

Optimising quality of information in RAw MAterial data collection across Europe

Deliverable 6.4 Informations to Roadmap for Investors

Title of the project:	Optimising quality of information in RAw MAterial data collection across Europe - ORAMA
Grant Agreement number:	776517
Funding Scheme:	H2020 – SC5-15-2017 – CSA
Start date:	01.12.2017
Duration:	24 months
Document title:	Deliverable 6.4 Information to the Roadmap for Investors
Work Package:	6
Author(s):	Toni Eerola
Date of delivery:	31.10.2019
Dissemination level:	PU/PP/RE/CO ¹
Reviewed by:	Pasi Eilu, Zoltán Horváth
Status of the document:	Draft/ Final
Document location:	Tiimeri: Documents / Deliverables
Project web site:	http://www.orama-h2020.eu

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Document control

Project Coordinator:	GTK
Work Package Leader:	GTK (WP6)
Deliverable leader	GTK
Due date:	M24 31 October 2019
Date of submission:	M24 31 October 2019
Dissemination level:	PU (Public)

Contributors: GTK, WEEE Forum.

Version history			
Ver. no.	Date	Reason for release	Responsible
0.0	25.10.2019	first draft	GTK
0.1	26.10.2019	revision of template for comments	GTK
0.2	28.02.2019	new version of draft	GTK
1.0	31.10.2019	final version	GTK
Final	31.10.2019	final version	GTK
2.0	04.05.2020	revised version	GTK

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Acronyms

BGS: British Geological Survey

BMNT: Federal Ministry for Sustainability and Tourism (Austria)

CRM: Critical Raw Materials

CRIRSCO: Committee for Mineral Reserves International Reporting Standards

ELV: End of Life Vehicles

EU: European Union

GTK: Geologian tutkimuskeskus (Geological Survey of Finland)

INSPIRE: Infrastructure for Spatial Information in the European Community

ORAMA: Optimising quality of information in RAw MAterials data collection across Europe

PRM: Primary Raw Materials

PRODCOM: PRODUCTION COMMUNAUTAIRE" (Community Production), EU statistics on production of manufactured goods

PV Panels: Photovoltaic panels

SRM: Secondary Raw Materials

R&D: Research and development

RMIS: Raw Materials Information System

UK: United Kingdom

UMP: Urban Mine Platform

UNFC: United Nations Framework Classification for Resources

WEEE: Waste Electrical and Electronic Equipment

WP: Work Package (a section of work in the ORAMA project)

Executive summary

The importance of primary (PRM) and secondary raw materials (SRM) is increasing in the world. Growing population requires growing amounts of resources but it is also challenged by the climate change. Mineral exploration and mining are needed to supply demand and assist in energy transition driven by the climate change which creates pressure for certain minerals needed for green energy that can also be obtained from the SRM sources. EU also looks to reduce its external dependency on import of such minerals. In order to sustainably manage such resources, reliable data on them and their materials flows are needed. However, there are lot of challenges in this respect. The EU's Member Countries and diverse industrial sectors have different practices on data collection, archiving and availability. In order to give a reliable picture on the issue in EU, the data collection needs to be harmonised and optimised. The EU Commission's Horizon 2020 Program financed ORAMA (Optimising quality of information in RAW MATERIALS data collection across Europe) Project is one of the steps to improve this situation in the EU.

This report is the deliverable 6.4 of the ORAMA Project. It gives information for roadmaps to investors on the issues to be taken in account regarding the harmonisation and optimisation of data collection on PRM and SRM in EU. The report presents the network of related projects and entities and gives recommendations appointed by the project for companies and the industry regarding the topic. The recommendations are separated for PRM and SRM, but there are also some general ones.

The report does not envisage direct investment targets on the harmonisation and optimisation of PRM and SRM data collection, except into the development of the Urban Mine Platform. However, research and project funding, cooperation and participation are possible ways to contribute and invest on the topic by the investors and industry. Participation of the industry and companies in working groups and cooperation in projects like ORAMA with other stakeholders are ways to contribute for the issue, bringing the industry point of view in. The industry and companies can also contribute for policy-making.

