

Deliverable D2.2

Stakeholder Needs

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List of abbreviations and project acronyms

AB	Advisory Board
CSO	Civil Society Organisation
CRM	Critical Raw Material
CRM_InnoNet	<i>Substitution of Critical Raw Materials (EC, 2012-2015)</i>
CWIT	<i>Countering WEEE Illegal Trade (EC, 2007-2013)</i>
DG GROW	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
DG JRC	Directorate-General Joint Research Center
EC	European Commission
EFG	European Federation of Geologists
EGDI Scope	<i>European Geological Data Infrastructure (EC, 2012-2014)</i>
EGS	Association of the European Geological Surveys
EHS	Environment, Health and Safety
EIA	environmental impact assessment
EIP	European Innovation Partnership
EIT	European Institute of Innovation and Technology
EIT KIC Raw Materials	<i>European Institute of Innovation and Technology/Knowledge and Innovation Community Raw Materials (EC, 2014-2022)</i>
ELV	End-of-Life Vehicles
EoL	End of Life
EO-MINERS	<i>Earth Observation for Monitoring and Observing Environmental and Societal Impacts of Mineral Resources Exploration and Exploitation (EC, 2010-2013)</i>
EU	European Union
EURare	<i>development of a sustainable exploitation scheme for Europe's Rare Earth ore deposits (EC, 2013-2018)</i>
EuroGeoSource	<i>a geological data portal (EC, 2010-2013)</i>
Fraunhofer ISI	Fraunhofer Institute for Systems and Innovation Research
GIS	geographic information system
i2Mine	<i>Innovative Technologies and Concepts for the Intelligent Deep Mine of the Future (EC, 2011-2016)</i>
INTRAW	<i>International Raw Materials Observatory (EC, 2015-2018)</i>
IRP WG on Global Metal Flows	<i>International Resource Panel Working Group on Global Metal Flows (UN, since 2007)</i>
ISIE	International Society for Industrial Ecology
LCA	Life Cycle Assessment
MFN	Most Favored Nation (a status or level of treatment accorded by one state to another in international trade)
MICA	Mineral Intelligence Capacity Analysis
Minerals4EU	<i>Minerals Intelligence Network for Europe (EC, 2013-2015)</i>
Minventory	<i>a metadata portal providing a directory of statistical data holders (EC, 2013-2015)</i>
n	(frequency) number
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
OG	Operational Group
ProMine	<i>exploration and the efficient use of mineral resources within Europe (EC, 2009-2013)</i>
ProSUM	<i>Prospecting Secondary raw materials from the Urban Mine and Mining waste (EC, 2015-2017)</i>
Q	Question
REACH	Registration, Evaluation, Authorisation of Chemicals
REE	Rare Earth Element
RMI	Raw Material Intelligence
R&I	Research and Innovation
SIP	Strategic Implementation Plan
SME	Small and Medium-sized Enterprises
STI	Science, Technology and Innovation
TRL	Technology Readiness Level
WEEE	Waste of Electrical and Electronic Equipment
WTO	World Trade Organization

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PURPOSE

Deliverable D2.2 of the Mineral Capacity Intelligence Analysis (MICA) project documents the identification and mapping of stakeholders' needs and requirements related to raw material intelligence (RMI). This Stakeholder Needs Report refers to Task 2.3 of the MICA project. The main purpose is to provide a broad synopsis of stakes in raw material intelligence (RMI) expressed by different stakeholders that could be future users of the envisaged MICA Online Platform.

EXECUTIVE SUMMARY

The aim and ambition of the Mineral Capacity Intelligence Analysis (MICA) project is to contribute to the emerging raw materials knowledge infrastructure in Europe. The objective of WP2 Needs: *Stakeholder identification, appraisal and mapping of stakeholder requirements* is

- to provide a comprehensive inventory of relevant stakeholders, and
- to explore current stakes (interests/questions) in raw material intelligence.

