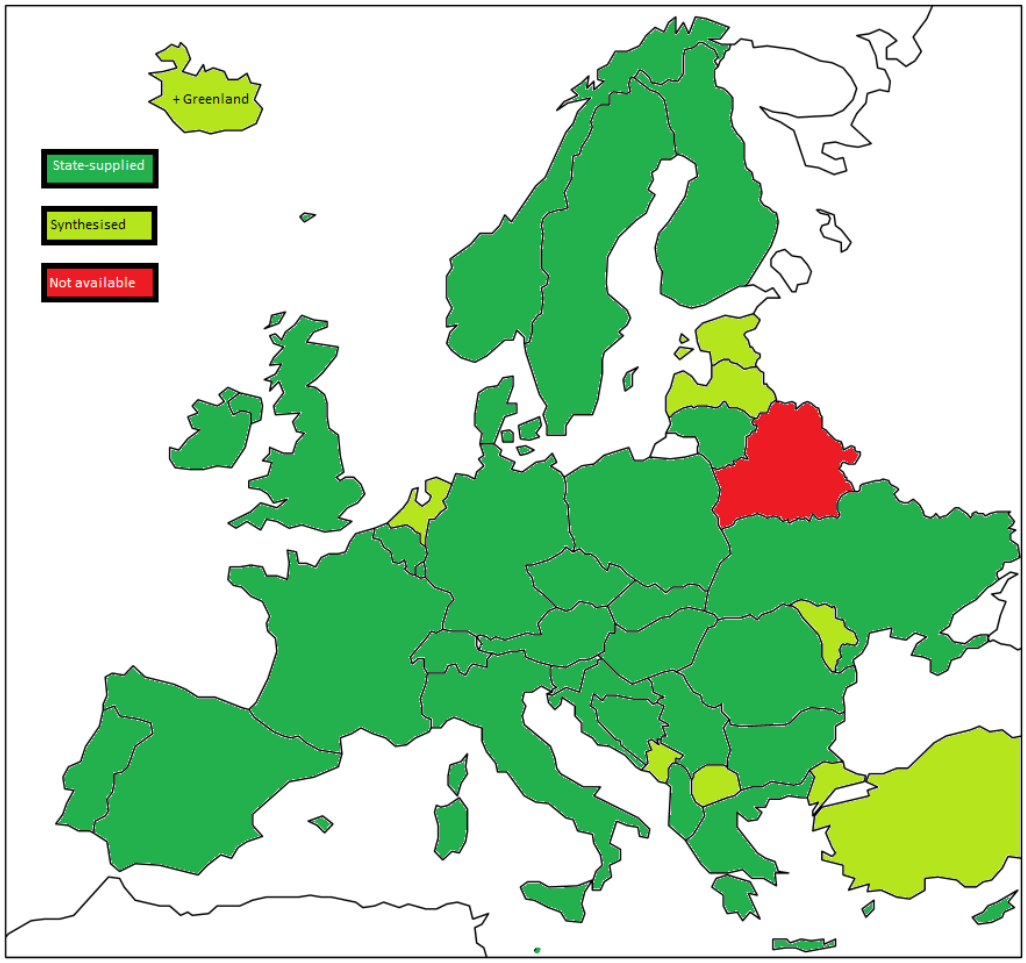
Country	Completed by	Returning Organisation	Q'aire	Sum
EU28		***Completion rate:***	***79%***	***100%***
Austria	Sebastian Pfleiderer and Robert Holnsteiner (jointly)	Geological Survey of Austria; Federal Ministry of Economy, Family and Youth	Yes	Yes
Belgium	Dusar Michiel Griet Verhaert Daniel Pacyna	Geological Survey of Belgium Flanders, Department LNE – Environment, Nature and Energy department Wallonia - DGO3 Branch Agriculture, Natural Resources and Environment - Department of Environment and Water	Yes	Yes
Bulgaria	Miloslav Katsarov	National Geological Survey of Bulgaria, Natural Resources and Concessions Directorate, Ministry of Economy, Energy and Tourism	Yes	Yes
Croatia	Slobodan Miko	Croatian Geological Survey	Yes	Yes
Cyprus	Christodoulos Hadjigeorgiou	Geological Survey Department, Ministry of Agriculture, Natural resources and Environment	Yes	Yes
Czech Republic	Ivo Sitenský	Czech Geological Survey	Yes	Yes
Denmark	--	Naturstyrelsen (Danish Nature Agency)	No	Yes
Estonia	No return	**Synthesised by BGS**	No	Yes
Finland	Jouni Vuollo and Mr. Antti Kahra	Geological Survey of Finland	Yes	Yes
France	Adeline Morliere Guillaume Bertrand Dominique Rabu	French ministry for environment Geological Survey of France GEODERIS	Yes	Yes
Germany	Various authors	Various Länder responses.	Yes	Yes
Greece	Pefani Varvara and Laskaridis Kostas (joint return) Kavalopoulos Christos	Institute of Geology & Mineral Exploration Greek Mining Enterprises Association**	Yes	Yes
Hungary	Zoltán Horváth and Gombár Gizella Forgács (joint return)	Geological and Geophysical Institute of Hungary (MFGI)	Yes	Yes

Country	Completed by	Returning Organisation	Q'aire	Sum
		Hungarian Office for Mining and Geology		
Ireland	Gerry Stanley, Koen Verbruggen, Charise McKeon; Reamonn McKeever	Geological Survey of Ireland; Central Statistics Office	Yes	Yes
Italy	Marco Di Leginio, Fiorenzo Fumanti and Carlo Dacquino	Geological Survey of Italy	Yes	Yes
Latvia	No return	**Synthesised by BGS**	No	Yes
Lithuania	Audronė Dumšienė	Geological Survey of Lithuania	Yes	Yes
Luxembourg	Anon	Administration de l'environnement	No	Yes
Malta	No return	**Synthesised by BGS**	No	Yes
Netherlands	No return Sytze van Heteren (marine minerals only)	**Synthesised by BGS**	No	Yes
Poland	Stanisław Wołkowicz	Polish Geological Institute	Yes	Yes
Portugal	Lídia Quental and Daniel de Oliveira	National Laboratory for Energy and Geology	Yes	Yes
Romania	Marian Munteanu	Geological Institute of Romania	Yes	Yes
Slovakia	Ivo Sitenský and Peter Baláž Dalibor Mašek Elena Bodíková	State Geological Institute of Dionýz Štúr Slovak Environmental Agency	Yes	Yes
Slovenia	Duska Rokavec	Geological Survey of Slovenia	Yes	Yes
Spain	Carmen Marchán and Manuel Regueiro	Geological Survey of Spain	Yes	Yes
Sweden	Anders Hallberg Johan Nyberg Anton Löf	Geological Survey of Sweden SNL	Yes	Yes
United Kingdom	Joseph Mankelow and Paul Lusty	British Geological Survey	Yes	Yes
Neighbouring countries		***Completion rate:***	***31%***	***92%***
Albania	Halim Dariu	Geological Survey of Albania	Yes	Yes
Belarus	No return		No	No
Bosnia and Herzegovina	Hazim Hrvatović	Geological Survey of Federation of Bosnia and Herzegovina	Yes	Yes
Greenland		**Synthesised by RMG**	No	Yes
Iceland	No return	**Synthesised by RMG**	No	Yes
FYR Macedonia	No return	**Synthesised by BGS**	No	Yes
Moldova	No return	**Synthesised by BGS**	No	Yes
Montenegro	No return	**Synthesised by BGS**	No	Yes
Norway	Henrik Schiellerup Reidulv Bøe	Geological Survey of Norway	Yes	Yes
Serbia	Radoslav Vukas	Ministry of Mining and Energy	No	Yes
Switzerland	Rainer Kuendig	Swiss Geotechnical Commission	No	Yes
Turkey	No return	**Synthesised by BGS**	No	Yes
Ukraine	Boris Malyuk	Ukrainian State Geological Research Institute	Yes	Yes

Source: BGS Survey, Sept. 2013

The state of the country summary information is shown graphically in Figure 47 and the country summaries in Figure 48.

Figure 47: Visual indication of completion of country summaries by area (as of end 2014)



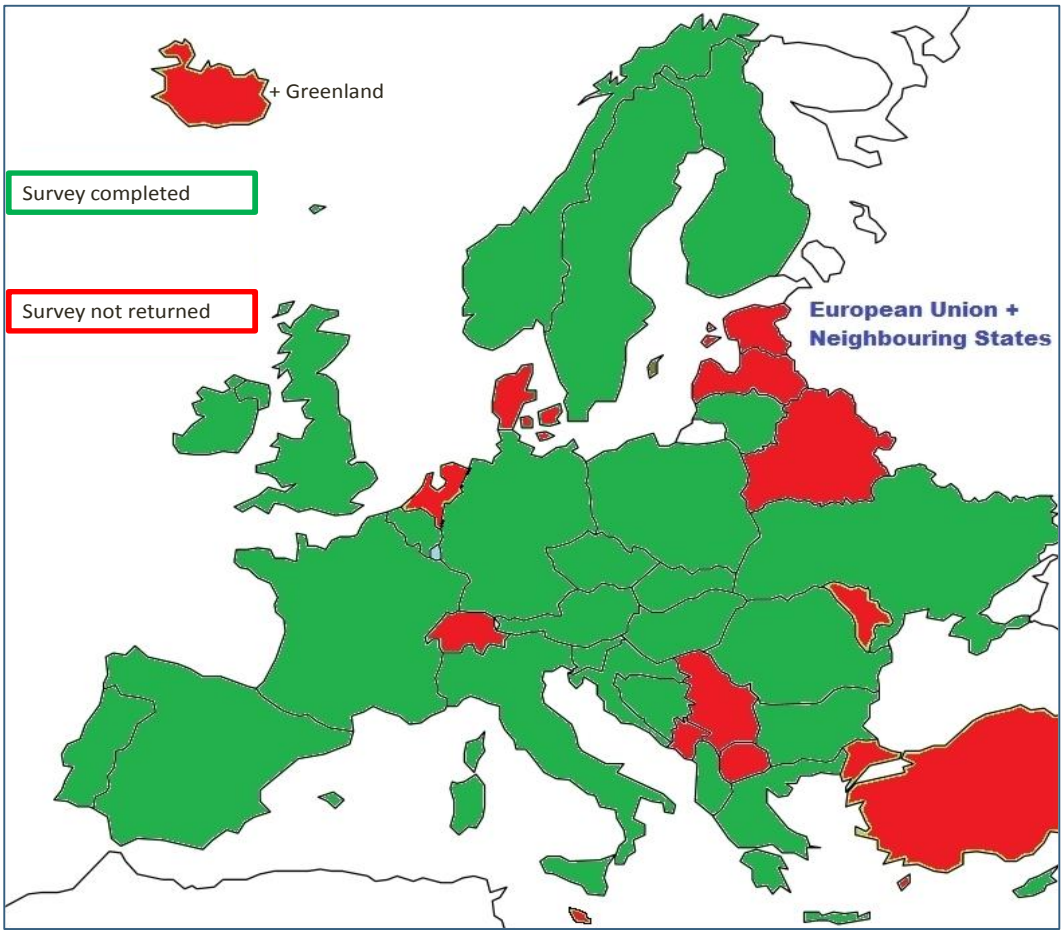
Source: BGS Survey

C2 Completeness of survey by state

Notable exceptions to the questionnaire returns are Netherlands, Estonia, Latvia and Malta. Accordingly, the British Geological Survey is now in the process of collating available information on these countries in order to provide its own synthesis for these states with the cooperation of project partners. When complete it is intended that the synthesis will be offered to each to enable checks of veracity, completeness and acceptability for publication.

Over the course of the project, the Commission's metadata needs have been refined and extended meaning that supplementary survey work will be required and which will continue into 2014. The speed and thoroughness of returns is highly dependent on the goodwill and cooperation of the state bodies concerned. However, the absence of some metadata has not prevented progress on subsequent tasks such as the harmonisation issue analysis. Specific actions are described in the relevant sections.

Figure 48: Visual indication of the completeness of survey by area (as of July 2014)



Source: BGS survey

C3 Status

C3.1 Basic survey responses

A number of smaller states have offered no response to the data survey or the country summary request. We suggest that the Commission waits until the final portal is published when the utility of the web-site will draw further interest from unresponsive State Surveys.

C3.2 Follow-up survey responses

Follow-up survey responses are now complete to the extent possible within the resources of the study.

Annexe F: Stakeholder survey documents

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Project overview document: Statistical information on EU raw material deposits

This document should be read in conjunction with the Glossary provided.

Background

This project has been commissioned by the European Commission Enterprise and Industry Directorate-General. The project is being delivered by a consortium of geological surveys and research institutes[139] from different parts of the European Union (EU) and is being co-ordinated and project managed by Oakdene Hollins in the UK.

Currently there is no centralised EU initiative or organisation responsible for managing raw material resources and reserves. There is also a lack of specific EU policies and related financing mechanisms for achieving a central harmonised data source. A standardised and accurate statistical database providing a complete source of information on the geological resources and reserves of the EU would be an invaluable tool for land-use planning and future technology development policies. Such a database is also essential for informing decision-makers regarding materials security and for establishing appropriate mitigation strategies.

With this in mind, the European Commission wishes to carry out an analysis of available geological data to establish the basis for a pan-European database on resources and reserves of non-energy, non-agricultural raw materials. This analysis will determine which bodies or organisations need to be involved in order to facilitate the delivery of an authoritative and reliable database. It will also examine a range of possible scenarios for realising such a database by 2020. Many different organisations, from geological surveys to mining companies, have amassed data useful for this database. However, this accumulated data is often presented in different formats, to varying standards and utilises varying terminology.

Objectives

1. Support the European Commission in conducting an analysis of the potential for establishing a pan-European statistical database on resource and reserves of non-energy, non-agricultural minerals.
2. Improve Europe's geological knowledge and safeguard resources and reserves.
3. Determine the feasibility of using standard codes to harmonise geological data across Europe.
4. Provide a policy response to the need to harmonise statistical geological data and terminology on resources and reserves on a European level.
5. Determine how existing national data can be collected into a European Minerals Yearbook.
6. Determine how a pan-European database could be achieved by 2020.

Scope

The focus of this project is **primary** and, where appropriate, **secondary resources** and **reserves** of **non-energy, non-agricultural** raw materials of a **'mineralic**' nature (a list is

[139] The full partner list is: Oakdene Hollins, British Geological Survey (BGS) - UK, Bureau de Recherches Géologiques et Minières (BRGM) - France, Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) - Germany, Raw Material Group - Sweden, Croatian Geological Survey (HGI-CGS), Czech Geological Survey (CGS), Geological Survey of Slovenia (GEO-ZS) - Slovenia, Geological Institute of Romania (GIR), Institute of Geology and Mineral Exploration (IGME) - Greece, Polish Geological Institute – National Research Institute (PGI-NRI).

specified in the associated questionnaire) as defined by the *Raw Materials Initiative (COM (2008) 699 final)* on **land** and in **marine** environments.

Although secondary raw materials resources and reserves are within the scope of this project data are extremely limited and no standardised reporting system exists. Accordingly, whilst these should be considered during the analysis and any relevant data/information sources highlighted we are aware that this is a challenging task.

The analysis will cover all **28 EU Member States** and consider data availability in **neighbouring countries**, which are members of the European Geological Survey (EGS). Data held by public (e.g. United States Geological Survey etc.) and private (e.g. SNL, Roskill etc.) organisations both inside and outside the EU will also be considered.

The project will assess the quality and availability of data on raw materials, but will **not** collect or provide any data on actual raw material resources and reserves.

The project will also consider the availability of **other data** and information relevant to the evaluation of raw materials. For example, in some countries (e.g. the UK) mineral resource maps are available which delineate zones containing mineral resources but provide no quantitative data on mineral resource and reserve availability. Mineral occurrence databases (which may contain quantitative information on mineral occurrences) and directories of active or historic mineral workings etc. are also important sources of information. The project will **not** consider baseline geosciences datasets (e.g. geological maps, geophysical data, general borehole information) which, although relevant to evaluation of raw materials, are beyond this scope of this study.

The project will seek to answer the following **key questions:**

1. What is the quality and quantity of statistical data available on raw material resources and reserves across Europe?
2. Who are the data holders/owners?
3. If resource and reserve data exists how are they organised – for example, at a national, regional or local level?
4. How do responsibilities for data gathering vary across the Member States depending on constitution, legislation, policy and other legal frameworks?
5. How does terminology used for resources and reserves and other geoscientific data vary across Europe?
6. Are the data and associated information publicly available and easily accessible?
7. Which standard or national codes are used to determine resources and reserves and by whom?
8. Is the use of these codes legally binding and are these standards applied to all types of raw materials?
9. If national codes are used, how do these relate to internationally recognised standard codes (e.g. UNFC, CRIRSCO template etc.)?
10. Are existing national data INSPIRE compliant?
11. How can existing national data be compiled into a pan-European database or year book?
12. What is required for interoperability of a pan-European database on raw material resources and reserves?
13. Which are the principal data gaps, bottle necks and obstacles to achieving a pan-European database?
14. What level of data interoperability could realistically be achieved by 2020?

15. How would the proposed database relate to other frameworks and infrastructures being implemented?

Methodology

The project consists of a number of tasks, which will address the overall objective of determining the potential for a pan-European statistical data portal:

Project inception - a steering group is currently being established that will 'guide' the project throughout its lifespan. This consists of key stakeholders including, data holders/owners, industry representatives, industry associations, geological surveys and others.

Review of data availability - The project will assess data availability on primary and secondary resources and reserves across the EU28, as well as the potential for data harmonisation and interoperability. This will be achieved through a:

desk-based review coordinated by a regional representative covering their own and neighbouring countries

stakeholder consultation through a survey questionnaire and one workshop.

Harmonisation issue analysis - Bottlenecks and gaps in data, including barriers to harmonisation and interoperability, will be identified. The magnitude of all identified issues and the potential and levels of data interoperability to be achieved by 2020 will be estimated.

Web-portal development - Information collected by the project on the availability of raw material resource and reserve data across Europe will be made publicly available through a web portal.

Development of a roadmap - An implementation plan outlining the actions required to establish a pan-European database on raw material resources and reserves. The roadmap will be tested through a stakeholder workshop to ensure that proposed actions and targets are realistic. Stakeholder involvement and input will be critical during this task in order to define a realistic database development strategy and agree targets, with appropriate mitigation actions, which can be achieved by 2020.

Glossary of terms: Statistical information on EU raw material deposits – glossary which accompanied the stakeholder survey questionnaire

The majority of the definitions provided in this glossary represent the terms used by European Commission Enterprise and Industry Directorate-General, some of which were defined in the Invitation to Tender. However, a key aspect of this project is to assess difference in terminology employed across Europe and the potential for harmonisation. **Accordingly, the defined terms should only be used as reference points during the questionnaire completion process.** Any differentiation from the definitions provided should be indicated, where possible on the questionnaire.

1. **CIM –** Canadian Institute of Mining, Metallurgy and Petroleum
2. **CRIRSCO template –** Committee for Mineral Reserves International Reporting Standards for Exploration Results, Mineral Resources and Mineral Reserves
3. **EU Member States –** Member countries of the European Union – currently comprising 28 countries. These are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom.
4. **INSPIRE –** Infrastructure for Spatial Information in the European Community. The INSPIRE Directive in Europe establishes an infrastructure for spatial information to support community environmental policies and policies or activities that may impact on the environment. The purpose of the INSPIRE Directive is to ensure that the spatial data infrastructures of the Member States are compatible and usable in a community and transboundary context.
5. **JORC –** Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves.
6. **Mineralic –** Raw materials (primary and secondary) of mineral origin
7. **National code* –** A domestically developed reporting standard for exploration results, mineral resources and reserves.
8. **Neighbouring countries –** countries neighbouring the EU28 e.g. Belarus, Albania, Ukraine etc.
9. **Non-agricultural –** Excludes commodities of agricultural origin e.g. plants and animals
10. **Non-energy minerals –** Excludes energy minerals. The non-energy minerals are divided into three sub-groups: construction minerals, industrial minerals and metallic minerals.
11. **Overseas territories –** Territories under the jurisdiction of the EU28 and it neighbouring countries, but which do not form part of them.
12. **PERC –** Pan-European Code for Reporting of exploration results, mineral resources and reserves.
13. **Primary –** Raw materials which are not derived from waste or recycling e.g. mining waste and their remnants as well as urban mines and land-fills.
14. **Raw materials –** As defined by the EU Raw Materials Strategy (COM (2011)25 final). Raw materials include metallic minerals, industrial minerals, and construction minerals but for the purposes of this project exclude wood and natural rubber.
15. **Reserve* –** The term is synonymously used for 'mineral reserve', 'probable mineral reserve' and 'proven mineral reserve'. In this case, confidence in the reserve is measured by the geological knowledge and data, while at the same time the extraction would be legally, economically and technically feasible and a licensing permit is certainly available.

16. **Resource* –** The term is synonymously used for 'mineral resource', 'inferred mineral resource', 'indicated mineral resource' and 'measured mineral resource. In this case, confidence in the existence of a resource is indicated by the geological knowledge and preliminary data, while at the same time the extraction would be legally, economically and technically feasible and a licensing permit is probable.
17. **SAMREC –** South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves
18. **Secondary* –** Raw materials derived from old or abandoned mining sites and their remnants as well as urban mines and land-fills.
19. **Standard code –** mineral classification codes such as the UNFC, the PERC Code; the CIM Code, the JORC Code, the SAMREC Code, or any other code generally accepted in a foreign jurisdiction or in line with the International Minerals Reporting Template on exploration results, mineral resources and mineral reserves.
20. **UNFC –** United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources.

*These definitions are used by the EC. However, given that a primary objective of the project is to assess differences in the use of terminology, we do not want exclude reporting of information on raw materials which is relevant but does not comply with these strict definitions.

Statistical information on EU raw material deposits - questionnaire

A description of the project is provided in the accompanying 'Project Overview' document. This provides background information that will be useful when completing the questionnaire. A number of key terms used in the questionnaire are defined in the attached Glossary.

Format of the questionnaire

The questionnaire comprises a combination of tables with check boxes and free format questions.

1. **Complete your contact details** - these should be completed by the recipient.
2. **Complete the summary tables** - a list of mineral commodities has been included in the summary tables. Please provide information for the commodities for which you are aware that resource and reserve or other relevant data is available. A worked example is shown below.

Commodity	Data availability			
	Resources	Reserves	Other data	Confidential (yes/no)
Construction minerals				
aggregates, sand & gravel	þ	þ	þ	No

3. **Answer the free format questions** - please complete the questions as fully as possible. If your work and/or knowledge is restricted to a particular commodity type (e.g. primary raw materials), then only complete the relevant sections. Certain questions or sections may not be applicable/relevant to you. However, it would be useful if you could provide a brief justification for not answering.

If you have any questions about the questionnaire or any aspect of this project please contact:

Email: David Parker or Adrian Chapman at Euromin@oakdenehollins.co.uk

Thank you for taking the time to complete the questionnaire and for assisting this feasibility on European resources and reserves.

Questionnaire on statistical information on EU raw material deposits

To be completed by the recipient

Completed by (title & name):	
Position:	
Email address:	
Telephone number:	

Country					
Government authorities	Level	national	regional	local	Other (define)
		o	o	o	
	Name of the institution				
Geological Survey	Level	national	regional	local	Other (define)
		o	o	o	
	Name of the survey				
Industry	Sector	Construction (etc)	Industrial minerals	Metals	Other (define)
		o	o	o	
	Name of the company and / or association				
Consultant	Sector	Industry	Government	Other (define)	
		o	o		
	Name of company				
Other	Sector	University / Research	NGO	Trade Union	
		o	o	o	
	Name of the organisation				
Primary focus/remit	Primary raw materials		Secondary raw materials		
	o		o		
Further Comments					

1. Summary of data available for primary raw materials (please tick/answer as required)

Commodity	Data availability			
	Resources	Reserves	Other data	Confidential (yes/no)
Construction minerals				
aggregates, sand & gravel	o	o	o	
aggregates, crushed rock	o	o	o	
gypsum	o	o	o	
limestone/ dolomite	o	o	o	
clay (e.g. brick clay)	o	o	o	
building stone	o	o	o	
Industrial minerals				
baryte	o	o	o	
bentonite and fuller's earth	o	o	o	
graphite	o	o	o	
diatomite	o	o	o	
feldspar	o	o	o	
fluorspar	o	o	o	
Kaolin	o	o	o	
magnesite	o	o	o	
mica	o	o	o	
potash	o	o	o	
talc	o	o	o	

Commodity	Data availability			
	Resources	Reserves	Other data	Confidential (yes/no)
Metallic minerals				
antimony	o	o	o	
bauxite	o	o	o	
cadmium	o	o	o	
chromium	o	o	o	
cobalt	o	o	o	
copper	o	o	o	
gallium	o	o	o	
gold	o	o	o	
indium	o	o	o	
iron ore	o	o	o	
lead	o	o	o	
lithium	o	o	o	

manganese	o	o	o	
molybdenum	o	o	o	
nickel	o	o	o	
niobium	o	o	o	
PGMs	o	o	o	
rare earths	o	o	o	
silver	o	o	o	
tantalum	o	o	o	
tin	o	o	o	
titanium	o	o	o	
tungsten	o	o	o	
vanadium	o	o	o	
zinc	o	o	o	

Secondary raw materials		Data availability		
	Resources	Reserves	Other data	Confidential (yes/no)
Mining waste (legacy or current; please specify commodities)				
End-of-life stocks (e.g. scrap; please specify commodities)				
Resources from urban mines (e.g. landfill sites; please specify commodities)				
Stocks of materials in products in use (e.g. gold in electronic products)				

A) Data collection

1 Are data currently collected on primary raw material resources and reserves? Yes / No

If yes to 1:

1.1 Which is the main government department/ministry responsible?

1.2 Is it devolved to another organisation/agency (e.g. national geological survey)? Yes / No

If yes to 1, please specify:

1.2.1 For which minerals or commodity groups? Please list.

1.2.2 Where is it sourced from (e.g. mineral operators, geological surveys, other)?

1.2.3 At what scale is it collected (e.g. national, regional, local, individual deposits, other or a combination)?

1.2.4 How regularly is it collected (e.g. annually, another defined period, variable etc)?

1.2.5 Where relevant does it include data on raw materials in the offshore/marine environment? Yes / No

If yes to 1.2.5:

1.2.5.1 Please specify which raw materials.

1.2.5.2 If this included overseas territories, please list territories and define the raw materials

2 Do other types of data relevant to primary raw material resource evaluation exist (e.g. mineral resource maps, mineral occurrences databases, mine and quarry information etc.)?

Yes / No

If yes to 2:

2.1 Please specify which minerals.

2.2 Who is responsible for or owns these data?

3 Does national legislation and/or policy require collection of data on primary raw material resources and reserves or other information? Yes / No

If yes to 3:

3.1 What is the relevant legislation/policy?

3.2 What does it specify?

3.3 Does it apply to all raw materials or only relate to specific groups (e.g. those of high value, metallic, industrial, construction minerals, secondary)? Please list.

3.4 What is the mechanism for data collection (e.g. by survey which mineral operators have a statutory obligation to fulfil, geological survey monitoring, company reporting)?

4 Which department/organisation – if any – monitors mineral exploration activity?

5 Are exploration and mining companies under a statutory obligation to report resource and reserve data? Yes/No

If yes to 5:

5.1 What is the relevant legislation?

5.2 Which raw materials does it cover? Please list.

5.3 Are they compelled to report their data using a standard code or national code? Yes/No

If yes for 5.3:

5.3.1 Please specify which materials/codes:

5.3.2 When do they have to fulfil this obligation (e.g. annually, specified in the licence terms, when new data becomes available, when they relinquish a permit, when they apply for licences etc.)?

5.3.3 In what format is the data received (e.g. reports, tables, maps)?

5.3.4 Do companies have an obligation to report or deposit more than resource and reserve data (e.g. geological mapping, drill hole logs, drill core)?

6 Are data currently collected on secondary raw material resources and reserves? Yes / No

If yes to 6:

6.1 Which are the main organisations responsible?

6.2 For which raw materials (please list)?

6.3 Where is data sourced from (e.g. industry, government departments, agencies)?

7 Does national legislation and/or policy require collection of data on secondary raw material resources and reserves or availability? Yes / No

If yes to 7:

7.1 What is the relevant legislation?

7.2 Which raw materials does it cover? Please list.

B) Harmonisation and standardisation

IF YOU DO collect data on primary raw material resources and reserves please answer these questions. IF NOT, please jump to Section **C DATA Accessibility**.

8 Does it comply with an internationally recognised standard code? Yes/No

If yes to 8:

8.1 Please specify which standard or code.

8.2 Which raw materials does it cover?

If no to 8:

8.3 Is a national code used for reporting? Yes/No

If yes to 8.3:

8.3.1 Which raw materials does it cover?

8.3.2 Is it aligned with internationally used standard codes (e.g. UNFC, CRIRSCO template etc)? If so, which resource and reserve categories/terminology are defined?

9 If a standard or national code is used is any attempt made to harmonise data received from different sources (e.g. companies, geological surveys etc)?

C) Data accessibility

10 Who are the data holders/ owners?

11 How is the data stored/managed (e.g. is there a national/regional or centralised database, geographic information system)?

12 At what scale is the data organised (e.g. national, regional, local, deposit level)?

13 Is the data spatially referenced? Yes / No

If yes to 13:

13.1 Is it INSPIRE compliant? Yes / No

14 Are you participating in any initiatives to harmonise/and or disseminate raw material resources and reserves data?

15 Is the data available to the public? Yes / No

If no to 15:

15.1 Is there a time limit to confidentiality? Please specify the period.

If yes to 15:

15.2 How can it be accessed (e.g. website, specific data requests)?

15.3 Is it charged for?

15.4 Who requests access to and uses the data? Please provide examples.

16 Is data and information available in multilingual formats? Yes / No

17 Which other organisations public (e.g. Eurostat, USGS) or private do you know of who have mineral resource and reserve data for your country?

18 What do you perceive as the key challenges to availability and harmonisation of mineral resource and reserve information in your country?

19 Please provide any other information relevant to this study (for example, other data providers or holders who we might contact or engage in later stages of the project).

Annexe G: Availability of resource and reserve data by country and primary mineral

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	Data availability	Construction mineral	aggregates, sand & gravel	aggregates, crushed rock	gypsum	limestone/ dolomite	clay (e.g. brick clay)	building stone	Industrial mineral	baryte	bentonite and fuller's earth	graphite	diatomite	feldspar	fluorspar	kaolin	magnesite	mica	potash	talc	Metal/Mineral	antimony	bauxite	cadmium	chromium	cobalt	copper	gallium	gold	indium	iron ore	lead	lithium	manganese	molybdenum	nickel	niobium	PGMs	rare earths	silver	tantalum	tin	titanium	tungsten	vanadium	zinc	Offshore/ marine minerals	sand and gravel	salt
Austria (*1)	Resources																																																	
	Reserves																																																	
	Other data		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Belgium	Resources		x	x		x																																										
	Reserves			x																																													
	Other data									x		x				x												?		?										x									
Bulgaria	Resources		x	x	x	x	x	x		x	x																																						
	Reserves		x	x	x	x	x	x		x	x																																					
	Other data		x	x	x	x	x	x		x	x																																					
Croatia (*3), (*4)	Resources		x	x	x	x	x	x		x	x																																					
	Reserves		x	x	x	x	x	x		x	x	x																																			
	Other data		x	x	x	x	x	x		x	x	x																																			
Cyprus	Resources		x	x	x	x	x	x		x	x																																					
	Reserves		x	x	x	x	x	x		x	x																																					
	Other data																																															
Czech Republic (*2)	Resources		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Reserves		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Other data		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Denmark	Resources																																																
	Reserves																																																
	Other data																																															
Estonia (*7)	Resources		x																																													
	Reserves																																															
	Other data																																														
Finland	Resources		x	x	x	x	x	x		x	x											x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Reserves		x	x	x	x	x	x		x	x											x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Other data		x	x	x	x	x	x		x	x											x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
France	Resources																																															
	Reserves																																															
	Other data		x	x	x	x	x	x		x	x											x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	?	?
Germany (*8)	Resources																																															
	Reserves																																															
	Other data		x	x	x	x	x	x		x	x											x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

	Data availability	aggregates, sand & gravel	aggregates, crushed rock	gypsum	limestone/ dolomite	clay (e.g. brick clay)	building stone	Industrial minerals	baryte	bentonite and fuller's earth	graphite	diatomite	feldspar	fluorspar	Kaolin	magnesite	mica	potash	halite	talc	Metal/Mineral	antimony	bauxite	cadmium	chromium	cobalt	copper	gallium	gold	indium	iron ore	lead	lithium	manganese	molybdenum	nickel	niobium	PGMs	rare earths	silver	tantalum	tin	titanium	tungsten	vanadium	zinc	Offshore/ marine minerals	sand and gravel	salt
Greece	Resources																																																		
	Reserves		x																																															
	Other data		x	x	x				x				x																																				
Hungary (*2)	Resources	x	x	x	x	x	x		x	x		x	x		x																																			
	Reserves		x	x	x	x	x		x	x		x	x		x																																		
	Other data		x	x	x	x	x		x	x		x	x		x																																		
Ireland (*5), (*9)	Resources																																																
	Reserves																																																
	Other data																																																
Italy	Resources		x	x	x	x	x		x	x		x	x		x																																		
	Reserves		x	x	x	x	x		x	x		x	x		x																																		
	Other data		x	x	x	x	x		x	x		x	x		x																																		
Latvia (*7)	Resources																																																
	Reserves																																																
	Other data																																																
Lithuania (*8)	Resources					x																										x																	
	Reserves					x																																											
	Other data																																															
Luxembourg (*7)	Resources																																																
	Reserves																																																
	Other data																																															
Malta (*7)	Resources																																																
	Reserves																																																
	Other data																																															
Netherlands (*7)	Resources																																																
	Reserves																																																
	Other data																																															

	Data availability	Construction minerals	aggregates, sand & gravel	aggregates, crushed rock	gypsum	limestone/dolomite	clay (e.g. brick clay)	building stone	Industrial minerals	baryte	bentonite and fuller's earth	graphite	diatomite	feldspar	fluorspar	Kaolin	magnesite	mica	potash	halite	talc
Poland	Resources		x	x	x	x	x	x		x	x		x	x	x	x	x				
	Reserves		x	x	x	x	x	x		x	x		x	x	x	x	x				
	Other data		x	x	x	x	x	x		x	x		x	x	x	x	x				
Portugal	Resources		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
	Reserves																				
	Other data		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Romania	Resources		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x
	Reserves		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x
	Other data		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x
Slovakia (*2)	Resources		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x		x
	Reserves		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x		x
	Other data		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x		x
Slovenia (*10)	Resources																				
	Reserves		x	x		x	x	x			x									x	
	Other data		x	x		x	x	x			x									x	
Spain	Resources		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
	Reserves		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
	Other data		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Sweden	Resources											x			x						
	Reserves											x			x						
	Other data																				
United Kingdom (*2)	Resources		x							x	x	x	x	x	x	x		x	x		x
	Reserves		x	x	x	x	x	x		x	x	x	x	x	x	x		x	x		x
	Other data		x	x	x	x	x	x		x	x	x	x	x	x	x		x	x		x

	Data availability	Metal/Mineral	antimony	bauxite	cadmium	chromium	cobalt	copper	gallium	gold	indium	iron ore	lead	lithium	manganese	molybdenum	nickel	niobium	PGMs	rare earths	silver	tantalum	tin	titanium	tungsten	vanadium	zinc
Poland	Resources							x		x			x			x	x				x						x
	Reserves							x					x								x						x
	Other data							x					x								x						x
Portugal	Resources		x		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Reserves																										
	Other data		x		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Romania	Resources			x		x		x		x		x	x		x	x	x	x		x	x	x		x	x	x	x
	Reserves			x		x		x		x		x	x		x	x					x	x				x	x
	Other data			x		x		x		x		x	x		x	x	x	x		x	x	x		x	x	x	x
Slovakia (*2)	Resources		x	x			x	x		x		x	x		x	x	x			x	x		x		x		x
	Reserves		x					x		x		x	x								x				x		x
	Other data		x	x			x	x		x		x	x		x	x	x			x	x		x		x		x
Slovenia (*10)	Resources							x				x	x										x				x
	Reserves																										
	Other data																										
Spain	Resources		x				x	x		x		x	x	x	x		x				x		x		x		x
	Reserves						x	x		x		x	x	x			x				x		x		x		x
	Other data						x	x		x		x	x	x	x		x			x	x		x	x	x		x
Sweden	Resources		x				x	x		x		x	x	x	x	x	x	x		x	x	x	x	x	x	x	x
	Reserves							x		x		x	x							x	x						x
	Other data																										
United Kingdom (*2)	Resources		x	x			x	x		x		x	x		x						x		x		x		x
	Reserves		x	x			x	x		x		x	x		x						x		x		x		x
	Other data		x	x			x	x		x		x	x		x						x		x		x		x

	Data availability	Offshore/marine minerals	sand and gravel	salt
Poland	Resources		x	
	Reserves		x	
	Other data		x	
Portugal	Resources			
	Reserves			
	Other data			
Romania	Resources			
	Reserves			
	Other data			
Slovakia (*2)	Resources			
	Reserves			
	Other data			
Slovenia (*10)	Resources			
	Reserves			
	Other data			
Spain	Resources		?	
	Reserves		?	
	Other data		x	
Sweden	Resources		x	
	Reserves		x	
	Other data			
United Kingdom (*2)	Resources		x	
	Reserves		x	
	Other data		x	

Additional EU countries	Data availability	Construction minerals	aggregates, sand & gravel	aggregates, crushed rock	gypsum	limestone/dolomite	clay (eg. brick clay)	building stone	Industrial minerals	baryte	bentonite and fuller's earth	graphite	diatomite	feldspar	fluorspar	Kaolin	magnesite	mica	potash	halite	talc	Metal/Mineral	antimony	bauxite	cadmium	chromium	cobalt	copper	gallium	gold	indium	iron ore	lead	lithium	manganese	molybdenum	nickel	niobium	PGMs	rare earths	silver	tantalum	tin	titanium	tungsten	vanadium	zinc	Offshore/marine minerals	sand and gravel	salt
Albania	Resources		x	x	x	x	x	x		x	x			x		x	x				x			x		x		x				x			x		x							x			x			
	Reserves		x	x	x	x	x	x		x	x			x		x					x			x		x		x				x			x		x							x			x			
	Other data		x	x	x	x	x	x		x	x			x		x	x				x			x		x		x				x			x		x							x			x			
Belarus (*7)	Resources																																																	
	Reserves																																																	
	Other data																																																	
Bosnia Herzegovina	Resources		x	x	x	x	x	x		x							x						x	x		x	x	x		x		x	x		x												x			
	Reserves		x	x	x	x	x	x		x							x						x	x		x	x			x		x	x		x												x			
	Other data		x	x	x	x	x	x		x							x						x	x		x	x			x		x	x		x												x			
Greenland	Resources		x	x																										x		x	x			x	x	x	x	x	x	x		x	x	x	x			
	Reserves																																																	
	Other data		x	x																										x		x	x			x	x	x	x	x	x	x		x	x	x	x			
Macedonia (*7)	Resources																																																	
	Reserves																																																	
	Other data																																																	
Moldova (*7)	Resources																																																	
	Reserves																																																	
	Other data																																																	
Montenegro (	Resources																																																	
	Reserves																																																	
	Other data																																																	
Norway	Resources		x	x		x		x													x						x	x		x		x	x			x	x							x						
	Reserves		x	x		x		x				x			x																	x												x						
	Other data		x	x		x		x		x		x		x	x	x	x	x			x		x		x	x	x	x		x		x	x		x	x	x	x	x	x	x	x		x	x	x	x			
Serbia	Resources		x	x	x	x	x	x		x	x		x	x	x	x	x	x			x		x			x		x		x		x	x	x	x	x	x										x			
	Reserves		x	x	x	x	x	x		x	x		x	x	x	x	x				x		x			x		x		x		x	x		x	x											x			
	Other data		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
Switzerland (*4)	Resources																																																	
	Reserves		x	x	x	x	x	x																																										
	Other data		x	x	x	x	x	x				x			x		x		x		x		x	x		x		x		x		x	x		x	x	x				x				x		x			
Turkey (*7)	Resources																																																	
	Reserves																																																	
	Other data																																																	
Ukraine (*4)	Resources		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x					x		x		x		x	x	x	x	x	x	x	x	x	x	x		x			x		x	
	Reserves		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x					x		x		x		x	x	x	x	x	x	x	x	x	x	x		x			x		x	
	Other data		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x					x		x		x		x	x	x	x	x	x	x	x	x	x	x		x			x		x	

X	Data are not confidential
X	Data are partially confidential - this may imply any of the following *. Indicators have been included (where required -see*1-*11) under the country name.
X	Data are confidential
?	Additional clarifications are required
*1	Information on the deposit location and commodity type is not confidential, any additional information are confidential
*2	Infomation on individual deposits is confidential
*3	Reserves data remain confidential for 5 years
*4	Data are not confidential but authorisation is required; A specific data request is required
*5	Resources and Reserves data confidential to individual producers. Other data relates to production data.
*6	Data is confidential for up to five years. It can only be used by official bodies for official needs (public regulation).
*7	Country did not provide a completed survey questionnaire. In some cases only partial information were provided.
*8	Synthesis of data from different Federal States to provide overall data availability in Germany. Data confidentiality depends on the rules of each Federal State. Data from exploration reports are released after 6years or upon surrender of a licence if earlier. Mine lease data would be mostly confidential until license surrender.
*9	Aggregated figures are reported annually and are open to the public.
*10	Data are confidential , but aggregated data at national level are not.
*11	For Cu, Zn, Pb, Sb, Fe only data on estimated resources of abandoned mines are available.

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Annexe H: Summary of requirement via a Mining Law or associated Act to provide resource and reserve data

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Countries - EU 28	National Mining Law / Act	Details	Primary raw materials	Comment	Organisation(s) responsible (or mandated where relevant) for collecting primary raw material statistical resources and reserve data	Primary raw materials required to be reported to a standard code (national or international)	National reporting code aligned with:
Countries - EU 28							
Austria	Yes	Mining Law nr. 38 1999, nr. 115, 2009.	No	"Vollzug des Lagerstättengesetztes" = implementation of the federal law on mineral deposits requires national surveying of mineral resources but not quantification of resources or reserves.	Federal Ministry of Economy, Family and Youth, Geological Survey of Austria.	No	-
Belgium	No		N/A	No national mining law. Management of mineral resources is the responsibility of the regions (except for the continental shelf). Coninental shelf: Act of 13 June 1969 on the exploration and exploitation of resources of the territorial sea and the continental shelf, modified by the law of January 20, 1999 and April 22, 1999. Flemish region: Flemish Parliament Act on Surface Mineral Resources forms the legislative framework of the Flemish Minerals Policy and defines the making of a general surface mineral resources plan and specific Surface Mineral Resource Summaries, applying to sand and clay in practice. Walloon region: Walloon - The Decree of 11 March 1999 as amended by Decree of July 04, 2002, relate to the environmental permit, and the Walloon Code of planning, urban and Heritage (CWATUPE) apply to quarrying products.	Geological Survey of Belgium Continental shelf: Continental Shelf Service - Federal Public Service Economy (SPF Economie, P.M.E., Classes moyennes et Energie). Flemish region: The Natural Resources Service of the Flemish government (Department LNE – Environment, Nature and Energy department, direction ALBON). Walloon region: The natural resources service of the Walloon government (Direction Générale Agriculture, Ressources Naturelles et Environnement - DGO3/SPW).	No	-
Bulgaria	Yes	Law on Underground Resources (LUR) March 1999	Yes	Complemented by: Regulation for the Compilation and Keeping of the National Balance and the Reserves and Resources. Register of the Discoveries and Specialised Cadastre. Register of the deposits of the Underground Resources.	Ministry Of Economy, Energy and Tourism, Natural Resources and Concessions Directorate, National Geological Survey.	National (modified former Soviet code)	UNFC
Croatia	Yes	The Mining Law 2009	Yes	Complemented by: Mineral Resource Management Strategy of Croatia (2008).	Ministry of Economics, Directorate for Mining, The Croatian Geological Survey.	National (modified former Soviet	?
Cyprus	Yes	Mines and Quarries (Regulation) Law nr. 5 1965 (as amended by nr. 88 1995; nr. 132 2001; nr. 63 2003)	Yes		Ministry of Agriculture, Natural Resources and Environment, Geological Survey and Mines Service.	National	No
Czech Republic	Yes	Mining Act nr. 44 1988	Yes	Complemented by: Ministry of the Environment Decree No. 368/2004, on geological documentation. Ministry of Economic Policy and Development Decree No. 497/1992, on the inventory of reserves of reserved mineral deposits. Act No. 89/1995, on the state statistical service.	Ministry of the Environment - Czech Geological Survey.	National (modified former Soviet code)	No
Denmark	Yes	Raw Materials Act, nr. 569 1997 (as amended by Law nr. 145 2002)		Complemented by the Danish Subsurface Law nr. 552 1995 which regulates minerals at depth.			
Estonia	Yes	Mining Law nr. 20-118 2003 (as amended by Law nr. 18-131 2004)			Ministry of Environment - Geological Survey or Estonia	National (modified former Soviet	
Finland	Yes	Mining Act nr. 621, 2011 - metal ores and industrial minerals Land Extraction Act nr. 555, 1981- rock, gravel, sand, clay and soil	Yes	Complemented by: Mining Decree nr. 391, 2012.	Finnish Safety and Chemicals Agency (TUKES). Geological Survey of Finland.	No	Looking to implement UNFC in the future

Countries - EU 28	National Mining Law / Act	Details	Primary raw materials	Comment	Organisation(s) responsible (or mandated where relevant) for collecting primary raw material statistical resources and reserve data	Primary raw materials required to be reported to a standard code (national or international)	National reporting code aligned with:
France	Yes	Mining Code, 1992 (as amended by Law nr. 105, 2004 and Regulation nr. 407, 2006)	No	Not a requirement of national legislation or policy.		No	-
Germany	Yes	Bundesberggesetzte vom 13. August 1980 (BGBl. I.S. 1310), das zuletzt durk Artikel 4 Absatz 71 des Gesetzes vom 7. August 2013 (BGBl. I.S. 3154) geändert worden ist. See http://www.gesetze-im-internet.de/bundesrecht/bberggg/gesamt.pdf	No	Federal Mining Law covers metallic ores and industrial minerals. Construction minerals covered by other laws, for example the Law to Protect National resources (Lagerstättengesetzt).	State Geological Surveys and other authorities	No	-
Greece	Yes	Mining Code, Legislative Decree nr. 210, 1973 (as amended by Law nr. 274, 1976)	No	Not a requirement of national legislation or policy.		No	-
Hungary	Yes	Act on Mining nr. XLVIII of 1993	Yes	Complemented by: Government Decree No. 203/1998. (XII. 19.) - implementing the Act XLVIII of 1993 on Mining	Ministry of National Development - Hungarian Office for Mining and Geology	National (modified former Soviet code)	UNFC
Ireland	Yes	Minerals Development Act nr. 31 1940, nr. 12 1979, nr. 15 1995 and nr. 21 1999	Yes		Department of Communications, Energy and Natural Resources - Exploration and Mining Division	International	JORC or equivalent
Italy	Yes	Republic President Decree July 24, 1977 nr. 616 Legislative Decree March 31, 1998 nr. 112	Yes	Regional authorities are in charge of administrative functions for construction minerals (?) and thermal waters as stated by the Republic President Decree July 24, 1977 n.616 (art.61).	For industrial and metallic minerals, national government has jurisdiction about mining exploration, mining industry data gathering, and national mining policy. Construction minerals fall within the jurisdiction of the	Yes (depending on regional laws)	-
Latvia	Yes	Law on Subterranean Depths of Latvia nr. 595 2006	Yes	Complemented by Cabinet Regulation No. 280 2007 - Procedures for the Issue of Licences for the Use of Subterranean Depths and Authorisations for the Extraction of Widespread Mineral Resources, and for the Use of Geological Information	Latvian Environment, Geology and Meteorology Agency	National (modified former Soviet code)	
Lithuania	Yes	Underground Law nr. VIII-573, 1995	Yes		Ministry of Environment - Lithuanian Geological Survey	National (modified former Soviet	No
Luxembourg	Yes	Mining Law 1990			Ministry of Environment		
Malta	Yes	Resources Authority Act nr. 25 2000 (as amended by Act nr. 23 2009)			Malta Resources Authority		
Netherlands	Yes	Mining Act 2003 (as amended 2006, 2008, 2009 and 2010)		Mining Act and associated regulations principally pertains to energy minerals. Non-energy minerals (industrial and construction) are governed by the Environmental Protection Act.	Ministry of Economic Affiars		
Poland	Yes	Geological and Mining Law, 2011	Yes	Complemented by: Regulation of the Minister of the Environment (Polish Act: Dz. U. Nr 262, poz. 1568) - regulates the way exploration company should report on the resources and	Polish Geological Institute	National (modified former Soviet code)	UNFC
Portugal	Yes	Decree-Law Nr. 90 1990	Yes	Complemented by: Decree-Law Nr. 88 1990 Mineral Deposits Regulation Decree-Law Nr. 89 1990 Quarry Regulation	Ministry of Economy and Employment	No	-
Romania	Yes	Mining Law nr. 85 2003	Yes		National Agency for Mineral Resources	National (modified former Soviet	UNFC
Slovakia	Yes	Mining Act nr. 44 1988	Yes		Ministry of the Environment - State Geological Institute of Dionýz Štúr	National (modified former Soviet	No
Slovenia	Yes	Mining Act nr. 61 2010	Yes	Complemented by relevant decrees.	Ministry for Infrastructure and Spatial Planning - Geological Survey of Slovenia	National (modified former Soviet	UNFC
Spain	Yes	Mining Law nr. 22 1973, Law nr. 54 1980	Yes	Data are reported using whatever international code is used by the companies supplying it.	Ministry of Industry, Energy & Tourism - Geological Survey of Spain	No	-
Sweden	Yes	Mining Law nr. 45 1991, Law nr. 943 2005	No	Data are reported using whatever code is used by the companies supplying it e.g JORC, SweMin.	Ministry of Enterprise, Energy and Communications	No	-
United Kingdom	No	-	No	Not a requirement of national legislation or policy. Reserve data on construction aggregates submitted annually on a voluntary basis to local land-use (mineral) planning authorities.	Local land-use (mineral) planning authorities.	No	-

Countries - EU 28	National Mining Law / Act	Details	Primary raw materials	Comment	Organisation(s) responsible (or mandated where relevant) for collecting primary raw material statistical resources and reserve data	Primary raw materials required to be reported to a standard code (national or international)	National reporting code aligned with:
Additional EU countries							
Albania	Yes	Mining Law nr. 10 304, 2010.		Complemented by: Order nr. 386 2011. Order nr. 310 2011.	Ministry of Economy Trade and Energy (Ministry of Environment for riverbed inerts (sands and gravels)) - Geological Survey of Albania and National Agency of Natural Resources	National (modified former Soviet code)	No
Belarus	Yes	Subsoil Code nr. 406-3 2004			Ministry of Natural Resources and Environment		
Bosnia Herzegovina	Yes	?	No	Data on resources and reserves are collected under the auspices of the Law on Geological Research.	Ministry of Energy, Mining and Industry - Geological Survey of Bosnia and Herzegovina	National (modified former Soviet code)	?
Greenland	Yes	Mineral Resources Act nr. 7 2009	Yes		Ministry of Industry and Mineral Resources	International	JORC?
Macedonia	Yes	Law on Mineral Resources			Ministry of Economy - Department for Mineral Resources		
Moldova	Yes	Subsoil Code nr.3 2009	Yes		Agency for Geology and Mineral Resources	National (modified former Soviet code)?	UNFC?
Montenegro							
Norway	Yes	Mining Act nr 101 2009	Yes	Complemented by: Norwegian Mineral Strategy	Government Ministry of Trade and Industry - Geological Survey of Norway and the Norwegian Mining Directorate	No	-
Serbia	Yes	Mining Law 2007		Complemented by: Law on Geological Exploration. New Law on mining and geological research planned for adoption in 2014.	Ministry of Natural Resources, Mining and Spatial Planning - Serbian Geological Institute		
Switzerland	No	-	No	Not a requirement of national legislation or policy. Cantonal Authorities each have their own mining law Construction minerals are regulated by the Land Use Planning Law and Environmental Law.	Swiss Geological Survey, Federal Office of Topography	No	-
Turkey	Yes	Mining Law nr. 3213 1985 as amended by Law nr. 5995 2010	Yes		Ministry of Energy and Natural Resources - General Directorate of Minerals Research and Exploration	No	Looking to implement UNFC in the future
Ukraine	Yes	Subsoil Code nr. 132 1994, Law nr. 1127 1999	No	Resource and reserve data collected under the auspices of the Resolution of the Cabinet of Ministers of Ukraine nr. 423 1995 - Procedure for Handling of Geological	Ministry of Ecology and Natural Resources of Ukraine - State Geological and Subsurface Survey of Ukraine	National (modified former Soviet	Yes

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Annexe I: Compiled country summaries

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Albania

Primary raw materials
Data collection
Collection of data on primary raw material resources and reserves is the responsibility of the Ministry of Economy Trade and Energy (METE) for crushed rocks and secondary aggregates (and presumably other commodities although no explicitly stated); and the Ministry of the Environment for riverbed deposits (e.g. sand and gravel). The Geological Survey is responsible for estimating and providing information/data on the geological availability of raw materials, whilst the National Agency for Natural Resources (AKBN) is tasked with collecting and monitoring primary aggregates production. The principal source of data is mineral operators and that derived from the work of the Geological Survey. Data is collected at a variety of scales ranging from national, local to individual deposits. At minimum data is collected annually (however, they are possibly referring to production data here. Private operators have to declare production data quarterly). Other data sources relevant to primary raw material resource evaluation include a GIS-based Mineral Resource Map of Albania, which includes all known mineral deposits, a database of mineral commodities and a database of mines and quarries. These data sources cover both metallic and non-metallic minerals and are the responsibility of the Geological Survey and AKBN. National legislation requires the collection of data on primary raw material resources and reserves. There are 21 'orders' and 12 'decisions' that regulate the mining activity in Albania. This legislation specifies that licence holders must provide quarterly information (presumably only production) to the AKBN on their mining activity, in accordance with the 'national code'. Holders of exploration licences are required to report to the Geological Survey the obligatory information described in the 'order'. Exploration and mining companies are under a statutory obligation to report resource and reserve data. The legislation covers all raw materials. The data is collected through private companies reporting directly to AKBN or the Geological Survey in accordance with the type of permit they hold. Data is received in the form of reports and tables. Companies do not have an obligation to provide more than resource and reserve data.
Data harmonisation and standardisation
Data collected does not comply with an internationally recognised standard code and a national code is used for reporting. This code covers all primary raw material types, but is not aligned with an international standard. Several initiatives have been undertaken in an attempt to align the national code with international standards, and Albania has been invited to be member of the UNFC Expert Group.
Data accessibility
There is no central body or system for the management of resource and reserve information. The Geological Survey has its own database associated with its GIS and AKBN has a separate database and GIS portal. The data is spatially referenced, but is not INSPIRE compliant. The data is publically available. General information (e.g. number of permits, type of permit, area of operation) can be obtained via the AKBN website. The AKBN GIS appears to be assessible online http://www.akbn.gov.al/index.php/en/mining-activity/harta-dixhitale (however, a fault meant it was not possible to verify the content).