1 Purpose

Within the Work Package (WP) 6 Dissemination and Communication Framework, this report was created having in mind the exploitation of the ORAMA (Optimising quality of information in RAW Materials data collection across Europe) Project's results. It was made from the point of view to orient potential investors and other relevant parties interested in the European Union's (EU) sustainable primary raw materials (PRM) and secondary raw materials (SRM) exploration, exploitation and management, and their data collection.

2 Introduction

Uniform collection, archive, reporting and availability of PRM and SRM data are essential for a sustainable management of natural resources and to promote circular economy. For this reason, the PRM and SRM data need to be optimised and harmonised in order to give a reliable picture on resources, production, and material flows. The availability of such data is also one of the main requirements to attract and increase investments into the sector. However, as is concluded by the ORAMA Project's D6.6 'Technical Final Report and Recommendations', the current situation is far from ideal. There is a diversity of practices on data collection and reporting by EU's different industrial sectors and member countries.

The ORAMA Project is a step ahead in a sense to optimise and harmonise PRM and SRM data in the EU. This D6.4 presents the network of key stakeholders composed by other similar and related projects and entities, and guidelines on what should be taken in account by investors on those sectors to support EU to achieve more harmonised data for its PRM and SRM. However, it should be kept in mind that the investors are only one, although very important, part of the whole value chain. Lot of ORAMA recommendations actually depends more on R&D, policies and legislation in which the EU agencies, academia, authorities, and decision makers play the most crucial role, as shown by the recommendations of the D6.6.

3 Objectives

The objective of this Deliverable 6.4 Informations to Roadmap for Investors is to help the Commission to formulate investment policies for potential investors for successful implementation of their businesses in the PRM and SRM sectors and to help them to optimise and harmonise their data in the EU in order to support its sustainable natural resource management and promotion of circular economy. The aim of these guidelines is also to support exploitation of the ORAMA results and outcomes.

4 Input from other WPs and tasks

Fundamental for this Deliverable were the following: D5.1 Mapping of relevant EU funded projects and initiatives, D5.2 Map of the relevant EU funded projects, initiatives and identification of synergies, D5.3 Organisation of clustering activities and D6.6 Technical Final Report and Recommendations, produced by the respective tasks of the ORAMA WP5 and WP6. Those are listed in the Appendix 1.

The Task 5.1 identified and mapped relevant EU-funded projects, i.e., related projects financed under the H2020 SC5-15 call (e.g., SCRREEN), other relevant projects (including MICA, ProSUM, INTRAW, MinGUIDE, FORAM, etc.), and new projects awarded in response to other relevant H2020 calls in the Societal Challenge 5. Besides, it also sought for other

initiatives relevant to the ORAMA topic, and partners that could bring in synergies, including efficient use of resources.

Task 5.2 analysed the relevance to ORAMA of the projects mapped in T5.1. A set of criteria was previously defined for this. Deliverable 5.2 provides the main results of this analysis exercise that grouped the projects and initiatives that:

- a) Were not relevant for ORAMA
- b) Were relevant for data input/exchange in WP1, WP2, WP3 or WP4
- c) Were relevant for clustering activities, specifically to:
 - a. Contact project or initiative directly to explore synergies
 - b. Unilaterally send ORAMA information
 - c. Invite for clustering event
 - d. Consider inclusion in RMIS (Raw Materials Information System - RM gateway – JRC11 internal recommendation)

Task 5.3 of ORAMA aimed at establishing two-way communication pathways with the coordinators and partners of the projects and initiatives identified in Task 5.2 as highly significant for ORAMA, with a view to:

- a) Setting up virtual meetings and two clustering events
- b) Agreeing transfer of information of relevant activities, as well as deliverables (reports, portals etc.), events, and other applicable information
- c) Maintaining regular contact to follow up on potential synergies identified in Task 5.2, during the ORAMA project
- d) Proposing, and potentially providing, a framework for structured co-operation among relevant players also after the end of the ORAMA project.

Their inventories of relevant and related EU project gave lists of the key stakeholders and networks to be taken in account in its elaboration. Especially the last item was essential for the identification of the relevant stakeholders for this report. Those are given in the next section.