Deliverable D2.2 of the Mineral Capacity Intelligence Analysis (MICA) project documents the identification and mapping of stakeholders' needs and requirements related to raw material intelligence (RMI).¹

The main target groups of the empirical needs appraisal are definitive, dominant and dependent stakeholders.² The MICA consortium consists of organisations that are considered to represent definitive stakeholders in RMI, i.e. they have power and legitimacy in the RMI discourse and their RMI needs should be gathered urgently. They include geological surveys, other public research institutes, universities, research & technology organisations, intelligence institutes, professional organisations, mining and extraction industry, material production industry, recycling and material recovery industry, innovation initiatives, project management agencies, ministries of economic affairs and ministries of education & research. Dominant stakeholders have legitimacy and power in the RMI discourse, but are not represented in the MICA consortium. They include the manufacturing industry as a user of materials and the re-manufacturing industry and governments formulating raw material policies. Dependent stakeholders with less power but equal legitimacy compared to dominant stakeholders are accounted for in accordance with the EU's Responsible Research and Innovation framework (EC 2012). They include industry sectors potentially affected by minerals RMI (e.g. the bio-based industry) and civil society organisations (e.g. environmental non-governmental organisations (NGOs)).

¹ according to the specifications of Task 2.3 of the Description of Work

² Mitchell et al. (1997) point out three main stakeholder attributes:

- Power: A stakeholder may have (actual or potential) power to the extent it can impose its will in a relationship, e.g. by access to coercive, utilitarian or normative means.
- Legitimacy: A stakeholder may have legitimacy by pursuit of a desirable social stake that is negotiated at different levels of social organisation and broadly shared.
- Urgency: A stakeholder may be attributed urgency in case there is both, time sensitivity and claims or relationships that are perceived as highly important.

Depending on whether one, two or three of these attributes are present, Mitchell et al. (1997) distinguish seven types of stakeholders, among them definitive, dominant and dependent stakeholders.

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Three empirical appraisal types (surveys, stakeholder workshop and interviews) were designed to collect RMI stakes in a broad and multi-faceted way.

The three online surveys were conducted between June and September 2016 to reach many stakeholders for identification and assessment of their RMI needs. In total, 95 questionnaires were filled in (almost) completely.

- The Association of the European Geological Surveys (EGS) Survey was circulated to EGS members, i.e. the national and regional geological surveys in Europe. The raw material information needs of national and regional ministries were asked for, too.
- The European Federation of Geologists (EFG) Survey was directly sent to EFG members, i.e. professional geologists in Europe. They are employed by a wide range of affiliations such as exploration industry, mining industry and consultancies. The raw material information needs of their key clients were gathered, too.
- In the Industry Survey, industry associations were approached via cold calling. The material production, manufacturing and recycling industries were focused on. Indirectly, the raw material information needs of member companies were collected.

The Stakeholder Workshop held on 27 September 2016 at the Eurometaux's premises gathered 25 stakeholders from industry, research and governments clustered in four focus groups: the Mineral Deposit Community, the Mining Community, the Urban Mining Community and the Materials Community. The focus groups refined the interim results and suggested further needs related to RMI from their different institutional backgrounds.

In addition, 20 interviews were conducted with representatives from NGOs and industry, EU agencies, ministries, cities, finance, education and consumers. The interviews explored RMI needs in depth and closed major gaps in the targeted stakeholder landscape.

The EGS Survey reached almost two thirds of the geological surveys organised under the umbrella of EGS. Respondents consider *budget pressure* and *public attitudes towards exploration and mining*, *raw material abundance* and *a European Circular Economy* as major strategic issues. Most needs for improvement of raw material information are broadly confirmed (the topics ranging from onshore and offshore resource potential, Greenfield and Brownfield exploration, historical exploration and mining data, abandoned mining sites, raw material criticality, and supply and demand trends, to policies, reporting issues and stakeholder identification), but *above ground infrastructure stock* and *subsurface infrastructure stock* are not yet issues for the majority of respondents. Most important clients of geological surveys are – in declining order – national ministries, exploration and mining industry, earth science and regional ministries. The emerging questions raised by the respondents' clients are mainly related to primary and secondary raw material access, local availability of building & construction materials, concessions, specific mineral resource objectives and mineral resources from a specific area, raw material/commodity types, and no net loss raw material utilization (e.g. zero waste generation, recycling).