Specific data requests have to be directed to the Geological Survey or AKBN depending on the data requried. Data is currently used by the Statistical Insitutite, academics and private companies. Data/information is generally not available in a multilingual format, although introductory material in English can be found on the AKBN website. The Mining Law of Albania and promotional material on the mineral potential of Albania is available online, in English e.g. http://www.akbn.gov.al/images/pdf/publikime/Minierat.pdf (this publication contains limited information on 'geological/mineral reserves' in some instances divided by region, although the information is highly variable ranging from actual quantities to qualitative disucssion). It appears as though the Geological Survey are planning to provide online access to their GIS, although it is currently 'under construction'.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at

http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/2014/albania2014

Great progress with regard to administration of the waste till now has been made in the legislation field. Albania has progressed with the approval of new laws, decisions and regulations / guidelines that reflect directives / decisions of the EC. Based on the National Plan of Implementation of the Stabilisation and Association Agreement during the period 2010-2012, new laws and decisions for waste streams were approved which transpose EU directives, while we are working for the development and adoption of other legal acts related to waste management.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC in 2012. This relates to national legislation: Decision No. 452, dated 11.7.2012 "On landfill of waste"

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC in 2011. This has been updated to include national legislation: Law No. 10463, dated 22.09.2011 "On integrated waste management", amended by Law no 156, dated 10.10.2013 and Decision No. 765, dated 7.11.2012 "On approving regulation for separated collection and treatment of used oils"

Mining wastes

The responsible governmental central authority that administers the entire mining industry is the Ministry of Energy and Industry of the Republic of Albania. The law no. 10304 dated 15.7.2010 "On the Mining Sector" (the "mining law") as amended, is the principal governing law of the entire mining sector in Albania.

Marine minerals
Not available. The eMODnet data collating centre is Polytechnic University of Tirana - Institute of GeoSciences, Energy, Water and Environment (IGEWE - PUT), Rr. "Don Bosko", 60, Tirane; +355 672155234, http://www.geo.edu.al
Overseas territories
No overseas territories identified.
Additional information
Other organisations who hold mineral resource and reserve data for Albania are the USGS, AlbEITIT and the Extractive Industries Transparency Initiative (EITI) for Albania.

Austria

Primary raw materials
Data collection
Data are currently collected on primary raw material resources and reserves in Austria. There is no obligation from the Mining Law to collect resoures and reserves data. Data are collected at the national and regional scale for construction, industrial and metallic minerals that are actively exploited. Mineral operators provide the data once through the initial permitting procedure. Although Mining Authorities monitor exploration activity, they are not under a statutory obligation to report resource and reserve data. Other types of data relevant to primary raw material resource evaluation (e.g. mineral resource maps, mineral occurrences databases, mine and quarry information etc.) do exist and are owned by the Geological Survey and the Federal Ministry of Science, Research and Economy. Legal regulations on the implementation of the federal law on mineral (Mining Law no. 38 1999, nr. 115, 2009 and a law on mineral exploration 'Vollzug des Lagerstättengesetzes', no. 246/1947) require the surveying of all mineral resources, but not the quantification of resources and reserves. The mechanism of data collection is through mapping and geological survey monitoring.
Data harmonisation and standardisation
Primary raw material resources and reserves data do not comply with an internationally recognised standard code. A national code is, however, partially used for reporting (ÖNORM G 1050). Although originally based on UNFC standards, the national reporting code is no longer aligned with internationally used standard codes. Attempts are not made to harmonise data received from different sources.

Data accessibility

The Geological Survey and Mining Authorities hold/own the data, which is accessed through central national databases, GIS and analogue archives. Metallic and industrial minerals data is partially available to the public through free web-based systems: 'IRIS' (Interactive Resource Information System - http://geomap.geolba.ac.at/IRIS/IRIS_main.cfm?Init=false) and 'BERGIS' (Mining Information System - http://www.bergis.at/). Both of these information systems are in German language. Sand and gravel maps are not available to the public although maps are available on specific request.

Data is organised at deposit level with the exception of aggregates data which is only accessible at the national / regional scale. The data is partially spatially referenced and is not yet INSPIRE compliant.

Users of IRIS are not monitored although specific requests from consultants and academia for EIA purposes occur. BERGIS is used by Authorities. Data is not available in multilingual formats.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=AT

The responsibility for waste management is split between federal and provincial governments. Legislation and execution concerning hazardous waste is a federal task. For other waste types the Federal Ministry of Agriculture, Forestry, Environment and Water Management is responsible only in cases where country-wide provisions are required. The federal government made use of this competence by issuing a number of ordinances for specific waste streams as well as waste treatment methods. Selected types of waste management facilities are governed by commercial law and not by waste legislation.

The main piece of waste legislation is the Act on waste management 2002, which sets the frame for waste management in Austria. More specific provisions, e.g. on certain waste streams or waste treatment methods, are dealt with in a number of waste ordinances which are based on the main waste act.

The Federal Ministry of Agriculture, Forestry, Environment and Water Management collect data from industry about end-of-life stocks and resources from urban mines. The federal waste management plan requires the collection of data on secondary mineral resources and waste.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. Ordinance on Landfilling, Law Gazette II No. 164/1996 amended 49/2004 Ordinance on limitation of leachate emissions from landfills, Gazette II No. 263/2003

Waste Flows Regulated by transposition of the Waste Framework Directive 2008/98/EC. This relates to the Federal Waste Management Act 2002, BGBl I No 2002/102 idF BGBl I 2009/115 (http://faolex.fao.org/cgi-bin/faolex.exe?rec_id=028661&database=faolex&search_type=link&table=result&lang=eng&format_name=@ERALL) and the nine Waste Management Acts of the provinces. Waste flows are reported on Eurostat at: http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/austria-country-paper-on-municipal
Mining wastes
Mining Authorities and the Geological Survey collect data from industry about mining waste. The federal mine waste ordinance requires the collection of data on secondary mineral resources and waste. Data for operating and closed mines can be found in the BergIS website http://www.bergis.at/ and in the website of Austrian Geological Survey http://www.geologie.ac.at/.
Marine minerals
Landlocked.
Overseas territories
Austria has no overseas territories or dependancies.
Additional information
Key challenges for Austrian data collection are perceived to be confidentiality, use of standards and the reliability of data.

Belgium

Primary raw materials
Data collection
Data are currently collected on primary construction raw material resources In Belgium. Data is not always collected on construction mineral reserves or on industrial or metallic mineral resources and reserves. It is the responsibility of a number of government departments: - Flemish region: The Natural Resources Service of the Flemish government (Department LNE – Environment, Nature and Energy department, direction ALBON). - Walloon region: The natural resources service of the Walloon government (Direction Générale Agriculture, Ressources Naturelles et Environnement - DGO3/SPW: Département des Permis et des Autorisations (DPA), Département de la Police et des Contrôles (DPC) - Belgian offshore: FOD Economie, K.M.O., Middenstand en Energie, Algemene Directie Kwaliteit en Veiligheid, FOD Economie, K.M.O., Middenstand en Energie, Algemene Directie Kwaliteit en Veiligheid, Dienst Continentaal Plat. LNE state that in the General Surface Mineral Resources Plan an estimation of the resources (before exploitation) is available. These General Surface Mineral Resources Plans are obligatory and made every 5 years. Data is not collected for reserves in a structured way although it should be possible to calculate the reserves because the needed data is available. Other types of data relevant to primary resource evaluation (such as mineral resource maps, mineral occurrences databases, mine and quarry information etc.) are available from collection agencies, producers federations, the Geological Survey and regional research institutes for sand and gravel, clay, limestone / dolomite, sandstone and aggregates. For sand and gravel and clay, data held by the Natural Resources Service of the Flemish Government includes: quarry information (maps, boreholes, GIS), the mandatory report of the annually mined minerals extraction companies, the total regional demand for primary raw materials, the total regional import and export of primary raw materials, mineral resource maps of the different near-surface mineral deposits, and in development currently is a 3D minerals model showing occurrence and quantity. Metallic ore maps and iron ore maps also exist under the responsibility of SPW – DG03 DGARNE – DEE – DRIGM. No national mining law exists. The management of mineral resources is the responsibility of the regions (except for the continental shelf). The Legal regulations which require the collection of data on primary construction raw material resources and reserves are: - Flemish region: Flemish Parliament Act on Surface Mineral Resources (forms the legislative framework of the Flemish Minerals Policy and defines the making of a general surface mineral resources plan and specific Surface Mineral Resource Summaries, applying to sand and clay in practice); VLAREM (the environmental regulatory process for any activities and /

or projects that have an impact on the environment, applying to sand and gravel and brick clay).

- Walloon region: décret 'Carrières' du 04 juillet 2002, par le décret du 11 mars 1999 relatif au permis d'environnement (et permis unique lorsque l'urbanisme est concerné), et par le Code wallon de l'aménagement du territoire, de l'urbanisme et du patrimoine (CWATUPE), applying to quarry products.

- Belgian offshore: Wet van 13 juni 1969 inzake de exploratie en de exploitatie van niet - levende rijkdommen van de territoriale zee en het continentaal plat, gewijzigd door de wetten van 20 januari 1999 en van 22 april 1999. These specify concessions, royalties and supervision for sand and gravel.

See http://economie.fgov.be/fr/entreprises/domaines_specifiques/Extraction_sable_gravier_mer which applies only to marine sand.

Data collection is undertaken through surveys, and construction mineral operators have a statutory obligation to report the data in annual reports 'voortgangsrapport'. A non-obligatory survey of the producers, traders and consumers of primary (surface) mineral resources and alternatives is undertaken. This does not concern resources or reserves, but calculates the total regional demand of primary raw materials and is necessary to justify new areas for exploitation of mineral resources (Used in the General Surface Mineral Resources Plan).

There are no legal regulations for industrial and metallic minerals. Regular bathymetric surveys of dredging areas are done by the Service Continental Shelf of the Federal Public Service Economy.

Exploration and mining companies are under a statutory obligation to report data on annual mined quantities to the departments responsible (as listed above) under the aforementioned legislation.

Resources and reserves are not reported directly to the authorities although can be deduced from these reports. SPW – DG03 – DPA monitors permits and mine concessions with regards to industrial and metallic minerals. Companies are under obligation to report resource and reserve data for "mine" substances in exploration permits and as part of an annual report only under 'AERW 26 juillet 1990 portant exécution du décret du Conseil régional wallon du 7 juillet 1988 sur les mines en ce qui concerne la procédure et les conditions d'octroi, de prorogation, de cession et de fusion des permis de recherche'.

Data harmonisation and standardisation

For sand and gravel, clay, limestone / dolomite, sandstone and aggregates, data and reporting on primary raw material resources and reserves do not comply with an internationally recognised standard code. Attempts are made to harmonise data received from different sources but not through a specific regional code. A reporting agreement does, however, exist between the monitoring department and industry.

A code is not used for reporting marine or industrial / metallic minerals.

Involvement in projects:

- H3O-project: In this project a harmonised cross-border (hydro)geological model of the Rhur valley Graben is determined (march 2012-march 2014-) which will contain harmonised lithological 3D-models of the subsurface.

- EuroGeoSource project.

Data accessibility

Data holders/owners in the Flemish region are the Natural Resources Service of the Flemish Government (LNE) for primary raw materials. The data is organised at a regional and individual site scale and is spatially referenced. Regional data are managed and stored in GIS shape-files in a locally stored GIS-database.

Geological maps are already available that are INSPIRE compliant and data concerning natural resources and mines will be made available through INSPIRE-compliant web services by the end of 2013.

In the Walloon region, data for construction minerals are being prepared for INSPIRE compliant webservices. Industrial minerals and metallic's data is stored as centralised "Thematics" of the Geological Map of Wallonia (database and GIS). Mines and maps (1802 – 1984) are centralised by SPW-DG03 DGARNE _DEE _DIGM (Cellule Sous-sol Géologie) whilst others are held at the Geological Survey of Belgium, State Archives of Belgium and private mining companies. The data is organised at a regional level (plans and maps are stored in the 3 mine districts) and is spatially referenced (Belgian Lambert 72/50 conical projection). Adaptations to make data INSPIRE compliant are on course, and new data will be compliant. Some data is available to the public, such as metallic and iron ore deposits, slag heaps and, in the near future, coal seams. The extent of mine concessions and ancient shafts are also available. Some have been made available as geoservices, free of charge, in 2013.

Public administrations, universities and private research departments request access to and use the data. In future, thematics of international interest will be made available in English, however, currently all data and information is in French. The Geological Survey of Belgium also holds mineral resource and reserve data for Belgium.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at:

http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=BE

The Federal government and the regions have a shared responsibility for environmental matters. Environmental and waste management has, for the most part, become a regional competence and falls under the responsibility of each of the three regions: Brussels Capital Region, Flanders and Walloon Region. The Federal Government has retained limited responsibility for specific environmental matters, including nuclear installations and nuclear waste, waste transit, product standards, import/export/transit of non-indigenous vegetal and animal species as well as activities in the North Sea. The waste management legislation is subject to the three regions but in principle follows similar lines in the three regions.

Regional governments offer actually a range of instruments to guide and steer waste management. These include licences, charges, acceptance obligations, covenants, grants, local controls, environmental policy agreements etc. For further details refer to the factsheet via the link above.

The Flemish Public Waste Agency (OVAM),DGARNE/DGO3, and Département du sol et des déchets (DSD) are the main organisations responsible for collecting data.

Landfill Stocks

Landfill legislation is specific to each of the regions: Brussels Capital, Flanders and Walloonia:

- Brussels Capital: Decree of the Government of the Region of Brussels-Capital on the landfill of waste, 18/04/2002 (MB 17.05.02);

- Flanders: Decision of the Flemish Government, the General and Sectoral provisions relating to Environmental, amended several times, and more specifically by a decision of the Flemish Government of 12:05:06 (BS 30.06.06); and

- Walloonia: Walloon Government (2003). Decree laying down the sectoral operating conditions of the technical landfills (Landfill Directive), 27.02.2003. Moniteur Belge 13.03.2003 Walloon Government (2004). Decree prohibiting the allocation of waste to landfills technical (landfill ban Regulation), 18.03.2004. Moniteur Belge 04.05.2004

Data on operating landfill sites is provided in terms of location, facility types, size and feed characterisation. No data is provided for closed landfill sites.

Data is collected annually from landfill sites at a regional scale and is available at: http://www.ovam.be/sites/default/files/20130930_Tarieven_Capaciteiten2012_1.pdf . Access to this data is not charged for and can be reproduced with permission. The data is only available in Dutch.

Waste Flows

Waste flows are reported under transposition of the Waste Framework Directive into law.

Data is provided for the quantity, type and treatment type of the waste, all of which is reported on an annual basis. Data is not provided on in-use metal/recyclate stocks.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

Mining wastes

Mines are regulated on a regional basis.

In **Wallonia**, no data is collected or published on waste at operating mines. However, data is collected on closed and abandoned facilities regarding location, type, size, waste characterisation, mineral sources and other data. It can be accessed by the public at http://geologie.wallonie.be/site/geoprod/soussol/exploitations/ssol_expl_dechets, but

deals only with those posing a serious threat to health and environment. Other information can be viewed via a GIS at http://carto1.wallonie.be/CIGALE/viewer.htm?APPNAME=SSOL, but only in French. The spatial data is managed by Service géologique de Wallonie, Service public de Wallonie, DGARNE, Avenue Prince de Liège 15, 5100 Jambes, cartegeologique@spw.wallonie.be, but it is not INSPIRE-compliant.

In Belgium, mine management differs from quarries management. Historically, the administration managed mines through mining laws. However, quarries were supervised until recently by environmental legislation. Ancient abandoned quarries are relevant to private property legislation.

Marine minerals

Marine granulates (aggregates, sand, gravel) from the North Sea are managed on a national basis by the Continental Shelf Service of the Federal Public Service Economy (Act of 13 June 1969 on the exploration and exploitation of resources of the territorial sea and the continental shelf, modified by the law of January 20, 1999 and April 22, 1999). More information on the legislation and limits of extraction zones is available at: http://economie.fgov.be/fr/entreprises/domaines_specifiques/Extraction_sable_gravier_mer/

This includes spatial-defined data which is INSPIRE-compliant and publicly accessible though mainly in Dutch and French. Assessment of the resource is conducted by regular bathymetric survey by the agency as companies are not obliged to assess or report resources or reserves. The data is not reported to a recognised code.

Overseas territories

Belgium has no overseas territories or dependencies.

Additional information

Further information on the organisation of waste services can be found in the information sheet at https://circabc.europa.eu/sd/a/ce5dc6b9-0036-4920-b493-8e058fb77a92/Belgium_QR_2010.pdf

Bosnia & Herzegovina

Primary raw materials
Data collection
All mineral resources fall under the law on geological research which regulates: how to carry out research of mineral resources; who can explore for mineral resources; necessary documents, obligations and rights of the Geological Survey (for example-cadastre of mineral resources); obligations of all private companies to deliver data to the Geological Survey, etc. Data are collected by obligatory survey, geological survey monitoring and company reporting. Responsibility for the collection on primary raw material resources and reserves is delegated by the Ministry of Energy, Mining and Industry to the Geological Survey of Federation of Bosnia and Herzegovina. Data for all minerals is collected annually at the regional, local, individual deposit scale. It does not include data on raw materials in the offshore / marine environment. Other types of data available are: the depth of wells, data on reserves and quality of mineral resources, how much money is invested in research, who performed the work, number and date of the licence for exploration and exploitation, maps of potential for mineral resources exploration and annual production. The Geological Survey and Ministry of Energy, Mining and Tourism are responsible for / own this data, which is available for all minerals. The Ministry of Energy, Mining and Industry and the Geological Survey monitors mineral exploration activity. Exploration and mining companies are under a statutory obligation to report resource and reserve data for all mineral resources under the Law on geological research, The Mining Law and the Law on Concessions. According to law, mineral resources are: - deposits of fossil fuel resources - metal deposits, - non-metallic deposits (industrial minerals and construction materials). Data is collected annually in a report that contains maps and tables. All types of works must be reported and a research report must be delivered to the Ministry.
Data harmonisation and standardisation
A national code is used for reporting data for all raw materials, and must be presented according to Bosnian Law. According to law, the reserves of mineral resources are classified by categories and the economy: - the proved reserves are classified in categories A reserves, reserves of category B and C1 category reserves,

- potential reserves are classified in category C2, D1 and D2 Economics (balance) reserves are those that can be used economically.

Data submitted to EUROSTAT complies with 2150/2002/EC.

Data accessibility

The Government, Ministry and Geological Survey are the data holders /owners.

Data are stored in a central information centre located in the Geological Survey. They are organised at a regional, local and deposit level and are spatially referenced. Data are not available to the public, although requests for information can be sent to the Ministry of Energy, Mining and Industry and the Government. These requests come from private companies, especially for metal deposits, gold and silver. Data and information are not available in multilingual formats.

The Geological Survey is participating in the drafting of laws that govern data reporting.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=BA

Under the Constitution, Bosnia and Herzegovina was organised as a state composed of two entities: the Federation of Bosnia and Herzegovina and the Republika Srpska. In the Federation, in addition to the federal government level, there are ten counties / cantons and municipalities and cities as units of local government.

The ministries responsible for dealing with environmental protection are the Federal Ministry of Environment and Tourism (FMOiT) and the Ministry of Physical Planning, Construction and Environment of the Republika Srpska (MPUGiERS). Environmental issues in the territory of Brčko District (BD), a third administrative unit in Bosnia, are the responsibility of the relevant departments of the Government of Brčko District.

Key bodies involved in policy and implementation are: responsibility for waste :

- Federal Ministry of Urban Planning and Environmental Protection with responsibility for waste management planning, legislation and policy;

- Federal Ministry of Energy, Mining and Industry with responsibility for industrial waste management;

National data on wastes and landfill is collated by the Department of transport, Environment, and Energy Statistics http://www.bhas.ba

Landfill Stocks

Landfill practice is governed primarily by the Law on Waste Management (Official Gazette of the FBiH, no. 33/03, 72/09) and the Law on Waste Management (Official Gazette of

Republika Srpska, no. 53/02), supplemented by Rules on Special Control Regime of Activities that Endanger or May Endanger the Environment (Official Gazette of SR BiH no. 2/76 and 23/76). Amendments to the law are given in Official Gazette of SR BiH 23/82 and 26/88. Information on facility location and volume and some information on content (hazardous/inert nature, D code) is collected. Information on landfill at a national, regional and site level is public and available at http://www.bhas.ba/saopstenja/2013/KOM_2012_001_01_bos.pdf, for the latest year. *Waste Flows* Waste flows are also regulated under the Laws on Waste Management. Periodic information on waste quantity, waste type, EWC/LoW code and NACE code are collated. There is no information on recyclate stocks. Data is available to the public but only at national and regional level via the bulletin link above in Bosnian and English. There are no confidentiality issues in accessing this data.
Mining wastes
No data on mine wastes could be located. However, we deduce that the responsible authority is the Federal Ministry of Energy, Mining and Industry, which has responsibility for industrial waste management
Marine minerals
Virtually landlocked.
Overseas territories
Bosnia and Herzegovina has no overseas territories or dependencies.
Additional information
None.

Bulgaria

Primary raw materials
Data collection
Collection of data on primary raw material resources and reserves and monitoring of exploration activity is the responsibility of the National Geological Survey (Natural Resources and Concessions Directorate, Ministry of Economy, Energy and Tourism). National legislation requires the collection of resource and reserve data. The relevant legislation is: 1) The 'Law For The Underground Natural Resources (Prom. SG. 23/12 Mar 1999, amend. SG. 28/4 Apr 2000, amend. SG.108/14 Dec 2001, amend. SG. 47/10 May 2002, amend. SG. 86/30 Sep 2003, amend. SG. 28/1 Apr 2005'; 2) 'Regulation for the Compilation and Keeping of the National Balance and the Reserves and Resources, Register of the Discoveries and Specialised Cadastre and Register of the Deposits of the Underground Resources'; 3) 'Regulation for the register and cadastre of permits for prospecting and/or exploration'; 4) 'Regulation for the National Geological fund'; 5) 'Regulation for the geological and technical documentation of exploration and mining and extraction sites'; and 6) 'Tariff for the charges that are collected in the system of the Ministry of Economy, Energy and Tourism'. The 'Law For The Underground Natural Resources' is the main act. This law states the conditions for prospecting, exploration and extraction of underground resources in Bulgaria, including the continental shelf and exclusive economical zone. The law applies to all non-energy minerals (metallic, industrial, construction), energy minerals and to secondary raw materials (mining waste). The law means that exploration and mining companies are under a statutory obligation to report resource and reserve data. Data collection is via a combination of survey, which mineral operators have a statutory obligation to fulfil and geological survey monitoring and company reporting. Companies are obliged to fulfil this obligation annually and/or as specified in the licence terms, or as new data becomes available and when they relinquish a permit. Data is received in the form of reports, tables and maps. Companies also have an obligation to provide geological mapping, drill hole logs and drill core to the Ministry. Other data available for Bulgaria which is relevant to primary raw material resource evaluation includes mineral resource maps and mineral occurrence databases.
Data harmonisation and standardisation
Data providers must report their data using the national code (no details provided, but it is aligned with UNFC). It is indicated that data received from various sources is harmonised.
Data accessibility
Generally the data holder/owner is the Ministry of Economy, Energy and Tourism, but for the period of validity of the permits for prospecting and exploring the data is the property of (and presumably only available to) the Ministry and the holder of the permit or concession owner. Resource and reserve data is available for most construction minerals and selected industrial minerals, with resource and/or reserve data available for some metals e.g. bauxite, chromium, copper, gold, tungsten etc. The 'National Balance of the Reserves And Resources' is stored as a national MS Access database. The 'Register of the Discoveries' is stored as MS Excel workbooks. The 'Cadastre and Register of the Deposits of

the Underground Resources' is in ArcView and the 'Register' is a national database in MS Access. The data is spatially referenced and partially INSPIRE compliant. Data is available to the public (with the exceptions stated above). Data can be accessed by specific request and it is charged for. Selected information (e.g. introductory information on the Ministry websites) is available in English or Russian in addition to Bulgarian. Legal documentation relating to mineral resources in Bulgaria is available online in English e.g. http://www.geology.bas.bg/admin/LUNR_en.pdf. Bulgaria has a 'Geofund' which contains thousands of geological reports covering all geological activities in the country, including exploration for mineral deposits and geochemical data. This appears to be an online GIS (it was not possible to access this online), with relevant datasets including the map of 'Mineral Deposits of Bulgaria, 1:100000' (an unpublished map series consisting of point data, representing the location of mineral deposits, occurrences and indications); 'Exploration Drill holes and Mining Workings'; the 'National Balance of Reserves and Resources' (consisting of reserves and resources of all metallic, industrial and energy mineral deposits); the 'Metallogenic Map of Bulgaria 1:1000000'; the 'Map of Delimited Areas of Gold Deposits'; the 'Map of Uranium Mineralisation in Bulgaria' and the 'Specialised Cadastre of Deposits and Register of Discoveries' (contains maps of mineral deposits and information about the discovery of underground resources resulting from geological research).

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at

http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=BG

The Ministry of Environment and Water (MOEW) is responsible for the development and implementation and drafting of the national waste management policy as well as regulation of the activities in the public and private sectors. The MOEW performs some of the activities by the Executive Environmental Agency (EEA) and a network of 16 Regional Inspectorates of Environment and Water (RIEW) that are specialised control bodies of the Ministry and control the implementation of the waste management activities on their territories. Inspectorates ensure that the 58 waste management regions, set by the National Waste Management Program (2009- 2013) under their supervision comply with environmental standards.

Landfill Stocks

Landfill and waste legislation is a transposition of the Waste framework Directives and Landfill Directives. The Waste Management Act, State Gazette No. 53 of 13.07.2012, effective13.07.2012, can be found at http://www.moew.government.bg/files/file/Waste/Legislation/Zakoni/English_versions/Waste_Management_Act.pdf

Waste Flows

The Waste Management Act, State Gazette No. 53 of 13.07.2012, effective 13.07.2012, is a transposition of the Waste Framework Directive 2008/98/EC and can be found at http://www.moew.government.bg/files/file/Waste/Legislation/Zakoni/English_versions/Waste_Management_Act.pdf Bulgarian National Waste Management Programme 2009-2013 (NWMP 2009-2013), 2009 at http://www3.moew.government.bg/files/file/Waste/Legislation/Zakoni/ZUO.pdf However, waste collection and treatment is organised at a local level and lists of sites and facilities must be available, though not necessarily public. Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/bulgaria-municipal-waste-management
Mining wastes
Information on wastes from operating and closed mines is handled nationally by the Ministry of Economy & Energy http://www.mee.government.bg/ but the data is not made freely public or INSPIRE-compliant, though it can be purchased. Closed and abandoned facilities are characterised in terms of location, type of facility, size, waste characterisation, waste source and other down to facility level. The treatment of mining wastes is dealt with according to the Subsurface Resources Act. It transposes the requirements for the Mining Waste Directive into law via SG No. 70/2008 available at http://www.mi.government.bg/library/index/download/lang/en/fileId/321 Information on operating mines is also collected with the same characteristics together with total waste and annual waste, but is not public for the duration of the mining concession.
Marine minerals
Not available.
Overseas territories
Bulgaria has no overseas territories or dependencies.
Additional information
None.

Croatia

Primary raw materials
Data collection
Data is currently collected on primary raw material resources and reserves in Croatia. It is principally the responsibility of the Mining Directorate of the Ministry of Economy. Collection of data is devolved to the Croatian Geological Survey. Legal regulations (the Mining Law 2009 and the Mineral Resource Management Strategy of Croatia) in Croatia cover provision of data on primary raw materials resources and reserves. In accordance with the Mining Act 2009, as overseen by the Department of the Mining Inspectorate owners of mineral concessions are obliged to submit data and documents on mineral raw materials reserves (including quality, production data and volumes sold, amount in stockpiles and waste produced) to the commission for determination of mineral raw material reserves. Data received takes the form of reports, tables and maps and must be submitted annually. The law applies to a range of metallic, industrial and construction minerals and also covers waste ('tailings') dumps and processing wastes ('melting slags').
Data harmonisation and standardisation
Under 'mineral raw material reserves' the Mining Law specifies that raw material reserves shall be classified in classes and categories 'pursuant to the regulations on the unified method of establishing, recording and collecting the data on mineral raw material reserves and a balance of these reserves'. Companies must report their data using a national code.
Data accessibility
In Croatia a range of Acts including the 'Mining Act' regulate activities related to exploration and exploitation of mineral raw materials, including provision of information on raw material reserves. Data on minerals in Croatia can be obtained both on the internet and through direct requests to the responsible bodies. The most comprehensive data can be obtained from the Ministry of the Economy (the Mining Directorate) which holds all data on resource and reserves. The Directorate holds all reports, geographical and geological data for all areas of exploitation. It also has statistical data related to both production and reserves on an annual basis for all counties in Croatia. The 'Economy directorates' at the county level can also provide statistical data on aggregates. A centralised data base (Excel tables) and GIS with the locations and types of commodities but without reserves information is maintained by the Ministry of Economy (Directorate for Mining). This data is not generally available to the public or accessible through the internet, but is available free of charge for groups of commodities on request. The Croatian Environment Agency maintains a web page within its environmental database containing information on the location mineral resources, mineral commodities as well as the size of the 'exploitation fields' and other basic data (e.g. company name) (http://rudarstvo.azo.hr/viewer.htm). The Croatian Geological Survey maintains a geological database and a GIS (ArcMap) of all existing and past mining activities in Croatia (approximately 4000 mining sites). The database is updated with data from the Ministry of Economy, Labor and Entrepreneurship, and the Mining Directorate. The GIS contains a

mineral resource database containing all available data on the mining sites and their history and mineral potential resource maps at a scale of 1:100000. This data is used for developing management plans for mineral resources at the county level and for spatial planning. The data from the Croatian Geological Survey is not available on the internet and the GIS is not INSPIRE compliant, but INSPIRE compliancy is expected to be achieved between 2013-2015. The Mining Directorate of the Ministry of Economy owns the data on Croatian mineral resources and reserves, but the Geological Survey has access to it as it is authorised by the Mining Act. Data received on reserves and production from producing companies appears to be confidential for 5 years. Data is not available in multilingual formats.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at

http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=HR

The Ministry of Environmental Protection, Physical Planning and Construction is a central body responsible for preparation of waste management legislation, national waste management strategy and waste management plan, as well as coordination of co-operation among all involved institutions in waste management in Croatia. Regional self-government units adopt county waste management plans, issue permits for non-hazardous and inert waste landfills, ensure conditions and implementation of measures for managing different waste streams, issue permits for municipal and non-hazardous waste management, and collect data on waste. Municipalities and cities adopt their waste management plans, implement measures of municipal waste management, and with coordination from the county, ensure the implementation of prescribed measures for separate waste collection.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. Ordinance on the methods and conditions for the landfill of waste, categories and operational requirements for waste landfills, (Official Gazette No. 117/07). This can be found here: http://www.mzoip.hr/

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. This relates to the Croatian national, Waste Act (Official Gazette No.178/04, 111/06, 60/08, 87/09. This is a framework act regulating and setting the legal framework in the waste management sector.

The Croatian Environment Agency (CEA) is a public institution responsible for the collection and consolidation of waste data, developing and maintaining the Waste Management Information System, enabling and facilitating access to information on

waste to decision-makers and general public, developing reports on the status of the waste sector. Croatian waste data can be found at http://www.azo.hr/Waste. This data is organised according to a set of 31 national waste indicators which are used to help monitor objectives. There are reports and databases on waste management permits, concessionaries, transporters mediators and exporters. It is not possible to access all of the databases listed Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data
Mining wastes
Not available. The ministry responsible for permitting mines is the Croatian Ministry of the Economy. The agency responsible for recording mine wastes is the Croatian Environmental Agency.
Marine minerals
Not available.
Overseas territories
Croatia has no overseas territories or dependencies.
Additional information
Key challenge: Development of a unified minerals GIS and INSPIRE compliant data base linked with the Croatian Bureau of Statistics for revenues and provision of a web based reporting system as currently exists which for fishing and forest management.

Cyprus

Primary raw materials
Data collection
Data relating to all types of primary minerals are currently collected by the Geological Survey Department and Mines Service of the Ministry of Agriculture, Natural Resources and Environment. These data are generally collected, processed and held at a local scale but only made available on a regional or national scale. There is a statutory obligation for operating companies to report annually to the Mines Service under the "Mines and Quarries Regulation Law nr. 5 1965 (as amended by nr. 88 1995; nr. 132 2001; nr. 63 2003)". This reporting is in the form of a report which includes

both tables and maps. Statistical data on resources and reserves of construction and industrial minerals are reported in either cubic metres and/or tonnes, whilst metallic minerals data are reported in tonnes.

Two basic licences are required for the exploitation of mineral resources. The Town Planning Permit from the Department of Town Planning and Housing based on their Town Planning and Housing law, and a quarry licence that is obtained from the Mine Service. Additional legislation and permits are involved in the licensing process, such as environmental impact assessments, air pollution legislation, mine waste legislation and others.

The Geological Survey Department also holds a Mineral Resource Map of Cyprus at 1:250,000 scale, published in 2007.

Data harmonisation and standardisation

Data do not comply with internationally recognised reporting codes such as JORC, PERC or NI 43-101. Instead they have to comply with a system of codes defined by Cyprus' Mines and Quarries Regulation Law.

Data accessibility

The data are held by the Geological Survey Department and Mines Service and are stored in a national geodatabase within a GIS and are spatially referenced. This is quoted as being INSPIRE compliant.

Data are not available to the public, but can be accessed via specific data requests and are chargeable. This is stated as being the key challenge. Reasons for data not being available to the public are varied. In some cases the data are owned by a private company and can only be made available if the company's consent is given. For data compiled by the Geological Survey it will depend on the importance of the specific mineral and/or resource. Therefore confidentiality is not affected by the level of data aggregation, but by data ownership. For metallic minerals data are confidential on deposit level.

The questionnaire states: "Information on the available reserves are kept by Geological Survey Department and are available to the members of the Sustainable Development of Mineral Resources Committee whenever is necessary. The committee is consisted of the following members: Geological Survey Department (President), Ministry of Agriculture, Natural Resources and Environment, Ministry of Interior, Planning Bureau, Town and Housing Department, Forest Department, Department of Environment and Mines Service."

Data are not available in multilingual formats.

Landfill stocks/waste flows

Legislative and Organisational Overview

The Ministry of Interior are responsible for collating landfill data. The relevant waste flow reporting regulation in Cyprus is *Waste Law N.185 (I)/2011, the Packaging and Packaging Waste Law 2002-2006.*

Landfill Stocks

Cyprus Solid and Hazardous Waste Law (Landfills) Regulations (2003): Transposition of the Landfill Directive in http://www.moa.gov.cy/moa/environment/environment.nsf/All/E572B137DE38BAB7C22579410044AD0E/$file/KDP562-2003.pdf.

Cyprus Solid and Hazardous Waste Law (Landfills) (Modified) Regulations (2007): Includes minor modifications to the 2003 regulations in http://www.moa.gov.cy/moa/environment/environment.nsf/All/1942A3B06C1B54ACC22579410044CD6F/$file/KDP618-2007.pdf)

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. This takes the form of a number of national laws:

- Cyprus Packaging and Waste Packaging Law (2002) at http://www.moa.gov.cy/moa/environment/environment.nsf/All/173E4D8BEAF05198C22578D30039FEC7/$file/N32(I)-2002.pdf

- Cyprus Solid and hazardous waste law (2002) at http://www.moa.gov.cy/moa/environment/environment.nsf/All/CCC7AAFE676A6D36C22578D30039DA65/$file/N215(I)-2002.pdf

- Cyprus Waste Law (2011) at (http://www.moa.gov.cy/moa/environment/environment.nsf/All/67A3FE2E88259E5EC225798100303816/$file/N185(I)-2011.pdf)

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/cyprus-municipal-waste-management

Mining wastes

The Mine Service of the Ministry of Agriculture, Natural Resources and Environment are responsible for collating data on mine waste. The agency responsible for the collection of mine waste data is the Mine Service of the Ministry of Agriculture, Natural Resources and Environment and the relevant legislative framework is the *Waste Management of the Extractive Industry Law (N.82 (I)/ 2009).*Further information on mine waste including an inventory of waste from the extractive industry can be located in the following web page: http://www.moa.gov.cy/moa/environment/environment.nsf/All/0C9D80A2596AE1A4C225796D00366BCF?OpenDocument

Marine minerals

Data for offshore/marine materials are not collected.
Overseas territories
Cyprus has no overseas territories or dependencies.
Additional information
None.

Czech Republic

Primary raw materials
Data collection
The Czech Geological Survey (CGS) is authorised by the Ministry of the Environment and the Ministry of Industry and Trade to collect data on primary raw materials resources and reserves on an annual basis, via a questionnaire survey, which mineral operators, exploration companies and owners of mineral rights have a statutory obligation to fulfil. Data is collected on a diverse range of minerals, including some 'critical raw materials', for the whole country. A number of legal regulations (Acts) in the Czech Republic are relevant to the provision of data on primary raw materials resources and reserves. They cover the collection, storage, processing, assessment and provision of geological documentation and the results of geological surveys; and management of an inventory of reserves and 'prognostic mineral resources', for all minerals. In accordance with an Act 'on the protection and use of mineral resources (Mining Act nr. 44 1988)', the Ministry of the Environment maintains an 'Inventory of Reserves of Non-Reserved Mineral Deposits of the Czech Republic' and the 'Register of Mineral Deposit Reserves' of the Czech Republic. The tables of the 'Register' include general data on the amounts of 'geological reserves' in individual 'reserved deposits' (reserved = owned by the State) and on the reserves of individual minerals. For selected minerals, the 'Register' also lists the quality characteristics of the reserves of reserved deposits and of extracted minerals for the previous year. An 'Inventory of Reserves of Non-Reserved Mineral Deposits of the Czech Republic' (non-reserved = owned by landowners in fact) based on an Act "on geological work" (Geological Act) is also compiled annually It includes non-reserved deposits of non-reserved minerals (primarily construction minerals).
Data harmonisation and standardisation
CGS receives data from mineral operators, exploration companies and owners of mineral rights in a variety of forms, but tables are always present. A comprehensive review of the history of reserve and resource classifications in the Czech Republic is published on the CGS website. The mineral reserves and resource classification system in the Czech Republic can trace it origins back to the classification system of the USSR, but has undergone a number of revisions since 1948. The Ministry of the Environment in its 'Mineral Commodity

Summaries' provides a comparison between the Czech, UNFC and CRIRSCO system. The Czech classification system is reasonably well aligned with internationally recognised standard codes, as all categories in the Czech system, with the exception of 'prognostic resources' can be mapped to a CRIRSCO category and 'prognostic resources' are comparable to the 'Reconnaissance Mineral Resource' category of the UNFC system. The most significant difference – in terminology only - is that 'reserves' in the Czech classification system include 'potentially economic reserves' (i.e. 'currently unexploitable due to being unsuitable for existing technical and economic conditions of exploitation, yet assumed to be exploitable in the future'). All mineral resource and reserve data available for the Czech Republic is harmonised at its source level i.e. when data is reported to CGS it should comply with the Czech classification system (i.e. the national code). The mineral reserves listed in the 'Register of Mineral Deposit Reserves of the Czech Republic ' are 'geological reserves', i.e. reserves present in their original state in the deposit (without considering mining losses and dilution) and calculated according to the reserves classification and exploitation conditions valid at the time the reserves were approved. Reserve calculations are currently approved by the 'Commission for Projects and Final Reposts (KPZ)' of the Ministry of the Environment. The Register lists the years in which deposits were evaluated and in which reserve calculations were approved or verified. Changes in geological reserves are documented and reported by relevant companies. The data reported by companies is verified by the Ministry of the Environment in collaboration with the Czech Mining Authority (ČBÚ) and the Ministry of Industry and Trade (MPO) as to their completeness, reliability and relevance to previous reports.

Data accessibility

In the Czech Republic the CGS owns/holds the data on national mineral resources and reserves, on behalf of the Ministry of the Environment. Data is stored in a national centralised database and GIS system, therefore the data is spatially referenced. It is not INSPIRE compliant. The 'Register of Mineral Deposit Reserves' of the Czech Republic and the 'Inventory of Reserves of Non-Reserved Mineral Deposits' of the Czech Republic are intended solely for use by a limited number of state authorities. The publication (yearbook) 'Mineral Commodity Summaries of the Czech Republic' has been published annually for professionals and the lay public since 1993. It is described as containing 'basic information' on the state of and changes in 'mineral reserves' of the country as presented in the 'Register of Mineral Deposit Reserves'. A table showing trends of reserves of minerals for five years is included for 'metallic ores', 'industrial minerals' and 'construction minerals' and 'prognostic resources'. The publication additionally provides perspectives on the mineral potential of the country, including 'prognostic resources' (unverified and based upon geological assumptions). In summary it contains key, selected data from the 'Register of Mineral Deposit Reserves' and other information including areal distribution of resources. Evidence of 'non-reserved' minerals (construction minerals owned by landowners and which constitute part of the land) is not publically available. Data for individual both reserved and non-reserved deposits are not publically available to protect commercial confidentiality. In conclusion selected data is available to the public and this can be accessed as printed documents 'Mineral Commodity Summaries of the Czech Republic' produced by the Czech Geological Survey, but is primarily distributed in an electronic format via their website since the first edition in 1993 (http://www.geology.cz/extranet-eng/publications/online/mineral-commodity-summaries). Data is available online and is free for download, but printed publications and CDs of data are charged for. The 'Mineral Commodity Summaries of the Czech Republic' are published

in English (together with its Czech version "Surovinové zdroje České republiky – nerostné suroviny"). Since 2009 the 'Mineral Commodity Summaries of the Czech Republic' has included resource and reserve data for minerals which do not have a history of production in the Czech Republic. These include some 'critical raw materials' e.g. rare earth elements, selenium, tellurium, tantalum, niobium etc.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=CZ

The competent authority responsible for the waste management on national level is the Ministry of Environment (MoE),Waste Management Department. The MoE provides for the implementation of EU provisions in national legislation and elaborates the national waste management plan (WMP - http://www.mzp.cz/en/waste). Further there are competent authorities at the level of the 13 regions and the city of Prague. Each region draws up a regional WMP, which has to be compliant with the national WMP. Further the regional authorities are responsible for permitting recovery and disposal operations and for registration of establishments and undertakings. Monitoring, controls and inspections are within the responsibility of the Czech Environmental Inspectorates (CEI) with its 10 local inspection offices. Since 2006, practical implementation lies in the responsibility of the 6,251 municipalities and communal environmental offices/inspectorates.

The 10 local inspection offices are performing inspection and controls (field activities) and are able to impose fines and stipulate remedy measures for all provisions based in Waste Act. However the regional and the sub-regional authorities (from the municipalities in total 206 with extended responsibility) can also perform inspection and controls. Further there exists Council of Waste Management as one of the advisory board to the Minister, including the Czech Republic Waste Management Board, the counties, leading experts from all government departments as well as the non-governmental sector (universities, professional association, NGOs).

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. This is achieved through: Act No. 106/2005 Coll., amending Act No. 185/2001 Coll., on waste and amending some other laws. Decree of the Ministry of Environment of the Czech Republic No. 294/2005 Coll., on the conditions of landfilling of waste and use of waste on surface and below the surface and amendment of Decree No. 383/2001 Coll., on details of waste management.

Information on landfill data and waste is collected in the Czech Republic by the Czech Statistical Office (CZSO) (a central body of the state administration of the Czech Republic). CZSO collects data in accordance with the Regulation 2150/2002 of the EP and of the Council on Waste Statistics, CENIA collects data for inspection purposes only.

Since 2011 the CZSO has collected data on secondary raw materials (including precious metals, ferrous metals (inc. steel), copper and copper alloys (brass, bronze), nickel, aluminium, lead, zinc, non-ferrous metals, construction materials) and waste via an annual

questionnaire (statistical survey on 'Generation, Recovery and Disposal of Waste from industry, municipalities and public administration'), targeting selected 'enterprises (about 1700) and municipalities (about 1000)'. The annual questionnaire survey covers: volumes of waste generated, transfers between companies and waste taken from stockpiles or imported from abroad, the use of the waste and its disposal, and the amount of generation of secondary raw materials.