For instance, the draft of the D6.6 was the base for the first considerations on the potential for investments in optimisation and harmonisation of data collection. After that, its recommendations were fundamental to formulate information for guidelines for investors and companies about what issues need to be taken in account for a sound data collection in order to support their optimisation and harmonisation.

5. Key stakeholders and networks of the ORAMA

According to the D5.3, the key stakeholders of the ORAMA Project are the entities dealing with primary and secondary raw materials data in EU, listed below.

5.1 Projects and entities

The WP5 mapped the projects and entities related to the ORAMA, and listed them in the D5.3. The 32 key stakeholders were recommended to be contacted to exploit synergies and to be invited for clustering events. Some industry associations were added in the recipient list, and

the stakeholders categorised on the Table 1 below in order to facilitate further communication and dissemination.

PROJECTS

Nr	Entity	Full name
1	COLLECTORS	Waste Collection systems assessed and good practices identified
2	CU-PV	Cradle to cradle sustainable PV modules
3	EGDI – SCOPE	Pan-European Geological Data Infrastructure
4	FISSAC	Fostering Industrial Symbiosis for a Sustainable Resource Intensive Industry across the extended Construction Value Chain
5	HISER	Holistic Innovative Solutions for an Efficient Recycling and Recovery of Valuable Raw Materials from Complex Construction and Demolition Waste
6	IGF	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development
7	INTRAW	International cooperation on Raw materials
8	MICA	Mineral Intelligence Capacity Analysis
9	MINATURA 2020	Developing a concept for a mineral deposits of public interest in Europe
10	Minfuture	Global material flows and demand-supply forecasting for mineral strategies
11	MIN-GUIDE	Mineral Policy Guidance for Europe
12	MIREU	Mining and Metallurgy Regions of EU
13	NewOres	Development of new models for the genesis of rare metal (W, Nb, Ta, Li) ore deposits from the European Variscan belt and valorization of low grade and fine graine ore and mine tailings
14	Platirus	PLATInum group metals Recovery Using Secondary raw materials
15	ProSum	Prospecting Secondary raw materials in the Urban mine and Mining waste
16	ReCreew	European network for innovative recovery strategies of rare earth and other Critical metals from electrical and electronic waste
17	RecycAL	High Shear Processing of Recycled Aluminium Scrap for Manufacturing High Performance Aluminium Alloys
18	REE Value Chain	Rare Earth Supply Chain and Industrial Ecosystem: A Material Flow Assessment of European Union
19	REMAGHIC	New Recovery Processes to produce Rare Earth -Magnesium Alloys of High Performance and Low Cost
20	RESEERVE	Mineral potential of the ESEE region
21	ReSiELP	Recovery of Silicon and other materials from End-of-Life Photovoltaic Panels
22	REslag	Turning waste from steel industry into a valuable low cost feedstock for energy intensive industry
23	ROSEWOOD	European Network of Regions On Sustainable WOOD mobilisation
24	SCALE	Production of Scandium compounds and Scandium Aluminium alloys from European metallurgical by-products
25	SCRREEN	Solutions for CRITICAL Raw materials - a European Expert Network
26	SIMS	Sustainable Intelligence Mining Systems
27	SNAP-SEE	Planning Aggregates Supply in South East Europe
28	SMART GROUND	SMART data collection and inteGRation platform to enhance availability and accessibility of data and infORMation in the EU territory on SecoNDary Raw Materials
29	STRADE	Strategic Dialogue on Sustainable Raw Materials for Europe
30	SUMILCERE	Sustainable Mining, local communities and environmental regulation in Kolarctic area
31	VERAM	Vision and Roadmap for European Raw Materials
INDUSTRY ASSOCIATIONS		
34	EuroMines	European Association of Mining Industries, Metal Ores & Industrial Minerals
35	EuRIC	European Recycling Industries' Confederation
36	Eucobat	European Battery Recycling Association
37	PV CYCLE	Photovoltaic recycling association
38	EERA	European Electronics Recyclers Association

Nr	Entity	Full name
EU BODIES		
32	EIT RAW-MATERIALS	European Institute of Innovation and Technology Consortium for Raw Materials
33	EuroGeoSurveys	Geological Surveys of Europe
NATIONAL BODIES		
39	Geological Surveys	
40	Mining authorities	

Table 1. Key stakeholders of the ORAMA Project, including projects, EU bodies, and industry associations. The PRM entities are in brown, SRM in green and blue involves both sectors.