The Czech Environmental National Information Agency (CENIA) also collects data on waste via an annual 'electronic' questionnaire for the Ministry of the Environment and manages the national 'Information System of Waste Management' established in 2002. CENIA publishes an annual report on state of the environment in the Czech Republic and a statistical yearbook of the Czech Republic environment, which are also both publically available. CENIA acts as the INSPIRE Member State contact point for the country.

With regard to landfill, the following information is collected: Location, Type of facility, Size, and number of operating facilities. There is no data on closed landfills.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. This act lays down essential rules for waste management: Act No. 185/2001 Coll., on waste and amendments to other pertinent laws, as amended. For a full list of Acts on waste and amending some other laws see the link above.

With regard to waste arisings, the following information is collected: Waste quantity, Waste type, Waste treatment (D &R code), Waste characterisation (EWC) and Economic Activity (NACE code) annually. Publications, web data and reports are published under Regulation No 2150/2002 aligned to EWC code and stored at the NUTS2 level on an INSPIRE-compliant database. Some unspecified data is available on recyclates.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

Example publications: http://www.czso.cz/csu/2013edicniplan.nsf/p/2001-13) or at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/waste_generation_management is publicly and freely available but only at the national level. Other data can be supplied on payment with no confidentiality restraints. The publications are also in English.

A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/czech-republic-municipal-waste-management

Mining wastes

Information on closed and abandoned mines and A-waste facilities is published by Czech Geological Survey (CGS) on behalf of the Ministry of the Environment. Various regulations apply to mining including: Act on the management of extractive waste and amending certain acts Act 157/2009 Coll.

Decree of the ČBÚ No. 15/1995 Coll., on the licensing of mining operations and operations employing mining methods as well as on the development of sites and installations, which

constitute these operations, in the wording of the Decree No. 298/2005 Coll. and the Decree No. 380/2012 Coll. decree of the MŽP ČR No. 363/1992 Coll., on the survey and registry of old mine workings in the wording of the Decree of the MŽP No. 368/2004 Coll. Decree of the ČBÚ No. 435/1992 Coll., on mine surveying documentation during mining and during some operations employing mining methods in the wording of the Decree of the ČBÚ No. 158/1997 Coll. and the Decree No. 298/2005 Coll. and the Decree No. 382/2012 Coll. Publications in support of MWD submissions are available at http://www.geology.cz/extranet-eng/sgs/mining-waste/inventory-hazardous-waste-facilities and http://www.geology.cz/extranet-eng/sgs/mine-workings/abandoned-mine-lands Operating mines are permitted, regulated and reported via the Czech Mining Authority, Ministry of Industry and Trade and the Ministry of the Environment. Status of data is unknown.
Marine
Landlocked.
Overseas territories
Czech Republic has no overseas territories or dependencies.
Additional information
None.

Denmark *

Primary raw materials
Data collection
In Denmark, non-energy mineral resources are composed mainly of industrial and construction minerals, such as chalk, diatomaceous earth, limestone, clay and sand and gravel. There are no known economically exploitable reserves of metallic ores. The Geological Survey of Denmark and Greenland (GEUS) is the Denmark national geological centre and according to the Geological Survey of Denmark and Greenland Act (no. 536 of 6 June 2007) is required to collect data e.g. pursuant to the Act on Raw Materials, the Act on Danish subsoil (No. 889 of 200), and others. The majority of the work undertaken by GEUS on mineral resource assessment is focused on Greenland rather than Denmark. Information on Greenland has been provided in a separate country summary.
Data harmonisation and standardisation
No information available.
Data accessibility
GEUS maintains extensive archives and databanks. The main GEUS programmes and databases are as follows (http://www.geus.dk/geuspage-uk.htm): - National well database (Jupiter): Nationwide database of geological and hydrogeological information from over 240,000 wells. - National geophysical database (GERDA): Nationwide geophysical database for environmental and resource area with information about the geophysical methods, exchange formats and options for data download. - Oil & Gas Database: Data from deep appraisal and exploration wells in Denmark. - Digital soil maps 1:200.000: - Maps of Denmark: A collection of GEUS' main maps of the Danish area. The above databases are used by many public agencies and private organisations in Denmark and abroad who need consolidated, quality checked, and instantly available data to establish the best possible and most reliable background for decision making in the field of geology.
Landfill stocks/waste flows
Legislative and Organisational Overview In Denmark the Ministry of the Environment is the government agency in charge of the overall policies and administrative matters relating to the environment. The

Environmental Protection Agency (EPA) operates under the Ministry and is responsible for the operation, monitoring and control of waste management. EPA sets out the overall framework for waste management. http://eng.mst.dk/

The Resources Strategy for Waste Management sets targets to ensure a move towards reuse and recycling. Waste management in Demark is governed by the Environmental Protection Act and specific waste management laws including:

- The Statutory Order No. 48 on Waste of 13 January 2010: sets the framework for waste incineration, environmental and efficiency report on incineration plant, and regulatory duty of municipalities

- The Statutory Order No. 1451 on Waste Incineration Plants of 20 December 2012

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. The following orders relate to the landfill directive:

- Order No. 719 of 24/06/2011

- Executive Order No. 1049 of 28.08.2013

In Denmark only a small amount of waste ends up in landfill, whilst incineration remains the principal waste management option.

Waste statistics can also be obtained by the Danish Environmental Protection Agency through the New Waste Data System.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. Waste management is regulated by Chapter 5 of the Environmental Protection Act and the Executive Order on Waste. The first national Waste Plan was developed in 1992, covering the period 1993-97. It included targets for all waste concerning recycling, incineration and landfilling (Fischer et al., 2012). Since then two plans covering the period 1998-2004 and 2005-2008 were developed and implemented. The current plan, the 'Danish Waste Plan 2009-2012', is the fourth national waste plan.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/denmark-municipal-waste-management

Mining wastes

The Danish Nature Agency is the relevant competent authority that monitors mine waste. The Executive Order No. 1150 of 28.11.2012 comprises the national mine waste legislation. There are currently no closed and abandoned mining waste facilities in Denmark as defined by the Mining Waste Directive.
Marine minerals
Raw materials in the seabed are also in focus. The Danish Nature Agency and the Danish Coastal Authority are responsible for monitoring exploration and extraction activities for marine minerals (sand and gravel, rubble) in Denmark. The Danish Nature Agency collects and publishes data on marine mineral resources. Companies that hold dredging licences are obliged to map and quantify the resources and reserves of marine minerals in the licensed area. There are however 84 areas with limited resources, where dredging companies can operate without a permit. Other information on marine minerals is also available. GEUS has been working to map seabed landscapes and sediments, in Danish coastal waters as well as in the North Sea. In Denmark, sea-floor sediments and mineral resources in the inner Danish waters have been mapped at a scale of 1:100.000. In 2011, GEUS completed a major survey of the North Sea on behalf of the Danish Nature Agency. Activities in the North Sea and the coastal waters included a survey of mineral resources and habitats on the seabed. In 2011, GEUS also launched its new national database for marine geological metadata (marine shallow geophysics – MARTA). This database contains all shallow seismic data acquired in Danish waters, i.e. data which are to be reported to GEUS pursuant to the Mineral Resources Act. In 2012, the Danish Nature Agency carried out marine geological surveys in three large areas of the North Sea, totalling 6,300 km2, to establish a basis for invitation to tenders for exploration and extraction of raw materials. Also statistical data on marine sand and gravel, and rubble production are produced from the Danish Nature Agency and yearly reports are available from the Statistics Office in Denmark.
Overseas territories
Information on Greenland is provided in a separate country summary. The Faroe Islands has no known mineral resources.
Additional information
None.

*Due to the absence of a survey response on primary raw materials, a desk-based review was undertaken to synthesise the above summary. Certain information (e.g. on marine minerals) is from a survey response.

Estonia

Primary raw materials
Data collection
Data are collected by the Ministry of the Environment and preserved in the Estonian Land Board. The data collection is based on the list of mineral deposits of the Environmental Register.
Data harmonisation and standardisation
According to the Estonian Earth Crust Act harmonisation of data on mineral resources and reserves is carried out. The Estonian Commission on Mineral Resources developed for Estonia the Mineral Resource Classification System which is based on internationally accepted principles[140].
Data accessibility
No information received from Member State.
Landfill stocks/waste flows
Legislative and Organisational Overview An overview of the pertaining legislation at national, regional and communal level may be found at http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=EE *Landfill Stocks* The following legislation relates to landfill: - Regulation of Ministry of the Environment (MoE) 29.04.2004, No 38 (RTL 2004, 56, 938) on requirements for establishment, operation and closure of landfills *Waste Flows* The main piece of waste legislation is the Act on Waste Management 2014, which sets the frame for waste management in Estonia. More specific provisions, e.g. on certain waste streams or waste treatment methods, are dealt with in a number of waste ordinances

[140] *Estonia UN CSD18: National Reporting on Mining. http://www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/estonia/CSD18_ESTONIA_Mining.pdf, Access date:[10/09/2014].*

which are based on the main waste act (for details of its structure, see the legislation link above). Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data
Mining wastes
The total quantity of mining waste produced **per year** from non-energy minerals is approximately 15 million tonnes of waste rock (mainly limestone).
Marine minerals
In Estonia there are 2 deposits of marine sand. Total quantity of explored reserves is 33 million m3 (ca 50 million tonnes).
Overseas territories
Estonia has no overseas territories or dependencies.
Additional information
Estonia has no explored metallic raw materials (ores).

Finland

Primary raw materials
Data collection
The Ministry of Employment and the Economy (MEE) and Finnish Safety and Chemicals Agency (TUKES) are responsible for collecting data on primary raw material resources and reserves. This responsibility is devolved to the Geological Survey of Finland (GTK) for all primary raw materials (Construction, Industrial and Metallic minerals). Data are sourced by GTK from the mineral operator and (in the case of construction minerals) from the regional state administration agencies. The data collection timeframe is variable. However, exploration and mining companies under the mining law are required to report data (confidentially) on an annual basis. Data are reported at a national level (for metallic and industrial minerals) and at a regional level (for construction minerals). Exploration and mining companies are under a statutory obligation to report resource and reserve data. Relevant legislation is the Mining Act nr. 621, 2011 (http://www.edilex.fi/tukes/fi/lainsaadanto/20110621) which relates to metal ores and industrial minerals and the Land Extraction Act nr. 555, 1981- which relates to rock, gravel, sand, clay and soil complemented by the Mining Decree nr. 391, 2012 (http://www.edilex.fi/tukes/fi/lainsaadanto/20120391). Exploration activities are administered and monitored by TUKES (see http://www.tukes.fi/en/Branches/Mining/Mining-permit/). The exploration report and the related information must be delivered as electronic files. In addition to the exploration work report, the file must include the geological, geophysical and geochemical exploration data, collected GIS data, reports and analyses of drill cores and other exploration material. The report and data must cover the exploration area in full, including all prior exploration phases in the exploration area, if these have not previously been reported. This report must include An estimate of the mineral resources in the area, based on a widely used standard, and an estimate of the ore potential (reserves) of the area.
Data harmonisation and standardisation
Exploration and mining companies are required to report data to an international standard code but the mining law does not specify which code (only 'the widely used standard'). It is the intention of GTK when reporting resource and reserve figures that they will do so using the UNFC classification but this has yet to be fully decided. There is not a national reporting code for Finland.
Data accessibility
Data on resources, reserves and, where relevant, production for primary raw materials (at the individual deposit level where not confidential) can be freely accessed from GTK via http://geomaps2.gtk.fi/activemap/. Further information on mineral investigation in Finland can be obtained via http://en.gtk.fi/mineral_resources/exploration.html#. Where otherwise available, data are reported at a national and regional scale. The main users of

the data are exploration and mining companies. In addition public media, land use planners and non-professional users are increasingly using the data because of the rapidly growing mining sector in Finland. Data are mainly reported in Finnish with certain information being provided in English.

Digital data are mainly INSPIRE compliant and GTK are participating in (by chairing) the IUGS/CGI EarthResourceML interoperability working group in order to further progress data harmonisation.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=FI

Ministry of the Environment (MoE) formulates waste management policies, carries out strategic planning and makes decisions in its own sphere of interest. It is also responsible for preparing legislation and setting binding standards. According to Waste Act, MoE's task is to draw up a national waste plan (https://helda.helsinki.fi/bitstream/handle/10138/38022/FE_14_2009.pdf?sequence=1). This strategic plan sets targets for the reduction of the amounts and harmful properties of waste, for waste recovery, for the prevention of risks to human health and the environment, for further development of waste management infrastructures and for supervision of waste transport. The national waste plan also presents the administrative and legal, economic and informative instruments to be used in implementation. It also includes a separate national waste prevention programme.

According to the Waste Act (1072/1993), The Finnish Environment Institute SYKE has to take part in preparing the national waste plan and regulations and directives to be issued under the Waste Act. SYKE also acts as the competent authority in relation to transfrontier shipments of waste.

According to the Waste Degree (1390/1993), ELY Centres (Centres for Economic Development, Transport and the Environment, of which there are 15) have to conduct research on waste and waste management serving regional administration, arrange training, provide information and advice, make announcements, compile statistics and engage in monitoring. Furthermore, their task is to draw up regional waste plans concerning waste and waste management.

According to Waste Act and Waste Decree, municipalities have to provide the regional environmental centres with the data necessary for drawing up regional waste plans concerning waste generated within the municipality, the organisation and supervision of waste management, and development targets. The Finnish Waste Act Reform sets out the framework for the management of waste in order to reduce landfill: http://www.ym.fi/en-US/The_environment/Waste

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. Landfill Directive 1999/31: Government Decision on landfills (861/1997, amendments … 1049/1999, 552/2001 and 13/2002).

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. (N.B. New waste legislation is currently under preparation in Finland).

Finnish waste legislation covers all wastes except certain special types of waste such as radioactive wastes, which are covered by separate laws. The waste legislation is largely based on EU legislation, but in some cases includes stricter standards and limits than those applied in the EU as a whole. Finland also has legislation on some issues related to wastes that have not yet been covered by EU legislation. The negative environmental impacts of wastes are addressed in legislation on environmental protection. Taxes and fees payable in relation to wastes are generally included in legislation on taxation, although some fees are included in waste legislation. Other statutes covering specific economic activities also include certain controls related to wastes. (http://www.ymparisto.fi/default.asp?contentid=235661&lan=en&clan=en).

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

Mining wastes

With respect to closed and abandoned mines, the authority is the Ministry of Environment.

An inventory of closed and abandoned mines is publicly available at http://www.ymparisto.fi/download/noname/%7B338BC4F5-62BF-4C76-A755-A6F1CB06E2E0%7D/44798

A description of the mine wastes is available at http://www.ymparisto.fi/fi-FI/Kulutus_ja_tuotanto/Jatteet_ja_jatehuolto/Jatehuollon_vastuut_ja_jarjestaminen/Kaivannaisjatteet

And the MWD assessment report in Finnish only is at http://www.ymparisto.fi/fi-FI/content/25033/26268 or http://www.ym.fi/fi-FI/Ajankohtaista/Julkaisut/YMra242013_Suljettujen_ja_hylattyjen_kai(25033) containing only a hazard assessment but listing Location, Type of Facility, Size and Waste Characterisation, Waste Source. All these are provided down to site level but not all data is open to the public. Further information is available from the Geological Survey of Finland (GTK). GTK is doing scientific research in the closed and abandoned mine sites. Three mine sites (Otravaara pyrite mine, Hammaslahti Cu-Zn-Au mine, Rautuvaara Fe-oxide-Cu-Au mine) have been studied and publishing papers is going on (in process).

With respect to operating facilities no data is held by GTK, except for an ongoing project to put historic information into a database.

GTK uses a national accredited sampling and analysis system, but not aligned to any codes.

Marine minerals
Statistical data on marine minerals are not collected in Finland. National legislation does not require the collection of data on marine minerals. Other types of data, such as sediment maps, information on marine sand and gravel deposits are available. Samples of sediments and supportive characterisation data are also available. The Geological Survey of Finland (GTK) is the owner of these data and data are accessible through the Geological Survey of Finland databases. Data are organised at local level and are spatially referenced, but not INSPIRE compliant. Access to data is through specific data requests including a permit from the Finnish Defense Forces (all marine geological information is classified in Finland hence a permit is required). Data is free of charge, but a processing cost may occur. Mineral exploration activity in the offshore/ marine environment is monitored by the Geological Survey of Finland and the Regional State Administrative Agencies. Companies undertaking exploration in the offshore/marine environment are under no statutory obligation to report resource and reserve data.
Overseas territories
Finland is responsible for one offshore community, the Åland Islands, but it has no resource interests and does not appear to hold data on them. Statistics & Research Ålund has its own web site at http://www.asub.ax/start.con?iLan=2 which is the most likely contact point for local information.
Additional information
A key challenge to enhancing the availability and harmonisation of mineral resource and reserve data in Finland is the lack of collection of data on secondary raw materials. In addition there is a need for material flow investigations.

France

Primary raw materials
Data collection
Data are not currently collected on primary raw materials resources and reserves in France. Other types of data exist, however, such as public digital deposit data for some metallics ores, industrial minerals and construction materials, resulting from the National Mineral Resources Inventory (1975 – 1992) and also global economic data produced each year for aggregates and industrial minerals and metals. More specifically, for example, mineral potential and predictive maps are provided in the ProMine portal, information on quarry production is contained in the ""Observatoire des Matériaux" and there are evaluations of the overall aggregate resources along the Atlantic coastal region. BRGM and the French ministries for deposit data own/are responsible for deposit data. Global economic data on industrial minerals / metals are owned by the French statistical survey (l'INSEE) and the French Ministries. UNICEM and the French Ministries own the global data for aggregates. It is only mandatory for UNICEM and INSEE to collect and report global economic data. DREAL (Directions Régionales de l'Environnement, de l'Aménagement et du Logement – Regional diretion of environment, land use planning and housing), the French Ministry of Ecology, Sustainable Development and Energy and the French Ministry of Industry monitor mineral exploration activity. There is no obligation for exploration and mining companies to report resource and reserve data.
Data harmonisation and standardisation
Secondary data collected on legacy metallic commodities and coal do not comply with an internationally recognised code, although a national code is used for reporting (which covers metallic ores and coal).
Data accessibility
Data holders / owners are industries for accurate data collected within the remit of the mining permit together with BRGM and the French Ministries for data collected in the framework of the National Minerals Resources Inventory. These data give only some indications about the mining potential of some areas. Data is spatially referenced and INSPIRE compliant. BRGM and the French Ministries' data are available to the public, however, industry data is confidential. Where drilling has taken place to a depth greater than 10 metres, data are confidential for ten years since the date on which they have been obtained. Free data are available at: - sigminesfrance.brgm.fr and infoterre.brgm.fr (metallics ores and industrial minerals in metropolitan France).

- materiaux.brgm.fr (construction materials and also industrial minerals in metropolitan France) data - gisguyane.brgm.fr (French Guyana - there is a specific GIS, essentially on ore minerals).

The ProMine database has a lexicon in French, English and Spanish and the SIG-Afrique is in French and English.

Landfill stocks/waste flows

Legislative and Organisational Overview

Data on landfill stocks and waste are required by national legislation / policy, through the 15 extended producer responsibility regulated chains. Data concerning the amount of metals integrated in some end of life products are currently collected. ADEME (Agence de l'Environnement et de la Maitrise de l'Energie) is the main organisation responsable. An annual recycling report was done every year until 2010 to collect data for ferrous and non ferrous metal (copper, lead, nickel and zinc) wastes. The aim of the study was to present the main national data for collection, preparation and production of secondary raw material for seven extended producer responsibility chains (WEEE, automotive, batteries and accumulators, lubricants, tyres, household packaging and graphic papers). Besides, these data had been collected until 2012 for the year 2010, there are currently discussions at national level to up-date the scope of this ADEME's report. http://www2.ademe.fr/servlet/getDoc?cid=96&m=3&id=86030&p1=30&ref=12441.

Data is sourced from professional associations, internet websites of public statistic surveys and bibliographique studies to estimate some specific data.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data and is also supplied by ADEME, the French Ministry for the Environment and Energy. More information is at http://www.developpement-durable.gouv.fr

A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/france-municipal-waste-management

Mining wastes

The data holders / owners of legacy metallic commodities and coal are the French Government – Ministère de l'Ecologie et du développement durable – Direction de la prévention des risques – Bureau du sol et sous-sol. The data is stored in a national GIS, at a

national cover scale, but deposit level in terms of data accuracy. Compliance of the data with INSPIRE is planned. Data is not available to the public or available in multilingual formats.

GEODERIS (post mining experts of the French Government) collect secondary data for legacy metallic commodities and coal in accordance with art. 20 of the Directive 2006/21/UE. Data collected is on geotechnical and environmental risk aspects.

With regard to closed and abandoned mines, ADEME has published a list under MWD of high risk facilities: http://www.developpement-durable.gouv.fr/IMG/pdf/Tableau_Mise_en_ligne_v3.pdf described by location, Material and action.

With regard to operating mines, Decree of 19 April 2010 on the management of waste from extractive industries NOR: DEVP1010260A is in force.

Marine minerals

The eMODnet collating centre for French marine data is: IFREMER/IDM/SISMER, http://www.ifremer.fr/sismer/

SISMER, Systèmes d'Informations Scientifiques pour la Mer, collaborates with BRGM, Centre de Données Géophysiques (CDG) / CNRS - Université de Strasbourg and SHOM (Service Hydrographique et Océanographique de la Marine).

Overseas territories

French has numerous overseas dependencies, but only a few have resources of interest. The major ones are:

- French Guiana, Bureau de recherche géologique et minière de la Guyane, information via the BRGM portal at http://gisguyane.brgm.fr/index.htm Materials of interest which have been assayed are: gold; surveyed for aluminium, boron, barium, chromium, copper, iron, nickel, lead, PGMs, potassium, silicon, strontium, tin, titanium, vanadium, zinc, zirconium etc.

- French Polynesia, where no in territory data source is listed. Refer to BRGM at http://www.brgm.fr Material of interest: Cobalt.

- New Caledonia, ISEE, New Caledonia Institute de la statistique et des études économiques at http://www.isee.nc/ Material of interest: Nickel

- Clipperton Island, no data holder listed. Material of interest: phosphorous (guano).

Other islands for which data is held by BRGM are: Guadeloupe, Martinique, Réunion, Mayotte and Wallis and Futuna.

Other islands not listed on BRGM, but having their own governments are:

- Saint Martin - Community of Saint Martin, http://www.com-saint-martin.fr/Economie/Pages/default.aspx

- Saint Barthélemy - Community of Saint Bartholemew, http://www.comstbarth.fr/index.aspx - Saint Pierre and Miquelon - prefecture of the Isles of Wallis & Futuna, http://www.wallis-et-futuna.pref.gouv.fr/ - French Southern and Antarctic Lands - French Polar Institute, http://www.institut-polaire.fr/
Additional information
BRGM consider the obligation to produce resource / reserve data according to a standard code as a key challenge to availability and harmonisation of mineral resource and reserve information for France. GEODERIS consider that good opportunities are the key challenge to availability and harmonisation of mineral resource and reserve information for France.

Germany

Primary raw materials
Data collection
In Germany, information on resources and reserves of primary raw materials is available on a regional level for the different Federal States of Germany. Data are sourced primary from mineral operators, the State Geological Surveys (SGD) and other authorities. The SGD are the official contacts for retrieving information on primary raw materials resources and reserves. With the exception of Hamburg, the SGD have a mandate to collect and store information on primary raw materials, which include construction minerals, industrial mineral and metals. In addition, information on certain types of secondary raw materials, including non-ferrous metals, ferrous metals, low-grade tailings from copper shale mining, tailings from potash and iron ore mining are collected. The data collection process across Germany is characterised by significant heterogeneity mainly due to its federal structure. Therefore, in some states (e.g. Saxony-Anhalt; Thuringia) data is being collected annually, while in most other states data are collected occasionally or intermittently. Data are compiled for all primary raw materials and the collation process is governed by the Federal Mining Law, the Law to prospect and protect natural resources (Lagerstättengesetz) and in some cases a specific geology code (e.g. Baden-Württemberg). Responsibility upon data collation varies considerably among the states. The ministries, the SGD, the mining authorities, or the state administrations can be responsible. A breakdown of the responsible ministries and authorities of the German federal states is given in the *Additional Information* (Table1) section. Primary raw materials covered by the mining law are subject to registration by the respective mining authorities. Exploration activities are monitored by different organisations and/or departments, including mining authorities, ministries of economics, SGD and regional government

authorities. Information on resources is collected (e.g. location, boring data, estimated ore grades). However, there is no estimation on mineral reserves. Exploration and mining companies are under no statutory obligation to report mineral resource and reserve data.
Data harmonisation and standardisation
In Germany, information on resources is classified using their own individual regional codes (e.g. Baden-Württemberg, Saxony-Anhalt). These codes do not correlate with any of the international resource classification systems. International codes are not being used in any case. Overall mineral resources and reserves are classified according to the Federal Mining Law. Currently there are no initiatives for data harmonisation of the individual regional codes or for the use of international resource classification systems.
Data accessibility
The rights of the data are held by the data owners (private enterprises), the SGD, the planning authorities and the mining authorities. There is restricted access to the data. Data of active licensed areas is confidential. The confidentiality either ends with the cessation of the mining control or is not terminated at all. Data in Germany are stored in numerous databases and/or in geographic information system (GIS) databases. Geospatial data will be INSPIRE compliant. The data are organised at regional, local or deposit level using own regional terminology and methods. However, most of the data is available in a limited or aggregated form. Data are mainly available in the German language only, except for a limited number of data that are also available in Russian. Data are accessible through reports, online or via specific data requests. Data requests are commonly made by land use authorities, regional councils, municipalities, the public, as well as from enterprises and consultants. Certain States might charge a fee for a specific data request. Examples of online reports/ data: - http://lgrb-bw.de/produkte_lgrb/informationen/informationen_27 http://www.lbeg.niedersachsen.de/portal/live.php?navigation_id=667&article_id=570&_psmand=4 - http://maps.lgrb-bw.de/
Landfill stocks/waste flows
Legislative and Organisational Overview An overview of the pertaining legislation at national, regional and communal level may be found at http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=DE The Federal Government has the right to adopt the waste management legislation. The competence of the Federal States (Länder) and Provinces/Districts is restricted to the fields where no federal legislation exists. The result is that beneath the national waste legislation, each Federal State has its own waste management legislation/regulation.

The Technical Instruction on Municipal Waste came into force in 1993, which defined the state of the art for the landfilling of municipal waste. Unfortunately, the Technical Instructions contained a loophole which meant that rules were not implemented as intended. With the Landfill Ordinance of 2001, the deadline for the landfilling of untreated waste was set at 1.6.2005.

Landfill Stocks

In Germany, the EU Landfill Directive is implemented by the Landfill Ordinance and by the Ordinance on Landfills and Long Term Storages. The latter transposes also the EU Landfill Decision. Landfill Directive 99/31: Ordinance on Landfills and Long Term Storages (24.7.2001, BGBl. I S. 2807)

Waste Flows

Transposition of the Waste Framework Directive 2008/98/EC. This takes the form of the main piece of waste legislation in Germany – the Recycling Management and Waste Act (RMWA). It is split into nine sections, detailed in the link above.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data .

Data on construction waste collected on a national level are published online at http://www.kreislaufwirtschaft-bau.de/akt_ber.html .

Mining wastes

The responsible mine authorities in Germany are the Landesamt für Geologie und Bergwesen (LAGB) and the Landesanstalt für Umwelt und Geologie (TLUG). Data are not collected by the various states. However, Saxony-Anhalt and Thuringia are the only two states collecting specific data on tailings and backfills to accomplice primary mining information. Those data support actions on mining waste.

Marine minerals

The State Geological Survey of Mecklenburg-Western Pomerania collects data on primary raw materials from the marine environment surface within 12 seamile area (parts of the Baltic Sea).

With regard to offshore minerals the Geo-Scientific Potential of the German North Sea (Geopotenzial Deutsche Nordsee = GPDN) created maps on the occurrence of sand and gravel or sand suitable for sluicing (coast protection) calculated by GIS from the grain-size distribution map of the seafloor in the German Bight (in German language only, see http://www.gpdn.de/gpdn/wilma.aspx?pgId=319&WilmaLogonActionBehavior=Default).

Overseas territories

The two recorded 'overseas' territories are Büsingen am Hochrhein and Heligoland. Büsingen is a German town (7.62 km^2) entirely surrounded by the Swiss canton of Schaffhausen. Heligoland is a small German archipelago in the North Sea.

Germany does not appear to hold resource and reserve statistical data on these territories.

Additional information

German Federal States	Responsible Authority	Executive Institution	Further relevant Ministries/ Authorities
Baden-Württemberg	Landesamt Geologie, Rohstoffe und Bergbau (LGRB)	Landesamt Geologie, Rohstoffe und Bergbau (LGRB)	-Ministerium für Umwelt, Klima und Energiewirtschaft
Bavaria	Landesamt für Umwelt (LfU)	LfU, Abteilung 10: Geologischer Dienst, Referat 105: Wirtschaftsgeologie, Bodenschätze	-Landesamt für Umwelt - nachgeordnete Behörde des Bayerischen Staatsministeriums für Umwelt und Verbraucherschutz (StMUV) -Bayerisches Wirtschaftsministerium (StMWi)
Berlin	Senat	Senatsverwaltung für Stadtentwicklung und Umwelt	Landesamt für Bergbau, Geologie und Rohstoffe (LBGR)
Brandenburg	Landesamt für Bergbau, Geologie und Rohstoffe (LBGR)	Landesamt für Bergbau, Geologie und Rohstoffe (LBGR)	Ministerium für Wirtschaft und Europaangelegenheiten
Bremen	Geologischer Dienst für Bremen (GDfB)	Geologischer Dienst für Bremen (GDfB)	Senator für Wirtschaft, Arbeit und Häfen
Hamburg	Behörde für Stadtentwicklung und Umwelt	Geologisches Landesamt Hamburg	Behörde für Wirtschaft, Verkehr und Innovation
Hessian	Hessisches Landesamt für Umwelt und Geologie (HLUG)	HLUG	Hessisches Ministerium für Umwelt, Klimaschutz, Landwirtschaft und Verbraucherschutz (HMUKLV)
Mecklenburg-Western Pomerania	Landesamt für Umwelt, Naturschutz und Geologie (LUNG)	Geologischen Dienst des LUNG Mecklenburg-Vorpommern	Ministerium für Landwirtschaft, Umwelt und Verbraucherschutz Mecklenburg-Vorpommern; Ministerium für Energie, Infrastruktur und Landesentwicklung
Lower Saxony	Landesamt für Bergbau, Energie und Geologie (LBEG)	Landesamt für Bergbau, Energie und Geologie (LBEG)	Niedersächsisches Wirtschaftsministerium
North Rhine-Westphalia	Geologischer Dienst NRW	Geologischer Dienst NRW	Ministerium für Wirtschaft, Energie, Industrie, Mittelstand und Handwerk
Rhineland-Palatinate	Landesamt für Geologie und Bergbau Rheinland-Pfalz (LGB)	Landesamt für Geologie und Bergbau Rheinland-Pfalz (LGB)	Ministerium für Wirtschaft, Klimaschutz, Energie und Landesplanung (MWKEL)

Saarland	Landesamt für Umwelt und Arbeitsschutz (LUA)	LUA, Geschäftsbereich Wasser. Fachbereich Hydrogeologie und Grundwassernutzung	-Für bergfreie Rohstoffe: Landesamt für Umwelt- und Arbeitsschutz, Ministerium für Umwelt und Verbraucherschutz -Unter Bergaufsicht stehende Rohstoffe: Oberbergamt, Ministerium für Wirtschaft, Arbeit, Energie und Verkehr
Saxony	Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie (LfULG)	LfULG – Abteilung Geologie	-Sächsisches Staatsministerium für Umwelt und Landwirtschaft (SMUL) -Staatsministerium für Wirtschaft, Arbeit und Verkehr (SMWA); -Sächsisches Oberbergamt
Saxony-Anhalt	Landesamt für Geologie und Bergwesen (LGB)	Abteilung 2: Geologie, Dezernat: Lagerstätten und Rohstoffe	Landesamt für Geologie und Bergwesen - nachgeordnete Behörde des Ministeriums für Wissenschaft und Wirtschaft des Landes Sachsen-Anhalt
Schleswig-Holstein	Landesamt für Landwirtschaft, Umwelt und ländliche Räume (LLUR)	Geologischer Dienst Schleswig-Holstein	Ministerium für Energiewende, Landwirtschaft, Umwelt und ländliche Räume des Landes Schleswig-Holstein
Thuringia	Landesanstalt für Umwelt und Geologie (TLUG)	Abteilung 6: Geologischer Landesdienst, Boden, Altlasten, Referat: Rohstoff-, Infrastrukturgeologie, Ingenieurgeologie	-Unter Bergrecht stehende Rohstoffe: Thüringer Landesbergamt (TLBA) - nachgeordnete Behörde des Thüringer Ministeriums für Landwirtschaft, Forsten, Umwelt und Naturschutz (TMLFUN) -Für Grundeigentümerbodenschätze: Thüringer Landesverwaltungsamt, Landkreisverwaltungen

Table 39: Ministries and authorities of the German Federal States responsible for compiling data on resource evaluation.

Greece

Primary raw materials
Data collection
IGMEM is a Legal Entity of Private Law, supervised by the Ministry for the Environment, Energy and Climate Change and is the official advisor of the State on geo-science, minerals and energy raw materials. Data is collected from IGMEM's reports and in collaboration with private companies. All information is stored in the Access-based ProMine Mineral Deposits database. According to the Greek Law, raw materials are classified in **metals** and **quarry minerals**. Relevant legislation is the **Mining Code, Legislative Decree nr. 210, 1973 (as amended by Law nr. 274, 1976)**. The Ministry collects annual activity reports in which information on reserves is also contained. The measurement unit used to report reserves figures for metals and industrial minerals is tonnes of material, and cubic metres for building materials, such as marble and aggregates.
Data harmonisation and standardisation
The Mineral Deposits' database stores all the information related to mineral deposits of the country. Each deposit is described through 40 fields, distributed in 8 folders: (1) General Information, (2) Deposit Information, (3) Information on Mineralisation and Host Rocks, (4) Economic Information, (5) High-tech Metals, (6) Comments, (7) Iconography and (8) Bibliography. Reserves are reported in the database in the form supplied by the industry. For many industrial mineral deposits entries in the database there are no supportive drill-holes data and so reserves are characterised as inferred reserves. The mining companies estimate reserves in a different way. There has not been made an effort to harmonise ore reserves estimation for all the deposits of the country.
Data accessibility
Data is stored at IGMEM's centralised database and GIS system, therefore the data is spatially referenced. Information referring to reserves estimated by IGMEM is available to the public through the reports that are stored in the Institute's Library. Reserves figures reported by mining companies for gypsum, bentonite, perlite, magnesite, bauxite and nickel ores are characterised as confidential.
Landfill stocks/waste flows
Legislative and Organisational Overview The Ministry of Environment, Energy and Climate Change (MEECC (YPEKA in Greek)) is responsible for the development and implementation of environmental policy at the national level. The municipal waste sector falls under different aligned Ministries (MEECC, Ministry of Interior, Ministry of Development) The MEECC is responsible for policy making, national planning, and technical matters as well as licensing of large waste treatment and

disposal facilities. It acts in cooperation with the other responsible Ministries and the Central Association of Municipalities (KEDE).

Thirteen administrative Regions represent the second level of local self-government and are responsible for the administration of local matters at regional level. The responsibilities of Regions include planning, economic development, social development, culture and quality of life. In particular, their responsibility for certain aspects lies on licensing and elaborating waste master plans so far. Municipalities have the responsibility for some aspects of planning (collection).

The integrated management of solid waste, which refers to the implementation of the objectives and actions for temporary storage, shipment, transfer, treatment, recovery and disposal of solid waste according to the Regional Waste Management Plan (RWMP), lies within the territorial jurisdiction of Regional Waste Management Bodies. The Ministry of Interior is responsible for the establishment of the registry, organizing and monitoring of those Bodies[141].

Landfill Stocks

The landfill directive (1999/31/EC) has been transposed to Greek legislation by issuing a Ministerial decree in 2002 (29407/3508). For more detail on this transposition see: http://www.oeue.net/papers/greeceeulandfilldirective.pdf).

Waste Flows

The legal framework that designates the direction of waste management in Greece follows closely the development of European waste management and the corresponding Directives (EIB, 2010). Over the last decade all relevant EU Directives have been transposed to Greek laws, with the most recent case being the transposition of the Waste Framework Directive (2008/98/EC) in the Law 4042/2012 of 2012 (YPEKA, 2012).

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data harmonised according to EWC codes.

Link to waste site map:

http://ypeka.gr/LinkClick.aspx?fileticket=QYjGmnmhC%2fQ%3d&tabid=438&language=el-GR

A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/greece-municipal-waste-management

Mining waste

[141] [BiPRO 2011]. Country Factsheet Greece (GR). http://ec.europa.eu/environment/waste/framework/pdf/GR%20factsheet_FINAL.pdf

In Greece there is legislation concerning the handling of mining waste. The Public Service responsible for this is the Ministry for the Environment, Energy and Climate Change (YPEKA). An inventory of mining waste is not available in Greece.
Marine minerals
No data are collected for marine mineral resources and reserves.
Overseas territories
The only 'overseas' territory attributable to Greece is Mount Athos, a religious sanctuary. Greece does not appear to hold resource and reserve statistical data on this territory.
Additional information
None.

Greenland

Primary raw materials
Data collection
The Ministry of Industry and Mineral Resources are responsible for data collection on primary raw material resources and reserves. Other types of data relevant to primary raw material resource evaluation exist (see www.greenmin.gl). The Ministry of Industry and Minerals and Geological Survey of Denmark and Greenland (GEUS) are responsible for the data. The requirement for the collection of data on primary raw material resources and reserves and other information is defined by Greenland Parliament Act no. 7 of December 7, 2009, on mineral resources and mineral resource activities (The Mineral Resources Act), with amendments from Greenland Parliament Act No. 26 of December 18, 2012. The Act obliges companies to report on their activities and finds and is applicable to all minerals. Data collection is undertaken through company reporting which is submitted to the Mineral Licence and Safety Authority. The Mineral Licence and Safety Authority monitor mineral exploration activity. Exploration and Mining companies holding a licence are under a statutory obligation to report resource and reserve data as stated in the exploitation licence and approvals under this licence, based on the Mineral Act. This is applicable to all minerals. A Licensee shall report data using a code that is outlined in the company's licence. The licensee must provide the data, in the form of tables, when they start production, and it must include all available data (e.g. geological mapping, drill hole logs, drill core etc.).

Data harmonisation and standardisation
Data collected comply with an internationally recognised standard code. Data are reported using various international codes and standards, such as JORC, NI 43-101 and covers all metals. A national code is not used for reporting. No attempt is made at present to harmonise data received from different sources.
Data accessibility
The data holder currently is GEUS and the owner is the Ministry of Industry and Mineral Resources. Data is stored in a centralised database, organised at deposit level scale. The data is not spatially referenced and is not available in multilingual formats. Data is available to the public, free of charge, through www.govmin.gl; www.greenmin.gl, with the exception of confidential material, which generally remain confidential for 5 years. Exploration companies often access the data.
Landfill stocks/waste flows
Legislative and Organisational Overview National legislation / policy does not require the collection of data, and data are not currently collected. *Landfill Stocks* Not applicable. *Waste Flows* Not applicable.
Mining wastes
No information received from State. The responsible authority for mining in Greenland is the The Mineral Licence and Safety Authority.
Marine minerals
No information received from State.
Overseas territories

No overseas territories identified.
Additional information
Greenland has had an olivine mine (not in production at present).

Hungary

Primary raw materials
Data collection
Data relating to primary raw materials are collected annually, with a deadline of end of February, by the Hungarian Office for Mining and Geology (MBFH) which is under the supervision of the Ministry of National Development. There is a statutory obligation for operators to complete the annual data survey under the Act on Mining No. XLVIII of 1993 and Mining Authority Presidential Statement and the Government Decree No. 203/1998. (XII. 19). These appear to cover all aspects of mining activities. This statutory obligation includes resources and reserves data. Data are collected for individual deposits and mining sites. Reserves data are confidential and mining companies are the data holders. Data collected are summarised at a national scale. Mining operators are responsible for the validity of their supplied data, but MGFH regularly checks these data at desk top and on site.The MBFH maintains the national "inventory/register" and website. Resources and reserves data must be reported according to a national code. However, this code is not published in a legal format. This is a nine-digit number for non-metallic minerals that describes the geographical position of the commodity on county, district and local level and also the position in the Register where the raw material is recorded. The register also uses another code which is specific to the mineral and published in a Government Decree regulating the mining royalty. The register also uses another code which is specific to the mineral and published in a Government Decree regulating the mining royalty. The data are received in digital or paper table format although there are other procedures occasions when the MBFH receive reports and maps from operators. Mineral resource maps exist for construction minerals and non-metallic minerals at 1:100,000 scale and are held by the Geological and Geophysical Institute of Hungary (MFGI) (http://www.mfgi.hu/en). Although these maps are not public, they can be studied at the MFGI and the MBFH.
Data harmonisation and standardisation
Data on primary raw materials correspond to "UNFC and USGS systems". The response to the alignment with internationally used standard codes says: "A+B correspond to the Measured Mineral Resources, C1 ~ Indicated Mineral Resources, C2 ~ Inferred Mineral Resources, D1+D2 ~ hypothetical resources, D3 ~ speculative resources. But using of standards is not obligatory: legal documents do not prescribe the use of international standards." Work is currently underway to harmonise resources and reserves data according to international standards. The response says: "The aim of this project is to look at the different types of international standards (e.g. UNFC, CRIRSCO (JORC, PERC)), and other standards like the Canadian one) and to apply the principle objectives of these standards in order to modernise the Hungarian inventory for mineral resources." This is also noted as their "key challenge".

Data accessibility

Data are owned by the Hungarian State with the exception of confidential data owned by mining companies.

Primary raw materials data are stored in a centralised database maintained by MBFH. There are some data stored in GIS format (polygons of mining plots and exploration plots) and is spatially referenced. These polygons are provided by operators and then checked by the Hungarian Office for Mining and Geology. The database includes data at deposit, local, regional and national level but only at national level is publically available. They are currently working towards compliance with INSPIRE.

Some data are available to the public via the MBFH website including some details on individual mining sites ("identification name, block type, mining method, status, base level, cover (m), substrate/sole m), name of mining ~~constructor~~ licensee, name of raw materials, codes, coordinates; on exploration licence: block, deadline, base level, cover (m), substrate/sole m), name of mining constructor licensee, name of raw materials, codes, coordinates"), but not resource or reserve data at that scale.

Data are used by "entrepreneurs", or by the government ministry for strategy and policy making.

Only limited data are available in multilingual formats (e.g. the most important parts of the mining law is available in English).

Information is also available on the website of the Hungarian Central Statistical Office (http://www.ksh.hu/?lang=en) but again only limited data are available in multilingual formats.

Landfill stocks/waste flows

Legislative and Organisational Overview

In Hungary, waste management tasks are regulated by the Act on Environmental Protection (1995) and by the Waste Management Act (2012). (http://www.eea.europa.eu/soer/countries/hu/waste-national-responses-hungary)

Data are published annually and are publicly available via http://okir.kvvm.hu/hir/ in Hungarian only entered by companies via the Waste Management Information System down to site level. Reports from 2015 onward are available digitally, spatially referenced and INSPIRE-compliant, and conform to the EWC codes. The owners of this data are the Ministry of Rural Development. There are no confidentiality constraints.

Another relevant agency is the National Waste Management Agency (http://www.szelektivinfo.hu/en/).

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. The most important provisions and the key instructions on the Landfill Directive are already present in the Act

on Waste management, and the technical enforcement rules are laid down in the Ministerial Decree on landfills. (For more detail concerning the transposition: http://www.oeue.net/papers/hungary-landfillsinhungary.pdf).

The transposition includes waste acceptance criteria and procedures as load down therein. It was transposed in 2001 by a Decree of the Ministry of the Environment (Decree No. 22/2001;X.10) on the landfill of waste and the condition and rules of waste deposition. (See http://ec.europa.eu/environment/waste/pdf/study/cowi_report.pdf)

Data on landfill stocks is provided by KSH (www.ksh.hu) the Hungarian Statistics Office. With regard to operating sites the following data is collected: Location, Type of facility, Size, Waste characterisation and number of facilities. On closed landfill, the following is collected: Location, Type of facility and Size.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. This is achieved through Hungary's Waste Management Act, 2012. It allows the adoption of secondary legislation on specific types of waste, for example, the Decree of Ministry of Environment No.22 of 2001 on landfills deal with the issue of Hungarian landfills.

With respect to waste flows: Waste quantity, Waste type, Waste treatment, Waste characterisation, Economic Activity, Time period, producer and operation site.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

In addition, stocks of recyclate metals are recorded (in kg), although it is not clear to what this refers.

Mining wastes

There is a statutory obligation for operators to provide generated mine waste volumes through the annual data survey undertaken for primary raw materials.

The national legislation on mining waste is G KM (Ministry of Economic and Transport) Decree No. 14/2008 (IV.3) on Mining Waste Management.

The full suite of data is recorded for closed/abandoned mines as well as operating mines. However, only the data relating to closed/abandoned mines are made available to the public, and is done so at a national level for free, and is accessible from http://www.mbfh.hu/home/html/index.asp?msid=1&sid=0&hkl=547&lng=1. Data are provided in Hungarian and English and can be reproduced with permission.

Data relating to operating mines is not made public, but can be accessed via special requests and for a fee.

The following *List of Waste (LoW)* codes are utilised in the reporting of mining data:

- Mining waste:

Inert, non-inert, non-hazardous, hazardous waste; LoW: 010101, 010102, 010306, 010409 - Drilling mud: Inert, non-inert, non-hazardous, hazardous waste; LoW: 010504, 010505, 010506, 010507, 010508;
Marine minerals
None reported by Member State.
Overseas territories
Hungary has no overseas territories or dependencies.
Additional information
None.

Iceland

Primary raw materials
Data collection
In Iceland, the main institution collecting geodata is the Iceland GeoSurvey (Íslenskar Orkurannsóknir - ISOR). This is a self-financing, state-owned, non-profit institution. It was established in 2003, when the GeoScience Division of Orkustofnun, the National Energy Authority of Iceland, was spun off as a separate entity.It receives no direct funding from the government and operates on a project and contract basis like a private company. ISOR conducts resource identification, surface exploration and assessments. It produces detailed maps of potential geothermal resource areas, covering tectonic and stratigraphic features, surface petrology, mineralogy, and lithology of the resource area. Most of the work of ISOR is focused on geothermal resources. Its core activities include research services, consultation (including projects in other countries), and training, based on basic or applied research.
Data harmonisation and standardisation
Iceland's mineral production is reported for crushed stone, sand and gravel, pumice, salt and scoria, while its aluminium and ferrosilicon production relies on imported commodities. Its mineral resources are considered insufficient for mining at this time. No data for mineral resources and reserves, in the public domain could be identified at this time.

Data accessibility
No data for mineral resources and reserves, in the public domain could be identified at this time.
Landfill stocks/waste flows
Legislative and Organisational Overview The Ministry for the Environment and Natural Resources together with the Environment Agency of Iceland are responsible for developing policy on waste and monitoring waste generation and management in Iceland. Waste management practices have evolved considerably in the last decade, but waste disposal remains the principal waste management route. Iceland is an EFTA member and has signed the agreement on the European Economic Area. Through this agreement, Iceland has to implement the EU directives in the area of environment. The National Plan for Waste Management 2004-2016 was published in 2004 and includes some quantitative targets until 2020. Further information can be found in http://www.ust.is/library/Skrar/utgefid-efni/Enska/Waste_Management_in_Iceland_21_feb_06.pdf *Landfill Stocks* Iceland states that the Landfill Directive 1999/31/EC on the landfill of waste has been transposed into national law. According to Iceland, provisions and procedures for the landfilling of waste are in line with the Directive. The Environment Agency is the competent authority as regards implementation, enforcement, inspection and reporting. *Waste Flows* Iceland indicated that it foresees transposition of the Waste Framework Directive 2008/98/EC for 2012. Older Directives in this sector, such as the Waste Framework Directive 2006/12/EC, Directive 91/689/EEC on hazardous waste, Directive 75/439/EEC on waste oils have been transposed by regulations 737/2003 and 184/2002, whereas the legal basis is Act 55/2003 on waste management. (http://ec.europa.eu/enlargement/pdf/iceland/key-documents/screening_report_27_is_internet_en.pdf) Data on waste flows and waste managed are found in the Statistics Office: http://www.statice.is/Statistics/Geography-and-environment/Waste Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data
Mining wastes

Data not found.
Marine minerals
Iceland Geosurvey is participating in two large cooperative projects with european geological institutions on the mapping of the seabed surrounding Iceland. The NAGTEC (Northeast Atlantic Geoscience Tectonostratigraphic Atlas) will be completed in 2014 with the publication of an atlas and electronic database on the geology of the northeast Atlantic.
Overseas territories
Not available. (Previously: Data not found).
Additional information
ÍSOR has specialised in making various categories of geological maps and has for decades mapped across the country for municipalities and energy companies. Geological maps form the basis of environmental assessment, land use and planning in urban and rural areas. In 2010, ÍSOR published the first complete geological map in the scale 1:100 000 of Southwest Iceland. This effort signifies a step towards comprehensive geological mapping of the Iceland volcanic zones. By the end of 2012, ÍSOR and Landsvirkjun joined forces and published a geological map of the northerly part of the Northern Volcanic Zone in the same scale. Last year a glacier map of Iceland on a scale of 1:500 000 was completed. Other than ISOR, the National Energy Authority collects data on geothermal and other energy resources such as oil and gas exploration. Its website http://www.nea.is/ also contains portal links for their data.

Ireland

Primary raw materials
Data collection
Data is currently collected on primary raw material resources and reserves for 'scheduled minerals' (most metallic and industrial minerals) and this is the responsibility of Exploration and Mining Division of the Department of Communications, Energy and Natural Resources. Some data is collected on aggregates by the Central Statistics Office. Where available, statistical data on resources and reserves are reported in tonnes. Other data sources relevant to primary raw material resource evaluation which do exist are mineral databases, covering 'all minerals' and aggregate potential maps (onshore and offshore), which are the responsibility of the Geological Survey. National policy in Ireland is that resource and reserve data is obtained from mining lease or licence holders. Data is obtained from lease or licence holders following requests from the Department. Companies are under a statutory obligation to report resource and reserve data according to the Minerals Development Acts 1940–1999, but this is on the basis of individual requests and not at a

defined time interval at present. Data received from companies includes reports, tables and maps.

Data harmonisation and standardisation

Companies reporting resource and reserve data to the Department have to use a CRIRSCO aligned code such as PERC, or JORC.

Data accessibility

The holder/owners of data relating to primary raw material resources and reserves in Ireland are the Exploration and Mining Division of the Department of Communications, Energy and Natural Resources. The data is stored in a centralised database at an individual 'deposit level'. The data is spatially referenced and INSPIRE compliant. The data is generally publically available and can be accessed for free via the Department website (http://www.mineralsireland.ie/Mining+in+Ireland/Current+Mining.htm), but is largely aggregated rather than deposit specific. For industrial minerals and metallic minerals data are confidential at the deposit level and may also be commercially sensitive at national level, depending on the number of producers available. Single producers of a mineral normally request that information be held on a confidential basis. The data is used and requested by researchers, journalists and the general public. The data is only available in English.

Data on lead, zinc and silver is generally available from individual companies. Information is not available on any other metals as there is no production at this time.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=IE

The waste management is Ireland is predominantly regulated under the Waste Management Acts 1996 to 2008 (available here: http://www.irishstatutebook.ie/1996/en/act/pub/0010/index.html). The Acts require the Environmental Protection Agency (EPA) to make a national plan in relation to hazardous waste, and local authorities to make waste management plans in relation to non-hazardous waste. The Acts also define responsibilities for individuals taking part in activities of an agricultural, commercial or industrial nature, for example.

Further legislative information can be on the EPA's website, www.epa.ie/licensing/, where you can search for a waste (landfill) licence and view documents, such as the licence and the licensee's Annual Environmental Reports. Other enforcement documentation and reports relating to the licensee are available to view on public file at EPA offices. See ww.epa.ie/licensing/info/files/ for information.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. Landfill and other waste management facilities: Waste Management (Licensing) Regulations 2004. Statutory Instrument No. 395 of 2004; Waste Management (Facility Permit and Registration) Regulations 2007, S.I. No. 821 of 2007. Waste Management (Facility Permit and Registration)(Amendment) Regulations 2008, S.I. No. 86 of 2008; Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008, S.I. No. 524 of 2008. More detail on each of these regulations is available at the links above.

The Environmental Protection Agency (EPA) makes available statistical information on landfill sites in Ireland at www.wastereport.ie. The data that makes up these statistical analyses are sourced from licensed landfill operators, scaled to the individual site level and reported annually. The landfill data are scaled to the national level, are not spatially referenced and therefore not INSPIRE compliant. Not all data that are reported are available to the public, some are held confidentially. Regional data are available in that the location of the landfill is reported and the landfill can therefore be assigned to a particular waste management plan (WMP) region (there are three WMP regions in Ireland). Individual site/facility data are publically available where reporting was done under licence condition obligations. Individual site/facility data for national waste reporting purposes are aggregated to protect confidential information, where necessary.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. The Irish Waste Management Acts from 1996 to 2008 set out the responsibilities and functions in relation to waste. Specific aspects of the legislation are then enacted through a series of Regulations which address particular requirements. Principal Act in 1996; amended in 2001, 2003, 2005, 2007 and 2008.

Data is held for waste flows and relates to the waste quantity, type, treatment type and characterisation and is normalised to an annual time period.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

Mining wastes

The Irish Environmental Protection Agency is responsible for mining waste in Ireland, under the Waste Management (Management of Waste from the Extractive Industries) Regulations 2009 (SI No 566 of 2009).

Regarding closed or abandoned mines, some basic estimates are available for mine waste for closed mines down to facility level and this is freely accessible by the public at http://www.epa.ie/pubs/reports/land/mines/ . This is also available in book format as ISBN: 1-84095-318-3. The inventory provides data for all waste facilities, not just those assessed to have a serious hazard potential. Information is collated on Location, Type, Size and Waste character.

For operating mines estimates are made by operators, but this is not publically available except by licence or permit search of the Annual Environmental Report and examination of the waste arisings data and PRTR data. Other information (unspecified) can be viewed in

public files by physical visits to the EPA's offices or specific data requests to the EPA via http://www.epa.ie

With regard to mine wastes in general (including landfill), information is collected annually on Location, Types, Size, Total Waste and Annual Arisings, Waste Source, Waste Characterisation (EWC) and General Environmental Performance at facility level. Data is held in digital form, is spatially reference, but is not INSPIRE-compliant.

Information is only available in English.

Marine minerals

Data on minerals in the offshore environment is also collected under the auspices of the Mineral Development Acts 1940-1999 along with the Foreshore Act 1933. Data is collated at the national scale. The State becomes the holder of data on offshore primary raw material resources and reserves with the exception of classified information of the companies.

In relation to marine minerals, the national marine mapping programme, INFOMAR (a joint venture between the Geological Survey of Ireland and the Marine Institute) is the successor to the Irish National Seabed Survey and is mapping all Irish waters. INFOMAR is covering some 125,000 km² of Irelands most productive and commercially valuable inshore waters, and is producing integrated mapping products covering the physical, chemical and biological features of the seabed. http://www.infomar.ie/. This data includes seabed classification maps, which map areas of sand and gravel, i.e. potential aggregate resources. There is reporting of resources data (commercial and public) to international standards though unharmonised and at various levels of aggregation. However, harmonisation efforts are in progress under EMODNET-Geology and are INSPIRE compliant. If out of the confidential period, data can be accessed on request via http://www.dcenr.gov.ie/Natural/Exploration+and+Mining+Division/

Example of relevant literature:

An estimate of marine aggregates from the Irish Sea has been produced based on an EU funded project called IMAGIN. A copy of the technical synthesis report can be obtained from the following link: http://oar.marine.ie/handle/10793/277

Overseas territories

Ireland has no overseas territories or dependencies.

Additional information

The list of 'scheduled minerals' can be accessed via http://www.dcenr.gov.ie/Natural/Exploration+and+Mining+Division/Mining+in+Ireland/Definition+of+Minerals.htm

No regularly published production information exists for aggregates or limestone/dolomite or building stones or industrial minerals, whilst any data on clay and gypsum is confidential to producers. However the Geological survey of Ireland (GSI) produced a Quarry Directories (2001) and are due to update this in 2014

https://www.gsi.ie/Programmes/Minerals/Databases/National+Quarry+Database.htm

GSI have also completed a national Aggregate Potential Mapping programme, onshore, with data available online via http://spatial.dcenr.gov.ie/APM/index.html

General information on minerals in Ireland (both onshore and offshore) can be accessed via http://www.dcenr.gov.ie/Natural/Exploration+and+Mining+Division/

Prospecting Licence holder's reports and data are made available on-line after a period of six years or upon surrender of the Licence, whichever is sooner http://www.dcenr.gov.ie/Spatial+Data/

Italy

Primary raw materials
Data collection
The regional offices collect primary raw material resources and reserves data for Italy. Regional authorities are in charge of administrative functions for mineral and thermal waters as stated by the Republic President Decree July 24, 1977 n.616 (art.61). A similar role is played by regional authorities for the exploration, use and supervision of quarries and peat bogs (art.62). Legal competences dealing with solid minerals extraction and mining activities, both for mines and quarries, were assigned to regions and local authorities by Articles 33, 34 and 35 of Legislative Decree March 31, 1998 n.112. Provinces and municipalities have been occasionally designated by Regions to operate in exploration, evaluation, development and production of raw materials. Data are collected by local authorities with the specific procedures provided by regional laws. For industrial and metallic minerals, national government has jurisdiction about mining exploration, mining exploration abroad, mining industry data gathering, national mining policy set up and its programs. The Raw Materials Laboratory of the Ministry of Economic Development gives support to regional policies for raw materials exploitation and supplies collaboration for the definition of strategic minerals on a national scale in compliance with European mining policy. At a national level, some statistical data on quarrying activities are collected by the Geological Survey of Italy (Department of ISPRA) in the Environmental Data Yearbook. ISPRA holds a database collecting data about industrial and metallic mineral extraction activities in the period 1860-2007 over the entire Italian territory. ISTAT (Italian National Institute of Statistics) collects data about economic /financial/statistical data of mining activities. Data is, therefore, available for all primary raw materials in Italy, sourced from regional mining databases, at a regional scale. Data is collected annually, but does not include raw materials from the offshore / marine environment. Other types of data relevant to primary raw material resource evaluation for all minerals are also available. For any extraction site, the majority of regional databases have information on production and reserves. The Geological Survey of Italy produced the Mining Map of Italy (1:1.000.000 scale) in 1973. Some regions (e.g. Tuscany, Sardinia) have more recent and detailed Regional Mining Maps. Geological maps (1:100.000) are available

for the entire national territory; 1:50.000 scale for approximately 50% of the Italian territory.

Regional offices monitor mineral exploration activity. Exploration companies are under a statutory obligation to report resource and reserve data for all raw materials in regional territories. The majority of Italian regions have implemented a Regional Plan for the Extractive Activities (PRAE) in order to efficiently manage extraction sites at every stage (identification, exploitation and remediation phases), natural resources use and environmental protection. The Regional legislation framework on mines and quarries, however, still appears varied and incomplete. The code used, regularity of collection, the format and the data necessary in reporting depends on regional laws.

Data harmonisation and standardisation

The Geological Survey does not use an internationally recognised standard code for data collection, and a national code is not used for reporting.

Currently ISPRA, in collaboration with ISTAT (Italian National Institute of Statistics), are arranging a national harmonised census of mining activities (quarries and mines) based on international standard codes. The census must be agreed with the Ministry of Economic Development (Directorate-General for mineral and energy resources).

Data accessibility

Data holders / owners are the departments / offices responsible for extraction in each region or province. Each region stores data in various ways (centralised databases, GISs, online inventories, etc.). Data is organised at a regional level and is generally spatially referenced. Data is not INPIRE compliant, but is available to the public through a specific request to ISPRA. Data is not available in multi-lingual formats.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=IT

The State (Central Government, Ministry of Environment) defines general strategies and sectoral policies, adopting Waste Acts and Environment Acts. The National EPA (ISPRA, former ANPA/APAT) provides technical support to policy-making; it also surveys and monitors effects of waste policy and the need for additional specific Acts and regulations. Together with the National Observatory on Waste (ONR) it publishes the National Annual Waste Report which is the primary source for waste statistics, given that it collects data from local observatories, and submits them to a validation procedure, also in order to homogenise datasets.

Regions are mandated to define Waste Management Plans and Waste Prevention Plans, although this is often “devolved” down to Provinces, in which case Regions only define the strategic provisions (e.g. number and boundaries of the Optimal Territorial Areas – ATO; supplementary incentives, bans, obligations, and targets that complement the National

ones). Also permitting procedures may be kept at Regional level or may be devolved down to Provinces. Regional EPAs (ARPAs) provide technical support in definition of Regional provisions, monitoring the plans and the single waste treatment/disposal sites, assessing compliance with permits. [BiPRO information]

Landfill Stocks

Legislative decree n. 36/03 of 13 January 2003, transposition of directive 1999/31/EC.

Ministerial Decree of 3 August 2005 (repealing ministerial decree of 13th march 2003) which establishes criteria and procedures for the acceptance of waste at landfills, according to decision 2003/33/EC).

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. The national waste framework legislation is included in the "Environmental Act", Decree 152/06, which contains all the prescription for the waste management; it also defines the responsibilities among the actors of the national waste management system.

Waste flows are reported on Eurostat at
http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

Mining wastes

In accordance with Legislative decree n. 117/2008, the National Institute of Environmental Protection (ISPRA- Department of Soil Protection) must collect data about extractive waste sites closed or abandoned.

Marine minerals

No data was received from the Member State.

Overseas territories

Italy is associated with two 'overseas' territories, Livigno and Campione d'Italia:

- Livigno is a commune on the Swiss-Italian border of area 211 km^2. It enjoys a special tax-free status, but no significant mineral activities are recorded.

- Campione d'Italia is a commune of the Province of Como in the Lombardy region, and an Italian exclave within the Swiss canton of Ticino, separated from the rest of Italy by Lake Lugano and mountains. It has an area of 1.6 km^2 and enjoys EU tax-free status.

Italy does not appear to hold resource and reserve statistical data on these territories.

Additional information

Other organisations that have mineral resource and reserve data for Italy:

- ISTAT (National Institute of Statistics) collect and process data on primary and secondary raw material fluxes.

- Assomineraria, the Italian Petroleum and Mining Industry Association, includes companies active in the exploration of the Italian underground to extract and produce solid minerals (bentonite, coal, silica, kaolin, feldspar, talc) and have the related data.

- Legambiente, one of the leading NGOs in Italy for environmental protection, publishes a report of quarry activities in Italy based on some regional offices data.

Key challenges:

A priority for Italy is the harmonisation of the great number of available data, based on an exchange format that is INSPIRE compliant and elaborated by all subjects who have interests in extractive activities (Regions, Ministers, Environmental and Statistic Institutes …).

The collection of data at national level (industrial and metallic minerals) is hampered by the heterogeneity of regional databases.

Latvia*

Primary raw materials
Data collection
No information received from Member State.
Data harmonisation and standardisation
No information received from Member State.
Data accessibility
No information received from Member State.
Landfill stocks/waste flows
Legislative and Organisational Overview An overview of the pertaining legislation at national, regional and communal level may be found at http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=LV Responsible institutions for waste policy and waste management are: The Ministry of Environmental Protection and Regional Development; the State Environmental Service

and its Regional Environmental Boards; the Latvian Environment, Geology and Meteorology Center and Municipalities.

The Ministry of Environment Protection and Regional Development (MEPRD) has the following responsibilities: elaborate the State waste management plan, including management of hazardous wastes, as well as regional waste management plans; co-ordinate implementation of the state waste management plan; elaborate and develop legislative acts in the field of waste management; batch information according to waste management; co-ordinate and organise management of hazardous wastes in compliance with legislative and normative acts, as well as provides management of non-host (abandoned) hazardous wastes; organise management of hazardous waste treatment and processing, including waste incineration installations and construction of waste polygons of national importance; co-ordinate construction of polygons for municipal wastes; provides information on waste management for European Commission, international institutions and general public.

Municipalities organise management of municipal wastes, including management of hazardous wastes, which origin is social and household conditions in its administrative territory, in compliance with state and regional waste management plans. Adopt decisions regarding placing in own administrative territory of new treatment objects and landfills for municipal waste; Pass binding regulations, designating municipal waste management in its own territory; determining also general principles of waste management.

Relevant legislation includes: Law on Pollution (01.07.2001., amendments 20.12.2010.); Law on Waste Management (18.11.2010., amendments 16.12.2010.); Law on Environment Protection (02.11.2006, amendments 16.12.2010.); Law on Packaging (09.01.2002., amendments 16.12.2010.); Law on Management of End of- Life Vehicles (05.01.2004., amendments 16.12.2010.); Law on Natural Resources Tax (15.12.2005, amendments 16.12.2010.). The mechanism of action of above-mentioned laws regulating waste management is implemented with a number of specific Regulations of the Cabinet of Ministers. The Cabinet of Ministers approves the State waste management plan as well as regional waste management plans.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. This is covered in the Latvian Waste Management Act of 2000, last amended in October 2006. The Latvian Waste Management Act of 2000 distinguishes between landfills and dumpsites, whereby landfills dispose of better environmental protection measure than dumpsites.

The following data is provided on operating landfill sites: location, type of facility and waste characterisation. Location data is also available for closed landfill sites. These data are available from the State Statistical survey of Wastes which collects data annually at an individual land site scale. All waste companies and biggest production companies reports with this survey. The data is standardised using EWC for waste classifications and D&R codes for treatment classification for all facilities. The data are aligned with internationally standard codes. Data is stored by Latvia Environment, Geology and Meteorology Centre on a centralised database (in Latvian) that is available to the public at all scales (national to individual site). This can be accessed here: http://www.meteo.lv/lapas/vide/atkritumi/atkritumi?id=1115&nid=367

Landfill site data is collected annually at a national level can be accessed here: http://www.lvgmc.lv/lapas/vide/atkritumi/atkritumu-statistikas-apkopojumi/atkritumu-statistikas-apkopojumi?id=1713&nid=380. Data is only available in Latvian, it can be reproduced with permission and there is no charge for its use. Examples of those who request to use it include: the State Environment service, Ministry of Environment and Regional Development, Educational organisations and Non-governmental institutions. Another relevant body is Ministry of Environment and Regional Development of Latvia. *Waste Flows* Regulated by transposition of the Waste Framework Directive 2008/98/EC. This affected the following selected laws (for details of these laws see link to legislative information): - Law on Environment protection, 02.11.2006, amended March 14.11.2008. - Law on Waste Management 2001 Amended 13.03.2008 - Law on Natural Resources Tax, amended 14.11.200 The following data is provided on waste flows: waste quantity, waste type, waste treatment, waste characterisation and time period. The amount of in-use metals/recyclates collected is also recorded. Waste flows are reported on Eurostat at {http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data}.' These data are harmonised to EWC codes and in the case of disposal operation, data is harmonised to D codes from Waste Framework Directive. No data is provided on in-use metal stocks.
Mining wastes
No information received from Member State.
Marine minerals
No information received from Member State.
Overseas territories
Latvia has no overseas territories or dependencies.
Additional information
None.

* No information on primary raw materials was received from Latvia

Lithuania

Primary raw materials
Data collection
The Ministry of the Environment is responsible for collection of data on primary raw material resources and reserves, but this activity is devolved to the Lithuanian Geological Survey. Resource and reserve data is collected for selected construction minerals (Lithuanian mineral production is dominated by these, industrial minerals and iron ore by purity. The data is derived from a combination of geological prospecting (presumably by the Survey) and mineral operators. Data is collected on a variety of scales, but these are not specified. Data from mineral operators is collected quarterly, whilst the frequency of data collection from other sources (primarily geological prospecting and exploration) is variable depending on when licences are issued and new data becomes available. Collection of data can be via specific requests to the licence owner or specified in the licence terms. The Geological Survey may instruct the licence owner to conduct additional investigations relevant to their work. No data is collected on marine/offshore minerals. Other data relevant to primary raw material resource evaluation exists, but no details are provided. Collection of data on primary raw material resources and reserves is covered by national legislation, the Underground Law nr. VIII-573, 1995. This states that individuals and organisations (e.g. ministries, departments, other state institutions, municipalities, scientific and educational institutions) must provide the Lithuanian Geological Survey with data on the subsurface acquired in the course of direct and remote investigations or during utilisation of the underground resources, irrespective of who financed the work. It indicates that the data must be provided free of charge by these sources. This legislation applies to all raw materials covered by this study. Reports on the results of prospecting, exploration and development have to be provided by the licence owners. Mineral exploration activity in Lithuania is monitored by the Geological Survey, with companies under a statutory obligation to report associated resource/reserve data.
Data harmonisation and standardisation
All data on the subsurface and the minerals covered by the project must be reported using the national code, therefore there is no requirement to harmonise data from different sources. It does not comply with an internationally recognised standard code, but is comparable to the UNFC. In the Classification of Solid Mineral Resources of the Republic of Lithuania all the reserves of mineral resources are classified by three criteria: geological exploration, investigation of utilisation potential and economic value. Data is received in a range of formats including reports, tables and maps. Boreholes (presumably the core) drilled in the course of subsurface investigations must be provided to the Geological Survey upon request.
Data accessibility
Data resutling from geological prospecting and 'reserve development' by the (Geological Survey) is owned by the State Treasury. Data acquired by private operators is owned by them, but must be provided to the Survey. State-owned data is stored in a GIS, which is created and managed by the Geological Survey. Deposits, prospective areas and associated

resources are registered in the 'State Cadastere of Underground Resources', which is managed by the Geological Survey. Data is organised at a national level and spatially referenced. Data acquired by licence holders can be accessed and used by the Geological Survey, without the permission of the licenece/data provider for official purposes, but cannont published or transfered to third parties, with the exception of requests from state instituions. These restrictions on data availability are valid for five years from the time of the data acquistion, or for two years following expiry of a licence to conduct exploratory work. Selected data can be obtained from the (Geological Survey) website or by specific request to the data owners. Publically available data can be used free of charge, but charges apply for admistering access to the data (e.g. printing, scanning etc). Data is requested by mineral propsectors, mineral operators and landowners. Most information is only available in Lithuanian, with selected introductory information on the Lithuanian Geological Survey website (www.lgt.lt) available in English. Some reports held by the Geological Survey are in Russian. No data are accessible from the website. The following online report in English contains limited information on the quantities of 'explored' resources in Lithuania: http://www.thefreelibrary.com/Lithuanian+mineral+resources,+their+reserves+and+possibilities+for...-a0250135106

Landfill stocks/waste flows

Legislative and Organisational Overview

The Ministry of Environment (MoE) is the main institution responsible for legislation and administration in the field of waste management, coordinating the activities of the State, regional and local institutions and preparing the National Strategy Waste Management Plan.

The Environment Protection Agency organises, coordinates and performs the state environmental monitoring, provides methodological help for Regional Environment Protection Departments in the environmental protection state control field, takes control, analyses and evaluates the implementation of environment protection state control, submits proposals for the formation and implementation of environmental protection policy etc..

Municipalities (10 regions, 60 municipalities) are the main institutions organising municipal waste management, formed in their territories. The main responsibility of municipalities is to create effective municipal waste management systems[142]. In Lithuania, local governments are responsible for organising municipal waste management and for reaching EU targets regarding recycling and recovery (except some waste stream (WEEE, packaging, batteries and accumulators waste) which are managed by EPR). They set out the terms of municipal waste collection, transport and treatment. Municipalities are responsible for providing selective collection of paper, glass, plastic, metal, etc.

[142] [LT ECAT 2012] Environmental Centre for Administration and Technology. 2012. Waste management system in Lithuania – history, trends, main actors and future scenarios. http://www.vartotojai.lt/get.php?f.1311

Regional waste management centres coordinate waste management in neighbouring municipalities in their region. There is an Association of Regional waste management centres in Lithuania. Regional waste management centres are the legal entities established by several municipalities. Those municipalities, who are owners of regional waste management centres, cooperate in order to improve waste management system and to create waste management infrastructure[143]. *Landfill Stocks* Regulated by transposition of the Landfill Directive 1999/31/EC. The main legislation dealing with landfilling comprises the Regulations on the Construction, Operation, Closure and Aftercare of Waste Landfills of 2000, 2001 and 2002. (http://ec.europa.eu/environment/waste/pdf/study/cowi_report.pdf). The disposal of waste must be prohibited by 16 July 2009 at the latest in landfills that do not conform to the requirements of the Regulations. The controlling legislation on stocks and flows is the 1998 Law on Waste Management (of 16 June 1998, Nr. VIII-787, as amended), overseen by the Lithuanian EPA. *Waste Flows* Regulated by transposition of the Waste Framework Directive 2008/98/EC. The controlling legislation on stocks and flows is the 1998 Law on Waste Management (of 16 June 1998, Nr. VIII-787, as amended), overseen by the Lithuanian EPA. Waste flows are reported on Eurostat at (http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data).
Mining wastes
The Lithuanian Ministry of Environment is the authority in charge of the mining sector in Lithuania.
Marine minerals
Not available.
Overseas territories
Lithuania has no overseas territories or dependencies.
Additional information

[143] [BiPRO 2011] Country Factsheet Lithuania (LT). http://ec.europa.eu/environment/waste/framework/pdf/LT%20factsheet_FINAL.pdf

None.

Luxembourg

Primary raw materials
Data collection
No information received from Member State.
Data harmonisation and standardisation
No information received from Member State.
Data accessibility
No information received from Member State.
Landfill stocks/waste flows
Legislative and Organisational Overview The Environmental Protection Agency is responsible for collection and storage of national scale waste management data. Data is publically available here: http://www.environnement.public.lu/dechets/statistiques_indicateurs/index.html http://www.statistiques.public.lu/stat/ReportFolders/ReportFolder.aspx?IF_Language=fra&MainTheme=1&FldrName=3&RFPath=65 This data is available in both French and English, it has been requested and or used by the National Statistical Office, Eurostat and OECD. *Landfill Stocks* Regulated by transposition of the Landfill Directive 1999/31/EC. The following data is available on operating landfill sites: location, type facility, size and waste characterisation. Further unspecified information is also available. All the above data is also available for closed landfill sites. The data is reported by companies to the Environmental Protection Agency, annually, at a national scale. All reports are standardised in order to be compliant with their permit and in order to gather the necessary data for waste statistics regulation. The following codes are utilised: EWC-code, NACE-code and R/D- code. The data are aligned with internationally used standard codes.

Waste Flows Regulated by transposition of the Waste Framework Directive 2008/98/EC. This occurred in the General Plan for Waste Management (PGGD, 2010) as published by the Government of Luxembourg, Ministry of sustainable development and infrastructures, Environment Administration. The following data is available on waste flows: waste quantity, waste type, waste treatment, waste characterisation and economic activity. This is collected annually. Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data No data is provided on in-use metal stocks. A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/luxembourg-municipal-waste-management
Mining wastes
No information received from Member State.
Marine minerals
Not available.
Overseas territories
Luxembourg has no overseas territories or dependencies.
Additional information
None.

Former Yugoslav Republic of Macedonia*

Primary raw materials
Data collection
No information received from Candidate Member State.
Data harmonisation and standardisation
No information received from Candidate Member State.

Data accessibility
No information received from Candidate Member State.
Landfill stocks/waste flows
Legislative and Organisational Overview An overview of the pertaining legislation at national, regional and communal level may be found at http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=MK According to the Law on waste management, Ministry of Environment and Physical Planning is a central body responsible for preparation of waste management legislation, national waste management strategy and waste management plan, as well as coordination of co-operation among all involved institutions in waste management in Macedonia. The supervision in terms of inspections over the enforcement of this Law and the regulations enacted on the basis of this law shall be carried out by the State Inspectorate for Environment. The general policy directions on waste management were outlined in the First and Second National Environmental Action Plan (NEAP), in 1996 and 2006 respectively, as well as in the 2004 Law on Waste Management. It includes the National Waste Strategy. One of the key ideas developed in the Strategy is that of regional waste management systems and landfills, the invitation to the Ministry of Environment and Physical Planning and the government to support and facilitate municipalities in setting up regional bodies and boards, and in promoting plans and investments for the regional management of waste. Additionally, the Strategy calls for the creation of a central body for the management of hazardous waste. *Landfill Stocks* Regulated by transposition of the Landfill Directive 1999/31/EC. This transposition relates inter alia to the following 'rulebooks': - Rulebook on the form and the content of the request for establishing landfill for non-hazard and inert waste (Official gazette of The Republic of Macedonia no. 133/07). - Rulebook for the monitoring of the work of landfills etc. (Official Gazette of The Republic of Macedonia no. 156/07). - Rulebook on the criteria for the acceptance of waste in landfills (Official gazette of The Republic of Macedonia no. 8/2008). - Rulebook for the conditions that need to be fulfilled by landfills. (Official gazette of The Republic of Macedonia no. 78/09). The State Statistical Office (Department for Environmental statistics). Are responsible for data collection and store it in a centralised database. Information about operating landfill sites is available on location and size.

Landfill site data is published in a booklet on Environmental Statistics, available at www.stat.gov.mk. This data is collected annually at the local level, it can be reproduced with permission and is not charged for. Those who have requested/accessed this data include: Domestic and foreign users (Ministry of Environmet and Physical Planning, Eurostat, EEA). It is avaliable in Macedonian and English *Waste Flows* Regulated by transposition of the Waste Framework Directive 2008/98/EC. This relates to the Law on Waste Management (Official Gazette of The Republic of Macedonia no. 68/2004, 71/2004, 107/07, 102/08, 143/08, 124/10, 09/11; 51/11). The Law on Waste Management (1) is a cover regulation act and provides general rules applying to main issues on waste and on hazardous waste and on special waste streams; it also represents the legal basis for variety of secondary legislation as rulebooks or guidelines. It is structured in several chapters, the details of which can be found at the legislation link above. The following information about waste flows is available: waste quantity, was type, waste treatment, waste characterisation and economic activity. No data is provided on in-use metal/recyclate stocks. Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data harmonised to EWC codes.
Mining wastes
No information received from Member State.
Marine minerals
No data found.
Overseas territories
Macedonia has no overseas territories or dependencies.
Additional information
None.

*No information on primary raw materials was received from the Former Yugoslav Republic of Macedonia.

Malta

Primary raw materials
Data collection
The minerals industry in the Maltese islands is dominated by the extraction of limestone for use in construction. The Malta Resources Authority (MRA) is the responsible authority for regulating mineral resources and for issuing exploration licences in the mineral resources sector. The Malta Environment and Planning Authority (MEPA) is the national agency responsible for land use planning and environmental regulation. Under the Development Planning Directorate (MEPA), the Minerals Unit is responsible for the processing of development permit applications for new quarries and extensions to existing mineral operations and the monitoring of quarrying sites and related operations. Historically, there were no statistical data on resources and reserves and even figures on mineral production have not been comprehensive. In early to mid 1990s, MEPA commissioned a Minerals Resource Assessment with a view to identify potential future resources of hardstone and softstone. The assessment identified 26 areas of interest. The resource classification used was based on two degrees of confidence in terms of the areas' geology: inferred or indicated. Indicated resources were further classified to determine constraints in development in Level 1(good degree of geological confidence and apparent lack of conflict with other land uses), and Level 2(a lesser degree of confidence and further investigations are required). MEPA has also undertaken research and produced a Draft Minerals Subject Plan, which puts in place a comprehensive framework to provide for the future supply of minerals and to control the impact of extraction. Through this research, figures of permitted reserves have been estimated and used to produce a database on production and permitted reserves data.
Data harmonisation and standardisation
There is no harmonised data and no requirement to report to a single international reporting code.
Data accessibility
According to the draft Minerals Subject Plan, MEPA has been in the process of developing a database on production and permitted reserves data. Current literature and online resources do not specify whether this database currently exists. Information compiled to produce the Draft Minerals Subject Plan include the key outcomes of the Minerals Resource Assessment and the reserves estimation undertaken. They can be accessed from the following link: http://www.mepa.org.mt/LpDocumentDetails?syskey=17

Landfill stocks/waste flows

Legislative and Organisational Overview

The Environment and Resources Unit of the NSO is responsible for reporting the Waste Statistics Regulation and the Municipal Waste Indicator to Eurostat. Other Waste reporting obligations fall under the remit of the Malta Environment and Planning Authority (MEPA). All operators provide the data to the MEPA, which then provides the data about private operators to NSO. NSO collects the data about the public waste facilities directly from WasteServ Malta Ltd. Data are collected annually from the National Statistics Office in Malta.

Data about landfills and public waste management facilities is organised at the site level. Data about other private waste management facilities is organised at the national level. At the national level, data is made public. NSO has a Memorandum of Understanding with MEPA in order have a constant data flow so that we can publish data locally and also report to Eurostat. The individual data about landfill sites which is not published by the NSO is owned by WasteServ Malta Ltd. and the operators of the private inert waste landfills. Data are INSPIRE compliant and can be reproduced with permission. A cost recovery charge applies for specific detailed data requests.

For further information It would be useful of you contact the Waste, Air, Radiation and Noise Unit (Unit D) of MEPA since this Unit is responsible for Malta's reporting for the Waste Framework Directive and the Landfill Directive (Tel no: +356 22902711). You can also contact WasteServ Malta Ltd, (Tel no: +356 23858000) since this government owned company is responsible for the management of the only non-hazardous landfill in Malta.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. This transposition relates to 2 acts:

-L.N. 168 of 2002 Environment Protection Act (Act No. XX of 2001) Waste Management (Landfill) Regulations, 2002 (http://www.mepa.org.mt/LpDocumentDetails?syskey=364)

-L.N. 289 of 2002 Environment Protection Act (Act No. XX of 2001) Waste Management (Landfill) (Amendment) Regulations, 2002 (http://www.mepa.org.mt/LpDocumentDetails?syskey=353)

Landfill data is available on the type of facility, its size and waste characterisation. Data is also available on closed landfill sites. This is collected at an individual site level on an annual basis. This data is obtained through administrative data reporting and presented in excel.

Data about the non-hazardous landfill is provided by WasteServ Malta Ltd which is the operator of this public landfill, and data about the inert waste landfills is provided by MEPA which collects data from the operators of these landfill sites (these are spent quarry sites which are used for the disposal of inert mineral waste). Data is collected annually at an individual landfill site scale

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. The Maltese act following the 2008 update of EU policy is: L.N. 22 of 2009 Environment Protection Act (Cap. 435) Occupational Health and Safety Authority Act (Cap. 424) - Waste Management (Management of Waste from Extractive Industries and Backfilling) Regulations, 2009

Waste flows data is available on waste quantity, waste type, waste type, waste treatment, waste characterisation, economic activity and time period. Data is not provided on in-use metal/recyclate stocks.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

Example of data on waste:

http://www.nso.gov.mt/statdoc/document_file.aspx?id=3864; and annual data on waste management can be found at http://www.nso.gov.mt/statdoc/document_view.aspx?id=3683&backurl=/themes/theme_page.aspx

Mining wastes

The regulations applicable to mine waste are "*Waste management (management of waste from Extractive industries and backfilling) Regulations L.N. 318 of 2010*".

Statistical data on mineral waste are collected by the National Statistics Office in Malta.

Example of statistical data on mineral waste:

http://www.nso.gov.mt/statdoc/document_file.aspx?id=3864

Marine minerals

According to the Draft Minerals Subject Plan, there is no source of marine dredged sand and gravel supplies that are economically exploitable.

Overseas territories

Malta has no overseas territories or dependencies.

Additional information

The country summary for Malta is the outcome of desk-based review. There was no survey response from relevant authorities.

Moldova*

Primary raw materials
Data collection
State Agency for Geology and Mineral Resources of the Republic of Moldova (AGMR) is under jurisdiction of the Ministry of Environment and has functions of regulating and coordinating the study, protection and rational utilisation of mineral resources. The main tasks of the Agency are (selections): - Government regulation in the field of study and use of mineral resources - Institutional control over compliance with requirements, standards, rules and regulations for the exploration of mineral resources, the rules of government accounting and reporting - Maintain state registration and state registration of the geological exploration of mineral resources, accounting licences areas - Developing proposals together with ministries and departments on the development of the mineral resources of the national economy - Creating a unified information system of subsoil use - Reporting the balance of stocks and inventory of mineral deposits, keep records of forecast resources; reviews the state of reserves of key minerals - Provides control over the presentation in the prescribed manner to the State Fund of information on mineral resources by geological materials research, provides a unified procedure for centralised storage and use - Carries out geological research Mining companies have responsibility (according subsoil law) to provide geological information to the State Fund of Information on mineral resources, and all information about mineral reserves (the flow of reserves). The geological exploration of mineral resources is organised and coordinated by the Agency for Geology and Mineral Resources. The State Fund of information on mineral resources is administered by the Agency for Geology and Mineral Resources. The Agency for Geology and Mineral Resources provides information on a fee basis. Geological information on minerals obtained from State and local budgets is public property. Geological information on subsoil obtained by subsoil users at their own expense is the property of the subsoil user and can be used for commercial purposes only with the consent of its owner. After the termination of the right to use, all the geological information becomes the property of the State.

Data harmonisation and standardisation
The most important law is the Subsoil Code (2009). Duties of subsoil users: to provide geological information to the State Fund of information on mineral resources, to submit to the State Fund and public authorities reliable data on the proven, recoverable and retained in the depths of mineral reserves (the flow of reserves).
Data accessibility
State inventory of mineral resources are maintained by AGMR in the manner determined by the Ministry of Environment. Government balances of mineral reserves reflect status of mineral resource for each type of minerals, that received a quantitative and qualitative assessment, providing information about quantity, quality and level of study. There is not information about standard, but it is probable to be similar to East European classification standard.
Landfill stocks/waste flows
Legislative and Organisational Overview No information received from State. *Landfill Stocks* No information received from State. *Waste Flows* No information received from State.
Mining wastes
No information received from State.
Marine minerals
Land locked.
Overseas territories
No overseas territories identified.

Additional information
Moldova has a small mineral industry that is primarily engaged in the mining and production of industrial minerals and mineral products, including granites, clays, gypsum, diatomites, limestones, and sand and gravel.

*Due to the absence of a survey response on primary raw materials, a desk-based review was undertaken to synthesise the above summary.

Montenegro*

Primary raw materials
Data collection
No information received from Candidate Member State.
Data harmonisation and standardisation
No information received from Candidate Member State.
Data accessibility
No information received from Candidate Member State.
Landfill stocks/waste flows
Legislative and Organisational Overview An overview of the pertaining legislation at national, regional and communal level may be found at http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=ME The authority competent for environmental protection (Ministry of Sustainable Development and Tourism) is also responsible for waste management. According to Article 19 of the Law on Waste Management (Official Gazette of Montenegro 80/05 and 73/08), this ministry performs the following tasks: - proposes a waste management plan to the Government; - monitors the status of management of all types of waste; - adopts the regulations to implement the Law; - performs other tasks stipulated by the Law.

Management of hazardous and special types of waste is also regulated at the national level.

In accordance with the Law, the conditions, manner and procedure of medical waste treatment are stipulated by the authority of state administration competent for health issues in cooperation with the authority of state administration competent for environmental protection, whereas the conditions, manner and procedure for veterinary waste management are stipulated by the authority of state administration competent for agriculture, also in cooperation with the authority of state administration competent for environmental protection.

The Law stipulates competences and responsibilities of entities regarding waste management. Local self-governments are responsible for management of the municipal waste, while the management of hazardous and other specific types of waste is regulated by the Government.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. This directive is related to: Article 66a of the Waste Management Law and Rulebook on detailed characteristics of location, construction requirements, sanitary and technical requirements, method of work and closing of landfills, professional qualification, qualifications of the landfill manager and types of waste and requirements for acceptance of waste into the landfill (Official Gazette of Montenegro 84/09)

Waste Flows

The Law on Waste Management (Official Gazette of Montenegro 80/05 and 73/08) established the basic legal framework for waste management activities. The waste management policy and strategy is regulated by the following documents:

- National Waste Management Policy (2004);

- Republic Level Strategic Master Plan for Waste Management (2005);

- National Strategy of Medical Waste Management (2008).

Mining wastes

Not available.

Marine minerals

Not available.

Overseas territories

Montenegro has no overseas territories or dependencies.

Additional information
None.

*No information on primary raw materials was received from Montenegro.

Netherlands*

Primary raw materials
Data collection
The mineral resources of Netherlands include aggregates, clay, peat, silica sand and carbonate rocks. The Ministry of Economic Affairs and the Ministry of Infrastructure and the Environment are the authorities responsible for the collection of resources and reserves data pertaining to these minerals. Responsibility for the data collection process is devolved to the Geological Survey of the Netherlands. National legislation, the Mining Act 2003 (as amended 2006, 2008, 2009 and 2010), requires the collection of data. Data are collected due to the requirement to produce environmental impact assessments for extraction sites and the need for national spatial planning which entails the assessment of reserves on a local scale.
Data harmonisation and standardisation
There is no harmonised data and no requirement to report to a single international reporting code.
Data accessibility
Available data are stored in a centralised database (DINO), which comprises a digital archive of subsurface data developed by the Geological Survey of the Netherlands. This database mainly holds borehole data. Data are publicly available and can be accessed in: www.dinoloket.nl. An assessment of aggregate resources (down to a 50m depth) was undertaken by the Geological Survey of the Netherlands. Further information on this assessment can be found in the published article[144]. There is also a website displaying the results from this study of sand and gravel resources for the Netherlands: http://www.delfstoffenonline.nl/delfstof/zandgrindviewer.htm)

[144] Van der Meulen, M.J., Van Gessel, S.F., Veldkamp, J.G. (2005). Aggregate resources in the Netherlands. Netherlands Journal of Geosciences – Geologie en Mijnbouw. 84 – 4. 379-387.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2009_edition/factsheet?country=NL

In 1997 there was a decision to centralise responsibility for waste management, implying a shift in powers from the provincial authorities to the central government authorities. The National Waste Management Plan is the plan for the national authorities, provinces and municipalities concerning waste management in the Netherlands. The plan implements related international regulations and it sets the rules for the regulation of the management of specific waste streams.

The legal duties of provinces are mostly concerning the licensing and enforcement of waste treatment facilities (including incineration and landfilling), including the regulation of waste prevention in individual licences. The provinces are also responsible (financially, administrative and organisationally) for the everlasting aftercare for the individual landfills.

Municipalities are responsible for the (separate) collection of household waste in their one city. Authorities are obliged to collect organic household waste separately, door-to-door, though there may be deviations in specific circumstances. Local authority bylaws mainly include rules on disposal of household waste, for example, which components have to be kept separate, frequency of waste collection and the agencies carrying out collection.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. In relation to this EU directive, the existing legislation used: Environmental Management Act. Decree on Waste Disposal at Landfills (Soil Protection Act), the Waste Substances (Prohibition of landfill) decree.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. This occurs in the form of the National Waste Management Act (2008). More detail can be found at the link above.

Waste flows are reported on Eurostat at
http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found here:

http://www.eea.europa.eu/publications/managing-municipal-solid-waste/netherlands-municipal-waste-management

Mining wastes

The State Supervision of Mines, Ministry of Economic Affairs is the authority with overall responsibility on mine waste management. The relevant mine waste legislation is the *Decision mining waste management Stb. 2008, 182 (and amendments).*

Marine minerals

Statistical data on offshore minerals, such as gravel, sand, clays, shells, and salt are collected in the Netherlands. Data are collected on variable time intervals. Additional information, such as mineral resource maps for sand and gravel have been produced by the Geological Survey of the Netherlands.

Exploration activity in the marine environment is monitored by RWS Sea (Rijkswaterstaat) and Delta, and the Ministry of Infrastructure and the Environment. RWS Sea and Delta manages and maintains the infrastructure required for performing measurements at sea. Companies are not under statutory obligation to report resource and reserves data. Data on resources and reserves are not reported using an internationally recognised standard code.

The data holders are the Geological Survey of the Netherlands, RWS Sea and Delta and the Ministry of Infrastructure and the Environment. Data are stored in a centralised database (DINO), now being transferred to the *Key registry for subsurface data (BRO)*. Data is organised at national scale. Data is spatially referenced, but not fully INSPIRE compliant. However, when data is fully transferred to the *Key Registry for subsurface data*, then they will be. Harmonisation efforts are in progress under EMODNET-Geology project. Data is publicly available and can be accessed using the following link: www.dinoloket.nl

Overseas territories

The Netherlands is associated with the overseas territories of Bonaire, Saba, Sint, Eustatius, Curaçao, Sint Maarten and Aruba.

The only significant minerals are gold and phosphate in Aruba. The contact for the Government department of nature and Environment is http://www.overheid.aw/index.asp?nmoduleid=19&wgid=6&sc=0&spagetype=21&nPageID=109&nCMSPageType=1

And sea salt in Bonaire. The contact for the public entity of Bonaire is http://www.bonairegov.nl/nl/omgeving/natuur-en-milieu

The state of minerals knowledge in the following is unknown: Sint Eustatius, Sint Maarten.

No mineral data were located related to Saba and Curaçao although they do have governmental web-sites.

However, no actual resource and reserve statistical data on overseas territories were found.

Additional information

The following are perceived as key challenges:

- data input from the private industry - merger of core and grain-size data from research institutes

*Due to the absence of a survey response on primary raw materials, a desk-based review was undertaken to synthesise the above summary. Certain information (e.g. on marine minerals) is from a survey response.

Norway

Primary raw materials
Data collection
Data on primary resources and reserves are currently collected by the Geological Survey of Norway and the Norwegian Directorate of Mining, both of which are administered by the Ministry of Trade, Industry and Fisheries. Operators are required to submit a yearly report which includes reserves data (but not resources) at a deposit scale or local area scale if operated by one producer. The requirement for operators to report annually is a statutory one under the Norwegian Mining Act nr 101 2009. Resource data are collected by the Geological Survey, but these are not updated at fixed intervals and the dataset is not comprehensive. Resources or reserves data for non-producing deposits may not be regularly updated. Data relating to all known deposits are kept in databases; many available mining reports are publically accessible. These are owned by either the Geological Survey or the Directorate of Mining. Norway has a “National Minerals Strategy” which requires that deposits are classified into “nationally, regionally or locally important” The Directorate of Mining owns all data related to mineral exploration activity but data collection is carried out jointly with the Geological Survey. There is no requirement for a specific code to be used.
Data harmonisation and standardisation
Whether resource or reserve data are compliant with internationally recognised codes depends entirely on the companies who report. The Geological Survey do not practice the function of a “qualified person”. The Geological Survey of Norway is participating in the EU-project Minerals4EU and other EU-projects requiring harmonisation of databases. The Geological Survey is also a partner in the Fennoscandian Ore Deposit Database and through this delivers data to Promine. There are also other co-operative projects.
Data accessibility

Data are owned/held by the Geological Survey of Norway and the Directorate of Mining. Data are stored in national databases at the deposit level, and are spatially referenced. Data at the deposit level reported by producers are confidential. The database is not INSPIRE compliant. Data are available to the public, free and can be accessed via two websites www.prospecting.no and www.ngu.no. The former is primarily maps.

Data are available in Norwegian and some in English.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=NO

In addition to the Ministry of Environment, Norway has three authority levels with regards to waste handling:

1. The Pollution Control Authority is responsible for following up firms that manage hazardous waste, which include both incinerators and landfills. The Authority also prepares suggestions for new waste regulations to the Ministry.

2. The County Governors are responsible for non-hazardous waste management, although they also follow up firms that handle some hazardous waste.

3. The Municipalities are responsible for following up collection and management of household waste. The municipalities are also responsible for local waste issues such as the ban on littering and open fire.

The Pollution Control Act regulates nearly all waste management activities. Specific requirements are given in Waste regulations under the Act. There are a number of waste regulations covering waste treatments such as landfilling and incineration or waste management of specific waste streams.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. This occurs in the Norwegian Waste Regulations (2002).

Waste Flows

The main piece of legislation concerning was management is the Waste Regulation (Avfallsforskriften, 2004). All the different regulations concerning waste and waste handling is gathered in on big regulation called “Avfallsforskriften”/Waste regulation. It contains 14 chapters, and regulates explicitly different waste categories (further detail on the structure of this regulation can be found at the legislation link above).

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data
Mining wastes
Data are collected on mine waste by the Geological Survey of Norway but these are "not currently collected systematically". These data include "rough estimates" of mine waste dumps. Data are collected via surveys but there is no regular time interval and no statutory obligation. Data relating to closed/abandoned mines is provided, but it is variable. It is provided at the individual site scale, its reproduction is permitted and is freely available at: http://www.miljostatus.no/Tema/Ferskvann/Miljogifter_ferskvann/Avrenning-fra-gruver. Data relating to operating mines is made available on the same basis, accessible at: http://www.norskeutslipp.no. Mining data are not spatially referenced and as such are not INSPIRE compliant. All mining data are collected, collated and held in databases owned by the Norwegian Environment Agency.
Marine minerals
No data are collected for the offshore/marine environment except for near-shore sand/gravel production. The Norwegian Oil Directorate is responsible for data relating to offshore oil and gas. The responsibility of ocean floor metal deposits is not yet clear, but under consideration.
Overseas territories
No information located.
Additional information
None.

Poland

Primary raw materials
Data collection
Data on resources and reserves is collected by the Polish Geological Institute-National Research Institute (PGI-NRI). The PGI-NRI fulfils the role of state geological survey. One of the tasks performed by the Survey is the 'national balance of mineral resources'. Data on Poland's mineral raw material deposits, resources, output and future potential are collected in the 'System of Management and Protection of Mineral Resources in Poland'

(MIDAS). There are two official data sources for the MIDAS system: 1) 'geological documentation' contained in the 'National Geological Archive' (including basic information on a deposit such as location, structure, hydrogeological conditions, raw material types, resources) and 2) 'statistical forms' filled out by concession holders and submitted annually to the PGI-NRI (containing information on the yearly output and changes to resource and reserves in a deposit), and used for preparing the 'balance of mineral resources' . Data is collected on a wide range of mineral deposit types including metallic, industrial and construction minerals, for the whole country. In terms of the regularity of data collection information derived from 'geological documentation' is compiled as soon as the documentation is sent to National Geological Archive of PGI-NRI. Data on resources, reserves and output changes in a deposit are sent to PGI-NRI annually, reporting the status as of end of December of the previous year. In Poland legal regulations require the collection of data on primary mineral resources. According to the Geological and Mining Law PGI-NRI is responsible for preparing the 'balance of mineral resources in Poland', of which collecting data on resources and reserves is a necessity. The 'Regulation of the Minister of the Environment' regulates the process of data collection via the 'statistical forms', which are returned by concession holders to PGI-NRI annually. The laws and regulations do not stipulate the raw materials on which data is collected, but the 'balance' has been always prepared for all primary raw materials occurring in Poland.