However, according to the D5.2, the D2.1 listed also other related projects for each SRM category, which are noteworthy as they contain valuable information on:

- Batteries: CloseWEEE, Circular Impact (not yet mapped), BioFlex and LEFAPO.
- ELV: EVA, Verbleib von Altfahrzeugen and ORKAM
- WEEE: CloseWEEE, Restra, e-RECMET, HARFIR, OPTNEWOPT, ILLUMINATE and RecycAl.
- PV panels: Photorec, PVMoReDe (not mapped yet), FRELPA (not mapped yet), CIRCUSOL, (not mapped yet), End-of-Life Management of Solar PV (not mapped yet), ITRPV (not mapped yet)
- Metal scrap: KartAL, I, II, III, IV
- Mining waste: ProMine, Minventory, Minerals4EU, EuRare, MSP-REFREAM, EURELCO, MINEA, RESEERVE.

The projects' detailed information and websites are listed within the Appendix of the D5.3. The final update of the stakeholder list will be given by the D5.4 at the end of the Project.

It should be noted that several of those projects have already ended. However, the contact information of their coordinators is important and held by the ORAMA Intranet Tiimeri database and in the website. Contact and synergies with them will be kept up after the end of the Project in order to contribute for the exploitation of the ORAMA results and outcomes. Further communication, participation in the same events, change of ideas, and collaboration in forthcoming projects with their members are crucial to develop, use and apply ORAMA's recommendations and contributions for the optimisation and harmonisation of EU's PRM and SRM data collection.

5.2 Tools for regular communication

The ORAMA tools for communication and dissemination, and the actions to be taken after the project with the key stakeholders and networks are described in the D6.3 Communication and Dissemination Plan.

6 Information to the Roadmap for Investors

In order to reduce dependency on imported PRM, the EU needs to increase mining industry investments to expand mineral exploration and mining in the Member States. On the other hand,

at the end side of the value chain, the importance of the SRM is growing as EU attempts to increase investments in recycling to promote the circular economy and sustainability, and to ensure its raw materials supply security.

The circular economy is one of the current global mega-trends promoted by the mitigation of the climate change. It offers several opportunities for investments in recycling and resource efficiency, and this industry is expected to grow considerably in the near future. However, both PRM and SRM sectors face several challenges, as described in the ORAMA D6.6.

In order to contribute for the topic, the ORAMA Project first studied both sectors from the point of view of investments on the optimisation and harmonisation of data collection. However, based on the D6.6 Technical Final Report and Recommendations, direct items into where to invest on this activity are not envisaged, except of the widening and deepening of the Urban Mine Platform (UMP), developed by the ProSUM Project (Huisman et al. 2017).

However, first of all, it should be noted that improving the EU's Raw Materials Information System (RMIS), collection, archiving, homogenisation, and availability of the data are dependent on sound policies and legislation, which need to be in place. Those, and the needed databases and IT infrastructures, are seen here as duties to be accomplished by the Member States and the European Commission but for which the private sector can contribute by direct investments or supporting them by other forms. Another possible perspective for the question is to consider in which other ways investors and companies can support optimised and harmonised data collection in EU, i.e., emphasising a bottom-up approach.

In order to obtain data suitable for the Member States to optimise and harmonise, the industry needs to be oriented towards sound and consistent reporting practices. The optimisation and harmonisation of data collection need to be done through the whole value chain. Recommendations dealing with the companies and the industry were selected from the D6.6, and are given for both the PRM as well as SRM. The summary of such recommendations is given in Table 2.