Data harmonisation and standardisation

In Poland there is national mineral resource classification system applied based on Polish law. The Act (Dz. U. Nr 291, poz. 1712) 'Regulation of the Minister of the Environment' defines the resource categories recognised in Poland. The use of these definitions is legally binding for people preparing documentation related to mineral deposits, for the reporting of resources of a specific deposit and also for PGI-NRI reporting on a national scale (because of the use of a national system in Poland and as all exploration and mining companies are under a statutory obliged to use it for reporting resource and reserve data there is no requirement to harmonise data received from various sources). The Polish classification is based on similar rules to UNFC and with some assumptions comparable classes to those defined by UNFC can be identified. Therefore whilst differences exist it is possible to map the Polish classification system to UNFC. The adaptation of Polish terminology to the UNFC standards is a continuation of attempts carried out by a range of representatives who were participating in meetings organised by the ECE in Geneva. The substantial difference between Polish system and the UNFC is the mode of presentation of resources and reserves data: hierarchical in Poland and complementary in the UNFC. In Poland the term hierarchical system means that resources are distinguished according to their economic usability within the total amount of resources called *geological resources in place*. Geological *resources in place* are divided into *anticipated economic resources* and *anticipated sub-economic resources*. *Anticipated economic resources* are divided into economic resources in place and *sub-economic resources* and then *economic resources in place* are divided into *extractable resources* and *losses of economic resources.* UNFC distinguishes exploitable resources and other resources (containing: sub-economic resources, anticipated sub-economic resources and anticipated economic resources not qualified to economic and sub-economic resources). This difference is important because data on resources in Poland cannot be comparable to other systems. Therefore, to obtain full compatibility between Polish and UNFC, the data on Polish resources should be released separately. It is suggested that the terminology used by the EC ('reserves' and 'resources') is comparable to two definitions used in the Polish classification system; i.e. anticipated

economic resources ('balance resources') are comparable to 'resources' whereas economic resources in place ('industrial resources') are comparable to 'reserves'.

Data accessibility

Publically available data covers metallic, industrial and construction raw materials. The information on resources presented by PGI-NRI covers the whole country (resources, output and location of deposits), but for most minerals data can also be found organised by regional/administrative level. Data collected by PGI-NRI is available on the Institute website in two areas: 1) the MIDAS database, updated regularly since 1988 contains detailed information on all raw material deposits in Poland, including information on individual deposits (including deposit documentation, location, concession holder(s), type of land use above the deposit, underground water levels (depth, quality), raw material data (thickness and depth, shape, qualitative parameters, resources and output), exploitation system, raw material processing, land reclamation planned for the future). This page is only available in Polish and the data is not spatially referenced; 2) The website 'Minerals Resources of Poland' presents selected information on resources of mineral raw materials in Poland, the state of their development and output. Data on 12 415 raw materials deposits in Poland are presented in four different chapters covering individual raw materials groups. The chapters usually contain information presented at a national level and also at a regional/administrative level, where deposits are listed within provinces and the name of a county is provided. The website also displays a set of maps showing the distribution of raw materials deposits. An English version of the website exists. The processing of the data and website updating are carried out by the 'Department of Deposits and Mining Areas Information' of PGI-NRI, based on the MIDAS System. They also produce a related publication: 'The Report of Mineral Reserves and Groundwater Resources in Poland'. This Report has been issued each year since 1953, after being accepted by the Department of Geology and Geological Concessions of the Ministry of the Environment and its publication is currently financed by the 'National Fund for Environmental Protection and Water Management'. PGI-NRI can be viewed as the data holder for resource and reserve data in Poland, whilst the Minister of the Environment is the owner on behalf of the 'State Treasure' and responsible for authorising their dissemination. It is suggested that this ownership situation would complicate collection of Polish data into a pan-European database or year book. All data is freely available to the public. Data covered by the PGI-NRI website (http://geoportal.pgi.gov.pl/surowce) are available in Polish and in English, but data in the MIDAS database (http://geoportal.pgi.gov.pl/midas-web) are available only in Polish. 'The balance of mineral resource in Poland' is published annually in Polish and every five years in English.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2009_edition/factsheet?country=PL

Waste legislation and implementation:

- The Ministry of the Environment (MoE, *Minister Środowiska),* Department of Waste Management is responsible for the preparation of a national waste management plan (http://www.mos.gov.pl/g2/big/2009_06/e97e2a07ce29b48c19f462f83a6bf1a9.pdf).

- Poland is divided into 16 voivodships. "Administrative authority at voivodship level is shared between a government-appointed governor called a voivode *(governmental administration)*, and an elected assembly (sejmik), with an executive chosen by that assembly *(self-governmental administration)*. At the voivodship level most of responsibilities in the field of waste management belong to self-governmental administration.

Inspections and enforcement:

- Chief Inspectorate for Environmental Protection (Główny Inspektorat Ochrony Środowiska);

- Voivodship Inspectorates for Environmental Protection (Wojewódzkie Inspektoraty Ochrony Środowiska);

- General responsibility for enforcement of municipal waste management is in responsibility of municipalities[145].

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. A number of acts and regulations relate to this transposition (for details on each, see the link above):

- Act of 27th April 2001 on waste (J. of L. of 2007 No. 39, item 251, with later amendments).

- Regulation of the Minister of the Economy of 30th October 2002 on the types of waste which can be deposited in a non-selective way (J. of L. No. 191, item 1595).

- Regulation of the Minister of the Environment of 9th December 2002 on the scope, time, manner, and conditions for monitoring landfills (J. of L. No. 220, item 1858).

- Regulation of the Minister of the Economy of 7th September 2005 on the requirements to be met by the waste to be deposited at particular landfills (J. of L. No. 186, item 1553, with later amendments).

- Regulation of the Council of Ministers of 14th October 2008 on environmental fees (J. of L. No. 196, item 1217).

Waste Flows

[145] [RETech 2009] RETech. Waste Management. Made in Germany. Die Exportinitiative Recycling- und Enffizienztechnik. Länderprofil Abfallwirtschaft. http://www.retech-germany.net/themen/laender_und_maerkte/laenderprofile/dok/323.php

Regulated by transposition of the Waste Framework Directive 2008/98/EC. Act of 27th April 2001 - Environmental Protection Law (J. of L. of 2008 No. 25, item 150, with later amendments). This act contains an introduction of general environmental principles, which are also relevant for waste management, such as principle of prevention, precautionary principle, environmental fees, integrated permissions, etc. Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data
Mining wastes
The Chief Inspectorate of Environmental Protection are the responsible authority for mine waste in Poland, and The Act of 10 July 2008 on Mining Waste is the relevant legislation.
Marine minerals
Data is collected by the Polish Geological Institute-National Research Institute (PGI-NRI) for the offshore/marine environment for sand and gravel.
Overseas territories
Poland has no overseas territories or dependencies.
Additional information
None.

Portugal

Primary raw materials
Data collection
Data on 'resources' of primary raw materials is collected for a range of construction, industrial and metallic minerals. Data collection is the responsibility (not devolved to LNEG) of the Ministério da Economia e do Emprego, which covers precious, transition and base metals, non-metallic minerals and energy mineral resources. Data is sourced from reports from (commercial exploration/mining) companies and work of the geological survey, at a range of spatial scales. The regularity of the data collection is variable. Other datasets owned by the geological survey are relevant to raw material resource evaluation in Portugal, covering precious metals, transition and base metals and non-metallic minerals. Legal regulations (Decree-Law Nr. 90 1990, Decree-Law Nr. 88 1990 Mineral Deposits Regulation, and Decree-Law Nr. 89 1990 Quarry Regulation) require collection of data on primary raw material resources and reserves and companies are under statutory obligation to supply this data. Exploration activity is monitored by the Direcção Geral de Geologia e Energia.

Data harmonisation and standardisation
Companies are not compelled to report their data using a standard code or national code. The data available for Portugal is not harmonised to a national or standard code, but there is a suggestion that it is 'partially aligned with UNFC'. It is INSPIRE compliant.
Data accessibility
Data on primary raw materials is held/owned by the Geological Survey and stored in paper and digital archives and databases, at a national level. It is spatially referenced and variably INSPIRE compliant. Data on 'resources' of primary raw materials is generally confidential. Any data available to the public can be accessed via the internet and/or through specific data request. Use by professionals is chargeable, but for research purposes data is made available for free. The data is requested by companies, researchers and government agencies.
Landfill stocks/waste flows
Legislative and Organisational Overview No information received from Member State although relevant legislation and data responsibilities are outlined below. *Landfill Stocks* Decreto-Lei 183/2009, Official Journal 153, 10/08/2009, Page: 05170-05198 transposes Directive 1999/31/EC of 26 April 1999 into national law. The transposition establishes the legal regime of the deposition of waste in landfills, the technical characteristics and requirements to be observed in the design, licensing, construction, operation, closure and post-closure of landfills, transposing into national law Directive n. º 1999/31 / EC of the Council of 26 April on the landfill of waste, as amended by Regulation (EC) n. º 1882/2003 of the European Parliament and of the Council of 29 September, implementing Decision No. º 2003/33/EC of 19 December 2002 and repealing Decree-Law n. 152/2002 of 23 May. (http://www.asser.nl/default.aspx?site_id=7&level1=12222&level2=12309&level3=12606&textid=37646) Data on landfill stocks is analysed by www.ine.pt (Portuguese Institute of National Statistics) on behalf of the Environment Agency collected from data owners via a web portal. With regard to operating sites the following data is collected by annual survey: Location, Type of facility, Size and other unspecified data. On closed landfill, the following is collected: Location, Type of facility and other unspecified data. This is for both mainland Portugal and the autonomous regions of Madeira and the Azores. These data are only made publicly available at the national aggregate level, and they are not INSPIRE-compliant. *Waste Flows*

Regulated by transposition of the Waste Framework Directive 2008/98/EC. National legislation currently in force concerning MSW management options is the Decree law nº 73/2011, of June 17 which makes the third change to Decree law nº 178/2006, of September 5 transposes Directive 2008/98/EC of the Parliament and the council. (For more detail on the main objectives of this law see p.13 of: https://estudogeral.sib.uc.pt/bitstream/10316/20460/1/Daniela_Pascoal.pdf). With respect to waste flows: Waste quantity, Type, Treatment (D&R code), Characterisation (LoW code), Economic activity are reported annually. Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/portugal-municipal-waste-management
Mining wastes
The competent authority in Portugal is Direção Geral de Energia e Geologia (DGEG), with the controlling legislation being Decreto-Lei n.º 31/2013. Data on 'resources' associated with mine waste is collected for gold, copper, zinc, lead, tungsten, uranium and lithium. Data associated with mine waste is generally confidential. No national legislation and/or policy require collection of data. Information on closed and abandoned mines is collected and is available at the web site: http://www.dgeg.pt?cr=13014 (otherwise it is necessary to follow the link to 'Minas e Pedreiras' and then 'Instalações Abandonadas e Resíduos' from where spreadsheets of mines may be retrieved (only in Portuguese)). The listing contains details of Type of facility, Size and Waste Source (type of mineral) at the site level. The related data is freely available. With respect to operating mines, data are collected, but not made available to the public. Meta-data include: Location, Type, Size, Estimated total and annual waste, Source and Characterisation. Where transferred to waste facilities, the wastes are characterised by EWC code i.e. under 01 xx xx and 19 xx xx. Although held in national databases and containing spatially referenced data, the data is not INSPIRE compliant.
Marine minerals
Data is not collected on marine minerals.
Overseas territories
Portugal does not appear to hold resource and reserve statistical data on overseas territories, except for data collected on landfill stocks and waste flows pertinent to the Azores and Madeira.

Additional information
The largest perceived challenge to availability and harmonisation of mineral resource and reserve data is getting data owners to organise the data and deliver it according to rules being established by the INSPIRE Directive.

Romania

Primary raw materials
Data collection
The Mining Law of Romania requires collection of data on all mineable primary raw material resources and reserves. Data on mineral resources and reserves are collected for a wide range of primary minerals. The National Agency of Mineral Resources (NAMR) (www.namr.ro) is responsible for data collection. NAMR has responsibility for surveying and registering Romanian minerals resources, establishing the 'National Geological Database', 'National Resources/Reserves Database' and 'Mining Book', based on registered resources/reserves and annual changes in the geological resources and reserves, determined from information submitted by mineral titleholders. NAMR also issues compulsory regulations and instructions for the minerals sector covering the organisation and monitoring the 'National Resources/Reserves Database' and the method of reporting data associated with it. In addition to collecting mineral resources and reserves statistical data, NAMR also has other relevant data in the form of a mineral occurrence database, mines and quarries information and mineral resource maps. All mineral licence holders have a statutory obligation to report on their production, exploration results, changes in resources/reserves (using the UNFC classification system) and the quality characteristics of the mined/explored resources, for all commodities, on an annual basis. The reporting takes the form of reports (data sheets), supplemented by other datasets/information (explanatory notes).
Data harmonisation and standardisation
Data on resources and reserves held by NAMR complies with the UNFC classification system. Since 1998, the UNFC classification system has been used in Romania. Prior to this and in older publications/reports a national classification system similar to other 'Eastern Europe' systems was used. According to the Mining Law nr. 85 2003, NAMR issued technical instructions regarding the classification of reserves into categories based on grade and other economic criteria.
Data accessibility
The owners/holders of mineral resource and reserve data are NAMR, which are updated annually. Other geological datasets and maps were dispersed in various archives across the country, legally administered by NAMR, but run by other institutions until recently. Since 2013, NAMR has started to gather all this old information into a centralised archive in Bucharest The process of archive organisation is underway. The majority of the data is in

printed format. GIS datasets exists for the areas licensed by NAMR for mining/exploration activities from 1996 onwards (this is the only spatially referenced data and partially INSPIRE compliant). Information regarding mineral deposits and reserves/resources are confidential and are covered by special regulations on data, only permitting use by authorised person. Companies receiving data/information from NAMR have an obligation to keep it confidential and use it only for internal purposes. Reports and synthesis relating to mineral resource estimation and used by NAMR for estimations at a national/regional level or for summarising the status of specific commodities are also produced. Selected data can be accessed for a charge, via specific data requests (). Data and information is not available in multilingual formats.

Landfill stocks/Waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=RO

Romania relies on agencies at three levels to manage waste: the Ministry of Environment and Climate Change (MoECC) and Ministry of Administration and Interior (MAI); the County Councils; and municipalities, which must ensure that all non-complying landfills and illegal dumps are closed, existing municipal landfills rehabilitated or extended, and new landfills constructed where needed. MoECC is responsible solely with environmental regulation and management of activities related to landfill and waste flows. They also have responsibility for environmental impact monitoring, enforcement and inspection.

Moreover, according to L 211/2011, local authorities are obliged to ensure separate collection of at least paper, metal, plastic and glass and to achieve, by 2020, the 50% preparation for reuse and recycling target. Eight Regional Environmental Protection Agencies (regional EPAs) had prepared Regional WMPs; County Councils had prepared county-level WMPs.

Regional Associations comprise municipalities within the same county and the County Councils are responsible for managing final disposal facilities and transfer stations. This function is delegated to the County Council, including contracting for investments and operation. In small towns and rural areas, where solid waste management infrastructure is difficult to sustain, the County Council may also carry out procurement and other administrative functions. Larger landfills near bigger urban areas accommodate waste produced in the entire county; and transfer stations near large urban centres collect waste generated in surrounding regions.

Landfill Stocks

As regards the landfill of waste, the national legislation transposed Directive 1999/31/EC mainly through Government Decision no. 349 of 21 April 2005 on landfill of waste. (http://www.clientearth.org/aarhus-centre-documents/berthier-gestdem-2010-4370/table-1-full-access-conformity-check-studies/48-Conformity-study-Directive-1999-31-RO/CS%20Directive%2099-31%20RO.pdf)

The Ministry of Environment is responsible for data provision. With respect to operating sites, it collects Location, Type of facility, Size and Waste characterisation. With respect to closed sites, it does not currently provide data. It has some information for the landfills for non-hazardous waste (municipal) that were not complying with Directive 1999/31 and were established to cease activity according to the Treaty for Romania's Accession to EU. Metadata is the same as for operating sites and is gathered from operating companies at site level. Only some of this (regarding location and type) is publicly available.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. The European Waste Framework Directive 2008/98/EC has been transposed into Romanian legislation (Law no. 426/2001). Also the National Strategy for Waste Management, the National and Regional Plans for Waste Management have been revised in the same period. An overview on the legal framework on waste in Romania is given in the report below: (http://eimpack.ist.utl.pt/docs/Report%200_Romania_final.pdf).

Waste flows are fully characterised: Waste quantity, Waste type, Waste treatment, Waste characterisation, Economic Activity, all per year. Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

Codes employed are NACE codes, waste codes according to Decision 2000/532, R and D codes according to Directive 2008/98. All data is held on a national centralised database at all levels of aggregation, but Romania is only starting the process of INSPIRE-compliance.

Mining wastes

National legislation transposed the Mining Waste Directive 2006/21/EC through Government Decision no. 856/2008. The Ministry of Environment is the competent authority (for coordinating reporting). NAMR, Ministry of Economy and the General Inspectorates for Emergency Situations have also responsibilities for the collection of data on mine waste (mine waste dumps and tailings), monitoring and reporting. The Mining Law/2003 requires collections of data on all mineral resources that is primary minerals and mine waste. Data is derived from industry, resource companies and the Geological Survey.

Marine minerals

Not available.

Overseas territories

Romania has no overseas territories or dependencies.

Additional information

It is suggested that current laws relating to data confidentiality and 'classified' information are a key challenge to the availability of mineral resource and reserve data from Romania.

Serbia

Primary raw materials
Data collection
Natural resources in Serbia are the property of the State and any exploration and exploitation taking place shall be conducted in accordance with the relevant legislative framework , which amongst other includes the: - Law of Mining and Geology Exploration –The Official Gazette RS N°88/2011 - Rules for the classification and categorisation of solid mineral resources – The Official Gazette SFRJ N°53/79 - The Constitution of the Republic of Serbia (2006) - National strategies for sustainable use of natural resources - The Official Gazette RS No 33/2012 - Several other Acts. The National legislative framework requires the collection of data on primary raw material resources and reserves. The Ministry of Mining and Energy (Sector for Geology and Mining – www.mre.gov.rs) monitors mineral exploration activity in Serbia and mining companies are under statutory obligation to report resource and reserve data. The Ministry collects statistical data on resources and reserves through the following mechanisms: - Annual survey, which mineral operators have a statutory obligation to full fill, - Geological and mining inspections, and - Company reporting (i.e annual reports) Companies are compelled to report data using the National Code as defined in the Rules for the classification and categorisation of solid mineral resources (The Official Gazette SFRJ N° 53/79). Sometimes companies use international codes and standards, such as the JORC code, NI-43 101 for non- public reporting. Companies are required to provide statistical data on an annual basis (survey), or/and when new data become available, or when they relinquish a permit. Data are provided to the Ministry of Mining and Energy in various formats, including tables, reports, maps, electronic data. Other, non-statistical data, such as mineral resources maps, mine and quarry information exist for all metals, industrial minerals, construction minerals and mine waste. Different organisations across Serbia are the owners of such data including the local/regional government, the Ministry of Mining and Energy, and the Chamber of Commerce and Industry of Serbia. Companies are under a statutory obligation to report other data for example, geological maps, drill hole logs etc.
Data harmonisation and standardisation
Statistical data on resources and reserves are reported using the National code, as specified in the Rules for the classification and categorisation of solid mineral resources

(The Official Gazette SFRJ N° 53/79). In the Law of Mining and Geology Exploration (The Official Gazette RS N°88/2011) the terms mineral resources and ore reserves are defined as in PERC. The National code classifies resources and reserves in different categories (A, B, C, D). It is currently under review and in the future the categorisation and terminology used will be aligned with PERC. The use of a 'Competent person' is essential to undertake the classification task.

In some cases, companies supplied data to the State using an international code or standard, such as PERC or NI-43 101, which are also aligned to the Serbian National code. Therefore for certain commodities (e.g Au, Mo) internationally aligned data exist.

Data accessibility

Statistical data on resources and reserves held by the Ministry of Mining and Energy are used to prepare the 'Balance' of data. This provides an evaluation of the exploitation opportunities associated with the identified recourse categories, which may become 'active' in the future. For example, Classes A and B in the 'Balance' correspond to deposit development and production preparation projects, and C1 relates to projects in the exploration phase and as a basis for trial production.

The Ministry of Mining and Energy have established a national WebGIS for mining and geology that holds data on exploration and exploitation projects, licences, infrastructure, etc. The WEbGIS will soon become available online through the following website www.mre.gov.rs. The Geological Survey of Serbia has established the Geological Information System of Serbia (GeolISS - http://geoliss.mprrpp.gov.rs/) that includes a different set of geological mainly information, such as maps, directories (i.e with project information and archive data), hydrogeology data and others.

Statistical data is organised at the deposit and national level. Data at the deposit level is owned by the company/ investor. Data at national level is publicly available, or can be accessed through specific data requests to the Ministry. In addition, sets of data are available in published scientific literature articles.

Data is often requested by investors, the mining industry and other Agencies. Other organisations, for instance, BRGM, UNEP, SIDA, IAEA, the Swedish Agency for Environmental Protection, also have mineral resource and reserve datasets for Serbia.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=RS

Statistical data on waste can be accessed from the Statistical Office in Serbia (http://webrzs.stat.gov.rs/WebSite/Public/PageView.aspx?pKey=200 – in Serbian language)

Landfill Stocks

Until new sub-Acts are adopted on the basis of the Law on Waste Management, regulations passed on the basis of the priory valid Law on Environmental Protection shall be applied ("The Official Gazette of the RS", no. 66/91, 83/92, 53/93-other law, 67/93-other law, 48/94- other law, 53/95 and 135/04):

By-law on criteria for the determination of location and development of landfills for hazardous substances ("The Official Gazette of the RS", no. 54/92) which sets forth the criteria for the determination of the location of hazardous substance landfills, method of sanitary and technical development of landfills for environmental protection, as well as the method of landfill eradication; By-law on hazardous waste management ("The Official Gazette of the RS", no. 12/95) sets forth the method of managing of certain types of hazardous waste, conducting inventory of types and quantities of hazardous substances in production, use, transport, marketing, storing and disposal and provides waste categorisation in accordance with the Basel Convention;

By-law on methodology for chemical incidence and pollution risk assessment, action plans for preparation and overcoming of consequences ("The Official Gazette of the RS", no. 60/94).

Waste Flows

The Law on Waste Management (The Official Gazette of the RS", no. 36/09) is the main document of waste legislation in Serbia adopted in May 2009. The Law on Waste Management is based on the basic principles of waste management and provides conditions for the full harmonisation with the EU legislation.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data and are harmonised to EWC codes.

Mining wastes

The Ministry of Mining and Energy (Sector of Geology and Mining) monitors mining waste in Serbia. The Law of Mining and Geology Exploration (The Official Gazette RS N°88/2011) refers to mining waste and the implementation of the EU Mining Waste Directive.

Marine minerals

Landlocked.

Overseas territories

No overseas territories identified.

Additional information

The following are perceived as key challenges to availability and harmonisation of mineral resource and reserve information:

- Law regulations - Historical data and property of quantity and quality of mineral resource and ore reserve – the definition of A, B, C, D categories for different types of ore deposits and the calculation procedures as defined in the Law of Mining and Geology Exploration and the Rules for the classification and categorisation of solid mineral resources. - Membership in the European Federation of Geology (EFG). Membership to EFG is essential for acquiring the 'Competent Person' title. - Academic qualifications of geologists do not necessarily match the criteria required for them to become a 'Competent Person' The background and specialisation of a geologist can be very diverse, for example, petrologists, sedimentologists, geophysists etc they all have a geology qualification, but none of the above are necessarily competent to undertake a resource and reserve classification assessment. Additional training is therefore essential to ensure that the right skills are in place. Also in depth knowledge of the country's resources and geology is seen as very important.

Slovakia

Primary raw materials
Data collection
The State Geological Institute of Dionýz Štúr (SGIDŠ) collects data, on behalf of the Ministry of the Environment, on primary raw materials 'reserves', on an annual basis, via a questionnaire survey which mineral operators, exploration companies and owners of mineral rights have a statutory obligation (for 'reserve' data only) to fulfil. In addition to providing reserve data annually to SGIDŠ, mineral operators have to report reserve data when applying for a 'mining lease'. A number of legal regulations (Acts, Decrees and Government Directives) in ~~the~~ Slovakia are relevant to the provision of data on primary raw materials resources and reserves, and these apply to the reporting of data on all minerals types. The 'Mining Law' (SNR Act No.44/1988 Col. on mineral protection and exploitation (Mining Law) in the wording of the SNR Act No.498/1991 Col. and the NR SR Act No.558/2001 Col., in the wording of the Act No.203/2004 Col., the Act No. 587/2004 Col., the Act No. 479/2005 Col. and the Act No. 219/2007 Col.) and the 'Geological Law'(NR SR Act No.569/2007 Col. on geological works) are the two principal legal regulations on prospecting and exploitation of mineral resources and they are supported and implemented by several additional Acts and Decrees. They cover the collection, storage, processing, assessment and provision of geological documentation and the results of geological surveys; and management of an inventory of mineral reserves, for all minerals. Classification of 'reserves' of 'exclusive mineral deposits' of ~~the~~ Slovakia is regulated by an Act on 'mineral protection and use' and a decree 'on classification of reserves and reserves calculation of exclusive mineral deposits'. Data is collected on a diverse range of minerals, for the whole country. A range of other datasets relevant to resource evaluation also exist for ~~the~~ Slovakia e.g. the map of 'raw mineral deposits'.
Data harmonisation and standardisation

Reserves of 'exclusive mineral deposits' are classified into the following three categories according to the stage of survey, quality, technological characteristics and mining conditions. These are further subdivided into a number of additional 'reserve' categories. The term resource is not used in ~~the~~ Slovakia classification system. Accordingly, ~~the~~ Slovakia reserve classification system differs significantly from that used in the Czech Republic and is not aligned with an internationally recognised standard code. It is used for 'reserve' reporting on all reserved minerals in the country. All mineral reserve data available for ~~the~~ Slovakia is harmonised at its source level i.e. when data is reported it should comply with the Slovakia classification system (i.e. the national code).

Data accessibility

In ~~the~~ Slovakia SGIDŠ owns/holds the data on national mineral 'reserves', on behalf of the Ministry of the Environment. Data is stored in a national centralised database and GIS system, therefore the data is spatially referenced. It is not INSPIRE compliant. SGDIŠ publishes a 'register of reserved (the states minerals) minerals', 'evidence of non-reserved minerals' (e.g. building stone, gravel sands and brick clays) (not publically available), and the 'Slovak minerals yearbook' (publically available). The 'Slovak minerals yearbook' contains a substantial amount of data on 'reserves', including information on the number of 'reserved deposits' registered; 'total geological reserves – reserves in their original form, without considering mining losses and dilution' for the following categories: 'mineral fuels', 'metals', 'industrial minerals' and 'construction minerals'. The number of 'deposits', 'reserves' and the number exploited and output are also reported by administrative region and district. Detailed information (number of deposits, number exploited, 'reserves' across the various Slovak 'reserve' categories, total 'reserves' and mining output) is provided for the following metals: uranium, iron ore, copper, lead, zinc, antimony, mercury, tungsten, silver and gold, industrial industrial minerals (magnesite, talc, bentonite, gypsum, baryte, limestone, dolomite, zeolite, perlite, ceramic and refractory clays, kaoline, basalt, dimension stone, diatomite, graphite, rock salt, silica minerals and sands, feldspar, mica) and construction minerals ('crushed stone', 'gravel sands' and 'brick clays'). Specific reports on mineral deposits can remain confidential at the request of the reporting company, for a maximum period of 10 years. 'Reserve' data can be accessed as printed documents produced by SGIDŠ and electronically (free of charge) via their website. With the exception of the 'Slovak Minerals Yearbook' data is generally not available in English. The 'Slovak Minerals Yearbook' can be accessed at: http://www.geology.sk/new/sk/node/1218.

Landfill stocks/Waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=SK

Responsible bodies:

- Ministry of Environment (MoE) – Department of Waste Management: preparation and implementation of waste legislation

- Regional Environmental Offices – prepare Waste Management Plans for regions, second-level authorisation

- District Environmental Offices: issue permits to waste management operations and activities, approve Waste Management Plans of municipalities and waste producers, control activities Slovak Environment Inspectorate (and some other institutions): inspection on waste legislation

- Local municipalities

- Slovak Environmental Agency: expert organisation of the MoE, support to MoE by data analysis and preparation of Waste Management Plans of SR [Source: BiPRO]

Further information on management and infrastructure at http://ec.europa.eu/environment/waste/framework/pdf/SK_factsheet_FINAL.pdf

Data on 'waste generation and treatment' is monitored and collected. In ~~the~~ Slovakia the Slovak Environmental Agency (SAŽP) and Statistical Office of ~~the~~ Slovakia both collect data on waste, according to the European waste catalogue codes. SAŽP collects data on waste via an annual questionnaire survey (targeting industry, municipalities and public administration), on behalf of the Ministry of the Environment and also manages the national 'Regional Information Waste System (RISO). There are legal regulations (Acts) in ~~the~~ Slovakia which require collection of data on waste as defined by the EC, as well as on 'mining waste'.

SAŽP is the holder of data. The data is held in a national centralised 'information system' and the data is organised at a national and regional level. The data is spatially referenced and INSPIRE compliant. The data is available free of charge and can be accessed via data requests and SAŽP manages an internet portal (ENVIROPORTAL - http://www.enviroportal.sk) open to public, and a database (RISO), which is only open to authorised users. The data is not available in multilinguial formats. The Statistical Office of Slovakia publishes a yearbook 'Waste in the Slovak Republic' (available to public) based on SAŽP data.

Further useful information is available at: www.geology.sk

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. Directive 1999/31/EC has been transposed into: Act No. 223/2001 Coll. on Waste and on Amendment of Certain Laws. (For further details, see the link above).

Data on operating and closed landfill sites are provided for location only. There is no data on in-use metal stocks.

National-level landfill data is collected annually and can be accessed by the public at the following addresses

http://globus.sazp.sk/skladky/

http://envirozataze.enviroportal.sk/

http://www.geology.sk/new/sk/sub/ms/geof/skladky

There is no charge to access these databases, and the data can be freely reproduced in other databases or publications with permission.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. Waste management (including hazardous waste management) in Slovakia is regulated by one comprehensive act: Act No. 223/2001 on wastes, as amended by later regulations and by a set of implementing regulations. The act has been harmonised with all EU Waste Directives, including the Directive 2000/53/EC on end-of life vehicles, the Directives on waste electrical and electronic equipment (WEEE), the Directive on PCB/PCT, the Directive on hazardous waste, the Landfill Directive and others. (For details on the structure of this act, see the legislation link above).

Waste flows arising from these sites are captured in terms of their type (e.g. hazardous), quantity, treatment (e.g. D and R code), characterisation (e.g. European Waste Code) and activity (e.g. NACE). These waste flow data are reported on an annual basis.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

Mining wastes

Information on **closed or abandoned mines** is being provided by the State Geological Institute of Dionýz Štúr (www.geology.sk), Regional centre Spišská Nová Ves within the project "The Inventory of closed and abandoned mining waste facilities which cause serious threat to human health or environment according to requirements under Directive 2006/21/EC". Time frame of the project is from July 2011 to December 2013. The object of the project is to inventory 350 closed and abandoned mining waste facilities. This number does not represent total number of closed and abandoned mining waste facilities on the territory of the Slovak Republic.

The Slovak Environmental Agency (SAŽP) administrates the Information System on Mining Waste Management (http://charon.sazp.sk/Odpady_tp/). This information system contains the Register on closed and abandoned mining waste facilities (http://charon.sazp.sk/Odpady_tp/Ulozisko.aspx). Information in this register represent to the public available output of the inventory on closed and abandoned mining waste facilities in the Slovak Republic.

Information is provided on the environmental impacts associated with these closed facilities. The inventory does not include all mining waste facilities on the territory of the Slovak Republic, but it includes all mining waste facilities which cause serious negative environmental impacts or have the potential of becoming in the medium or short term a serious threat to human health or the environment.

The closed or abandoned inventory contains information on the locations, types and size of facilities, the types of minerals being extracted, and many other data points also (including geographic coordinates, altitude, information on operator of waste facility, general description of current status of mining waste facility, risk assessment of mining waste facility etc.). The data are made available to the public via the Information System on Mining Waste Management (http://charon.sazp.sk/Odpady_tp/), and are available at

national scale and free of charge. However, these data are not permitted to be reproduced elsewhere. Information is also provided on **operating mining waste facilities**; The Information System on Mining Waste Management contains the Register on operating mining waste facilities (http://charon.sazp.sk/Odpady_tp/ObsahRegistrov/WasteFacility.aspx?status=34). At present, to 1st December 2013, 105 operating mining waste facilities are registered. Information on these facilities is provided for their locations, facility types (e.g. heap), size, and waste characterisation (e.g. mineral content), as well as other data points (including descriptions of waste management plans and necessary permits held). Information is available at a national scale only. Access to the data is free, but these data are not permitted to be reproduced elsewhere.
Marine minerals
Land locked.
Overseas territories
Slovakia has no overseas territories or dependencies.
Additional information
Improved definition of secondary raw materials would facilitate better monitoring in ~~the~~ Slovakia

Slovenia

Primary raw materials
Data collection
Data are collected for primary raw materials jointly by the Geological Survey of Slovenia and the Ministry for Infrastructure and Spatial Planning. Data for all commodity types are collected annually from mineral operators and are aggregated at the national level. Limited data exist on metal resources because no metal mines are currently operating (they just have some estimates for closed mines). Data do not include raw materials in the offshore/marine environment. Other information available through the Geological Survey includes over 30,000 geological expert reports of different mineral deposits and these include maps at various scales. The Mining Act nr. 61 2010 includes reporting forms for reserves, production, exploitation/exploration area, etc for all raw materials. The Mining Act creates a statutory obligation on mineral operators to provide the data annually in the form of tables. They also have to allow the Geological Survey to take material samples from their research work, including from drill cores. The Mining Inspectorate (part of the Ministry of Infrastructure and Spatial Planning) is responsible for monitoring mining activity.
Data harmonisation and standardisation
Data comply with a reporting code which is similar to the “Russian classification”. It could be transformed to UNFC codes. The Geological Survey are participating in an INSPIRE expert group and a UNFC expert group.
Data accessibility
The data are held/owned by the Ministry of Infrastructure and Spatial Planning. They are stored on a national centralised database, and organised on a national scale. The data is spatially referenced. The database is INSPIRE compliant Data on production and reserves/resources for a particular deposit are not publically accessible, but summarised data at the national level is publically available and can be accessed via an Annual Bulletin (http://www.geo-zs.si/podrocje.aspx?id=68, http://www.geo-zs.si/podrocje.aspx?id=492) There is no charge for these data. Some data are available in multilingual formats (the EuroGeoSource project is mentioned).
Landfill stocks/Waste flows
Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=SI

It is the responsibility of the Ministry of the Environment and Spatial Planning (MESP) to set up the legislative frame for waste management and national waste management plans for specific waste groups. These waste management plans ensure waste management strategies in general by giving guidelines and setting up qualitative and quantitative goals on a national level.

The Nuclear Safety Administration is responsible for the issues concerning radioactive waste management.

The Environment Agency of the Republic of Slovenia (EARS) is responsible for the implementation of waste legislation, waste management information system development and maintaining and licensing in the waste management field, including shipment of waste, monitoring and reporting of data on wastes and waste management. It is the responsibility of the Inspectorate for the Environment and Spatial Planning to inspect and verify in practice waste management.

The Ministry for Agriculture and the Environment is another relevant body.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. This transposition occurs in the following rules and decrees:

- Rules on the landfill of waste (OJ RS, No. 5/00, 41/04, 43/04)

- Decree on the landfill of waste (OJ RS, No. 32/06, 98/07, 62/08)

- Decree on the emission of substances in the discharge of landfill effluent (OJ RS, No. 62/08)

Data relating to operating landfill sites is recorded for the type and size of facility as well as the waste characterisation. For closed sites, only data on the type and size of facility is recorded.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. The Environmental Protection Act (EPA; Official Gazette, No. 39/06, 70/08-ZVO-1B) represents the legal basis for waste management in Slovenia. The most important Decree is that on on waste management (Official Gazette, No. 34/08), which together with EPA provides an overall legislative framework and policy objectives for the handling of waste in Slovenia and transposing the EU Waste framework Directive.

Data relating to waste flows is a little more complete, with the quantity, type, treatment, and characterisation all being recorded on a quarterly and annual basis. Data on in-use metal/recyclate stocks is not available. Waste flow data is made available to the public at the national, regional and local scale, to the individual site level, and is available at:

http://pxweb.stat.si/pxweb/Database/Environment/27_environment/02_waste/01_27061_waste_removal/01_27061_waste_removal.asp. The data is prepared in line with 2008/98/EC and according to EWC-Stat 2150/2002/EC, but is not INSPIRE compliant. The data is owned by SURS and Ministry for Agriculture and the Environment. The data are free and can be reproduced with permission. It is also available in English. Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data
Mining wastes
The Ministry of Agriculture and the Environment are the responsible authority. Data are also collected on "non-sales mining products". These data are collected by the Ministry of Infrastructure and Spatial Planning and provided to the Geological Survey to update their national database. There is no statutory obligation for operators to provide secondary raw material data; the collection appears to be done on an ad-hoc basis. Slovenia has a national Database on Mining waste disposal/tailings from past metal mines.
Marine minerals
Slovenia has about 43 km of coast but as the Geological Survey does not perform any offshore research they have no knowledge of any marine sediment bearing potential minerals.
Overseas territories
Slovenia has no overseas territories or dependencies.
Additional information
None.

Spain

Primary raw materials
Data collection
The Ministry of Industry, Energy & Tourism has delegated the responsibility of collection of data, for all primary raw material resources and reserves, to the Spanish Geological Survey. Data on individual deposits is collected from mining operators on an annual basis. It does not include the offshore / marine environment. Mineral resource maps for some regions, such as Cantabria, Extremadura, Andalucia and Galicia, together with a database about metals, mineral and rock occurrences (BDMIN) also are available for all minerals produced in Spain. Data are held and owned by both IGME and by some producer associations. In general the data is freely distributed. Data on offshore sand used for beach nourishment is the responsibility of the Ministry of agriculture and the Environment whilst other minerals fall under the auspices of the Ministry of Economy. The National Statistical Information Legislation and policy requires the central collection of data on primary raw material production. Under this policy it is compulsory to provide the Spanish Institute of Statistics with data on production, employment, production value and material consumption (explosives, energy, water, etc.). This applies to all mineral resources produced in Spain. Data is collected through an obligatory annual questionnaire which is sent to all exploitations. Mineral exploration activity is monitored by the relevant autonomic (regional) authorities, unless a permit covers two different autonomic regions, in which case the Ministry of Industry monitors the activity. Most information contained in the regional databases are included in the General Mining Cadaster held in the Ministry of Industry and mirrored in the Spanish Geological Survey's website. Exploration and mining companies are under a statutory obligation to report resource and reserve data through Spanish Mining Legislation that covers all mineral resources (via the "Law of Mines" and corresponding rules (Reference: BOE» núm. 295, de 11 de diciembre de 1978, BOE-A-1978-29905). They are not compelled to report their data using a standard code or national code, but where standard codes are used by the companies, data will be reported in this format.
Data harmonisation and standardisation
The Spanish Geological Survey collects data on primary raw material resources and reserves on a voluntary basis. Data does not comply with an internationally recognised standard code and a national code is not used for reporting. Definitions used by the Spanish Geological Survey: <u>Reserves:</u> Part of the mineral resources in a mineral deposit, whose exploitation is, at the time of the evaluation, economically, socially, environmentally and technologically (at the present state of the art) feasible.

Resources: All resources within a mineral deposit, disregarding if they are economically, environmentally or technologically (at the present state of the art) exploitable, at the time of the evaluation, or not.
Data accessibility
Mining companies own the data, and the Ministry of Industry, Energy and Tourism makes them available to all interested parties. The data is organised at a national scale, detailed by provinces and autonomic communities, in a national database. It is not spatially referenced. The Spanish Geological Survey is taking part in initiatives to harmonise and disseminate raw material resources and reserves data. Data is made available to the public, free of charge, through the Spanish Geological Survey website (http://www.igme.es/infoigme/aplicaciones/rmnweb/). The public in general, universities, mining companies, other geological surveys, industrial associations and research centres all request and use the data. Data is not available in multilingual formats.
Landfill stocks/waste flows
Legislative and Organisational Overview -- *Landfill Stocks* Regulated by transposition of the Landfill Directive 1999/31/EC. This occurred through Royal Decree 1481/2001, of 27 December, on the landfill of waste, transposing Directive 1999/31/EC. (http://www.boe.es/buscar/doc.php?id=BOE-A-2002-1697) *Waste Flows* Regulated by transposition of the Waste Framework Directive 2008/98/EC. In July 2011 the new law (22/2011) on waste and contaminated soils came into force, transposing the Waste Framework Directive (2008/98/EC) into Spanish legislation and adopting all related targets and objectives (Ministry of Agriculture, Food and Environment, 2012). Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/spain-municipal-waste-management
Mining wastes
The Spanish Ministry of Industry, Energy and Tourism regulate mining waste under Royal Decree 975/2009.

Marine minerals
Marine data is the responsibility of IGME/Geological Survey of Spain, Marine Geology Service (http://www.igme.es), although ownership is shared amongst other departments: Ministero de Agricultura, Alimentación y Medio Ambiente: beach nourishment sand; Ministerio de Industria, Energía y Turismo. Although not to an international code, statistical data is available by law to various levels of aggregation (but subject to some confidentiality constraints) as well as resource maps, reports and publications. Spain is part of the EMODNET-Geology harmonisation project, but the data is not INSPIRE-compliant.
Overseas territories
Spain does not appear to hold resource and reserve statistical data on overseas territories.
Additional information
http://www.igme.es http://www.mityc.es/energia/petroleo/ http://www.magrama.gob.es Key challenges: - Single code for definition of resources and reserves. - Variety of data sources leads to difficulty in harmonising data.

Sweden

Primary raw materials
Data collection
There is no legal requirement for mining companies to report statistical data on reserves & resources and there is no institution mandated by the Swedish government to collect data on primary metallic raw materials. It is however stipulated by national law that if an exploration permit expires and if no concession permit has been applied for the relevant area, the exploration results must be reported to the Mining Inspectorate, were they become publically available. The Geological Survey of Sweden (SGU) have, for many years, gathered and reported reserves & resources figures. Data is gathered for individual deposits all over the country and is constantly updated. Data on reserves & resources is gathered by SGU from annual reports, press releases, and the companies' web-sites and from exploration reports. There are no confidentiality

issues for data gathered by SGU on metallic mineral deposits and some industrial mineral deposits. Other types of data of varying quality relevant to primary raw material resource evaluations exist for some deposits, such as mine maps with resource estimates / rough estimates or poor maps without co-ordinate references. A mineral resources database with geological information (not including grades and tonnages) is also held by the geological survey. Data on reserves & resources of aggregates and industrial minerals not included in the Minerals Act (Mining Law nr. 45 1991, Law nr. 943 2005) are not available.

The Geological Survey of Sweden and Bergsstaten monitors mineral exploration activity. Publicly available data use the JORC code, NI-43-101 cod and the SweMin FRB standard. The Swedish code is operated on a voluntary basis by the Swedish Minng Association (SweMin) and is based on Canadian legislation. There is no statutory professional organisation in Sweden but a special accreditation process has been introduced. Data is available in many kinds of formats (reports, tables and maps etc.). Companies have an obligation to register mine maps with the Mining Inspectorate.

Data harmonisation and standardisation

Data complies with any of the commercially accepted codes covering metallic and some industrial minerals: JORC, FRB, NI 43-101, Samrec. The Swedish Association of Mines, Mineral and Metal Producers (SveMin) recommend a reporting code (Fennoscandian Review Board standard or FRB standard) covering metallic and industrial minerals. This is aligned with internationally used standard codes (JORC and NI 43-101). There are no major differences in reporting using the FRB standard, so data is easy to harmonise.

The Fennoscandian Reviewboard is the joint organisation of the Swedish, Finnish and Norwegian mining company organisations set up to make sure reporting is done in a consistent and proper way.

Data accessibility

The Geological Survey of Sweden manage data in MS Excel format, although data will soon be stored in database systems. Spatially referenced data is organised at a National level and is INSPIRE compliant. The data is published annually in the Swedish Minerals Yearbook (sv: Bergverksstatistik).

The Geological Survey is participating in initiatives to harmonise / disseminate raw material resource and reserve data partly through cooperation between NGU, GTK and Russian organisations. Free data is available to the public through the Fennoscandian Ore Deposit Database available for download at www.gtk.fi. The data includes Sweden, Finland, Norway and north western Russia.

Exploration companies use the data, which is available in English only. USGS and RMG may have other mineral resource reserve data for Sweden.

Landfill stocks/waste flows

Legislative and Organisational Overview

The Swedish Environmental Protection Agency is responsible for producing, publishing and reporting national waste statistics and for the Swedish Portal for Environmental Reporting (SMP).

The register covers all activities related to environmentally hazardous activities according to the Environmental Code and is updated continuously by the county administrations. At the portal yearly environmental reports from facilities are available. The Swedish EPA has a framework agreement with the SMED consortium (Swedish Environmental Emission Data) for the provision of services regarding data collection, statistics production and the development of methodology for waste statistics production. Arisings data is collected by NUTS2 region, and – for facilities – down to the treatment site level.

Landfill Stocks

Regulated by transposition of the Landfill Directive 1999/31/EC. This occurs in the following legislation:

- Ordinance (2001:512) on landfilling

- The EPA regulation (NFS 2004:10) on landfilling

- Landfill Tax: Law (1999:673) on waste tax

Regarding landfill sites, accumulated capacity is not reported, only notional waste acceptance levels or notional capacity in terms of height or area.

Waste Flows

Regulated by transposition of the Waste Framework Directive 2008/98/EC. Chapter 15 of the Environment Act (1998:808) and the Waste ordinance (2001:1063) contain the general waste legislation. Legislation on specific waste streams or waste treatment methods could be found in specific ordinances. In some cases there are complementing regulations, issued by the EPA.

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data

Mining wastes

The Swedish Environmental Protection Agency enforces Regulation (2013:319) on Extractive Waste. National legislation /policy do not require collection of data. However, data is indeed collected and published by the Environmental Protection Agency.

With respect to operating mines, data is made available to site level to the public and relates to: Location, Type of facility, Waste characterisation (mineral and EWC, sometimes LoW codes for landfilled wastes) and Waste source. It can be searched on the Swedish PRTR register at http://utslappisiffror.naturvardsverket.se/en/Search/ and is available in English.

Environmental reports from all active mines and concentrators required to have permits, including controls and imputations made possible by using data on single mines in the "Bergverksstatistik" record from the Geological Survey of Sweden (SGU). With regards to closed and abandoned facilities, data is collected, but it is not available generally to the public, only to local and regional authorities via online access. (https://ebh.lansstyrelsen.se/EBHLoginPage.aspx?id=19&ReturnUrl=%2ftemplates%2fTemplatePages%2fEBHStartPage.aspx%3fid%3d24&id=24 contains a database of all condemned sites, not only mines.) Types of data collected include: Location, Type of facility, Waste characterisation, Waste source and other information (risk classification, whether investigated, whether treated…) N.B. There is currently a project to put limited site information onto a public service. See http://pejl.svt.se/miljo/fororenade-platser/ (only in Swedish).
Marine minerals
The Ministry of Enterprise, Energy and Communications is the body responsible for statistical data on offshore/ marine resources and reserves. The Geological Survey of Sweden have devolved responsibilities in sourcing and publishing such data. Marine minerals in Sweden include sand and gravel and data is available at a national scale. The Geological Survey of Sweden collects and publishes such data if companies release the information (which they are not obliged to do). Statistical data is collected at an ad-hoc basis. It is spatially references, but not INSPIRE compliant. Data is stored at the National Geographic Information System. Statistical data is available upon request at http://www.sgu.se/sgu/eng/produkter-tjanster/databaser/marin_databas_e.html There is no obligation to declare data to an international standard
Overseas territories
Sweden has no overseas territories or dependencies.
Additional information
None.

Switzerland

Primary raw materials
Data collection
Swiss national legislation and policy does not require the collection of data on primary raw material resources and reserves or other information, however, the Federal Office of Topography and the Swiss Geological Survey in cooperation with other federal agencies collect data for non energy resources and coal. Information is sourced from mineral operators, industry associations and cantonal authorities, and is collected at a

combination of scales, sporadically. It does not include data on raw materials in the offshore / marine environment.

Mineral occurrence maps and databases are available for Fe, Mn, Pb, Zn, Ag, Cu, Ni, Cr, Sb, W, Mo, Au, Ba, F, aluminosilicates, garnet, talc, asbestos, olivine, dolomite, gypsum, graphite, magnesite, pegmatites, phosphate, quartz, clay, uranium, bitumen, carboniferous shale, peat, coal and gas which are mainly for scientific rather than economic purposes. Historical mine and actual quarry information is also available.

The Swiss Geotechnical Commission monitors mineral exploration activity on behalf of the Swiss Geological Survey. Exploration and mining companies are not under a statutory obligation to report resource and reserve data.

Data harmonisation and standardisation

Resources and reserves data do not comply with an internationally recognised standard code.

Data accessibility

Organisations who collect the data are the dataholders / owners and there is no centralised database. The data is organised at a variety of scales, is partly spatially referenced and is not INSPIRE compliant.

The Swiss are currently building up networks and structures to collect and provide data at a national level, and, although not available yet, plans are to make the data accessible by web-access or on request. Data will not be charged for with the exception of possible administration fees. Governmental and cantonal authorities, industry, statistics bureaus and scientists request access to and use the data. The data will be available in multilingual formats including German, French, Italian and English.