INFORMATION TO THE ROADMAP FOR INVESTORS: A SUMMARY		
Sector		Recommendations
PRM	Production	<ul style="list-style-type: none"> -Encouragement to follow best practice examples. -Share of production statistics by publically reporting data -Consideration of the whole life-cycle.
	Trade	<ul style="list-style-type: none"> -Better understanding of PRM-specific issues by national statistical agencies. -Location of reported data capture within the specific commodity lifecycle.
	Exploration	<ul style="list-style-type: none"> -Inform countries of the value of collecting data. -Encourage to collect using good practice examples/policy incentives from the EU to ensure data collection. -Agreement upon common reporting metrics across EU, such as recommended by the ORAMA.
	Environmental & social data	<ul style="list-style-type: none"> -Link PRM datasets to social and environmental datasets/ -Improve social and environmental datasets by disaggregation of industry sectors involved. -Follow the ORAMA recommendations on already harmonised metrics.
	Reserves	<ul style="list-style-type: none"> -Reporting by companies: CRIRSCO or correspondent code; -Reporting by the state: UNFC -Participate in training events; -Use guidelines
SRM	Mining waste	<ul style="list-style-type: none"> -Follow reporting guidelines: -Site investigations; -Single network and system for classifying, collecting and reporting; -Invest for the development of the UMP
	Batteries & vehicles	<ul style="list-style-type: none"> -Obligatory reporting along the chain; -Legally binding reporting requirements; -Supporting policies; -Working group; -Explore existing information and its infrastructures; -Identify and communicate components to be dismantled for SRM; -Expand existing vehicle classification systems; -Invest for the development of the UMP
	WEEE & PV Panels	<ul style="list-style-type: none"> -Research the “disposal routes”; -Amend statistics (WEEE, energy, production and trade statistics) -Industry associations encourage to extend reports to cover other data types needed for SRM stock and flow modelling; -Harmonised data representation by producers, researchers and treatment plants following ORAMA systems; -Determination of type and age of PV panels entering the waste stream; -Follow ORAMA sampling protocol; -Invest for the development of the UMP

Table 2. Summary of ORAMA recommendations for the PRM and SRM data collection optimisation and harmonisation for investors and industry.

6.1 PRM

6.1.1 Introduction

The decision making on investments is based on information and data on the potential destinations. The picture on regions’ and countries’ mining industry and their mining investment attractiveness are revealed by diverse national or regional information and data sets which might be available or not. One of the tasks of the ORAMA Project was to check out the existence, reporting, reliability, and availability of PRM data across the EU.

Considering that the EU compose one of the best developed industrial regions in the world, the serious deficiencies found by the ORAMA in this very fundamental sector are surprising.

Here we summarise the findings of the ORAMA about the problems, best practices and solutions in data collection and reporting regarding the production, trade, exploration, environmental and social data, and resources and gaps on reserve and resource data of PRM in EU.

6.1.1.1 Production data

- All EU countries compulsorily supply some form of production data for PRMs to the PRODCOM database.
- Many countries produce easily accessible national statistics on commodities as reported in World Mineral Production (BGS, UK) or World Mining Data (BMNT, Austria).
- Data gaps still exist regarding minor metals and many critical raw materials (CRM).
- Important metadata for production data are often not available.
- Confidentiality issues, the variable level of aggregation, and the aggregation as such challenge the use of PRODCOM data, as many commodities cannot be differentiated.
- Need to develop protocols to handle and report confidential data if the PRODCOM data is used to report EU production data.
- Countries are encouraged to follow best practice examples.
- National data providers are encouraged facilitate the sharing of production statistics by publically reporting data.
- Clarity of the data could be improved by considering the full life-cycle of the mineral commodity, allowing its location within the life-cycle.
- Entire life-cycle consideration helps to reduce current data gaps, including for by- and co-products as well as products from intermediate manufacturing stages.

6.1.1.2 Trade data

- Trade data are very well established types of PRM data collected in some form by all countries within well-established European and international frameworks.
- Issues by miscoding of commodities and in complex trade arrangements where material is imported and re-exported.
- Better understanding by national statistical agencies of PRM-specific issues recommended.
- Issues on lack of disaggregation of trade codes meaning data for many minor or critical metals cannot be resolved.
- Location of reported data capture within the specific commodity lifecycle may help with current data gaps, especially of some CRM.

6.1.1.3 Exploration data

- Data for mineral exploration are disparate and inconsistent across Europe.