USGS, BGS, Eurostat, World Mining Data (Austria) and the Swiss federal office of statistics also hold mineral resource and reserve data for Switzerland.

Landfill stocks/waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=CH

There are three political levels in Switzerland: federal state, cantons (26) and communes (around 2800). The competences are shared between the three levels, based on the principle of subsidiarity. At the federal level, the Waste Management Division in the FOEN (Federal Office for the Environment) is responsible for developing legislation and policies to ensure the recovery and environmentally sound disposal of waste, controlling the import and export of waste, coordinating the planning of waste disposal facilities. The cantons and municipalities are responsible for the implementation of the policy framework.

There is no statutory or policy obligation for any organisation to collect this data, although many are doing so for resources such as construction waste, metals, scrap, WEEE and phosphate in sewage and sludge.

Landfill Stocks

No landfill, incineration only.

Waste Flows

The main national act is the environmental protection law which defines principles, responsibilities and task sharing. Main points:

- Prevention, collection, treatment, recovery, final disposal

- Hazardous waste

- Waste disposal facilities

- Waste management plan

- Financing of waste disposal (Polluter pays principle)

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data However, recent entries are absent.

A report on efforts towards meeting the demands of EU legislation on landfill and waste can be found at http://www.eea.europa.eu/publications/managing-municipal-solid-waste/switzerland-municipal-waste-management

Mining wastes

Not available.

Marine minerals

Land locked.

Overseas territories

No overseas territories have been identified.

Additional information

Key challenges:

- Establishment of national legislation on raw materials.

- Communication between stakeholders at a national / governmental level.

Turkey*

Primary raw materials
Data collection
The policy maker and leading body (policy making, monitoring and controlling) in Turkish mining industry is the Ministry of Energy and Natural Resources (MENR). Turkey has several additional state bodies, including the: - General Directorate of Mining Affairs (MIGEM) Licensing, monitoring and controlling - General Directorate of Minerals Research and Exploration (MTA) Research and exploration - National Boron Research Institute (BOREN) Research and development on boron minerals Turkey has a diverse range of mineral deposits due to its complex geology. Metallic minerals include gold, silver, copper, lead, zinc and chromium. The country is a major producer of many industrial minerals, including boron minerals The country has worldwide reserves of baryte, bentonite, dolomite, kaolin, gypsum, rock salt, boron, clays, emery, feldspar, limestone, magnesite, marble and natural stones, perlite, pumice, strontium, thorium, trona and zeolite and is a leading producer of antimony, boron minerals, chromite, feldspar, magnesite, marble, meerschaum, perlite, pumice, sepiolite and strontium. Today, 53 different minerals are produced in the Turkish mining sector. Most of the production is carried out by the private sector. The main producers are Eti Mine Works General Management, Turkish Hard Coal Corporation (TKİ), Turkish Hard Coal Institute (TTK) and private sector companies. The public sector is dominant in fuel minerals and metallic ore production, while the private sector is concentrated in industrial mineral production. According to the Turkish Constitution “Natural wealth and resources shall be placed under the control of, and put at the disposal of the state. The right to explore and exploit resources belongs to the state. The state may delegate this right to individuals or public corporations for specific periods.” The regulatory framework in Turkey is the Mining Law No. 3213 (has been amended several times, most significantly in June 2010 by law no. 5995).
Data harmonisation and standardisation
The classification system used (until 2010) in Turkey is mainly based on geological knowledge. The General Directorate of MTA is exploring the use of UN standards for resources/ reserves classification. Some mining companies report reserves and resources data (measured, indicated and inferred resources) using CIM Standards (Canadian Institute of Mining and Metallurgy).

Data accessibility

Some information is found in reports prepared by the General Directorate of MTA. MTA projects are prepared by expert personnel and reports are written under the control and management of these persons.

Core and sample specimens are preserved in the core bank/laboratory archive. MTA holds a drilling core archive, and a geochemical sample archive.

Landfill stocks/Waste flows

Legislative and Organisational Overview

An overview of the pertaining legislation at national, regional and communal level may be found at
http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/factsheet?country=TR

The Ministry of Environment and Forestry are responsible for inspecting and supervising the institutions and establishments that have the task of disposing of waste and finding solutions for any insufficiencies. They also generate the National Waste Management Policy and ensure it is implemented effectively and announce any notifications concerning the implementation of the legislation.

Municipalities are responsible for providing all services regarding collection, transportation, separation, recycling, disposal and storage of solid wastes; or to appoint others to provide these services

Other related bodies include: The Ministry of Health, Ministry of Finance, Ministry of the Interior, The State Planning Organisation, Iller Bank and the Turkish Statistical Institute.

Landfill Stocks

A series of landfill legislation has been adopted:

- Regulation on Solid Waste Control (14.03.1991-20814)

- Metropolitan Municipality Law (10.7.2004- 5216)

- Municipality Law (3.7.2005 – 5393)

- Regulation on the landfill of waste (Drafted but not adopted)

The same types of data are provided on both operating and closed landfill sites, including their location, type, size and whether they are controlled or uncontrolled sites.

Waste Flows

The general legislation on waste management includes:

- The Environmental Law (08.11.1983- 2872). As a framework law, it puts forward the rules and principles for environmental protection, defines the responsible and authorised

institutions and organisations, determines the processes for the implementation and establishes the punishments for the improper acts and the liabilities of the concerned within the framework of the principle “polluter pays”.

- The Regulation on General Principles of Waste Management (05.07.2008-26927). It outlines general principles of waste management, from waste generation to disposal, so that the procedures are followed without harming the environment and human health.

The waste flow data relating to those sites is recorded for the entire suite, including quantity, type, treatment, characterisation and activity, and is recorded on a biennial basis.

Data relating to landfill sites in Turkey is collected and collated by TurkStat, and is stored on their databases. Data between 2005 and 2010 covers waste disposal and recovery facilities operated by or on behalf of municipalities. Starting from 2012 the coverage is enlarged, and is expressed as “all of the licensed and temporary licensed waste recovery and disposal plants, besides from the unlicensed waste recovery and disposal plants operated by or on behalf of the municipalities”. Data is collected only for final waste treatment operations, are presented in press bulletins, and they are free of charge. Any additional requests for data not freely available are charged for. Data is available in both Turkish and English.

Example of data sources from TurkStat:

2012: http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=16177. Data concerning type of waste is harmonised to EWC codes. But for waste treatment, although R&D codes are used, there is a national breakdown (ex. D1A: uncontrolled landfill, D1B: controlled landfill)

Waste flows are also reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data harmonised to EWC codes.

Mining wastes

Mining wastes are considered as wastes which require special treatment as per Regulation on Control of Hazardous Wastes. Wastes from mining activities are identified and classified as “Wastes occurring from mine prospecting, extraction, operation, physical and chemical processing”. Regulation regarding management of mining wastes is jointly being produced by the Ministry of Environment and Forestry (MOEF) and Ministry of Energy and Natural Resources (MENR).

Marine minerals

No data was supplied by the Member State.

Overseas territories

No data was supplied by the Member State.

Additional information

None.

*Due to the absence of a survey response on primary raw materials, a desk-based review was undertaken to synthesise the above summary.

Ukraine

Primary raw materials
Data collection
The Ministry of Ecology and Natural Resources of Ukraine is responsible for collection of data on a wide range of primary raw material resources and reserves both onshore and offshore, although this responsibility is devolved to the State Geological and Subsurface Survey of Ukraine (SGSSU). The State Research and Development Enterprise "Geoinform of Ukraine" is involved in scientific research on mineral resources and provision of information and monitors mineral exploration activity. The State Commission of the Ukraine on Mineral Resources (SCMR) conducts economic-geological evaluation (EGE) of mineral resources and reserves as well as scientific research on the development of methodologies for EGE. Data appears to be derived from a variety of sources, including geological survey monitoring and company reporting. Data is collected annually at a national scale. Other datasets relevant to primary raw material evaluation exist but are not specified. National legislation requires collection of data on primary raw material resources and reserves and specifies the procedures for handling of geological information for all raw materials (Subsoil Code nr. 132 1994, Law nr. 1127 1999). In Ukraine, mineral data collection, processing and distribution is governed by four principal legislative documents: 1) Decree of President of Ukraine "On the Statement of State Geological and Subsurface Survey of Ukraine"; 2) Resolution of the Cabinet of Ministers of Ukraine "On approval the Procedure for disposing of geological information"; 3) Resolution of the Cabinet of Ministers of Ukraine "On approval the Procedure of the State inventory of mineral deposits, reserves and occurrences"; and 4) The Code of Ukraine on Subsurface. Accordingly, companies are under a statutory obligation to report resource and reserve data, when they apply for licences and then annually. Data on resources and reserves is received in the form of reports, tables and maps and companies are obliged to report additional information e.g. drillhole logs. More than 12 000 non-energy mineral deposits and occurrences are found in the Ukraine, of which about 6000 deposits covering 91 mineral commodity types are evaluated to be economic and are included in the 'State Inventory of Mineral Reserves'.
Data harmonisation and standardisation
Reporting by companies to SGSSU must be in the form of a standard code. Up to 1995 the State Commission of Ukraine on Mineral Resources used the classification system of the former Soviet Union. After 1995, economic-geological evaluation (EGE) and reporting of resources and reserves of newly found, explored or developed deposits has used the UNFC. There is a scheme for comparison between the Ukrainian Classification of mineral reserves and resources and the UNFC-2009 (among the 40 classes specified by UNFC only 10 are used in the Ukrainian Mineral Resource Classification). There has been a process of

transferring the 'reserves' of mineral products on the balance of the 'State Reserves Register' into the UNFC system. The UNFC system is also used when producing the annual accounts of the 'resource base'. Ukraine was the first country that adapted its classification of mineral reserves and resources to UNFC, following the UNECOSOC № 227/1997 decision. Data received from different sources is harmonised by the SCMR. The experts of the SCMR conduct investigations and analysis of the information submitted for the EGE and prepare conclusions according to the completeness and quality of the exploration conducted, reliability of the discovered mineral resources and their readiness for commercial development.

Data accessibility

The procedure for the management of geological information is subject to the restricted access procedures specified by the current legislation of Ukraine. Resource, reserve and other relevant data is held for construction and industrial minerals and selected metals e.g. chromium, copper, gold, iron ore etc. Data for construction, industrial minerals and some metals e.g. base metals is not confidential, although 'authorisation' is required for access. Data relating to other metals e.g. gold, niobium, REE etc is confidential and there is not time limit to confidentality. The geological information created at the expense of the State budget is owned by the State and sold by the Ministry of Ecology and Natural Resources of Ukraine. The data is held in the database of the State Research and Development Enterprise "Geoinform of Ukraine" and is organised at varying scales. The data is partly spatially referenced and is not available in multilingual formats. The Ministry of Ecology and Natural Resources of Ukraine website is not in English. Data can be accessed by specific request to SGSSU and for which some charges apply. The data is largely requested by companies.

Landfill stocks/waste flows

Legislative and Organisational Overview

No information located.

Landfill Stocks

No information located.

Waste Flows

The main document, defining waste management in Ukraine is Law on Waste on 05/03/1998 # 187/98-BP with amendments of 2002, 2005 and 2010. (http://www.wastegovernance.org/Documents/ANNEX_Ukraine.doc).

Mining wastes

Not available.

Marine minerals
Data collection for the marine environment covers energy resources and construction minerals. The collection and publication of marine data is the responsibility of the State Geological and Subsurface Survey of Ukraine (SGSSU). Data is collected annually at national scale. The 'Resolution of the Cabinet of Ministers of Ukraine of 13.06.1995 No. 423' is the national policy requiring the collection of statistical data. The policy document sets specific procedures regarding the handling of geological information. In Ukraine, companies undertaking exploration in the offshore / marine environment are under a statutory obligation to report resource and reserve data. Publication is mandated, to former Soviet Union codes or to UNFC, and includes statistical and other data. Harmonisation is achieved by the State Commission of Ukraine on Mineral Reserves and the State owns the data and stores it in the 'GeoInform of Ukraine' database at various levels of aggregation. Some data is available on request, but may be subject to charge. It is not multilingual. Apply directly to SGSSU.
Overseas territories
No overseas territories identified.
Additional information
None.

United Kingdom

Primary raw materials
Data collection
There is limited statistical data collection on primary raw material resources and very limited data collection on reserves. Any collection of statistical data on mineral resources and reserves is ad hoc and only publically undertaken by local land-use (mineral) planning authorities during the permitting (licence to operate) process. The exception to this is for aggregates minerals where data on sales and reserves are collected annually by local planning authorities but such data are provided by mineral operators on a voluntary basis. With the exception of aggregate minerals there is no regular (e.g. annual) collection of resources and reserves data. Statistical data (when needed) on resources and reserves are sourced from the minerals industry. Spatial data on mineral resources are collected by the British Geological Survey (BGS). The BGS is the custodian of other data relevant to primary raw material resource evaluation. These, for example, include mineral resource maps, sand and gravel evaluation maps,

historic Government funded exploration results, mineral occurrence database and a database of mines and quarries.

Data harmonisation and standardisation

There is no Mining Act for any of the countries of the UK. Planning for the supply of domestic non-energy minerals is undertaken via the land-use planning system as largely implemented by the Town and Country Planning Act, 1947, 1990.

There is no harmonised data and no requirement to report to a single international reporting code. Both PERC and JORC are used. There is no national standard code.

Data accessibility

Data depicting the distribution of mineral resources (along with limited statistical information on production, resources and reserves) in the UK are available via the BGS MineralsUK.com website. See http://www.bgs.ac.uk/mineralsuk/maps/maps.html

For England and Wales, four yearly data on sales and reserves of construction aggregates at a sub-national (regional) and national scale are published by Government. See http://webarchive.nationalarchives.gov.uk/20121030202828/http://www.communities.gov.uk/publications/planningandbuilding/aggregatesurvey2009

Similar data on construction aggregates are available for Scotland but collection and publication are less frequent. Latest data available pertains to 2005. See http://www.scotland.gov.uk/Publications/2007/11/26104244/14

Annual data on sales and reserves of construction aggregates are published at a sub-national (regional) scale by Government in annual monitoring reports: See https://www.gov.uk/government/organisations/department-for-communities-and-local-government/series/aggregates-working-parties-monitoring-reports

For England, annual data on sales and reserves of construction aggregates should be published by the 150+ local land-use (mineral) planning authorities. Planning authorities can choose to work together to publish joint local aggregagte assessments.

Landfill stocks/waste flows

Legislative and Organisational Overview

The responsibility for enforcing legislation varies depending on the region within the UK: in England it falls to the Environment Agency, in Scotland to the Scottish Environment Protection Agency, in Wales to Natural Resources Wales and in Northern Ireland to the Northern Ireland Environment Agency.

In England and Wales, both stocks and flows data are recorded to the site level with reporting performed annually.

Landfill Stocks

The Landfill Directive applies to England, Wales, Scotland and Northern Ireland.

In England and Wales, the requirements of the Directive were transposed into national legislation through the Landfill (England and Wales) Regulations 2002, subsequently amended in 2004 and 2005 to transpose the requirements of Council Decision 2003/33/EC on Waste Acceptance Criteria. The provisions were re-transposed as part of the Environmental Permitting (England and Wales) Regulations 2007, under the Environment Agency (contact: enquiries@environment-agency.gov.uk) (http://www.ciwm.co.uk/CIWM/InformationCentre/AtoZ/LPages/LandfillDirective.aspx).

In Scotland, the Directives are transposed as The Landfill (Scotland) Regulations 2003, SSI 2 No. 235 of 10/04/2003 amended 09/02/2004, and are the responsibility of Scottish Environmental Protection Agency (SEPA) (contact: http://www.sepa.org.uk/about_us/contacting_sepa/by_email.aspx).

In Northern Ireland, the Directives are transposed as The Landfill Regulations (Northern Ireland) 2003 SRNI 2003 No. 496 of 01/12/2003, and are the responsibility of the Northern Ireland Department of the Environment (contact: enquiries@doeni.gov.uk).

Waste Flows

The revised Waste Framework Directive (rWFD) (2008/98/EC) has been transposed by Parliament and the National Assembly for Wales as the Waste (England and Wales) Regulations 2011 (S.I. 2011 No. 988) and came into force from 29th March 2011. The Regulations have been published by The Stationery Office and are available at http://www.legislation.gov.uk/uksi/2011/988/contents/made.

In Scotland, the Directive is transposed as The Waste (Scotland) Regulations 2011, and in Northern Ireland as The Waste (Northern Ireland) Regulations 2011.

Reporting of waste flows is harmonised across all three to LoW/EWC codes, and the assumptions about how the statistics are generated may be found at http://www.environment-agency.gov.uk/research/library/data/150328.aspx

Waste flows are reported on Eurostat at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data with all data being harmonised to EWC Codes.

Mining wastes

The responsibility for enforcing legislation regarding mining waste varies depending on the region within the UK: in England it falls to the Environment Agency, in Scotland to the Scottish Environment Protection Agency, in Wales to Natural Wales and in Northern Ireland to NI Department of Environment, Minerals Unit.

The controlling legislation in England and Wales is the Environmental Permitting (England and Wales) Regulations 2010, in Scotland is the Management of extractive waste (Scotland) regulations 2010 and in Northern Ireland is the Planning (Management of Waste from

Extractive Industries) Regulations (Northern Ireland) 2010. All operations managing extractive waste are required to produce and implement a Waste Management Plan (WMP – as stated in the Mining Waste Directive). The WMP provides valuable information about the characteristics of extractive waste and related management activities. Waste types are recorded using the *List of Waste* codes and approximate quantities of arisings are reported. However, quantities of waste generated might not necessarily be per waste type (i.e for the reported *List of Waste* codes), but instead for the different extractive waste categories included in the WMP, that is inert, non-hazardous non-inert or/and hazardous waste. Additional information on the physical or/and chemical properties of waste are also provided. WMPs are reviewed every 5 years or before if substantial change to the operation of waste management facilities takes place.

The Environment Agency has developed and maintains an inventory of closed mining waste facilities in England and Wales. However, this inventory is a shortlist only of the closed and abandoned mining waste facilities causing serious environmental impacts (http://www.environment-agency.gov.uk/homeandleisure/139297.aspx). Additional information on closed mines in England and Wales are found from BGS (BGS BritPits database and BGS reports e.g. http://nora.nerc.ac.uk/10083/1/OR10014.pdf)

Marine minerals

Resource and 'reserve' (licensed tonnage allowed to be dredged) data for offshore aggregate minerals are collected by The Crown Estate (who are the authority responsible for issuing offshore mineral extraction licences). Limited statistics are publically available on a regional basis and are published jointly by The Crown Estate and the British Marine Aggregate Producers Association. See http://m.thecrownestate.co.uk/energy-infrastructure/aggregates/our-portfolio/. The Crown Estate will also have data on reserves of Potash which occurs underneath the UK Continental Shelf. However, these will be confidential.

The British Geological Survey is the generator and analyser of data in this domain, though it is not always the data owner or publisher. Materials of interest are generally limited to construction aggregates (sand and gravel) and sand (for beach nourishment). There is no statistical data but significant volumes of other data: maps, reports etc. Resource maps for offshore aggregates have been produced by the BGS for The Crown Estate.

Data publication is mandated in a company's licence to operate, and is usually to PERC standard.

Overseas territories

No resource and reserve statistical data is collected on overseas territories.

Additional information

With the exception of aggregates it is likely to be difficult to obtain any statistical resource and reserve data that have been collected in a systematic manner. Due to the limited number of mineral operators for other minerals it is likely that such data will be confidential.

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Annexe J: Data coverage from private sources

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As a way to include the private sources of data collection this section describes the databases provided by SNL Metals & Mining. SNL Metals & Mining is a private company (part of SNL Financial) that has developed two databases with information on the mining industry. These two databases, IntierraLive and Raw Materials Data (RMD), have been around for several years and have slightly different approach to how the data is structured and presented.

Availability & access (confidentiality)

Both databases are by subscription. The shortest period of subscription is one year. Depending on modules included the price will vary.

Aggregation level or granularity

Aggregation level or granularity is dependent on what is research within the databases. In RMD the bottom level is generally the mine (or mine cluster). In IntierraLive you would find data on tenements. However production data would be by mine. When it comes to resources reserves those are generally broken down to mine/mine cluster or project. Generally the resources/reserves within a mine/project are bundle together to give one resource/reserve per mine/project. Within IntierraLive one has access to the information broken down by mine/project but you cannot search that data or compile it in reports automatically generated by the database.

How is data obtained and compiled?

The information put into RMD is derived mainly from material published by the companies themselves, such as annual and quarterly reports, news, production-and technical reports and the company's' website in general. Other sources include mining journals, newsletters, ordered information from sub-consultants and general searches on the internet.

What sort of agreements are in place for this and complexities?

IntierraLive has data on tenements and ownership for mining leases etc. This kind of data is provided by the official governmental bodies in the various countries and through a series of agreements the data is published within IntierraLive.

The information in IntierraLive is generally acquired from whatever newsletters, press releases etc. is published by the companies. Through a series of agreements all news material that comes out from the major mining stock exchanges are gathered and published in IntierraLive.

What codes or harmonisations are applied?

Financial years may vary between companies with respect to the production; the databases are harmonised to make sure that the data is comparable.

When it comes to resources and reserves, generally the definitions given by the companies are applied in the databases and it is clearly stated if it is for example JORC, historical resources etc.

Neither of the databases is looking at the mineral resources. This is a term widely used by various institutions etc. to describe what might be present in a country. Both RMD and IntierraLive use the general definition of the mineral economists, that if there is not enough information or a clear project in connection to the resource it is not a resource. It is only a

mineral anomaly that might be turned into a resource/reserve given the attention and funds needed.

What is the update frequency?

IntierraLive is an internet based database that is updated continuously. RMD is updated monthly with a break during new years and summer (northern hemisphere). This gives 10 updates per year.

All information is updated when found but most types of data are updated once a year or more frequent, whereas other information might only need to be checked every third year or less. In general the information within the databases is updated as stated below.

Frequency of update checks

Monthly or quarterly

- Cash costs every quarter.
- Investment projects when new information (updated project cost, payback time etc) is received. The number of new investment projects is usually more or less the same for every quarter.
- Mergers & Acquisitions every month.

Yearly

- Mines/projects specification, such as resources and reserves, grades, ore production, coal production and metal production are checked for updates once a year, at least for about 200 of the largest companies.
- Financial data for larger companies are also updated once a year.
- Company descriptions are updated every year in August/September by Simon Walker.

Every third year or less

- Addresses every third year.
- Ownership more thorough every third year, even though this is often checked when going through the annual report.
- Coordinates of mines/projects, as well as some other specifications such as geology and main metal, will not change and will only be checked occasionally for accuracy.

Geographic and mineral coverage compared to Minventory.

RMD and IntierraLive are global databases primarily designed for the mining community. As such they take a global outlook and include the entire companies and all of the companies resources/reserves and not only those that are defined by a certain geographical area.

RMD includes the following metals/minerals:

Alumina	Aluminium	Antimony	Bauxite	Beryllium
Bismuth	Boron	Chromite	Coal	Cobalt
Copper	Diamond	Ferrochrome	Gold	Iron ore
Iron ore pellets	Lead	Lithium	Magnesium	Manganese ore
Molybdenum	Nickel	Niobium	Palladium	PGMs
Phosphate rock	Platinum	Potash	Rare earths	Rhodium
Silver	Tantalum	Tin	Titanium	Uranium oxide
Vanadium	Zinc	Zirconium		

For all of these minerals the RMD has data on mines and resources and reserves.

Some data is collected on the type of rock and geological data. But generally speaking geological data is not really covered by the two databases as these type of data is generally collected by the various geological surveys of the world. The two databases are more focused on the economical part of the industry and sets a limit at a resource or where there are an owner to a tenement. Mineral anomalies are not found in either database.

Commercial data holders and a common access portal

Commercial data providers, like SNL and others, are working in parallel with traditional statistical sources such as governments, industrial organisations, international organisations etc. They are able to co-exist because there are users with different demands and different capabilities to cover the cost of providing these data. The needs of these commercial organisations can be described as:

- **Bespoke:** The business idea of, for example, SNL is and has been to provide company by company statistics. It is the companies, which in most cases are making the decisions – not countries - about investments, production levels etc. i.e. almost all decisions which directly influence present and future production levels.
- **Insightful:** Secondly the idea has been to provide data, which are treated and recalculated from the base data and presented in interesting and valuable formats such as excel spread sheets, maps, graphs and time lines.
- **Timely:** Another important aspect is how quickly the information and data is made available. A commercial user is often willing to pay a premium for fast and up-to-date information. This creates additional space for commercial data providers such as SNL.

Against this background there might hence be opportunities for cooperation between commercial data providers and free access portals. They could take different shapes:

- Consider having the provision of base data outsourced to and handled by private organisations. There is a cost of compiling these data, whether done by government organisations or by private providers; it could be of interest to those which already do collect, collate and distribute statistics like state run organisations. In this way a portal could get access to data at a low cost and duplication of efforts would be avoided. This type of operation is already taking place for example in the UNCTAD iron ore data which is regularly put out to tender but which is still published in the name of UNCTAD.
- Buy or (in some other suitable way) get access to the data from commercial providers and present it with a suitable time lag. There could also be direct links in the open access system to commercial providers for those who want more recent or specialised information and data. Commercial providers could be willing to pay for this marketing service and this could be made in the form of additional data input or in some other suitable manner.

There could be some historical data which might be less valuable and perhaps provided at no cost at all but if this is the case the use or demand for this data would probably also very limited.

Annexe K: List of organisations included in the wider stakeholder survey

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Statistical Offices	
Country	Organisation
Albania	Institute of Statistics
Austria	Statistics Austria
Belgium	Statistics Belgium
Bosnia & Herzegovina	Agency of Statistics of Bosnia & Herzegovina
Bulgaria	National Statistical Institute
Croatia	Croatian Bureau of Statistics
Cyprus	Statistics Service of Cyprus
Czech Republic	Czech Statistical Office
Denmark	Statistics Denmark
Estonia	Statistics Estonia
Finland	Statistics Finland
France	National Institute of Statistics & Economic Studies
Germany	Federal Statistics Office
Greece	National Statistics Service of Greece
Greenland	Statistics Greenland
Hungary	Hungarian Central Statistics Office
Ireland	Central Statistics Office Ireland
Italy	National Institute of Statistics
Latvia	Central Statistics Bureau of Latvia
Lithuania	Statistics Lithuania
Luxembourg	National Statistical Institute
FYR Macedonia	State Statistical Office of the Republic of Macedonia
Malta	National Statistics Office of Malta
Moldova	National Bureau of Statistics, Republic of Moldova
Montenegro	Statistical Office of Montenegro
Netherlands	Statistics Netherlands
Norway	Statistics Norway
Poland	Central Statistical Office of Poland
Portugal	Statistics Portugal
Romania	National Institute of Statistics
Serbia	Statistical Office of the Republic of Serbia
Slovakia	Statistical Office of the Slovak Republic
Slovenia	Statistical Office of the Republic of Slovenia
Spain	Spanish Statistical Office
Sweden	Statistics Sweden
Switzerland	Swiss Federal Statistical Office

Turkey	Turkish Statistical Institute
UK	Office for National Statistics
Ukraine	State Statistical Service of Ukraine

Government Departments / Ministries (Other than those already surveyed)

Country	Organisation
Albania	Ministry of Economy Trade and Energy
Albania	National Agency of Natural Resources
Bulgaria	Natural Resources and Concessions Directorate, Ministry of Economy Energy and Tourism
Czech Republic	Ministry of the Environment of the Czech Republic, Department of Geology
Czech Republic	Ministry of Industry and Trade of the Czech Republic, Department of Raw Material and Energy Security
Czech Republic	Czech Mining Office
Czech Republic	Prague City Authority, Construction Department
Czech Republic	Regional Authority of the South Bohemian Region, Department of regional development, landscape planning, building regulations and investments
Czech Republic	Regional Authority of the South Moravian Region, Department of landscape planning and building regulations
Czech Republic	Regional Authority of Karlovy Vary Region, Building Office
Czech Republic	Regional Authority of Vysočina (Highlands) Region, Department of landscape planning and building regulations
Czech Republic	Regional Authority of Hradec Králové Region, Department of landscape planning and building regulations
Czech Republic	Regional Authority of Liberec Region, Department of landscape planning and building regulations
Czech Republic	Regional Authority of Moravian-Silesian Region, Department of landscape planning and building regulations
Czech Republic	Regional Authority of Olomouc Region, Department of strategic development and culture
Czech Republic	Regional Authority of Pardubice Region, Estate, building regulations and investment department
Czech Republic	Regional Authority of Plzeň Region, Department of regional development
Czech Republic	Regional Authority of Central Bohemia Region, Department of regional development
Czech Republic	Regional Authority of Ústí Region, Department of regional development
Czech Republic	Regional Authority of Zlín Region, Department of landscape planning and building regulations

Denmark	GEUS Köbenhavn
Estonia	Estonian Land Board
Germany	Federal Ministry for Economic Affairs and Energy
Greece	Ministry of Development
Greece	Prefecture Authority of Pella
Italy	Parma Province
Italy	Torino Province
Italy	Emilia - Romagna Region
Luxembourg	Ministry of sustainable development and infrastructures
Malta	Malta Resources Authority
Netherlands	Ministry of Transport, Public Works and Water management
Norway	Direktoratet for mineralforvaltning med Bergmesteren for Svalbard Trondheim
Romania	Ministry of Transport and Infrastructure
Romania	Ministry of Health
Slovakia	Ministry of Environment of the Slovak Republic
Slovakia	Ministry of Environment of the Slovak Republic
Slovakia	Ministry of Economy of the Slovak Republic
Slovenia	Ministry for Infrastructure, Energy Directorate, Sector for Energy and Mining
Spain	Ministry of Industry, Tourism and Commerce
Sweden	Swedish Ministry of Industry, Energy and Communications
Sweden	Bergsstaten Luleå
Turkey	General Directorate of Mining Affairs
Turkey	Region of Central Macedonia
UK	Department for Business Innovation and Skills
UK	Department for Communities and Local Govertment
UK	Department for Environment Food and Rural Affairs

Environmental Organisations	
Country	Organisation
Albania	Agency of Environment and Forestry
Austria	Umweltbundesamt
Belgium	Flemish Environment Agency
Bosnia & Herzegovina	Ministry Of Environment And Tourism
Bulgaria	Executive Environment Agency Bulgaria
Croatia	Croatian Environment Agency

Cyprus	Environment Service Ministry of Agriculture, Natural Resources and Environment Republic of Cyprus
Czech Republic	Czech Environmental National Information Agency, Waste Department
Czech Republic	Ministry of Industry and Trade, Environmental and Economical Strategy Coordination
Czech Republic	Ministry of the Environment of the Czech Republic, Waste Department - Unit of Take-back Policies
Czech Republic	Ministry of Agriculture, Department of Security Policy and Emergency Control
Czech Republic	Moravian – Silesian Region, Department of the Environment and Agriculture
Czech Republic	Plzen Region, Department of the Environment
Czech Republic	The South Moravian Region, Department of the Environment
Czech Republic	Hradec Králové Region, Department of Technical Environment Protection
Czech Republic	Liberec Region, Department of the Environment and Agriculture
Czech Republic	Ústí Region, Department of the Environment
Czech Republic	Olomouc Region, Department of the Environment and Agriculture
Czech Republic	Central Bohemia Region, Department of the Environment and Agriculture
Czech Republic	Visocina Region, Department of the Environment
Czech Republic	Zlín Region, Department of the Environment and Agriculture
Czech Republic	South Bohemia Region, Department of the Environment, Agriculture and Forestry
Czech Republic	Karlovy Vary Region, Department of the Environment and Agriculture
Czech Republic	Pardubice Region, Department of the Environment and Agriculture
Czech Republic	Prague City Hall, Department of the Environment
Czech Republic	Arnika - a Czech non-governmental organisation uniting people seeking better environment
Czech Republic	Children of the Earth - a non-governmental environmental organisation
Czech Republic	Greenpeace - a non-governmental environmental organisation
Czech Republic	South Bohemia Mothers - a non-governmental environmental organisation
Czech Republic	Association of the Recycling Development of Construction materials in the CR
Czech Republic	Ecological Law Organisation
Denmark	Danish Environmental Protection Agency
Estonia	Estonia Environment Agency
Estonia	Estonian Environment Information Centre
Finland	Finnish Environment Institute SYKE Helsinki
France	French Environment and Energy Management Agency

Germany	Federal Environment Agency / Umweltbundesamt, Germany
Greece	Greece National Centre for Environment And Sustainable Development
Hungary	Ministry of Rural Development (formerly Ministry of Environment and Water)
Ireland	Environmental Protection Agency, Ireland
Latvia	Latvian Environment, Geology and Meteorology Centre
Lithuania	Environmental Protection Agency
Luxembourg	Département de l'environnement
Malta	Malta Environment and Planning Authority
Moldova	Ministry of Environment of Republic of Moldova
Montenegro	Environmental Protection Agency of Montenegro
Netherlands	PBL Netherlands Environmental Assessment Agency
Norway	THE NORWEGIAN DIRECTORATE FOR NATURE MANAGEMENT
Norway	THE NORWEGIAN CLIMATE AND POLLUTION AGENCY
Poland	Chief Inspectorate of Environmental Protection
Portugal	Portuguese Environment Agency
Romania	NATIONAL ENVIRONMENTAL PROTECTION AGENCY
Serbia	Serbian Environmental Protection Agency
Slovakia	Ministry of Environment of the Slovak Republic
Slovakia	Slovak Environmental Agency, Centre of Natural and Energy Resources Planning
Slovenia	Slovenian Environment Agency
Sweden	Naturvårdsverket Stockholm (Sweden's Environment Protection Agency)
Switzerland	Federal Office for the Environment
UK	Environment Agency
UK	Waste and Resources Action Programme
Ukraine	State Environmental Investment Agency of Ukraine

Trade Associations	
Country	Organisation
All	Barytes Association
All	Beryllium Science and Technology Association
All	Cobalt Development Institute
All	European Aggregates Association (UEPG)
All	European Assocation of Mining Industries
All	European Association of Metals
All	Eurometaux
All	European Cement Association (Cembureau)

All	European Ferrous Recovery and Recycling Federation
All	Eurostat
All	Industrial Minerals Association of Europe
All	International Aluminium Institute
All	International Copper Study Group
All	International Council on Mining and Metals
All	International Lead Zinc Study Group
All	International Nickel Study Group
All	International Tungsten Industry Assocation
All	Minor Metal Trade Association
All	Municipal Waste Europe
All	Nickel Institute
Belgium	Belgian Steel Federation
Belgium	O.V.O. (Flemish Extractors Association)
Czech Republic	The Employers' Association of Mining and Oil Industries
Czech Republic	Silicate Association
Czech Republic	The Czech Silicate Society
Czech Republic	Czech Association of Cement Producers
Czech Republic	Czech Lime Association
Czech Republic	Confederation of Industry of the Czech Republic
Czech Republic	Czech Chamber of Commerce
Czech Republic	Czech Association of Economic Geologists
Czech Republic & Slovakia	Steel Federation
France	ADEME - Agence de l'Environnement et de la Maîtrise de l'Energie Fr
France	Fédération Française de l'Acier - FFA
Germany	German Mining Associations
Greece	Greek Mining Enterprises Association
Italy	ENEA it
Italy	Federacciai
Luxembourg	Cimalux
Netherlands	DWMA - Dutch Waste Management Association
Portugal	ANIET - Associação Nacional da Indústria Extractiva e Transformadora
Slovakia	Slovak Mining Chamber
Slovakia	Slovak Chamber of Commerce and Industry
Slovakia	Slovak Association of Economic Geologists
Slovakia	Slovak Association of Aggregates Producers
Spain	Unicobre

Spain	Foundation Ecolec
Sweden	Jernkontoret – The Swedish Steel Producers' Association
Sweden	Swedish Petroleum & Biofuels Institute
Sweden	Bergforsk - the Swedish Mining Research Foundation
Sweden	MinFo, the Swedish Mineral Processing Research Organisation
Turkey	Turkish Miners Association
UK	International Steel Statistics Bureau
UK	Intitute of Materials, Minerals and Mining
UK	Mineral Products Association
UK	Royal Society
UK	Royal Society of Chemistry

Mining Companies and/or Recycling Companies	
Country	Organisation
All?	Tasman Metals Ltd
Austria	Wolfram Bergbau & Hutton
Austria?	H C Starck
Belgium	Carmeuse Group
Belgium	Comet Traitements SA
Belgium	Machiels Group
Belgium	Nyrstar
Belgium	Nyrstar
Belgium	Sidech SA
Belgium	SUEZ- SITA NORTHERN EUROPE WASTE SERVICES
Belgium	Umicore
Belgium, France & Netherlands	Galloo
Bulgaria	Dundee Precious Metals
Cyprus	Hellenic Copper Mines Ltd
Czech Republic	Agir spol. s r.o., Petrovice
Czech Republic	AGRO Brno – Tuřany, a.s.
Czech Republic	BÖGL a KRÝSL, k.s., Praha
Czech Republic	Budějovické štěrkopísky spol. s r.o., Vrábče
Czech Republic	Cement Hranice, a.s.
Czech Republic	CEMEX Sand, s.r.o., Napajedla
Czech Republic	Česká naftařská společnost s.r.o., Hodonín
Czech Republic	České lupkové závody a.s., Nové Strašecí
Czech Republic	České štěrkopísky spol. s r.o., Praha

Czech Republic	Českomoravský cement, a.s.(HeidelbergCement Group)
Czech Republic	Českomoravský štěrk, a.s.(HeidelbergCement Group)
Czech Republic	DIAMO, s. p., Stráž pod Ralskem
Czech Republic	Družstvo DRUMAPO, Němčičky
Czech Republic	EUROVIA Stone CZ, s.r.o., Praha
Czech Republic	Granát, družstvo umělecké výroby, Turnov
Czech Republic	GRANITA s.r.o., Skuteč
Czech Republic	Green Gas DPB, a.s., Paskov
Czech Republic	GYPSTREND s.r.o., Kobeřice
Czech Republic	HASIT Šumavské vápenice a omítkárny, a.s., V.Hydčice
Czech Republic	HELUZ cihlářský průmysl v.o.s., Dolní Bukovsko
Czech Republic	Holcim (Česko) a.s., člen koncernu
Czech Republic	Kalcit s.r.o., Brno
Czech Republic	Kamenolom a vápenka Malá dohoda, s.r.o., Holštejn
Czech Republic	KÁMEN Zbraslav, spol. s r.o.
Czech Republic	Kaolin Hlubany, a.s.
Czech Republic	KERAMOST a.s., Most
Czech Republic	KMK GRANIT, a.s., Krásno
Czech Republic	Krkonošské vápenky Kunčice, a.s.
Czech Republic	Lafarge Cement, a.s., Čížkovice
Czech Republic	LB Cemix, s.r.o., Borovany
Czech Republic	LB MINERALS, s.r.o., Horní Bříza
Czech Republic	Litvínovská uhelná a.s., Most
Czech Republic	LOM SKALKA, s.r.o., Ochoz u Brna
Czech Republic	LOMY MOŘINA spol. s r.o., Mořina
Czech Republic	MAWE CK s.r.o.
Czech Republic	MND a.s., Hodonín
Czech Republic	OKD a.s., Ostrava
Czech Republic	Omya CZ s.r.o.
Czech Republic	P-D Refractories CZ a.s., Velké Opatovice
Czech Republic	Provodínské písky a.s., Provodín
Czech Republic	Průmysl kamene a.s., Příbram
Czech Republic	RAKO – LUPKY s.r.o., Lubná u Rakovníka
Czech Republic	Sedlecký kaolin a.s., Božičany
Czech Republic	Severočeské doly a.s., Chomutov
Czech Republic	Sklopísek Střeleč, a.s., Mladějov
Czech Republic	Slezský kámen, a.s., Jeseník
Czech Republic	Sokolovská uhelná, právní nástupce, a.s., Sokolov

Czech Republic	Štěrkovny Olomouc a.s.
Czech Republic	TONDACH Česká republika s.r.o., Hranice
Czech Republic	Unigeo a.s., Ostrava – Hrabová
Czech Republic	UNIKOM a.s., Kutná Hora
Czech Republic	Vápenka Vitošov s.r.o., Leština
Czech Republic	Velkolom Čertovy schody a.s., Tmaň
Czech Republic	Vršanská uhelná a.s., Most
Czech Republic	Wienerberger Cihlářský průmysl, a.s., Č.Budějovice
Finland	Agnico Eagle
Finland	Dragon Mining
Finland	Endomines
Finland	First Quantum Minerals
Finland	Inmet
Finland	Lapland Goldminers
Finland	Outokumpu
Finland	Pyhäsalmi Mine Oy
Finland	Talvivaara Mining Company Plc
Finland	Ticomet Oy
Finland	Vulcan Resources (Altona Mining)
Finland (HQ)	Outotec
Finland (HQ)	Outotec and UNEP Resource Panel
Finland + Sweden	Boliden
France	Eramet
France	Technip
France + UK	Imerys
Germany	CEPMC
Germany	Süd-Chemie
Germany	K+S AG
Germany	SGL Carbon
Greece	ELMIN, Hellenic Mining Enterprises S.A.
Greenland	Angel Mining
Hungary	Eltex Kft
Hungary	National Association of Recyclers of Hungary
FYR Macedonia	Cunico (nickel producer)
FYR Macedonia	Solway Group (copper producer)
Multiple States	Aurubis
Multiple States	Johnson Matthey
Norway	Hydro

Norway	Xstrata
Poland	KGHM
Portugal	Colt Resources
Portugal + Spain	Lundin Mining
Romania	Bega Minerale Industriale SA
Romania	Carpat Agregate SA
Romania	LAFARGE Agregate & Betoane
Romania	MARMOSIM SA
Romania	MINVEST SA
Romania	Prospectiuni SA
Romania	S.C. Cupru Min S.A.
Romania	Vimetco
Slovakia	Hornonitrianske bane Prievidza, a.s.
Slovakia	LUDOVIKA ENERGY, s.r.o
Slovakia	NAFTA, a.s.
Slovakia	Slovenská banská, s.r.o.
Slovakia	Eastern Mediterranean Resources - Slovakia, s.r.o.
Slovakia	SMZ,a.s. Jelšava
Slovakia	SLOVMAG, a.s.
Slovakia	Holcim (Slovensko), a.s
Slovakia	VSK, a.s.
Slovakia	CEMMAC a.s. Horné S?nie
Slovakia	Dolvap, s.r.o.
Slovakia	KERKOSAND, s. r.o.
Slovakia	LB MINERALS, a.s.
Slovakia	Carmeuse Slovakia, s. r. o.
Slovakia	Považská cementáre?, a.s.
Slovakia	Rudohorská investi?ná spolo?nos?, a.s.
Slovakia	Východoslovenské stavebné hmoty, a.s.
Slovakia	ALAS SLOVAKIA, s.r.o.
Slovakia	EUROVIA SK, a.s.
Slovakia	A.S.A. SLOVENSKO, Ltd.
Slovenia	TERMIT d.d. Moravce
Spain	Cobre Las Cruces
Spain	Iberpotash
Spain	Magnesitas Navarras
Sweden (+ others)	Rusal
Turkey	Adora Marble & Mining ind. Co., ltd.

Turkey	Eczacıbaşı Esan
Turkey	ETI ALUMINYUM A.S.
Turkey	Eti Krom
Turkey	Fe-Ni Mining Ltd.
Turkey	Koza Altin (Koza Gold Operations Company)
Turkey	MadenBank
Turkey	Milenyum Mining
Turkey	Tuprag Metal Madencilik
UK	Aggregate Industries Europe
UK	Cleveland Potash Ltd
UK	Saint Gobain
UK	Scotgold
UK	Sibelco
UK	Sirius Minerals
UK	SITA, UK part of SUEZ Environment
UK	Tata Steel
UK	Veolia
UK	Wolf Minerals
UK (Based)	Anglo American
Ukraine	Ferrexpo Poltava Mining
Ukraine	Metinvest
Unknown	BHP Billiton
Unknown	Geothermal Anywhere
Unknown	Lubelski Wegiel Bogdanka
Unknown	Tecnicas Reunidas
Unknown	Zincobre Ingenieria SLU

Academic Institutions	
Country	Organisation
All	Mineral Industry Research Organisation
Austria	Sustainable Europe Research Institute (SERI)
Austria	University of Leoben
Belgium	K.U. Leuven
Bulgaria	Bulgarian Academy of Sciences
Czech Republic	Charles University in Prague
Czech Republic	VŠB - Technical University of Ostrava, Faculty of Mining and Geology
Czech Republic	Charles University, Faculty of Science, Geology Section
Czech Republic	Masaryk University, Faculty of Science, Department of Geological Sciences
Czech Republic	Palacký University Olomouc, Faculty of Science, Department of geology
Czech Republic	Charles University Environment Center - conducts environmental research and provides environmental expertise and information for students
Czech Republic	Institute for Environmental Studies, Charles University in Prague
Czech Republic	Centre of the Environmental Engineering of the Technical University Ostrava
Finland	VTT Technical Research Centre of Finland
Finland	University Helsinki
Finland	University Oulu
France	ENS Paris
France	G2R Nancy
France	INSEAD
France	ISTerre
France	ISTerre, Grenoble
France	Université Bordeaux -CNRS and UNEP
France	Université de Lorraine
France	Université Joseph Fourier
France	University Orleans
France	University Savoie
France	University Savoie
France	University Toulouse
Germany	Fraunhofer
Germany	Helmholtz Institute Freiberg for Resource Technology
Germany	Institut für Umweltforschung (INFU)
Germany	Martin Luther University Halle-Wittenberg
Germany	Max-Planck-Institut fur Plasmaphysik

Germany	Öko Institute
Germany	RWTH - ME Process Metallurgy and Metal Recycling Department
Germany	RWTH Aachen University
Germany	Technische Universitat Bergakademie Freiberg
Germany	University Clausthal
Germany	University of Augsburg
Germany	Wuppertal Institute for Climate, Environment and Energy GmbH
Germany	RWTH- IAR Procssing and recycling
Germany	BAM Federal Institute for Materials Research and Testing
Germany	Hamburg University of Technology
Greece	Technical University of Crete
Ireland	Trinity College Dublin
Italy	Department of Geoengineering and Environmental Technologies
Italy	Universia di Napoli Federico II
Netherlands	Delft University of Technology
Netherlands	The Hague Centre for Strategic Studies
Norway	University Oslo
Norway	NTNU - Norweigian University of Science and Technology
Poland	Academy of Sciences
Poland	IMBiGS
Poland	Polish Mineral and Energy Economy Research Institute, Polish Academy of Science
Poland	University of Wroclaw
Portugal	University Lisbon
Romania	Alexandru Ioan Cuza University, Geology and Geography Faculty
Romania	Babes-Bolyai University, Cluj-Napoca, Biology and Geology Faculty
Romania	Facultăţii de Mine, Universitatea din Petroşani
Romania	GeoEcoMar (National Research and Development Institute for Marine Geology and Geoecology)
Romania	North University Baia Mare, Mineral Resources and Environment Faculty
Romania	Univerity of Bucharest, Geology and Geophysics Faculty
Serbia	University of Belgrade, Faculty of Mining and Geology
Slovakia	University Bratislava
Slovakia	Technical University of Košice
Slovakia	Comenius University Bratislava
Slovenia	University of Ljubljana, Faculty of Natural Sciences and Engineering
Spain	Universidad Autonoma de Barcelona
Sweden	Lulea Technical University
Sweden	Linköping University

Switzerland	ETH Zurich
Switzerland	University Geneve
Turkey	Dokuz Eylul University, Deparment of Geotechnic
Turkey	Instanbul University, Faculty of Engineering, Department of Geology
UK	Camborne School of Mines, University of Exeter
UK	Cardiff University
UK	Green Alliance
UK	Natural History Museum
UK	Roskill
UK	UK Energy Research Centre
UK	University Durham
UK	University Manchester
UK	University of Brighton
UK	University of Bristol (BHP Billiton funded work)
UK	University of Leeds
UK	University of Leeds
UK	University of Leicester
UK	University Southampton

Other	
Country	Organisation
All	Mining Journal
All	Industrial Minerals Magazine
All	Metal Bulletin
All	Mineral Planning
All	Eurogeosurveys
All	Ernst & Young
All	European Federation of Geologists
France	Bio Intelligence Services
Romania	Belevion SA
Sweden	SNL
UK	Chemical Innovation - Knowledge Transfer Network
UK	Environmental Sustainability - Knowledge Transfer Network
UK	Energy Research Partnership
UK	Granta design

Annexe L: Top level (2 digit) waste codes

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These codes are taken from (2000/532/EC) and are commonly used in specifying waste returns to Eurostat.

Head Code	Class description
01	Wastes resulting from exploration, mining, quarrying, physical and chemical treatment of minerals
02	Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing
03	Wastes from wood processing and the production of panels and furniture, pulp, paper and cardboard
04	Wastes from the leather, fur and textile industries
05	Wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal
06	Wastes from inorganic chemical processes
07	Wastes from organic chemical processes
08	Wastes from the manufacture, formulation, supply and use (MFSU) of coatings (paints, varnishes and vitreous enamels), adhesives, sealants and printing inks
09	Wastes from the photographic industry
10	Wastes from thermal processes
11	Wastes from chemical surface treatment and coating of metals and other materials; non-ferrous hydro-metallurgy
12	Wastes from shaping and physical and mechanical surface treatment of metals and plastics
13	Oil wastes and wastes of liquid fuels (except edible oils, 05 and 12)
14	Waste organic solvents, refrigerants and propellants (except 07 and 08)
15	Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified
16	Wastes not otherwise specified in the list
17	Construction and demolition wastes (including excavated soil from contaminated sites)
18	Wastes from human or animal health care and/or related research (except kitchen and restaurant wastes not arising from immediate health care)
19	Wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use
20	Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions

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Annexe M: Mining wastes metadata survey

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Background

Unlike primary raw materials, reporting on waste is largely based on waste flows and not material deposits. Data such as waste generation and waste treatment are available. These indicate the amount of waste which is collected or transferred within a specific period of time and in a specific region. In contrast, primary raw material inventories reflect the amount of a certain material present within a specific deposit or area, at a specific time.

Phase 1 Survey

The first (Phase 1) survey that was distributed as part of this project included a section on secondary raw materials, which includes mining and other wastes (see *Annexe F: Stakeholder survey documents*). This survey was distributed to national geological survey organisations as covered in Part 2; however, in most countries, these organisations are not authorities in non-mining 'secondary' raw material statistics. Survey responses provided limited insight on this subject.

Regarding mining wastes:

- 16 EU States responded to this aspect;
- Of these 15 affirmed that information on the waste legacy in terms of location and mineral type was available, although this was frequently assessed only for "priority" materials;
- Some countries reported that actual inventories were available.

Regarding scrap stocks:

- 8 EU States responded to this aspect;
- Of these, 7 affirmed that information on scrap stocks was available. However, most respondents listed either products that are the subject of End-of-Life Directives (WEEE, vehicles, batteries, packaging), or those with obvious commercial value, such as catalysts and common metals. Consequently, it is not clear that the respondents correctly differentiated wastes arisings from stocks;
- Only the UK respondent listed aggregates explicitly as a tracked commodity, reflecting the primary interests of the responding body.

Regarding Landfill Stocks:

- 6 EU States responded on this aspect;
- Of these, 4 responded that information on landfill stocks was available. Again, the nature of the commentary supplied does not yield confidence that a differentiation of stocks and flows has been made.

(In parallel, an extensive desk research study evaluated public sources of data related to the diverse aspects of secondary raw materials, their availability, scope and standards. The indication from this was data on stocks was extremely sparse with no obligation to report. Flows and arisings data is, however, prevalent and - for some categories - covered by waste codes and aggregated both nationally and at other NUTS levels.)

Phase 2 Survey

Given the sparse data expected and obtained from Phase 1, a 'secondary materials' survey was constructed and distributed to around 450 stakeholders

This generated only three responses. We concluded that the recipients were not in fact the correct authorities, and also did not recognise the generic concept of secondary materials or have authority to report on them. This led us to go back to first principles and be more rigorous in definitions. It also required research.

Literature Review

A literature review of European documents and reports was undertaken to assess whether a common definition for secondary raw materials was present. However, no well-bounded or universal definition of 'secondary raw materials' could be found. *Annexe M: Mining wastes metadata survey* reports more fully on this aspect.

The literature review extended into desk-based and internet research into mining waste authorities. This information was used to enhance the existing responses although such information and links were very hard to locate.

Phase 3 Survey

Therefore we decided to widen the scope of these surveys by designing questionnaires specific to secondary raw materials and to distribute these to the competent authorities in each country. The survey was also distributed to interested parties such as national waste associations. In order to gather a complete set of data, this survey has also been designed for waste management operators. Suitable contacts are currently being obtained in order to achieve this but they have not been released by the Commission. In the meantime, as a proxy, it has been sent to the State stakeholder group membership of a recently completed project on European contaminated land remediation, which includes mining interests.

As mentioned in the previous section, this section of the project concentrates on two types of 'secondary' raw materials: landfills and mining waste. Different authorities within nations can be responsible for these resources, and reporting requirements, standards, type of information and availability vary between these. For this reason, two different questionnaires were produced – dedicated to mining wastes or landfill stocks and waste arisings - and distributed to interested parties (see Annexe N: and Annexe P:).

In both cases, the surveys contained questions under three headings which paralleled the Primary Materials survey structure:

1. the process of ***data collection***
2. ***data harmonisation*** and the ***use of standards***
3. ***data accessibility***.

The following table indicates the status of the Phase 3 survey.

Country	Phase 3 received	Country	Phase 3 received
EU 28			
Austria	No	**Italy**	No
Belgium	Yes	**Latvia**	Yes
Bulgaria	Yes	**Lithuania**	No
Croatia	No	**Luxembourg**	No
Cyprus	No	**Malta**	No
Czech Republic	No	**Netherlands**	No
Denmark	No	**Poland**	No
Estonia	No	**Portugal**	No
Finland	Yes	**Romania**	No
France	No	**Slovakia**	Yes
Germany	No	**Slovenia**	No
Greece	No	**Spain**	No
Hungary	Yes	**Sweden**	No
Ireland	No	**United Kingdom**	No
Neighbouring Countries			
Albania	No	**Serbia**	No
Belarus	No	**Switzerland**	No
Bosnia and Herzegovina	No	**Turkey**	No
FYR Macedonia	Yes	**Ukraine**	No
Moldova	No	**Greenland**	No
Montenegro	No	**Lichtenstein**	No
Norway	Yes		

- EU response: 6/28
- Non-EU response: 2/13

Status

The low response rate is out of the project's control. Access to Stat contacts was only possible via a voluntary participation request made by Eurostat to the Technical Advisory Committee to the Mining Waste Directive review committee. However, as noted at the beginning of this section, other responses were received during the Phase 1 primary materials survey, albeit at a very low level of detail. All this information has, however, been built into the portal, although a substantial number of data links are missing. As a result there is some entry (even if it is only the State department responsible) for all except four States.

Summaries of the information found, by state, under the categories investigated are reported within this work. In short, in compliance with the Directive, most States have directories of at least high hazard facilities, locations, characterisation etc., but few genuinely assess the inventories held at closed, abandoned or operating mines.

Note that the first survey included questions related to landfill and waste deposition data. Whilst information was sparse, responses have been incorporated into the Landfill and Arisings aspects of this project and supplemented by desk-based research. All this information is captured within the Commission's metadata portal.

Consultation of interested parties

Since this area is highly disparate, it was deemed sensible to broaden the involvement of external experts. This is particularly true as the Steering Group is almost exclusively concerned with representatives of Primary Material interests. Accordingly, in addition to targeting waste-related interests at the survey and for attendees of Stakeholder Meeting 2, we sought to include a wider group of consultees including landfill operators, recyclers, materials reprocessors and landfill miners. Their inputs have been canvassed during Stakeholder Meeting 3.

Annexe N: Mining wastes questionnaire

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Project overview document: Statistical information on EU raw material deposits

Background

This project has been commissioned by the European Commission Enterprise and Industry Directorate-General. The project is being delivered by a consortium of geological surveys and research institutes[146] from different parts of the European Union (EU) and is being co-ordinated and project managed by Oakdene Hollins in the UK. For more information visit www.minventory.eu.

Currently there is no centralised EU initiative or organisation responsible for managing raw material resources and reserves. There is also a lack of specific EU policies and related financing mechanisms for achieving a central harmonised data source. A standardised and accurate statistical database providing a complete source of information on the geological resources and reserves of the EU would be an invaluable tool for land-use planning and future technology development policies. This database should include data on secondary raw materials, such as landfills. Such a database is also essential for informing decision-makers regarding materials security and for establishing appropriate mitigation strategies.

With this in mind, the European Commission wishes to carry out an analysis of available geological data to establish the basis for a pan-European database on resources and reserves of non-energy, non-agricultural raw materials. This analysis will determine which bodies or organisations need to be involved in order to facilitate the delivery of an authoritative and reliable database. It will also examine a range of possible scenarios for realising such a database by 2020. Many different organisations, from geological surveys to waste operators, have amassed data useful for this database. However, this accumulated data is often presented in different formats, to varying standards and utilises varying terminology.

Objectives

1) Support the European Commission in conducting an analysis of the potential for establishing a pan-European statistical database on resource and reserves of non-energy, non-agricultural minerals.
2) Improve Europe's geological knowledge and safeguard resources and reserves.
3) Determine the feasibility of using standard codes to harmonise geological data across Europe.
4) Provide a policy response to the need to harmonise statistical geological data and terminology on resources and reserves on a European level.
5) Determine how existing national data can be collected into a European Minerals Yearbook.
6) Determine how a pan-European database could be achieved by 2020.

Scope

[146] The full partner list is: Oakdene Hollins, British Geological Survey (BGS) - UK, Bureau de Recherches Géologiques et Minières (BRGM) - France, Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) - Germany, Raw Material Group - Sweden, Croatian Geological Survey (HGI-CGS), Czech Geological Survey (CGS), Geological Survey of Slovenia (GEO-ZS) - Slovenia, Geological Institute of Romania (GIR), Institute of Geology and Mineral Exploration (IGME) - Greece, Polish Geological Institute – National Research Institute (PGI-NRI).

The focus of this project is **primary** and, where appropriate, **secondary resources** and **reserves** of **non-energy, non-agricultural** raw materials of a **'mineralic**' nature (a list is specified in the associated questionnaire) as defined by the *Raw Materials Initiative (COM (2008) 699 final)* on **land** and in **marine** environments.

The analysis will cover all **28 EU Member States** and consider data availability in **neighbouring countries**, which are members of the European Geological Survey (EGS). Data held by public (e.g. United States Geological Survey etc.) and private (e.g. SNL, Roskill etc.) organisations both in and outside the EU will also be considered.

The project will assess the quality and availability of data on raw materials, but will **not** collect or provide any data on actual raw material resources and reserves.

In this task, the project considers data regarding secondary raw materials, more specifically data on mining waste facilities and landfill sites. The aim is to understand what kind of data is collected in this field, its availability and standardisation across Europe. Examples of this are closed mining waste facility inventories as required by Directive 2006/21/EC.

The project will seek to answer the following **key questions:**

1) What is the quality and quantity of statistical data available on raw material resources and reserves across Europe?
2) Who are the data holders/owners?
3) If resource and reserve data exists how are they organised – for example, at a national, regional or local level?
4) How do responsibilities for data gathering vary across the Member States depending on constitution, legislation, policy and other legal frameworks?
5) How does terminology used for resources and reserves and other geo-scientific data vary across Europe?
6) Are the data and associated information publicly available and easily accessible?
7) Which standard or national codes are used to determine resources and reserves and by whom?
8) Is the use of these codes legally binding and are these standards applied to all types of raw materials?
9) If national codes are used, how do these relate to internationally recognised standard codes (e.g. European Waste Catalogues, R and D codes according to Directive 2008/98/EC)?
10) Are existing national data INSPIRE compliant?
11) How can existing national data be compiled into a pan-European database or year book?
12) What is required for interoperability of a pan-European database on raw material resources and reserves?
13) Which are the principal data gaps, bottle necks and obstacles to achieving a pan-European database?
14) What level of data interoperability could realistically be achieved by 2020?
15) How would the proposed database relate to other frameworks and infrastructures being implemented?

Questionnaire on statistical information on Mining Waste:

To be completed by the recipient

Completed by (title & name):	
Position:	
Email address:	
Telephone number:	

Country					
Government authorities	Level	national	regional	local	Other (define)
		☐	☐	☐	
	Name of the institution				
Geological Survey	Level	national	regional	local	Other (define)
		☐	☐	☐	
	Name of the survey				
Industry	Sector	Construction (etc)	Industrial minerals	Waste Management	Other (define)
		☐	☐	☐	
	Name of the company and / or association				
Consultant	Sector	Industry	Government	Other (define)	
		☐	☐		
	Name of company				
Other	Sector	University / Research	NGO	Trade Union	
		☐	☐	☐	
	Name of the organisation				
Primary focus/remit					
Further Comments					

SECTION 1 – TO BE COMPLETED BY DATA PROVIDERS

Summary of data provided for closed and abandoned waste facilities for extractive waste from mines, quarries and other mineral extractions

1. Do you currently provide an inventory on closed or abandoned mining waste facilities?

   Yes / No

2. Does the inventory contain information on all waste facilities or only for those 'which cause serious negative environmental impacts or have the potential of becoming in the medium or short term a serious threat to human health or the environment'?

3. What information does this inventory contain (please tick/answer as required)?

Data	Data availability	
Location	o	*Eg. Post code, district, region*
Type of facility	o	*Eg. Heap, pond*
Size	o	*Eg. Area, volume, total waste quantity held in facility*
Waste characterisation	o	*Eg. Mineral / Metal content, European waste code*
Waste source	o	*Eg. Type of minerals being extracted*
Other	o	*Please specify*

4. Are the data available to the public?

   Yes / No

If no:

4.1 Is there a time limit to confidentiality? Please specify the period.

If yes:

4.2 At what scale are data made publicly available?

National	Yes / No
Regional	Yes / No
Local	Yes / No
Individual site/facility	Yes / No

4.3 How can the data be accessed (e.g. website (please provide web address/link), specific data requests)?

4.4 Are the data charged for?

4.5 Is reproduction of the data in other databases or publications permitted with permission?

4.6 Who requests access to and uses the data? Please provide examples.

5. Are data and information available in multilingual formats? Yes / No

5.1 If so, please state which languages.

Summary of data provided for operating waste facilities for extractive waste

6. Do you currently provide data on operating mining waste facilities?

Yes / No

7. What information is provided (please tick/answer as required)?

Data		Data availability	
Location		o	*Eg. Post code, district, region*
Type of facility		o	*Eg. Heap, pond*
Size		o	*Eg. Area, volume*
Waste Quantity	Estimated total waste	o	*This relates to the net stock or inventory of the waste*
	Annual waste accepted	o	*This relates to the annual accumulation or depletion flow*
Waste Source		o	*Eg. Type of minerals being extracted*
Waste characterisation		o	*Eg. Mineral / Metal content, European waste code*
Other		o	*Please specify*

8. Are the data available to the public? Yes / No

If yes:

8.1 At what scale are data made publicly available?

National Yes / No

Regional Yes / No

Local Yes / No

Individual site/facility Yes / No

8.2 How can the data be accessed (e.g. website (please provide web address/link), specific data requests)?

8.3 Are the data charged for?

8.4 Is reproduction of the data in other databases or publications permitted with permission?

8.5 Who requests access to and uses the data? Please provide examples.

If no:

8.5 Is there a time limit to confidentiality? Please specify the period.

9. Are data and information available in multilingual formats? Yes / No

9.1 If so, please state which languages.

A) Data collection

10. Do you make available or publish, publicly or for private sale statistical data on mining waste?

Yes / No

11. Where are the data sourced from (e.g. your own records, mineral operators, geological surveys, environmental agencies, other)?

12. At what scale are the data collected (e.g. national, regional, local, individual site/facility, other or a combination)?

13. How regularly are the data collected (e.g. annually, another defined period, variable etc)?

14. What is the mechanism for data collection (e.g. by survey monitoring, company reporting)?

15. In what format are the data received (e.g. reports, tables, maps, hardcopy, digital)?

B) Harmonisation and standardisation

16. If you report data do they conform to a standard code or national code? Yes / No

If yes

16.1 Please specify the codes utilised and for which wastes.

16.2 Are the data aligned with internationally used standard codes (e.g. European Waste Catalogues)?

16.3 If a standard or national code is used is any attempt made to harmonise data received from different sources (e.g. companies, geological surveys etc)?

C) Data accessibility

17. Who are the data holders/owners (e.g your organisation, the company/organisation supplying the data, a government department/ministry, other) please specify?

18. How are the data stored/managed (e.g. is there a national/regional or centralised database, geographic information system)?

19. At what scale are the data organised (e.g. national, regional, local, deposit level)?

20. Are the data spatially referenced? Yes / No

If yes:

15.1 Are the data INSPIRE compliant? Yes / No

21. What do you perceive as the key challenges to availability and harmonisation of secondary resources information across Europe?

22. Please provide any other information relevant to this study (for example, other data providers or holders who we might contact or engage in this project).

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Annexe O: Landfill & arisings metadata survey

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The landfill and arisings survey was conducted in parallel with the primary and mining waste surveys and its genesis is reported within *Annexe M: Mining wastes metadata survey.*

In summary the following rounds of research were conducted:

- The Phase 1 adjunct to the Primary Materials survey to geological bodies; this yielded little insight.
- A Phase 2 survey, using a 'secondary materials' questionnaire (mining wastes and landfill etc.) that was distributed to a very wide stakeholder list; this also yielded few responses.
- An extensive desk based, internet search to synthesise lists of responsible organisations, laws and any data available (synthetic data entry).
- A Phase 3 survey which specifically targeted Landfill Stocks and Waste Flow data providers, and addressed to a list of contacts provided by Eurostat.

The desk based research and the Phase 3 survey have yielded most information and largely confirmatory where overlapping. With respect to survey responses, the following table describes the situation at the end of April 2014.

Country	Phase 3 received	Country	Phase 3 received
Austria	No (synthetic entry)	**Italy**	No (synthetic entry)
Belgium	Yes	**Latvia**	Yes
Bulgaria	No (synthetic entry)	**Lithuania**	No (synthetic entry)
Croatia	No (synthetic entry)	**Luxembourg**	Yes
Cyprus	No (synthetic entry)	**Malta**	Yes
Czech Republic	Yes	**Netherlands**	No (synthetic entry)
Denmark	No (synthetic entry)	**Poland**	No (synthetic entry)
Estonia	No (synthetic entry)	**Portugal**	No (synthetic entry)
Finland	No (synthetic entry)	**Romania**	Yes
France	No (synthetic entry)	**Slovakia**	Yes
Germany	No (synthetic entry)	**Slovenia**	Yes
Greece	No (synthetic entry)	**Spain**	No (synthetic entry)
Hungary	Yes	**Sweden**	No (synthetic entry)
Ireland	Yes	**United Kingdom**	No (synthetic entry)
Neighbouring Countries			
Albania	No (synthetic entry)	**Serbia**	No (synthetic entry)
Belarus	No (synthetic entry)	**Switzerland**	No (synthetic entry)
Bosnia and Herzegovina	Yes	**Turkey**	Yes
FYR Macedonia	Yes	**Ukraine**	No (synthetic entry)
Moldova	No (synthetic entry)	**Greenland**	No (synthetic entry)
Montenegro	No (synthetic entry)	**Lichtenstein**	Yes
Norway	No (synthetic entry)		

EU response: 10/28; Non-EU response: 4/13

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Annexe P: Landfill & arisings questionnaire

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Completed by (title & name):	
Position:	
Email address: **Generic email:**	(email address is for survey contact queries only; generic email is one that it would be safe to use in the public domain for contacting your unit.)
Telephone number:	

Country					
Government authorities	Level	national	regional	local	Other (define)
		☐	☐	☐	
	Name of the institution				
Industry	Sector	Construction (etc.)	Industrial minerals	Metals	Other (define)
		☐	☐	☐	
	Name of the company and / or association				
Consultant	Sector	Industry	Government	Other (define)	
		☐	☐		
	Name of company				
Other	Sector	University / Research	NGO	Trade Union	
		☐	☐	☐	
	Name of the organisation				
Primary focus/remit	Primary raw materials		Secondary raw materials		
	☐		☐		
Further Comments					

N.B. Secondary Raw Materials means waste materials that could be reprocessed or recycled for use as equivalents to virgin material.

SECTION 1 - Summary of data provided on landfills

N.B. Questions 1 to 4 relate to the inventory or stocks in Landfill NOT flows into them. Inventory and stocks relate to information on landfill sites and the materials already present within these sites, NOT information on the wastes being accepted at these sites.

23.Do you currently provide data on operating landfill sites?

Choose an item.

24.What information is provided (please tick/answer as required)?

Data	Data availability	
Location	☐	*e.g. Post code, district, region*
Type of facility	☐	*e.g. Hazardous, non-hazardous, inert, D codes (Directive 2008/98/EC)*
Size	☐	*e.g. Area, volume, total waste quantity, capacity*
Waste characterisation	☐	*e.g. Characterisation of waste content*
Other	☐	*e.g. Number of operating facilities* *Please specify:* Click here to enter text.

25.Do you currently provide data on closed landfill sites?

Choose an item.

26.What information is provided (please tick/answer as required)?

Data	Data availability	
Location	☐	*e.g. Post code, district, region*
Type of facility	☐	*e.g. Hazardous, non-hazardous, inert, D code (Directive 2008/98/EC)*
Size	☐	*e.g. Area, volume, total waste quantity, capacity*
Waste characterisation	☐	*e.g. Characterisation of waste content*
Other	☐	*e.g. Number of facilities* *Please specify:* Click here to enter text.

N.B. Questions 5 & 6 relate to the arisings or flows of wastes NOT stocks or inventories. Waste arisings refer to the amount of waste generated in a period of time (generally per year) and waste flows refer to the movement of such waste, for example for disposal into landfill.

27.Do you currently provide data on waste flows?

Choose an item.

28.What information is provided (please tick/answer as required)?

Data	Data availability	
Waste quantity	☐	*e.g. Tonnes*
Waste type	☐	*e.g. Hazardous, non-hazardous, inert*
Waste treatment	☐	*e.g. Landfill, D and R code (Directive 2008/98/EC)*
Waste characterisation	☐	*e.g. European Waste Code chapter, European Waste Code*
Economic Activity	☐	*e.g. NACE code*
Time period	☐	*e.g. Annual, quarterly*
Other	☐	*Please specify:* Click here to enter text.

SECTION 2 - Summary of data provided on in-use metal/recyclate stocks

1. Do you currently provide data on in-use metal/recyclate **stocks**?

Choose an item.

If yes:

1.1 What kind of data is provided? Click here to enter text.

SECTION 3 - Summary of data collection

A) Data collection

1. Do you currently make available or publish, publicly or for private sale, statistical data on landfill sites?

Choose an item.

If yes:

1.1 Please provide link (URL) to data if available. Click here to enter text.

2. Where are the data sourced from (e.g. your own records, mineral operators, geological surveys, other)?

Click here to enter text.

3. At what scale are the data collected (e.g. national, regional, local, individual landfill site, other or a combination)?

Click here to enter text.

4. How regularly are the data collected (e.g. annually, another defined period, variable etc.)?

Click here to enter text.

5. Do you provide other types of data relevant to landfill sites?

Choose an item. *If yes:*

5.1 Please specify the types of other data available and provide link (URL) to data.

Click here to enter text.

5.2 Who is responsible for collating, publishing or owning these data?

Click here to enter text.

6. What is the mechanism for data collection (e.g. by survey monitoring, company reporting)?

Click here to enter text.

7. In what format are the data received (e.g. reports, tables, maps, hardcopy, digital)?

Click here to enter text.

B) Harmonisation and standardisation

8. If you report data, do they conform to a standard code or national code?

Choose an item.

If yes:

8.1 Please specify the codes utilised and for which wastes and which facilities:

Click here to enter text.

8.2 Are the data aligned with internationally used standard codes (e.g. European Waste Catalogue, treatment code according to Directive 2008/98/EC)?

Click here to enter text.

8.3 If a standard or national code is used is any attempt made to harmonise data received from different sources (e.g. companies, trade associations etc.)?

Click here to enter text.

C) Data accessibility

9. Who are the data holders/owners (e.g. your organisation, the company/organisation supplying the data, a government department/ministry, other) please specify?

Click here to enter text.

10. How are the data stored/managed (e.g. is there a national/regional or centralised database, geographic information system)?

Click here to enter text.

11. At what scale are the data organised (e.g. national, regional, local, site level)?

Click here to enter text.

12. Are the data spatially referenced?

Choose an item.

If yes:

12.1 Are the data INSPIRE compliant?

Choose an item.

13. Are the data available to the public?

Choose an item.

If yes:

13.1 At what scale are data made publicly available?

National

Choose an item.

Regional

Choose an item. Local

Choose an item.

Individual site/facility

Choose an item.

13.2 How can the data be accessed (e.g. website (please provide web address/link), specific data requests)?

Click here to enter text.

13.3 Are the data charged for?

Click here to enter text.

13.4 Is reproduction of the data in other databases or publications permitted with permission?

Click here to enter text.

13.5 Who requests access to and uses the data? Please provide examples.

Click here to enter text.

If no:

13.6 Is there a time limit to confidentiality?

Choose an item. Period: Click here to enter text.

14. Are data and information available in multilingual formats?

Choose an item.

14.1 If so, please state which languages.

Click here to enter text.

15. What do you perceive as the key challenges to availability and harmonisation of secondary resources information across Europe?

Click here to enter text.

16. Please provide any other information relevant to this study (for example, other data providers or holders who we might contact or engage in this project).

Click here to enter text.

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Annexe Q: Landfill & waste data availability

Notes to the tables

- Landfill Stock metadata is reported in lilac cells.
- Waste Flow metadata is reported in blue cells.
- Neighbouring country tables appear after EU-28 tables

Meaning of responses
"Not Stated" if absent from a survey response;
"None" if survey positively stated none.
"Unknown" if research could not identify.

Links
Fields link to (a) the data pages themselves; (b) the Authority overview page; or (c) text to say "approach authority directly"

Landfill Stock Reporting Standard
Reports may be made in the absence of legislation for internal regulatory purposes. Where stated, the typical parameters are listed. This may relate to the level at which data is collected, not published.

Landfill Stock/Waste Flow Aggregation Policy
Identifies the level at which data is freely available to the public. "Not Stated" if absent from a survey response; "Not published" if survey positively stated so. "Unknown" if research could not identify.

Landfill Waste Legislation
EU Member States should have transposed the Landfill Directive 1999/31/EC into national law. Where known this law is stated.

Waste Flow Reporting Legislation
Within the EU, the default is the transposition of the Waste Framework Directive 2008/98/EC into national law.

Waste Flow Reporting Standard
By default EU Member States report in Eurostat based on the principles of Regulation (EC) No 2150/2002 on waste statistics (incorporating the European Waste Catalogue), but locally data may be categorised in other systems.

Waste Flow Publication Frequency
For EU Member States, data is submitted annually to Eurostat, but may be collected or published locally at a higher frequency.

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Country	Region	Landfill Authority	Link to Authority/Data	Landfill Stock Reporting Legislation	Landfill Stock Reporting Standard	Stock Data Aggregation Policy	Stock Data Publication Frequency	Contact details (as present in others - unit, address)	Contact details (as present in others - email)	Landfill Waste Legislation
		"Not Stated" if absent from a survey response; "Unknown" if research could not identify.	This field links to (a) the data pages themselves; (b) the Authority overview page; or (c) text to say "approach authority directly"	"Not Stated" if absent from a survey response; "None" if survey positively stated none. "Unknown" if research could not identify.	Reports may be made in the absence of legislation for internal regulatory purposes. Where stated, the typical parameters are listed. This may relate to the level at which data is collected, not published.	Identifies the level at which data is freely available to the public. "Not Stated" if absent from a survey response; "Not published" if survey positively stated so. "Unknown" if research could not identify.	"Not Stated" if absent from a survey response; "None" if survey positively stated none. "Unknown" if research could not identify.			EU Member States should have transposed the Landfill Directive 1999/31/EC into national law. Where known this law is stated.
Austria	Austria	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (Federal Ministry of Agriculture, Forestry, Environment and Water Management)	http://www.bmlfuw.gv.at/	Unknown	Unknown	Unknown	Unknown	Stubenring 1, 1010 Wien, Österreich	service@bmlfuw.gv.at	Ordinance on Landfilling, Law Gazette II No. 164/1996 amended 49/2004 Ordinance on limitation of leachate emissions from landfills, Gazette II No. 263/2003
Belgium	Flanders	Flemish Public Waste Agency (OVAM)	http://www.ovam.be/sites/default/files/20130930_Tarieven_Capaciteiten2012_1.pdf	Not stated	Facility location, facility type, facility size, feed characteristics for open sites only.	Regional	Annual	Not stated	Not stated	Transposition of the Landfill Directive
Belgium	Walloon	DGARNE/DGO3 and Département du sol et des déchets (DSD)	www.economie.fgov.be	Unknown	Facility location, facility type, facility size, feed characteristics for open sites only.	Unknown	Unknown	Avenue Prince de Liège 15 • B - 5100 Namur (Jambes) Tél. : +32 (0) 81 33 65 75 Fax : +32 (0) 81 33 65 22	http://environnement.wallonie.be/administration/dsd.htm	Decree of 27 June 1996 on waste, industrial waste component including interregional and international relations
Bulgaria	Bulgaria	Ministry of Environment & Water, Executive Environment Agency	http://eea.government.bg/waste	Unknown	Unknown	Unknown	Unknown	136 Tzar Boris III blvd., P.O.Box 251, 1618 Sofia, Bulgaria. Phone: 359 2 9559011	ncesd@eea.government.bg	The Waste Management Act, State Gazette No. 53 of 13.07.2012, effective13.07.2012; Subsurface Resources Act

Country	Region	Landfill Authority	Link to Authority/Data	Landfill Stock Reporting Legislation	Landfill Stock Reporting Standard	Stock Data Aggregation Policy	Stock Data Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)	Landfill Waste Legislation
Croatia	Croatia	Croatian Environmental Agency	http://gospodarenje-otpadom.azo.hr/	Unknown	Unknown	Unknown	Unknown	Trg marsala Tita 8, Zagreb-10000, Croatia. Phone: 385 14886 840	info@azo.hr	Transposition of the Landfill Directive
Cyprus	Cyprus	Ministry of Interior	http://www.moi.gov.cy/moi/moi.nsf/index_en/index_en?OpenDocument	Unknown	Unknown	Unknown	Unknown	Demosthenis Severis Avenue, 1453 Nicosia.	info@moi.gov.cy	Transposition of the Landfill Directive
Czech Republic	Czech Republic	Ministry of Environment (MoE),Waste Management Department	Example publications: http://www.czso.cz/csu/2013edicniplan.nsf/p/2001-13) or at http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/waste_generation_management	Not stated	Location, Type, Facility Size, and Number of Operating Facilities. None for closed landfill.	Regional	Annual	Ministry of the Environment of the Czech republic Vršovická 65 Praha 10 100 10 Phone: +420-2-6712-1111	info@mzp.cz. (a detailed list of contacts is avaliable)	Regulation No 2 150/2002; Decree No 341/2008 Coll., on the details of the management of biodegradable waste and amending Decree No 294/2005 Coll., on conditions of depositing waste in landfills; Decree No. 294/2005 Coll., on the conditions of landfilling of waste and use of waste on surface and amendment of Decree No. 383/2001 Coll., on details of waste management and for recovery of waste through its application to land, and amending Implementing Decree No 383/2001 laying down details for managing waste
Denmark	Denmark	Ministry of the Environment, Environmental Protection Agency	http://eng.mst.dk/	Unknown	Unknown	Unknown	Unknown	Strandgade 29 1401 Copenhagen K Denmark Tel.: + 45 70 12 02 11	info@mim.dk (Ministry), mst@mst.dk (EPA)	Bekendtgorelse nr. 648 af 29. juni 2001 om aendring af bekendtgorelse om affald, i kraft den 16. juli 2001
Estonia	Estonia	Ministry of the Environment	http://www.envir.ee/66813	Unknown	Unknown	Unknown	Unknown	Narva mnt 7a, 15172 Tallinn, Estonia	keskkonnaministeerium@envir.ee	Waste Act (RT I 2004, 9, 52), 2004
Finland	Finland	Ministry of the Environment	http://www.ym.fi/en-US/The_environment/Waste	Unknown	Unknown	Unknown	Unknown	Mailing address P.O. Box 35, 00023 Valtioneuvosto Visiting address Kasarmikatu 25, Helsinki. Phone: +358 2952 50000 (switchboard)	kirjaamo.ym@ymparisto.fi	Unknown
France	France	ADEME (Agence de l'Environnement et de la Maitrise de l'Energie)	http://www2.ademe.fr/servlet/KBaseShow?sort=-1&cid=96&m=3&catid=17570	Unknown	Unknown	Unknown	Unknown	27 rue Louis Vicat 75737 PARIS Cedex 15 Phone: 0147 65 20 00	http://contacts.application.developpement-durable.gouv.fr/contact/contacts.jsp	Unknown

Country	Region	Landfill Authority	Link to Authority/Data	Landfill Stock Reporting Legislation	Landfill Stock Reporting Standard	Stock Data Aggregation Policy	Stock Data Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)	Landfill Waste Legislation
Germany	Germany	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	In Germany, the EU Landfill Directive is implemented by the Landfill Ordinance and by the Ordinance on Landfills and Long Term Storages. The latter transposes also the EU Landfill Decision.
Greece	Greece	Ministry of Environment, Energy and Climate Change	http://www.ypeka.gr/Default.aspx?tabid=224&language=en-US	Unknown	Unknown	Unknown	Unknown	17 Amaliados str. 115 23 Athens Greece. Phone: 213 15 15 000	http://www.ypeka.gr/Default.aspx?tabid=234&language=en-US	Landfill Directive 1999/31/EC into national law.
Hungary	Hungary	Ministry for Rural Development	http://okir.kvvm.hu/hir/	Not stated	Locations, Type, Facility Size, and (for operating sites only) Waste Characterisation and Number of Facilities	To site level	Annual	1055 Budapest, Kossuth Lajos tér 11. Postal address: 1860 Budapest Phone: +36-1-795-2000	(ministry of the interior) ugyfelszolgalat@bm.gov.hu. (others avaliable at:http://www.kormany.hu/en/contacts)	Landfill Directive 1999/31/EC into national law.
Ireland	Ireland	EPA	http://www.epa.ie/irelandsenvironment/waste/#.U7KFEPldWXk http://www.epa.ie/licensing/	None	None	None	No reporting	PO Box 3000 Johnstown Castle Estate Wexford 053-916 0600	info@epa.ie	Landfill Directive 1999/31/EC into national law.
Italy	Italy	The National EPA	http://www.apat.gov.it/	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	National Environmental Act (d.lgs. 152/06, as amended by d.lgs. 205/10)
Latvia	Latvia	Latvia Environment , Geology and Meteorology centre	http://www.meteo.lv/lapas/vide/atkritumi/atkritumi?id=1115&nid=367 Landfill site data is collected annually at a national level can be accessed here: http://www.lvgmc.lv/lapas/vide/atkritumi/atkritumu-statistikas-apkopojumi/atkritumu-statistikas-apkopojumi?id=1713&nid=380.	Not stated	Locations and (for operating sites only) , Type, Waste Characterisation	National	Annual	Moscow street 165, Riga, LV-1019 Phone: 67032600	intars.cakars@lvgmc.lv; lvgmc@lvgmc.lv	Cabinet of Ministers of December 30, 2011 Nr. 1032 "landfill, landfill and landfill management, closure and remediation rules"
Lithuania	Lithuania	Lithuanian EPA	No public data	No public data	No public data	No public data	No public data	Juozapavičiaus st. 9, LT-09311 Vilnius, phone. (8) 70662008	aaa@aaa.am.lt	1998 Law on Waste Management (of 16 June 1998, Nr. VIII-787, as amended)

Country	Region	Landfill Authority	Link to Authority/Data	Landfill Stock Reporting Legislation	Landfill Stock Reporting Standard	Stock Data Aggregation Policy	Stock Data Publication Frequency	Contact details (as present in others - unit, address)	Contact details (as present in others - email)	Landfill Waste Legislation
Luxembourg	Luxembourg	Environment Protection Agency	http://www.statistiques.public.lu/stat/ReportFolders/ReportFolder.aspx?IF_Language=fra&MainTheme=18&FldrName=38&RFPath=65	Not stated	Locations, Type, Facility Size, Waste Characterisation and (for operating sites only) Number of Facilities	National	Annual	4, Place de l'Europe L -1499 Luxembourg. Phone: +352 247-86824	Online communication form	Grand-Ducal Regulation of 28 June 2012 supplementing the Annexes I, II and III of the Grand-Ducal Regulation of 24 February 2003 on the landfill of waste.
Malta	Malta	National Statistics Office (NSO), Environment & Resources Unit	http://www.nso.gov.mt/statdoc/document_file.aspx?id=3864	Not stated	Number of facilities and (for operating sites only) Type, Facility Size and Waste Characterisation	National	Annual	Lascaris Valletta VLT 2000 Malta Phone: +356 2599 7000	nso@gov.mt	Transposition of the Landfill Directive
Netherlands	Netherlands									Transposition of the Landfill Directive
Poland	Poland	Ministry of the Environment, Department of Waste Management	http://www.mos.gov.pl/kategoria/1857_waste/					Wawelska Str. 52/54 00-922 Warszawa POLAND Phone: +48 (22) 57 92 900	info@mos.gov.pl	Transposition of the Landfill Directive
Portugal	Portugal	Environment Agency	http://www.ine.pt	Not stated	Location and Type of facility and (for operating sites only) Size and miscellaneous data	Unknown	Unknown	STATISTICS PORTUGAL - HEAD OFFICE Av. António José de Almeida 1000-043 LISBOA Tel.: + 351 218 426 100	webinq@ine.pt	Not stated
Romania	Romania	Ministry of the Environment and Climate Change (MoECC)	http://www.anpm.ro	Not stated	Location, Type, Size of facility, and Waste characterisation	National and site level	Annual	B Presa Office. 12, Sector 5, Bucharest. Phone: 021 408 9521 (numbers also avaliable for individual deptartments at http://mmediu.ro/new/?page_id=183#)	office@anpm.ro	Governmental Decision 349/2005 on landfill of waste and Ministry Order 757/2004 approving the technical norms on landfill of waste (transposing Directive 1999/31/EC)
Slovakia	Slovakia	Ministry of Environment (MoE) - Department of Waste Management	http://globus.sazp.sk/skladky/	Not stated	Location only	National	Annual	The Ministry of the Environment of the Slovak Republic Námestie Ľudovíta Štúra 1 812 35 Bratislava Slovak Republic. Phone: 00421-2 / 5956 1111	http://www.minzp.sk/components/send_link/send_link_form.jsp?docid=8038&sendType=link	Transposition of the Landfill Directive
Slovenia	Slovenia	Environmental Protection Agency	http://pxweb.stat.si/pxweb/Database/Environment/27_environment/02_waste/01_27061_waste_removal/01_27061_waste_removal.asp	Not stated	Type, Size of facility and (for operating sites only) Waste characterisation	To local level	Annual	Vojkova 1b SI-1000 Ljubljana, Slovenia Tel: +386 14784 000	gp.arso@gov.si	Transposition of the Landfill Directive
Spain	Spain	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

Country	Region	Landfill Authority	Link to Authority/Data	Landfill Stock Reporting Legislation	Landfill Stock Reporting Standard	Stock Data Aggregation Policy	Stock Data Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)	Landfill Waste Legislation
Sweden	Sweden	Swedish Environmental Protection Agency	http://www.swedishepa.se/State-of-the-environment/	Licensed annual acceptance or capacity (height or area)	Unknown	To site level	Annual	SE-106 48 Stockholm. Phone: +46 10 698 10 00	environmental-objectives@swedishepa.se (more department specific emails avaliable at:http://www.swedishepa.se/About-us/Contact/)	Regulation 2150/2002/EC transposed into law; Ordinance (2001:512) on the Landfill of Waste
United Kingdom	England	Environment Agency	http://www.environment-agency.gov.uk/research/library/data/150326.aspx	None	Locations and Size of facility	To site level	Annual	PO Box 544 Rotherham S60 1BY. Phone: 03708 506 506	enquiries@environment-agency.gov.uk	The Pollution Prevention and Control (Designation of Landfill Directive) Order 2001
United Kingdom	Wales	Environment Agency	http://www.environment-agency.gov.uk/research/library/data/150326.aspx	None	Locations and Size of facility	To site level	Annual	PO Box 544 Rotherham S60 1BY. Phone: 03708 506 507	enquiries@environment-agency.gov.uk	The Pollution Prevention and Control (Designation of Landfill Directive) Order 2001
United Kingdom	Scotland	Scottish Environment Protection Agency	http://www.sepa.org.uk/about_us/publications.aspx	None	None	None	None	Strathallan House Castle Business Park Stirling FK9 4TZ Tel: 01786 457700	http://www.sepa.org.uk/about_us/contacting_sepa/by_email.aspx	The Landfill (Scotland) Regulations 2003, SSI 2 No. 235 of 10/04/2003 amended 09/02/2004
United Kingdom	Northern Ireland	Northern Ireland Environment Agency	http://www.doeni.gov.uk/niea/waste-home/public_reg.htm	None	None	None	None	Goodwood House 44 - 58 May Street Town Parks Belfast BT1 4NN Telephone: 028 9054 0540	enquiries@doeni.gov.uk	The Landfill Regulations (Northern Ireland) 2003 SRNI 2003 No. 496 of 01/12/2003

Country	Region	Waste Flows Authority	Link to Authority/Data	Waste Flow Reporting Legislation	Waste Flow Reporting Standard	Waste Data Aggregation Policy	Waste Flow Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)
		"Not Stated" if absent from a survey response; "Unknown" if research could not identify.	This field links to (a) the data pages themselves; (b) the Authority overview page; or (c) text to say "approach authority directly"	"Not Stated" if absent from a survey response; "None" if survey positively stated none; "Unknown" if research could not identify. Within the EU, the default is the transposition of the Waste Framework Directive 2008/98/EC into national law.	By default EU Member States report in Eurostat based on the principles of Regulation (EC) No 2150/2002 on waste statistics (incorporating the European Waste Catalogue), but locally data may be categorised in other systems.	Identifies the level at which data is freely available to the public. "Not Stated" if absent from a survey response; "Not published" if survey positively stated so. "Unknown" if research could not identify.	For EU Member States, data is submitted annually to Eurostat, but may be collected or published locally at a higher frequency.		
Austria	Austria	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (Federal Ministry of Agriculture, Forestry, Environment and Water Management)	http://www.bmlfuw.gv.at/	Waste Management Act 2002 – Federal Law of the Republic of Austria, with a federal law on sustainable waste management (Waste Management Act 2002 – Act of 2002) is adopted. BGBl. I 102/2002 (Act on waste management 2002 – Federal law of the Republic of Austria with Which the act on a	Harmonised to EWC codes	Unknown	Annual	Stubenring 1, 1010 Wien, Österreich	service@bmlfuw.gv.at
Belgium	Flanders	Flemish Public Waste Agency (OVAM)	Via OVAM website	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Regional	Annual	Not stated	Not stated
Belgium	Walloon	DGARNE/DGO3 and Département du sol et des déchets (DSD)	www.economie.fgov.be	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Unknown	Annual	Avenue Prince de Liège 15 • B – 5100 Namur (Jambes) Tél. : +32 (0) 81 33 65 75 Fax : +32 (0) 81 33 65 22	http://environnement.wallonie.be/administration/dsd.htm
Bulgaria	Bulgaria	National Statistical Institute	www.nsi.bg	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Unknown	Annual	2, P. Volov Str., 1038 Sofia, Bulgaria. Phone:(+359 2) 9857 148	Info@nsi.bg / Publikacii@nsi.bg
Croatia	Croatia	Croatian Environment Agency	www.azo.hr	The Law on Sustainable Waste Management Official Gazette 94/13	Harmonised EU; Official Gazette 50/05 , 39/09	Unknown	Annual	Ministry of Environment and Nature Protection of the Republic of Austria Street 14, Zagreb Phone: 01/3717-111 (switchboard)	Unknown
Cyprus	Cyprus	Ministry of Interior	http://www.moi.gov.cy/moi/moi.nsf/index_en/index_en?OpenDocument	Waste Law N.185 (I)/2011, the Packaging and Packaging Waste Law 2002-2006	Harmonised to EWC codes	Unknown	Annual	Demosthenis Severis Avenue, 1453 Nicosia.	info@moi.gov.cy

Country	Region	Waste Flows Authority	Link to Authority/Data	Waste Flow Reporting Legislation	Waste Flow Reporting Standard	Waste Data Aggregation Policy	Waste Flow Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)
Czech Republic	Czech Republic	Czech Statistical Office – Department of the Environment	http://www.cenia.cz/rocenka2011/index.htm#a3_an	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Regional	Annual	Vrsovicka 1442/65, Praha 10, 100 10 Phone: 267 225 226	info@cenia.cz
Denmark	Denmark	Ministry of the Environment, Environmental Protection Agency	http://www.mst.dk	Transposition of the Waste Framework Directive 2008/98/EC	Unknown	Unknown	Annual	Strandgade 29 1401 Copenhagen K Denmark Tel.: + 45 70 12 02 11	info@mim.dk (Ministry), mst@mst.dk (EPA)
Estonia	Estonia	Ministry of the Environment	http://www.envir.ee/66813	Waste Act, Packaging Act, regulation 2150/2002/EC transposed into law	Harmonised to EWC codes	Unknown	Annual	Narva mnt 7a, 15172 Tallinn, Estonia	keskkonnaministeerium@envir.ee
Finland	Finland	Unknown	http://www.stat.fi	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Not stated	Unknown	Työpajankatu 13, FI-00580 Helsinki, Finland. Switchboard: 029 551 1000	info@tilastokeskus.fi
France	France	ADEME	http://www.developpement-durable.gouv.fr	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Unknown	Unknown	27 rue Louis Vicat 75737 PARIS Cedex 15 Phone: 01 47 65 20 00	http://contacts.application.developpement-durable.gouv.fr/contact/contacts.jsp

Country	Region	Waste Flows Authority	Link to Authority/Data	Waste Flow Reporting Legislation	Waste Flow Reporting Standard	Waste Data Aggregation Policy	Waste Flow Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)
Germany	Germany	Federal Statistics Office	http://www.destatis.de http://www.kreislaufwirtschaft-bau.de/akt_ber.html	landfill regulation (Deponieverordnung	Harmonised to EWC codes	Unknown	Unknown	(Statistics Office) Main Customs Office Friedrich-Ebert-Allee 4 D-65189 Wiesbaden	https://www.destatis.de/DE/Service/Kontakt/Kontakt.html;jsessionid=7418771DD3D101F692E575C14D161DE3.cae4
Greece	Greece	Hellenic Statistical Authority (EL.STAT)	http://www.statistics.gr	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Unknown	Annual	Address Pireos 46 & Eponiton, 185 10 Pireus. Phones +30 213 1352022	data.dissem@statistics.gr data.source@statistics.gr data.supply@statistics.gr
Hungary	Hungary	Ministry for Rural Development?	http://okir.kvvm.hu/hir/	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	To site level	Annual	1055 Budapest, Kossuth Lajos tér 11. Postal address: 1860 Budapest Phone: +36-1-795-2000	(ministry of the interior) ugyfelszolgalat@bm.gov.hu. (others avaliable at:http://www.kormany.hu/en/contacts)
Ireland	Ireland	EPA (Ireland)	http://www.epa.ie, www.wastereport.ie	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Regional	Annual	PO Box 3000 Johnstown Castle Estate Wexford 053-916 0600	f.mccoole@epa.ie
Italy	Italy	ISPRA	http://www.isprambiente.it	National Decree on Landfilling (d.lgs. 36/03) and subsequent integrations and modifications. The Waste Acceptance Criteria are currently transposed through D.M. (Decree of Ministry) 27/09/2010, that repeals and updates previous	Harmonised to EWC codes	Not stated	Annual	Unknown	Unknown
Latvia	Latvia	Latvia Environment , Geology and Meteorology centre	http://www.lvgmc.lv	Waste Management Law (18.11.2010.) the amendments made by 01.05.2012.	Harmonised to EWC, D/R codes	To site level	Annual	Moscow street 165, Riga, LV-1019 Phone: 67032600	intars.cakars@lvgmc.lv
Lithuania	Lithuania	Lithuanian EPA, reported by Office of Statistics Lichtenstein	http://gamta.lt/ ; http://www.llv.li/#/12176/umweltstatistik	1998 Law on Waste Management (of 16 June 1998, Nr. VIII-787, as amended)	None (but includes D codes)	Local	Annual	For EPA: Juozapavičiaus st. 9, LT-09311 Vilnius, phone. (8) 70662008 For Statistical Office: Äulestrasse 51 PO Box 684 9490 Vaduz	For EPA: aaa@aaa.am.lt For statistical office: info.as@llv.li

Country	Region	Waste Flows Authority	Link to Authority/Data	Waste Flow Reporting Legislation	Waste Flow Reporting Standard	Waste Data Aggregation Policy	Waste Flow Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)
Luxembourg	Luxembourg	Environment Protection Agency	http://www.environnement.public.lu/dechets/statistiques_indicateurs/index.html	Act of 21 March 2012 on the management of waste and amending one law of 31 May 1999 on the establishment of a fund for the protection of the environment.; 2 Act of 25 March 2005 on the operation and financing of SuperDrecksKescht action.	Harmonised to EWC codes	National	Annual	4, Place de l'Europe L -1499 Luxembourg. Phone: +352 247-86824	Online communication form
Malta	Malta	National Statistics Office, Malta	http://www.nso.gov.mt/statdoc/document_view.aspx?id=3683&backurl=/themes/theme_page.aspx	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Not stated	Annual	Lascaris Valletta VLT 2000 Malta Phone: +356 2599 7000	http://www.nso.gov.mt/adhoc/adhoc_contact_details.aspx
Netherlands	Netherlands	Unknown	http://www.cbs.nl	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Not stated	Annual	Unknown	Unknown
Poland	Poland	Unknown	http://www.stat.gov.pl	Act of 27 April 2001 on waste (Journal of Laws of 2010, No. 185, item. 1243, with later amendments)	Harmonised to EWC codes	Not stated	Annual	Unknown	Unknown
Portugal	Portugal	Environment Agency	http://www.ine.pt	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC, /D/R codes	National	Annual	STATISTICS PORTUGAL – HEAD OFFICE Av. António José de Almeida 1000-043 LISBOA Tel.: + 351 218 426 100	webinq@ine.pt
Romania	Romania	Ministry of the Environment and Climate Change (MoECC)	http://www.anpm.ro	Law 211/2011 on waste, transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC, D/R codes	Not stated	Annual	B Press Office. 12, Sector 5, Bucharest. Phone: 021 408 9521 (numbers also avaliable for individual deptartments at http://mmediu.ro/new/?page_id=183#)	office@anpm.ro
Slovakia	Slovakia	Ministry of Environment (MoE) – Department of Waste Management	http://www.statistics.sk; http://envirozataze.enviroportal.sk/	Act No. 223/2001 Coll. on waste and on amendment of certain acts, as amended.	Harmonised to EWC, D/R codes	National (charges apply)	Annual	The Ministry of the Environment of the Slovak Republic Námestie ľudovíta Štúra 1 812 35 Bratislava Slovak Republic. Phone: 00421-2 / 5956 1111	http://www.minzp.sk/components/send_link/send_link_form.jsp?docid=803&sendType=link
Slovenia	Slovenia	Ministry for Agriculture and the Environment	http://pxweb.stat.si/pxweb/Database/Environment/27_environment/02_waste/01_27061_waste_removal/01_27061_waste_removal.asp	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC, D/R codes	To local level	Annual	Dunajska 22 SI-1000 Ljubljana Phone: +386 1 478 00 00	Not stated
Spain	Spain	Unknown	http://www.ine.es	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes	Unknown	Annual	Unknown	Unknown