- Data collection and their type depend on specific national legislation about mineral extraction licensing within a specific country.
- Significant data gaps where exploration data are not collected.
- Some countries in the EU have good quality data collection and availability on mineral exploration, such as Ireland and Finland, which also is among the major reasons why these countries are, globally, within the top mining investment destinations.
- Countries need to agree upon common metrics to be reported across Europe.
- The ORAMA project recommends essential achievable metrics for harmonised EU data (D1.2 and D1.5).
- Countries need to be informed of the value of collecting data and encouraged to collect them by the use of good practice examples, or, alternatively, through policy incentives from the EU that ensure data is collected.

6.1.1.4 Environmental and social data

- No systematic data collection regarding PRMs, nor standard metrics in the EU.
- Many social and environmental datasets across EU, but few directly related to PRMs.
- Purpose of existing environmental and social data is prevention, protection and compliance.
- This needs to change if the impacts of extraction are to be quantified and understood.
- Possibility to link PRM datasets to social and environmental datasets, or improve social and environmental datasets by further disaggregation of industry sectors involved, etc.
- Resources and decision needed by the user community on the most effective metrics for measuring the social and environmental impacts of mineral extraction across EU.
- The ORAMA project recommends already harmonised metrics with immediate use and full European coverage, but other metrics may be more useful.

6.1.1.5 Resource data

- Much resource data exist within EU and many countries report some form of data.
- Data conform many different indirectly comparable standards.
- Data may be provided, but the figures are not always complete, i.e. uneconomic resources or resources not associated with currently producing mines may or may not be included.
- It is extremely important to be aware of these data gaps, even when comparing data using the same reporting standards (like UNFC).
- Need to continue to invest in mineral resource and mineral potential studies and exploration to fully understand European mineral endowment.
- One long-term solution for these data gaps and harmonisation issues is for European policy to require reporting of resource data.
- Adoption of the UNFC code for reporting of resource information at EU level. This is explored in more detail in 6.1.3 below.

6.1.2 Issues for all data types

Funding is required for a consistent source of PRM statistical data, aggregated at both a European and national level. There is no funding mechanism for long-term data collation. These data are currently being produced by individual projects, such as Minerals4EU and Mintel4EU, which are then not updated after project completion. For continued provision of these data, a permanent programme for European PRM data collation needs to be established.

6.1.3 Uniform national EU-wide PRM resources reporting

Although there are several options for different systems of PRM reporting, all with advantages and disadvantages regarding the compilation of statistics at a European level, the ORAMA project recommends the use of the UNFC. This classification system seems to be best suited for the task as it is designed for national-scale resource management, has several guidance documents and case studies linked to it bridging other systems of reporting to UNFC, and has the flexibility to include a large variety of commodities. The ORAMA project has attempted to enable the use of the UNFC by producing training materials and case studies showing how it is already used in Europe.

Therefore, for the PRM data, the ORAMA Project recommends:

- As a condition for exploration and mining licenses, the companies need to report their data for the competent authorities (e.g. national geological survey or mining authority).
- Companies report mineral resource data according to CRIRSCO (Committee for Mineral Reserves International Reporting Standards) or a correspondent code.
- Member states convert the data received from companies into the UNFC (United Nations Framework Classification for Resources) Reporting Code for EU level reporting performed by the national geological surveys or similar institutions.
- Member states report uniformly to the EU's RMIS.
- In order to be implemented by the companies and agencies, training and raising of awareness are needed. This can be done by working groups and projects where the stakeholders have their representatives together with authorities.

If implemented, this guidance will allow to start a uniform PRM data collection in the EU. The benefits of that are obvious: nations and the EU will expand their geological knowledge and resource databases which, for instance, are a strong base for mineral exploration and mining companies to orient and support their investment decisions and target selection. At the same time, companies contribute for this growing knowledge and are benefitted by it by reducing their mineral exploration costs. Examples of best practice are Finland and Ireland, which have been selected in several consecutive years among the most favoured mining and mineral exploration investment destinations by the Fraser Institute's annual surveys (Stedman and Green 2019). One of the reasons for this high ranking is the availability of high-quality geological databases.

Like the D6.6 states, examples of good practice suggest that there are two pathways for the harmonisation of raw materials data across Europe. One option is that new legislation is created at a European level that requires data to be collected from specific points in the value chain of raw material production, and in accordance with specific standards and classification schemes, such as UNFC in the case of resource data. This approach has worked out very well in the case

of spatial data using the example of the INSPIRE directive, however, this is probably unrealistic to expect for the foreseeable future.