Country	Region	Waste Flows Authority	Link to Authority/Data	Waste Flow Reporting Legislation	Waste Flow Reporting Standard	Waste Data Aggregation Policy	Waste Flow Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)
Sweden	Sweden	Swedish Environmental Protection Agency	http://www.naturvardsverket.se	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC codes; NFS 2004:10 (Swedish EPA regulations on the landfill of waste) describes waste characterisation	To site level	Annual	SE-106 48 Stockholm. Phone: +46 10 698 10 00	environmental-objectives@swedishepa.se (more department specific emails avaliable at:http://www.swedishepa.se/About-us/Contact/)
United Kingdom	England	Environment Agency	http://www.environment-agency.gov.uk/research/library/data/150326.aspx	The Waste (England and Wales) Regulations 2011	Harmonised to EWC codes; assumptions at http://www.environment-agency.gov.uk/research/library/data/150328.aspx	To site level	Annual	PO Box 544 Rotherham S60 1BY. Phone: 03708 506 506	enquiries@environment-agency.gov.uk
United Kingdom	Wales	Environment Agency	http://www.environment-agency.gov.uk/research/library/data/150326.aspx	The Waste (England and Wales) Regulations 2011	Harmonised to EWC codes; assumptions at http://www.environment-agency.gov.uk/research/library/data/150328.aspx	To site level	Annual	PO Box 544 Rotherham S60 1BY. Phone: 03708 506 507	enquiries@environment-agency.gov.uk
United Kingdom	Scotland	Scottish Environment Protection Agency	http://www.sepa.org.uk/waste/waste_data.aspx	The Waste (Scotland) Regulations 2011	Harmonised to EWC codes; assumptions at http://www.environment-agency.gov.uk/research/library/data/150328.aspx	To site level	Annual	Strathallan House Castle Business Park Stirling FK9 4TZ Tel: 01786 457700	http://www.sepa.org.uk/about_us/contacting_sepa/by_email.aspx
United Kingdom	Northern Ireland	Northern Ireland Environment Agency	http://www.doeni.gov.uk/niea/waste-home/municipal_data_reporting.htm	The Waste (Northern Ireland) Regulations 2011	Harmonised to EWC codes; assumptions at http://www.environment-agency.gov.uk/research/library/data/150328.aspx	To site level	Annual	Goodwood House 44 - 58 May Street Town Parks Belfast BT1 4NN Telephone: 028 9054 0540	enquiries@doeni.gov.uk

Country	Region	Landfill Authority	Link to Authority/Data	Landfill Stock Reporting Legislation	Landfill Stock Reporting Standard	Stock Data Aggregation Policy	Stock Data Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)	Landfill Waste Legislation
Bosnia & Herzegovena		Ministry of Physical Planning, Construction and Environment of the Republika Srpska (MPUGiERS)	http://www.bhas.ba/saopstenja/2013/KOM_2012_001_01_bos.pdf	Not stated	For operating sites: Size of facility and Waste characterisation; for closed sites: Location and Type of facility	Regional	Unknown	Phone: 339-581 http://www.vladars.net/sr-sp-cyrl/vlada/Pages/kontakt.aspx	mier@mier.vladars.net	Law on Waste Management (Official Gazette of the FBiH, no. 33/03, 72/09), Law on Waste Management (Official Gazette of Republika Srpska, no. 53/02), Rules on Special Control Regime of Activities that Endanger or May Endanger the Environment (Official Gazette of SR BiH no. 2/76 and 23/76). Amendments to the law given in Official Gazette of SR BiH 23/82 and 26/88.
Norway		Ministry of the Environment	Unknown	Unknown	Unknown	Unknown	Unknown	P.O.Box 8013 Dep N-0030 Oslo The ministries' switchboard: (+47) 22 24 90 90	http://www.regjeringen.no/en/contact.html?id=224637 mailto:postmottak@kld.dep.no	Waste Regulation (Avfallsforskriften, 2004)
Lichtenstein		Office of Environmental Protection	http://www.llv.li/#/12176/umweltstatistik	No landfill	No landfill	No landfill	No landfill	Dr. Grass-Strasse 12 Postfach 684 9490 Vaduz Phone:+423 236 64 00	info.au@llv.li	Umweltschutzgesetz vom 29. Mai 2008 (USG), LGBl. 2008 Nr. 199; Also subject to Swiss Law
FYR Macedonia		State Statistical Office (Department for Environmental Statistics)	Published in booklet on Environmental statistics available on www.stat.gov.mk	Not stated	Location and Facility size for operating sites only	Local Level	Annual	„Dame Gruev" 4 – Skopje Phone: +389 2 3295 600	http://www.stat.gov.mk/Contact_en.aspx	Law on Waste Management "Official Gazette of Montenegro", 64/2011 of 29 December 2011
Serbia		Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	until new sub-Acts are adopted on the basis of the Law on Waste Management, regulations passed on the basis of the priory valid Law on Environmental Protection shall be applied (*The Official Gazette of the RS*, no. 66/91, 83/92, 53/93-other law, 67/93-other law, 48/94- other law, 53/95 and 135/04): I By-law on criteria for the determination of location and development of landfills for hazardous substances (*The Official Gazette of the RS*, no. 54/92) which sets forth the criteria for the determination of the location of hazardous substance landfills, method of sanitary and technical development of landfills for environmental protection, as well as the method of landfill eradication; I By-law on hazardous waste management (*The Official Gazette of the RS*, no. 12/95) sets forth the method of managing of certain types of hazardous waste, conducting inventory of types and quantities of hazardous substances in production, use, transport, marketing, storing and disposal and provides waste categorization in accordance with the Basel Convention; I By-law on methodology for chemical incidence and pollution risk assessment, action plans for preparation and overcoming of consequences (*The Official Gazette of the RS*, no. 60/94).
Switzerland		Swiss Federal Statistics Office	http://www.bfs.admin.ch	Unknown	No landfill; incineration only	No landfill; incineration only	No landfill; incineration only	Espace de l'Europe 10, 2010 Neuchâtel Phone: 032 713 60 11	http://www.bfs.admin.ch/bfs/portal/de/tools/kontakt.html	Unknown
Turkey		The Ministry of Environment and Forestry (via municipalities)	http://www.csb.gov.tr/turkce/index.php; http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=16177	Not stated	Location, Type, Size of facility and Number of facilities	National	Biennial	Ministry of Cad. No. 1 Ministries / Ankara Phone: 0 (312) 410 10 00	Not stated	Landfill Regulation on Solid Waste Control (14.03.1991-20814) 1991; Landfill Metropolitan Municipality Law (10.7.2004-5216) 2004; Landfill Municipality Law (3.7.2005 – 5393) 2005; Landfill Regulation on the landfill of waste (Drafted but not adopted)

Country	Region	Waste Flows Authority	Link to Authority/Data	Waste Flow Reporting Legislation	Waste Flow Reporting Standard	Waste Data Aggregation Policy	Waste Flow Publication Frequency	Contact details (as present in others – unit, address)	Contact details (as present in others – email)
Bosnia & Herzegovena		Agency for Statistics	http://www.bhas.ba/saopstenja/2012/OTP_2009_001_02_BH.pdf	Transposition of the Waste Framework Directive 2008/98/EC	LoW harmonised to EWC codes	Regional	Annual	Zelenih beretki 26 71000, Sarajevo Bosna i Hercegovina Phone: +387 (33) 911 911	bhas@bhas.ba for director's office
Norway		Statistics Norway	http://www.ssb.no/en/natur-og-miljo?de=Waste+	Unknown	Unknown	National	Annual	Akersveien 26 0177 Oslo Phone: +47 62 88 50 00	ssb@ssb.no
Lichtenstein		Office of Environmental Protection	http://www.llv.li/#/12298	Waste transport statistics are collected by the Swiss authorities as all waste is exported via Switzerland.	See Switzerland and http://www.llv.li/#/12176/umweltstatistik	Local	Annual	Dr. Grass-Strasse 12 Postfach 684 9490 Vaduz Phone: +423 236 64 00	info.au@llv.li
FYR Macedonia		State Statistical Office (Department for Environmental Statistics)	Published in booklet on Environmental statistics available on www.stat.gov.mk	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC	Not stated	Annual	„Dame Gruev" 4 - Skopje Phone: +389 2 3295 600	http://www.stat.gov.mk/Contact_en.aspx
Serbia		Ministry of Environment and Spatial Planning and other competent ministries, Environmental Protection Agency, Environment Protection Fund	http://www.stat.gov.rs	Unknown	Unknown	Unknown	Unknown	Belgrade, Milan Rakic 5 Phone: 011/2412-922 (switchboard)	stat@stat.gov.rs
Switzerland		Swiss Federal Statistics Office	http://www.bfs.admin.ch/bfs/portal/de/index/themen/02/06/ind17.indicator.1300209.13002.html	Unknown	Unknown	Unknown	Unknown	Espace de l'Europe 10, 2010 Neuchâtel Phone: 032 713 60 11	http://www.bfs.admin.ch/bfs/portal/de/tools/kontakt.html
Turkey		The Ministry of Environment and Forestry (via municipalities)	http://www.tuik.gov.tr/PreTablo.do?alt_id=1019	Transposition of the Waste Framework Directive 2008/98/EC	Harmonised to EWC	Not stated	Biennial	Ministry of Cad. No. 1 Ministries / Ankara Phone: 0 (312) 410 10 00	Not stated

Annexe R: Supplement – landfill mining

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Landfill mining projects require site specific data to justify the feasibility of such projects. However, the analysis presented above shows that data on landfill waste characterisation is not available except in the case of a few one-off evaluations. It is a point raised by mining representatives that such exploration and assay for a primary resource would be carried out by a private operator at their own risk; but it is notable that few such private investments in exploring landfill sites have been carried out, despite their locations being known absolutely. A number of factors may have led to this, but one is likely to be an absence of coherent information on the volumes, tonnages and approximate compositions of landfills.

In the absence of primary information, collected and collated on landfill resource characterisations, we believe that a feasible way forward would be to synthesise a base case for existing and closed landfills; subsequently, with appropriate and perhaps modified waste acceptance tracking, and allowing for leachate removal, anaerobic digestion etc., to produce incremental estimates periodically per site.

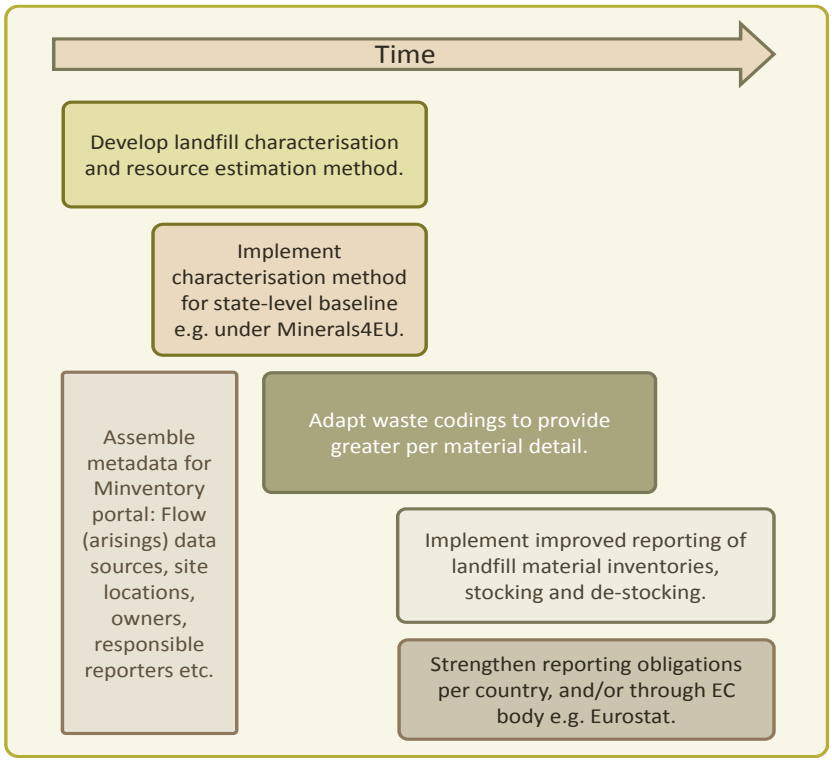
Of course, these estimates must be per site in order that they identify a resource potential at a particular location, with a view to supporting the availability of the resource and hence the economic feasibility of recovery at any subsequent time.

The roadmap could comprise the following steps:

- A macro analysis by country of landfill resource potential i.e. gross landfill material content, using a method similar to that used by BRGM in 2003. (A more detailed analysis has been conducted in the UK using a timeslice/time based composition approach for categories of landfill, to arrive at a gross landfill content.) This could be replicated across Europe, taking account of state of nation's economic development and consequent implied waste composition per year and arisings per year. As a result, landfill potential could be placed in context against primary raw materials.
- Development of the method to better characterise landfills by site, perhaps based on the UK method. A more detailed consideration of landfill type (household, commercial, industrial, hazardous, inert…) would enable better detail, especially when combined with the relevant waste codings. For example, general waste might only be characterised along the lines of basic materials (paper, plastic, ferrous, non-ferrous, glass, organics…); whereas industrial landfills may have accepted wastes including mining wastes according to a number of the minerals and metals waste codings. This compositional data would need to be extrapolated back in time and combined with waste receipt data to generate net material increase figures.
- Consider changes to waste coding criteria to enable better operation of future waste reporting according to metals, metal derivative and other wastes of significance.
- Strengthen obligations to report such waste arisings by site, and for them to be aggregated and published by Eurostat annually, for example.
- Application of the estimation method generally to landfills year on year by states. Using the agreed codings, together with received tonnages would permit the calculation of the inventory increase (or decrease if material is abstracted by mining).
- In the short term, the Minventory portal can be augmented with a section for landfill metadata which will assist whichever organisation is tasked with carrying out the synthesis. Much of this key metadata has been gathered, but includes pointers to national standards, locations and extents of landfills, landfill permitting authorities, waste composition statistics and waste reporting authorities. Other information may be relevant.

This timeline is summarised graphically in Figure 49.

Figure 49: Graphical illustration of landfill inventory assessment timeline



Annexe S: The example of copper in use

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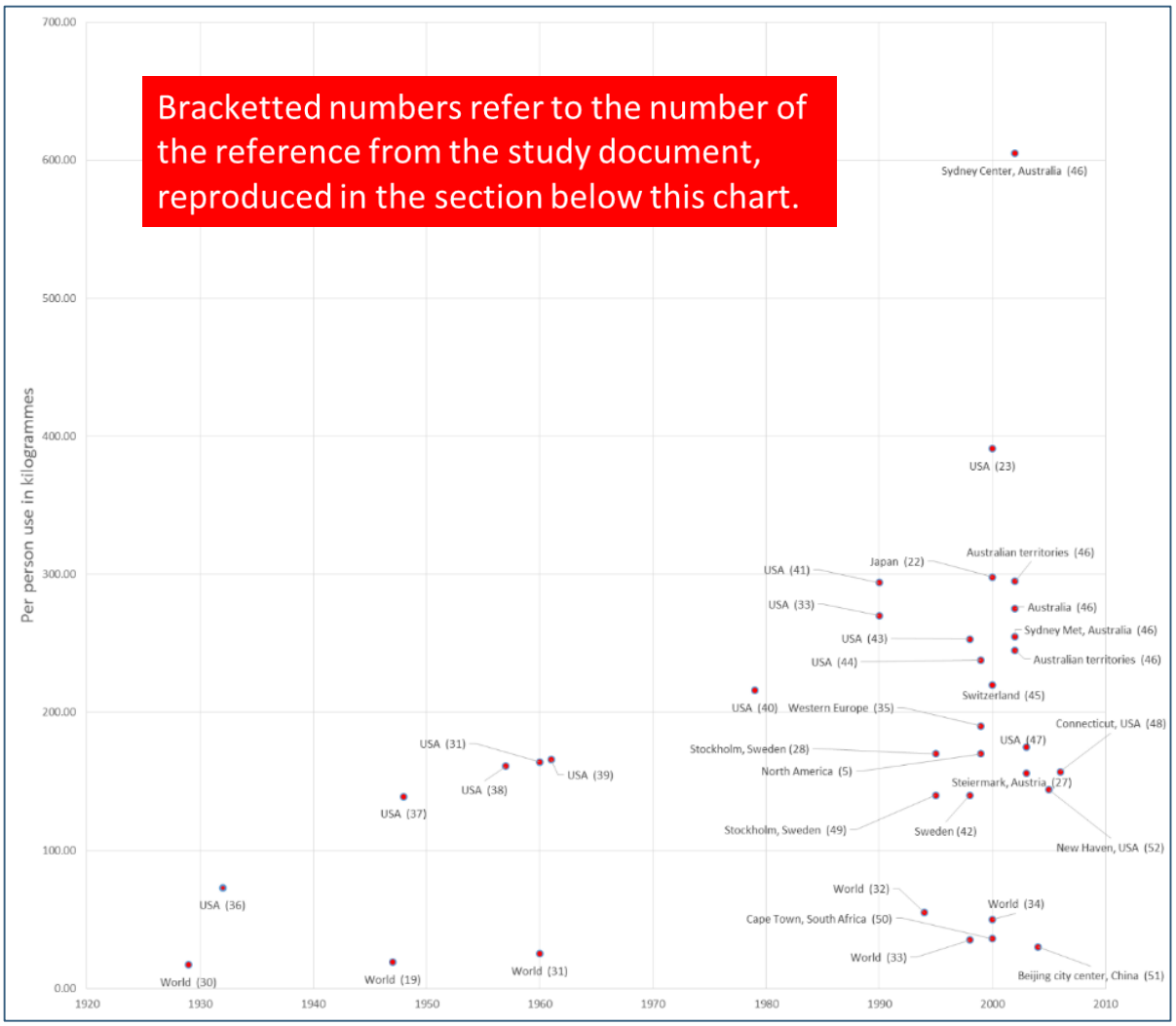
Copper is one of the most studied of metals in respect of its stock in use. A synthetic report published by UNEP in 2010[147] provides the most comprehensive review to date for around 19 common metals and 5 precious metals.

Figure 50 is an excerpt detailing the summary data for copper, by location over time. Per capita increases in time can be seen, for example, by following the World, USA and other estimates.

Of most significance to this work is the finding that stocks within less and more developed regions can be differentiated, and that the values for the latter lie in the range 140-300 kg per person. The most recent analysis for Western Europe suggests a figure of 190 kg per person; no state data is indicated. If this is the case, copper stocks stand at around 70 Mt.

Figure 50: Per capita in-use stock estimates (in the population of the locale).



Source: Appendix 2 of Graedel, T.E. et al. (2010) METAL STOCKS IN SOCIETY; Scientific Synthesis, UNEP/IPSRM, ISBN: 978-92-807-3082-1

[147] Graedel, T.E. et al. (2010) METAL STOCKS IN SOCIETY; Scientific Synthesis, UNEP/IPSRM, ISBN: 978-92-807-3082-1

Transcription of references from Metal Stocks in Society (Graedel et al., 2010) report

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Annexe T: Key publications on in-use resources

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Key Publications on Multi-level Metal Cycles

Copper: “The multilevel cycle of anthropogenic copper”, T.E. Graedel, D. van Beers, M. Bertram, K. Fuse, R.B. Gordon, A. Gritsinin, A. Kapur, R. Klee, R. Lifset, L. Memon, H. Rechberger, S. Spatari, and D. Vexler, Environmental Science & Technology, 38, 1253-1261, 2004.

Zinc: “The multilevel cycle of anthropogenic zinc”, T. E. Graedel, D. van Beers, M. Bertram, K. Fuse, R.B. Gordon, A. Gritsinin, E. M. Harper, A. Kapur, R. J. Klee, R. Lifset, and S. Spatari, Journal of Industrial Ecology, 9 (3), 67-90, 2005.

Silver: “Contemporary anthropogenic silver cycle: A multilevel analysis”, J. J. Johnson, J. Jirikowic, M. Bertram D. van Beers, R. B. Gordon, K. Henderson, R. J. Klee, T. Lanzano, R. Lifset, L. Oetjen, and T. E. Graedel,, Environmental Science & Technology, 39, 4655-4665, 2005.

Chromium: “The contemporary anthropogenic chromium cycle”, J. Johnson, L. Schewel, and T.E. Graedel, Environmental Science & Technology, 40, 7060-7069, 2006.

Iron: “Forging the anthropogenic iron cycle”, T. Wang, D. B. Müller and T. E. Graedel, Environmental Science & Technology, 41, 5120-5129, 2007.

Nickel: “Anthropogenic nickel cycle: Insights into use, trade, and recycling”, B. K. Reck, D. B. Müller, K. Rostkowski, and T.E. Graedel, Environmental Science & Technology, 42, 3394-3400, 2008.

Lead: “The multilevel cycle of anthropogenic lead”, J.S. Mao, J. Dong, and T.E. Graedel, Resources, Conservation, and Recycling, 52, 1050-1057, 2008.

Stainless steel: “Global stainless steel cycle exemplifies China’s rise to metal dominance”, B. K. Reck, M. Chambon, S. Hashimoto, and T.E. Graedel, Environmental Science & Technology, 44, 3940-3946, 2010.

Special Topics Explored by the STAF Project

Chen, W. Q.; Graedel, T. E., Anthropogenic Cycles of the Elements: A Critical Review. Environ. Sci. Technol., 46, (16), 8574-8586, 2012.

Urban mines: “Copper mines above and below the ground”, A. Kapur and T.E. Graedel, Environmental Science and Technology, 40, 3135-3141, 2006.

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Spatial analysis of metal stocks: “Spatial characterisation of multi-level in-use copper and zinc stocks in Australia”, D. van Beers and T.E. Graedel, Journal of Cleaner Production, 15, 849-861, 2007.

Rauch, J. N., Global mapping of Al, Cu, Fe, and Zn in-use stocks and in-ground resources. Proc. Natl. Acad. Sci. U. S. A. 2009, 106, (45), 18920-18925.

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Chen, W. Q.; Graedel, T. E., Dynamic analysis of aluminum stocks and flows in the United States: 1900-2009. Ecological Economics, 81, 92-102, 2012.

"In-use stocks of metals: status and implications", M.D. Gerst and T.E. Graedel, Environmental Science & Technology, 42, 7038-7045, 2008.

Metal in products: "The 'Hidden Trade' of metals in the United States", J. Johnson and T.E. Graedel, Journal of Industrial Ecology, in press, 2008.

Loss of metal to the environment: "Silver emissions and their environmental impacts: A multilevel assessment, M. J. Eckelman and T.E. Graedel, Environmental Science & Technology, 41, 6283-6289, 2007.

Lifset, R. J.; Eckelman, M. J.; Harper, E. M.; Hausfather, Z.; Urbina, G., Metal lost and found: Dissipative uses and releases of copper in the United States 1975-2000. Sci. Total Environ., 417, 138-147, 2012.

Recycling: Reck, B.K.; Graedel, T.E.' Challenges in metal recycling. Science, 337, 690-695, 2012.

Graedel, T. E.; Allwood, J.; Birat, J.-P.; Buchert, M.; Hagelüken, C.; Reck, B. K.; Sibley, S. F.; Sonnemann, G., What Do We Know About Metal Recycling Rates? Journal of Industrial Ecology, 15, (3), 355-366, 2011.

Annexe U: Stakeholder meetings

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1 Stakeholder Meeting 1

The first Stakeholder Meeting took place on 14 May 2013.

1.1 Objectives & process

A separate report has been compiled which outlines the objectives, structure, content and raw outputs of the first workshop. In summary, the event tackled the following:

Table 40: Parameters of Stakeholder Meeting 1

Parameter	Notes
Target audience	Primarily those who would use the mineral and resource data, such as national and regional planners or investors. In addition, we seek those who are holders or suppliers of data.
Scope	This event considers the needs of users of the data repository and potential suppliers of that data. It considers availability of data, barriers to sharing (IP etc.), and formats. It will cover some of the ground of our Minventory Survey.
Objectives	To ensure that the Minventory data survey obtains the most complete coverage of suppliers. To obtain an improved understanding of the queries that data users are making, a specification of what data users would most value, and in what format of a web-based system. To understand the range of concerns that must be addressed in creating a meta-data portal and beyond it to a possible data portal.

Presentations included reports of background work on PERC and UNFC standards and codes, the practices of the Czech Geological Survey and a status update from BGS on the survey, results of which form the bulk of this report.

The interactive part of the event comprised three break-out sessions of 10-man groups to directly explore the three objectives presented above. The above-mentioned report includes the raw notes of these sessions, but the implications of these are reported below.

1.2 Learning & implications

This section summarises some of the key issues raised during the workshop that need consideration during roadmap development.

Whilst the primary focus of the portal is aimed at policy formulators, additional users could include:

- government resource managers (i.e. licensing authorities, for informing land-use planning and facilitating authorisation and permitting associated with minerals);
- industry/business managers and trade associations;
- the investment and finance sector;
- academies/research institutes; and
- non-governmental organisations.

Provision of data on European resources and reserves would be valuable for public communication. Specialists need technical knowledge of what is available in Europe before they can attempt to communicate the issues to the public. However, there is a danger information provided could be misinterpreted and used in a negative manner.

A prime requirement for any data user is access to as comprehensive dataset as possible. This outweighs the need for access to a harmonised dataset provided that appropriate metadata is available that declares to what code, if any, the data is reported.

Successful implementation of a database portal will need to address a number of barriers. These include:

- **Underlying national minerals policy drivers are in place.** The project has assumed that all countries which currently collect/hold the relevant data have a minerals policy and/or strong advocacy for minerals. The presence of such policies has been found to be highly variable across the EU.
- **There is an established, reliable data collection infrastructure in place.** Related to the above, in some countries there is no statutory obligation to collect data on resources and reserves (as confirmed via the questionnaire survey). Legislation may have a role, but this is viewed as an option of last resort; it is probably too early to focus mechanisms for ensuring delivery before we have identified a clear need for harmonisation and determined whether it is a realistic proposition.
- **Data ownership.** Minerals data in private ownership comprises a significant adjunct to state-held data. However, in some countries, the conditions under which this could be accessed will require substantial further investigation.
- **Data confidentiality.** Whilst there are clear reasons for some data being confidential, consideration needs to be given as to whether movements in the legislative and political landscape may now mean some data historically labelled 'confidential' may now no longer need to be so.
- **Variable data quality.** Some quantification of error in reporting data for an EU-level database needs consideration as this will impact on data quality. Averaging of data within and across countries will result in some errors; but what level is acceptable? If a user is attempting to determine national or European totals for a commodity, for example, then the accuracy is less critical than for reporting on individual deposits to the market. This implies that an assessment of error is necessary in order to determine whether the data is fit for the proposed purpose. UNFC for solid minerals does not employ error bands; however, they are used in reporting in the petroleum industry. In the petroleum industry UNFC uses a probabilistic approach to express the uncertainty associated with recoverable quantities. The Soviet reporting system does take account of statistical error.
- **Level of harmonisation.** The roadmap must consider what level of harmonisation is actually required and at what level/point it should occur. Two possibilities emerge: harmonisation at source or harmonisation by a central organisation receiving the data potentially in a non-harmonised form. Attendees felt that, in many instances, only the national geological survey would have sufficient insight into their own data to harmonise it with a defined system. Likewise it would not be possible to automate harmonisation e.g. an automatic transfer from an international standard reporting code to, for example, the UNFC, because of interpretations needed.
- **Ensuring consistent application of standards.** The presentations on PERC and UNFC indicated that harmonised standards were not unachievable. However, since the standards are frameworks for reporting, the credibility of the comparability of data would be governed more by the consistency of interpretation and implementation in states. This would be an issue requiring further development of guidance and training in each data aggregator or provider.
- **Achieving momentum for change.** Attendees considered it better to make current data available as quickly as possible regardless of the level of harmonisation ('something is better than nothing'). An extant portal would raise the profile of the activity, and possibly fuel further demands for a more comprehensive solution and with a greater incentive for harmonisation.

2 Stakeholder Meeting 2

2.1 Objectives & process

The second Stakeholder Meeting took place on 12 November 2013.

A separate report has been compiled which outlines the objectives, structure, content and raw outputs of the first workshop. In summary, the event tackled the following:

Table 41: Parameters of Stakeholder Meeting 2

Parameter	Notes
Target audience	Primarily those who would use the mineral and resource data, such as national and regional planners, miners or investors, but also including data owners and providers.
Scope	This event considers the needs of users of the (meta)data repository (The Portal). Via demonstration and discussion, it addresses uses and features of the portal and possible developments. It presents findings of the data harmonisation issue analysis and issues related to harmonisation of data supply.
Objectives	To update potential users on the progress to date; as a priority, to obtain feedback on the functionality and meta-data content of the prototype Minventory Data Portal with possible enhancements to content and presentation; as a priority, to check the validity of the harmonisation issue analysis, barriers, enablers and possible means to address them; to supplement other aspects of the project such as the location of public sources of data.

Presentations included a status update from Oakdene Hollins; a report by Vitor Correia of European Federation of Geologists on their survey of use of data portals by the membership.

The interactive part of the event comprised two thematic sessions:

- BRGM demonstrated and stepped through the features of the prototype metadata portal, after which attendees trialled for themselves. A number of group and plenary sessions considered the metadata content, site function and features, and possible future developments including accessing other data providers.
- BRGM presented the draft harmonisation issue analysis covering both primary and 'secondary' materials. Attendees considered the scope and completeness of the issues rasied in groups, then reported in plenary.

2.2 Learning & implications

This section summarises some of the key issues raised during the workshop that need consideration during roadmap development. Responses of the project team and any resulting action (contemporaneous to the meeting) are highlighted in [brackets], and in [red] respectively.

Portal Meta-data

Participants were asked to comment on the following:

- Does the metadata address your needs?
- Are the options e.g. lists of codes, sufficient?

This generated the following responses:

1. With respect to the definition of the terms used (reserves, resources) some said they felt these were too restrictive; they were applicable to the reporting for financial communities, but may limit the scope of other uses. [The project reported that the terms of reference were initially set out by the Commission. However, the portal actually contained standards as used by the responding states. This was because the Commission required understanding the current position before considering harmonisation policy. The terminology used therefore represents a broadly acceptable interpretation of a harmonised definition.]
2. To assist potential users, each country/mineral/domain entry should include a statement of the reporting standard used. Currently this is supplied generically per country in the country summary. [Action identified]
3. Inrespect of secondary resources, one participant felt that the same structure could be used, but there may be a terminology mis-fit. By this we interpret that primary definitions are not applicable to secondary raw materials, which constitute not just mineral wastes, but also ill-defined products and other scraps of indeterminate status. [For consideration]
4. On the whole it was considered that mining wastes could be merged into the current format since they shared common characteristics and (sometimes) are reported as such. It was also noted that the UNFC codes can accommodate mining wastes (where not sent to landfill). [For consideration]
5. On the whole it was considered that landfill and other stocks were not a good fit to the current format. These are harmonisation (if at all) by either ad hoc approaches; or as a set of broad resources (e.g. landfill: wood, paper, plastics, metals, glass, inerts, organics…); or as elements (metals) in the case of scraps. [For consideration]
6. An alternative to the name 'domain' would be preferable. The project invited suggestions for the term to describe the difference between land and sea. [Action identified]

Web-site Functionality

Participants were asked to comment on the following:

- Does the interface meet your needs?
- What views or functions would you like to see?
- What forms of output and reporting would you like?

This generated the following responses:

1. The two major searches desired were by country (i.e. what minerals are in a country); and by mineral (i.e. what countries is a mineral present in). [Users were unable to locate this latter facility, but it does exist by applying the All Countries+{Mineral} selection criterion.]
2. There was a request for a map-based output of country availability of mineral data according to another metadata parameter i.e. All countries+{Mineral}>map coded by e.g. {standard used}. [BRGM stated that dynamic mapping was beyond the capabilities of the coding environment envisaged for this work.]
3. It was noted that the contact details did not always provide an email of a contact person. [The project responded that there were both issues of personal data confidentiality and of such a personal contact going out of date]. The intention is to provide a general email contact.
4. The export format should be improved to make the content more readable. This might apply to the Excel spreadsheet, which could include standard glossary terms (e.g.

reserves, resources); and to the country summaries, which were in rather dense text. It was requested that country details should appear in the country summary page, not tagged into the meta-data table. [Action identified]

5. An ability to search country summaries for particular terms was also desirable. It was noted that the depth and completeness of the country summaries was very variable. [The project replied that quality was dependent on each state's interpretation of the survey brief.] [Action identified]
6. The portal did not contain any data and so did not breach any confidentiality concerns. The statements about confidentiality applied to the actual data held elsewhere by others.
7. A date-stamp field should be added to each mineral so that the currency of the information could be assessed. This would be important for user comfort, but also to indicate that an update would be desirable for yearbook purposes. [Action identified]
8. A related request was that users could be informed of any update to information they had previously requested. [The project stated that this would likely require some form of registration and activity tracking.] [For consideration]
9. A major absent function was considered to be a direct link to the source of the data. This would address a need identified by EFG to make data searching simple rather than navigating multiple sites. [The project iterated that the scope related to mapping current data and identifying owners. There were potential confidentiality and ownership issues associated with linking to sources. In addition these sources might go out of date if there were no mechanism to maintain the portal; or be a frustrating experience if not universally available. However, we acknowledge that links to both available state-specific resources – per mineral – and to generic resources – such as ProMines –should be included.] [Action identified]
10. The portal would benefit from more help text and quick links to common searches. [Action identified]

Portal Development

Participants were asked to comment on the following (in addition to any other general comments):

- What problems do you foresee in obtaining this metadata (not the data itself)
- How would portal be modified to report (a) Mining wastes (b) Landfill wastes?
- Who would hold such data?

1. There is perceived to be a trade-off between gathering enough data for a complete view vs difficulty/time. This will different for primary raw materials and secondary raw materials. Participants questioned whether these two aspects should be combined in the portal or split. [For consideration]
2. It was difficult to understand whether these should be integrated as the relevant end-users were not present. Participants talked of flow comparisons, although these were out of scope of stocks.

Harmonisation issue analysis

This table provides a summary of the twelve major gaps identified, especially in respect of primary materials.

Table 42: Summary of Harmonisation issue analysis findings (provisional)

Topic	Issues/Gaps
I. Policy, legislation and regulation	1. National mining law/national minerals policy
	2. Legal requirement to provide resources/reserves data
	3. Terminology on primary RM and dedicated regulation (mine vs quarry)
II. Data quality and comparability	1. Required use of a standard reporting code
	2. Alignment of national reporting code with international standards (on 17 countries*)
	3. Central harmonisation process of data
	4. Data reliability
	5. Application of the INSPIRE Directive
III. Data infrastructure provision and accessibility	1. Several organisations in charge of collecting and harmonisation data (exc. Geological Survey)
	2. Data ownership and confidentiality
	3. Public access to data
	4. Multilingual format of data (or English)

Participants were asked to comment on the following:

- Do you agree with the preliminary findings? why/not?
- Are there any dimensions missing?
- How could the gaps be addressed?
- What do you consider to be the easiest and most difficult? Why?
- What are the implications for full data harmonisation and generation of a year book?

There were no additions or major disputes with these findings, but the following key points were noted:

Primary raw materials

1. I-1, -2. National policy was acknowledged to be very much at the discretion of member states. This could not be influenced directly. However, policy might be influenced by the use of related geo-specific policies such as INSPIRE, which becomes mandatory in 2018. Where possible, voluntary approaches should be used. [For consideration]
2. II-2. There is compatibility already between the CRIRSCO template (and PERC for example) and UNFC classification systems. The latter provides a more rigorous framework for assigning uncertainty to estimates. However, both are dependent on the validation required of a competent person (CP). There were concerns that the need for a competent person within organisations would pose an unacceptable cost burden on private companies. However, some delegates disputed this assertion.
3. II-3. Management of the historic or legacy information would be a challenge, with extremely varied data and practices in place. How would back-adding be funded and to what standard?
4. II-4. The issue of the credentials of the Competent Person (CP) was repeatedly mentioned. To a large extent data reliability and comparability depends on the uniformity of standards and application of standards. The CP role would require training as well as experience to manage to the level of legal accountability required in public disclosure.
5. II-4. Usefulness of ultimate data will be enhanced by an explicit evaluation of error margin being present on resource and reserve estimates.

Secondary raw materials

1. The definition of and availability of data for 'secondary raw materials' was acknowledged by several participants as being poor, and they questioned the value. The project team considered that further work was necessary to determine whether there was a coherent view of the term within or outwith The Commission, and structure the report and approach accordingly. [Action Identified]
2. NACE 2 Codes are available and being used now. They provide a practical route for collection of flow data, which could be used to synthesise, albeit imperfectly, stock data for certain categories of waste. [For consideration]
3. This aspect is topical for Wuppertal which is conducting the secondary stocks analysis for Minerals4EU.
4. Further clarification of the scope of secondary raw materials is needed especially if there are a range of definitions in use within the EC and elsewhere. [Action identified]

The harmonisation issue analysis deserved more attention since it contained more information than anticipated. The slides would therefore be distributed after the meeting for rapid receipt of comments, say within a week. [Action identified]

3 Stakeholder Meeting 3

3.1 Objectives & process

Table 43: Parameters of Stakeholder Meeting 3

Parameter	Notes
Target audience	Primarily those who would use the mineral and resource data, such as national and regional planners, miners, recyclers, landfill miners or investors, but also including data owners, providers, trade bodies and related project representatives.
Scope	It will present updated findings of the Harmonisation Roadmap analysis and its implications, including projects running and planned. This event will also consider the metadata portal, and gather further views on the possible developments on the road to a full data portal.
Objectives	To update potential users on the progress to date; as a priority, to obtain feedback on the final Harmonisation issue analysis and the implications for Harmonisation Roadmap; to check the feasibility and desirability of proposed roadmap actions and any improvements or modifications; to determine interest and commitment to plan to improve stock data in deficient aspects, such as 'secondary materials'; to demonstrate the final Meta-Data Portal.

3.2 Learning & implications

There was substantial feedback and comment during the meeting which has been placed in a separate report, Minventory Stakeholder Meeting 3.docx. It will not be repeated in full here as the main outputs appear in other sections, such as within the roadmaps and within the manifestation of the portal.

3.2.1 Primary Materials:

Purpose

- The need to identify the motivating factors for every potential data contributor was acknowledged. Some believed that a common glossary and harmonisation in place would attract others to add data. Others noted the role of publicity and public adoption by national bodies.
- A very pertinent point was raised that reserves are confidential for a reason and that it might be more pragmatic to concentrate on harmonising reserves data. The roadmap needs to acknowledge the value of information to various users, especially if tied to UNFC (general analysts, government resource management, industry business process management, capital markets...).
- There was a divergence of views over whether companies would pay for information that was public and not exclusive in a model that offered paid-for benefits.
- There are differences in reporting between commodities, e.g. coal vs. niobium. Are you reporting whether there are no resources or where is potential?

Characterisation and standards

- It was noted that data models and code lists are being completed for Primary Raw Materials. The need for early availability of a glossary was repeatedly noted, but the difficulties of doing so also acknowledged. When the codes lists have been agreed, what will be the procedures for updating them e.g. in 2 years?
- The INSPIRE specification was suggested to be too coarse. Involvement of its stakeholders is required.
- Time series data for resources and reserves was noted as being important.
- It will be important to differentiate between verified and unverified data; is data provided by companies verified by a competent person on receipt at the relevant authority?

Process and timing

- Attendees believed that establishing a motivation to provide data was a priority.
- Terminology harmonisation could be advanced to obtain agreement during 2016.
- Minerals4EU follows Minventory to produce data. In turn, Emodnet then aims to produce harmonised data.
- It was suggested that the historic data reconciliation under II.4 and II.3 could be completed by 2020. Others, however, thought this was a complicated and lengthy task though it would depend on the resources allocated. One group suggested a benefits analysis to see what was worth doing.
- Local authorities may have access to confidential information that might be useful if it could be located.
- One group suggested there was an action missing to inform citizens on the actions and outputs. Could roadmap progress be reflected in the portal?
- One suggestion was for a different timeline for different commodities.
- It was questionable whether planning beyond 2020 had any meaning.

3.2.1 Mining wastes:

Purpose

- Some questioned the purpose of this work and the value of the information gained. Were wastes to be reclassified as deposits as is the case in Czech Republic? Backfilling should not be defined as waste, it was suggested, since it had a structural purpose. Why is data needed and who would use it? Is the purpose distorted towards environmental impact? Should it focus on economically important materials?

Mining wastes: Characterisation and standards

- A definition of closed and abandoned mines was requested.
- Re II.1, it was commented that classification of resources should be broadly correlated across all waste types.
- Re II.1, it was commented that the PERC Reporting Standard and other CRIRSCO Template-based reporting codes could be used for reporting mining wastes but they need to be consistent with primary raw materials. UNFC distinguishes between sale and non-sales production from mines, where the non-sales production (equivalent to mining waste) is material that could undergo future refinement.
- It was noted that a number of waste deposits are rich in by-products of current interest. A competent person might identify these if the right historical data were available.
- UNFC – distinguishes between sale and non-sales production from mines, where the non-sales production (equivalent to mining waste) is material that could undergo future refinement.

Mining wastes: Process and timing

- Definitions were known to be important and had to be agreed as they were not clear presently. Some commented that agreement on harmonised definitions should be available during 2016 for both primary materials and mining wastes as a precursor to data access.
- Delegates recognised as in the report that Promines and the MWD did inventory wastes, but only from a hazard and environmental perspective; they don't consider raw material and resources issues, so will need to be redone, which will be a lot of work.
- It was suggested that the identification of priority mines should be completed before a directory is compiled.
- The challenge of motivating the transfer of private data to the public domain was noted. A similar issues was raised in the Primary Raw Materials brainstorm.
- It was questioned whether closed and remediated mines would be candidates for reopening, but that is beyond the scope of this roadmap.

3.2.2 Landfill:

Purpose

- Some questioned the purpose of this. Was it to promote landfill mining or to avoid land filling? Who would be the beneficiary of harmonised data? Others questioned the value compared to primary materials and mining wastes.
- It was agreed that modern landfill practices resulted in the diversion of many useful sources of materials into recycling etc., so residuals disposal was of lower interest.
- The difficulty of pulling this into an inventory harmonised with primary materials and mining wastes was acknowledged.

Characterisation and standards

- It was noted that landfill is not the natural domain of geologists. Relevant standards and knowledge are not held by them.
- At least one person believed that the European Waste Coding was already assisting sufficiently in reuse. However, several others noted the inadequacy of the codes against the modern materials agenda.
- This was recognised as a prime issue. In landfill, although a prioritisation approach would be a usual tactic, the heterogeneity of landfills, by location and over time, makes this a very difficult exercise. Would they be characterised in terms of waste streams entering or by root minerals?
- Some questioned how priority examination could take place prior to having improved waste codings.
- Terminology of waste was see as confusing: old scrap, new scrap, inert, hazardous...

Process and timing

- It was suggested that industrial be prioritised over household landfill due to the problems identified above; this confirmed the draft findings.
- If there were to be an annual waste update, it should be after any changes to waste codes, that is, the code changes should happen earlier. Collection of site level data is similarly dependent.

3.2.3 Portal demonstration and review

Guillaume Bertrand gave a short presentation and overview of the Drupal-based portal hosted on the BRGM server. Then attendees tried some hands-on use and offered feedback. This is shown below with the team response (to date).

Overall design

- On tablets (Google Nexus 7 2013 + Android 4), neither the map nor the menu works to reach country summaries.

>>> This will be investigated to see if it is a Drupal issue or can be corrected in the code.

- Question: Is Flash going to be obsolete? If yes, shouldn't the map block use other technology (HTML, PHP?)? Is it necessary and is it possible in the Commission's Drupal environment?

>>> BRGM will check with DG ENTR IT personnel.

- Participants noted that links to other relevant projects had disappeared from the Drupal version, but they found them relevant and useful.

>>> Links to portals of other EU projects should be added in the home page. List of links has to be agreed on, but could include ProMine, EuroGeoSource, One Geology Europe, Minerals4EU, EURARE …

- The team noted that tables were inconsistently named with terminology that varied from that in use in various legislation and stakeholder communities.

>>> Terminology will be rationalised, for example, the "Secondary Raw Materials" table should be renamed "Mine waste."

- When clicking on the link in the "additional information" column (and perhaps other locations where addition text pops up), a synthetic view of all fields is displayed; at the bottom is the URL, in full text, of the data or data provider, but they are not active links.

>>>Any URLs provided within text should be clickable (i.e. hypertext link) to reach the page it announces.

- On reviewing the functionality, the team queried the value of an "additional information" column.

>>> We suggest that we remove any "additional information" column. All relevant and not easily tabulated info can appear in the country summary (even if it duplicates elements of the tables). The "active URLs in text" issue has been addressed already in the country summaries.

- Participants noted that it was a waste of space to have two columns where one would do, for example, the name of a "competent authority" a link field.

>>> Where relevant in all tables, any organisational name will be made clickable to its associated hypertext e.g. authority to authority url thus removing a links column.

- Alphabetical sorting of countries in the drop-down lists doesn't work properly and has to be fixed.

>>> Investigation shows that this is because EU member states are listed first, then non-member states. If we want to preserve this separation, some way of showing the segregation is needed in the table (or maybe prefix the non-EU country names?). (Need to make sure that Greenland and Iceland are correctly positioned in the table.)

- When the filter combinations produce no results, users doubt they have correctly clicked the "apply" or they doubt it works properly.

>>> If a filtering returns no results, then a message should inform of it (like "no result found" or "your query returned no results") instead of providing an empty table.

- Do we need to state in the portal the project partners?

>>> Discuss with DG ENTR.

Content issues

>>> SweMin is mis-spelled. Change occurrences into SveMin in the Swedish country summary.

>>> Replace "mining waste liste" by "mining waste list" (we have to locate it first!)

Usability

- Information should be in English and national languages.

>>> This would be ideal, but it would require a lot of work (either in terms of translation and portal development) and is not possible in the framework of Minventory. That is, however, an idea that could be suggested for future developments.

- There is no facility to send comments or updates on content.

>>> A contact form should be added to allow a user to either send feedbacks or propose to deliver new/updated data

- Can the navigation be improved?

>>> Along the lines suggested and permitted by F3, create pages for each stock/flow type.

Primary materials table

- Participants noted that the interpretation of terminology of resources and reserves was not compatible across States which could lead the user down a false trail or open it to abuse, accidentally or otherwise.

>>> The fact that terminology is different is the reason for the harmonisation project! To avoid confusion, a disclaimer will be inserted in the home page, stating the "information is given as provided by the competent authority". Full text of this disclaimer should be prepared in consultation with DG ENTR.)

- One participant queried the use of the term « supplementary data » under Data Type. (It didn't help that the pop-up text for «Data Type » only describes resources and reserves.)

>>> Consider changing the term to something more explicit such as « non-statistical info » The pop-up also needs changing to include this terminology. It could also repeat the disclaimer indicating that there may be a disparity over specific meaning of the terms resources and reserved between States so it is not harmonised.

- More fundamentally, a participant noted that the use of the filters on "resources" and "reserves and resources" might not in the second case return all instances of resources, only those with resources AND reserves.

>>> Seriously consider a three column approach with a tick or empty for Resources, Reserves and Non-Stat Data, NOT separate line entries for resources and reserve!

- Subsequent input from Raül Romero-Valls indicated that the selection criteria should be separated i.e. have a tick box to filter requirements separately for resources and reserves.

What will be displayed in the current data-type column:

Has data: / Select	Resources only	Reserves only	Both
Resources only	Resources	Blank	Resources
Reserves only	Blank	Reserves	Reserves
Both	Resources	Reserves	Resources & Reserves

- N.B. no need to use the word 'data' – it's already in the Data Type column header, so will save space.
- A separate (tick?) column would show if non-statistical data was also available.
- A participant noted that under marine, a new category of "sand and gravel" appears, confusingly.

>>> Check with BGS whether this is required. The participant was happy for the existing "aggregates, sand and gravel" to be used.

- The above comment prompted a debate on the need for a marine and land segregation and perhaps it could be combined.

>>> The team is not in favour of combining terms (see other issue associated with "reserve+resources"). It is preferable to keep separate entries for the two though it should be considered whether we could have separate lines for land and marine that connect to the same mineral commodity. See example below.

Example of table format to include the new datatype/Non-stat data split; it doesn't include an extra column for Standard. This has not been ratified by DG ENTR.

Country	Mineral	Data type	Non-Stat data	Confidentiality	Aggregation	Electronic access	Domain	Data owner	Data provider

Mineral data links

- An issue raised was that clicking on a mineral often simply took the user to a top level web page on e.g. a survey, not to data. There was at least one comment that this was just a waste of time and a warning that no data link existed and the user should contact the data provider directly should be available

>>> Consider if it is it possible to have a per-mineral entry pop-up on roll-over or must it be generic to the field?

- In the primary raw materials table, do we need a column that specify reporting template for resources and reserves data?
- The text under the portal table headings need to be reviewed, but that might be one of the last things we have to adjust.

Mine wastes/landfill/flows

- More detailed information on 'secondary materials' should be included.

>>> This would be ideal and the plan works towards more information, though many gaps in the links will remain.

- Landfill is sometimes written as land-fill.

>>> Standardise terminology to 'landfill'.

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