The more realistic option is for a voluntary process through projects, such as ORAMA, to persuade geological surveys and other data collection agencies of the merits of a unified approach across Europe and the importance of obtaining high quality harmonised data on raw materials on a European level.

It is hoped that the guidelines training materials, outreach, training events and advances in how these data are collected and displayed, can go some way to achieving this goal whichever route is chosen. Deliverable 1.5 contains a range of training materials aimed to help with resource data harmonisation. This actually offers for companies and the industry an opportunity to support such initiatives by financing and participating as industry partners in potential forthcoming projects. Actually, the organization of training courses may be an investment opportunity, considering that those courses can be offered for the industry, authorities and national bodies of data collection across the EU.

6.2 SRM

The SRM sector is a relatively new and growing industry with several challenges, of which the data collection is actually not the biggest one. Sound policies and legislation are also needed.

The SRM sector studied by the ORAMA is subdivided into three main categories:

1. Mine waste;
2. Batteries and vehicles;
3. WEEE and PV Panels

Those so diverse categories make the issue much more complex than for the PRM; and the categories need to be observed separately. Although the details vary from one category to another, the general recommendations for the companies in the SRM sector are:

- Follow up recommendations;
- Participate in training events;
- Use and disseminate guidelines and training materials
- Report for the competent authority according to recognised reporting systems;
- Participate in working groups representing the industry;
- Explore the use of industry data to improve policy-making;
- Support R&D projects and initiatives like ORAMA financially, by support letters or as an industry partner;
- Invest into the development of the Urban Mine Platform and/or build alliances with the data providers.

6.2.1 Mine Waste (MIN)

Mine wastes are a direct product of ore beneficiation. Therefore, the producing mining companies are responsible for their reporting for the competent authorities. However, the comprehensive study and characterisation of their compositions and volumes are still needed to be developed in order to be reported in a consistent manner. According the D6.6, the lack of

chemical waste characterisation is one of the main reasons for the undefined secondary potential of waste. However, a new guideline has been developed for MIN for data providers within the ORAMA project:

- G4.1.02.03 Mining Waste Extension insert data guidelines

The presented best practices, together with the new guidelines, improve the understanding and knowledge on how to provide quality-controlled MIN data to the Minerals for EU database.

Site investigations are the key to obtaining the lacking information and improving the quality of reported data, while existing sources of reported information should unite under a single network and system for classifying, collecting and reporting of MIN information. This is something in which the industry and investors can contribute for.

6.2.2 Batteries and vehicles

A key recommendation for the batteries from the ORAMA project D6.6 is to extend the reporting obligations along the battery value chain towards improved composition data from the manufacturers (critical raw materials [CRM] content) and set legally binding reporting requirements that allow stakeholders to estimate the CRM flows in Europe. Policies supporting this approach and working towards an improved and harmonised data collection system around batteries in Europe are highly recommended.

A key recommendation from the ORAMA project for vehicles is to establish a working group involving vehicle manufacturing and recycling industries, with support from reporting authorities and the SRM research community. The aim could initially be to explore possibilities to best utilise the already existing information and information infrastructures within the vehicle industry to identify and communicate components to be dismantled for SRM recovery. The working group could also serve as a stakeholder forum for development of ELV management policy in general. In addition, it is recommended to expand the existing vehicle classification systems to better represent current variation in vehicle mass and new drivetrain technologies in statistics on registered vehicles and to include information on drivetrain and cohort year in ELV statistics.

6.2.3 WEEE and PV Panels

The PV panels are still an emerging product group and, consequently, also an emerging waste stream. Comparison of past forecasts for future quantities of waste PV panels show significant differences to initial data reported under the WEEE Directive; the reported amounts have been seen to be significantly lower than forecasted amounts. This emphasises the need to research the disposal routes of waste PV panels. Separate and, for SRM forecasts, applicable data is still barely available. In order to improve data, statistics (WEEE, energy, production and trade statistics) need to be amended. Further, the industry associations already publish some helpful data and should be encouraged to extend their reports to cover other data types needed for SRM stock and flow modelling. Data on composition should be represented in a harmonised way by producers, researchers and treatment plants according to the systems developed in the ORAMA project. Treatment plants also play an important role concerning the determination of type and age of PV panels entering the waste stream. In order to collect harmonised data, a sampling protocol was developed by ORAMA.

6.2.4 The Urban Mine Platform

The ProSUM project developed the very first EU-wide and open-access Urban Mine Platform (UMP) located at www.urbanmineplatform.eu. According to Huisman et al. (2017), this dedicated web portal is populated by a centralised database containing all readily available data on market inputs, stocks in use and hibernated, compositions and waste flows of electrical and electronic equipment (EEE), vehicles and batteries (BATT) for all EU 28 Member States plus Switzerland and Norway. The UMP's user-friendly design features dedicated applications, allowing the user to select and produce charts and to download resulting data 'on-demand' in a quick manner. The knowledge base is complemented with an extensive library of more than 800 source documents and databases. With the ability to view the metadata, methodologies, calculation steps and data constraints and limitations are made explicit, allowing the user to review key information and to get an idea of the data quality of the sources used for this massive prospecting effort.

This work has been innovative in that it has taken available data from a very unstructured and wide range of published documents and unpublished data and created a system for harmonising and structuring this data. This is done by means of a new classification system and harmonisation code lists for all elements, materials and components in products which are feeding the carefully designed ProSUM Unified Data Model. This provides the ability to easily update, maintain and expand the data behind the platform in the future.

The centralised database built on the Unified Data Model includes data for products put on the market, in use or hibernated in-stocks within the Urban Mine, the waste generated at end of life, and the flows of waste generated. The data includes those elements and materials found to be of high abundance in these waste products. This includes mainly base metals, precious metals and those also listed as CRM. Some glass and plastics data is also recorded and provided although this was not a focus of the project. For more informations, see Huisman et al. (2017).

If the industry and investors believe in the strategic value of a knowledge database such as the UMP, this is a reliable investment option, or at least an alliance can be built with those who contribute with data.

7 Conclusions

Although the ORAMA cannot unfortunately give direct tips where to invest in the data optimisation and harmonisation in EU, except of the UMP, and training course organization, the project can offer some recommendations for further avenues in order to improve the situation with the industry participation.

According to the D6.6, a recommendation that cuts across all themes (of PRM and SRM) is the need for a permanent funding mechanism for data provision. More R&D are also needed. Currently, data is produced by specific projects (such as Minerals4EU, which produced the European Minerals Yearbook and subsequently Mintell4EU). A more long-term, stable, funding mechanism is required for these data to be continually updated and improved in the future. Similarly, such a body must also have a strong mandate to continue to monitor data

harmonisation for PRM. This offers an opportunity for the industry to support such initiatives by financing and participating as industry partners in the projects. It is an activity that does not bring immediate return of investments, but will be beneficial for the whole industry in a long run.

The industry associations have also a great importance in influencing and improving the policy-making together with other stakeholders. There is also a need to raise public awareness regarding the importance of PRM and SRM. A good example of this kind of campaign was the recent E-Waste Day in which the ORAMA also participated. Similar initiatives are possibilities for major cooperation between the industry, academia, authorities and EU bodies and institutions which should be encouraged. Raising public awareness is also recommended to be part of EU projects on PRM and SRM as an educational component.

Another recommendation that repeats along the way is to increase industry representative participation and activity in working groups together with other stakeholders. A need for larger cooperation and sharing of ideas, and practices among companies, authorities, academia and decision makers must be emphasised and collaboration stimulated for the use of the data by them. There is also a need for agreements and common characterisation projects. Creation of new joint projects like those financed by the European Commission's Horizon 2020 Program are good opportunities to exploit further potential for cooperation and to develop and implement ideas and results of the ORAMA. For instance, ultimately the decision making by the EU Commission should play the most fundamental role to implement sound policies in this respect.

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[ORAMA Deliverable 5.1 Mapping of relevant EU funded projects and initiatives.](#)

[ORAMA Deliverable 5.2 Mapping of relevant EU funded projects, initiatives and identification of synergies.](#)

[ORAMA Deliverable 5.3 Organisation of clustering activities.](#)

ORAMA Deliverable 6.6 Technical Final Report and Recommendations (in prep.)