The EFG Survey enhanced the knowledge and understanding of raw material information needs of professional geologists as potential users of the envisaged online platform. They belong to four major organisation types: academia/university/research institute, consultancy/planning office,

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geological survey and industry. The need for improving access to raw material information in order to support them in responding to information needs is pointed out broadly in all response categories (including land use constraints, investment in exploration and mining, existing and planned mining ventures, mining operations and environmental, health and safety issues). The exploration industry and mining industry, followed by the geological surveys and policy makers, are the main clients of the respondents. The emerging questions raised by the respondents' clients are mainly related to commodity pricing, financing, tailings operations, permitting, social constraints, environmental restrictions, security constraints, infrastructure, groundwater impact and access to public data.

The Industry Survey reached the people involved with strategic management within the industry associations covering large parts of the value chain from material processing to recycling. Industry associations broadly emphasize the strategic relevance of trade and environmental policies and regulations. The need for improving access to specific raw material information in order to support them in responding to specific information needs varies depending on the industry associations' positions in the value chain. Frequently mentioned topics of interest include material price development, raw material processing industry plants and structure, supply chains and regional industry clusters, stocks and flows of secondary resources, and technologies (e.g. agile re-manufacturing). The industry associations' members and key external stakeholders increasingly ask for life cycle analyses, recycling streams, innovations and conflict mineral due diligence.

Further analysis of the three surveys revealed that the Sustainable Development Goals and data selection options in the MICA Online Platform are particularly important. Depending on the raw material knowledge domain, information is non-existent or not exploited sufficiently giving hints for designing the MICA Online Platform.

The Stakeholder Workshop enabled the raw material information needs to be sharpened and also brought a number of additional aspects to the fore. Major amendments generated by the four focus groups were related to actors in charge of local raw material availability and waste registers, links to existing data bases and projects, information about by-products, inventory and composition of stocks, mining venture sites, profitability and risks, supply chains/value chains, material fate between primary production and its secondary production, and properties of alternative materials for the design stage. All in all it was found, that MICA should make clear to the Online Platform user what can be expected of its services.

The interviews explored raw material information needs in depth. Interviewees interested in investment topics asked for area/country comparisons of exploration projects, propensities to invest, availabilities and costs of production factors and financial models for regeneration of mining sites. Supply chain/value chain information needs of the interviewees include trade-related, material/design-related, transparency and sustainability issues. A number of NGOs, consumer organisations, trade unions, environmental NGOs and transparency & democracy NGOs, share the need for transparent information of corporate actors/networks but differ with regard to the part of the value chain they are engaged in. Civil society actors wish to be on an equal level on raw material information with private and public sector actors through better access to such raw

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material information. The interviews on urban mining and cities specified the information needs with regard to stocks and flows, best waste management practices and actors in detail.

Ten major avenues for redesigning the MICA Ontology in its version of 29 July 2016 are suggested:

1. Differentiate existing concepts according to stakeholders' perceptions of the raw material field
2. Consider stakeholders' needs for navigating the numerous raw-material related actors, initiatives and projects at EU and other levels
3. Assist tracing material fates between virgin raw materials statistics and waste statistics
4. Account for technology/innovation (available/emerging) as a sub-concept of raw material related processes
5. Support supply chain/value chain analysis
6. Introduce a material/design perspective on raw materials
7. Assist stakeholders to find financial information on mining companies and networks
8. Account for trade as a well visible concept
9. Sort out, if and how to address procurement, standards, skills, property issues and communication
10. Provide orientation according to the Sustainable Development Goals

The empirical needs appraisal has reached stakeholders in RMI systematically and in large breadth, despite its shortcomings here and there. Taking into account the methodological approach and the research restrictions, the entire picture of needs and requirements related to RMI is considered sufficiently diverse and comprehensive.

DELIVERABLE REPORT

I. Introduction

The aim and ambition of the MICA project is to contribute to the emerging raw materials knowledge infrastructure in Europe. To do so, the project team conducts a careful analysis of stakeholder needs and undertakes a review of existing data, methods and tools that provide intelligence on raw materials. The outcome of this analysis and review will be integrated into a powerful, user-friendly decision-support platform that provides different stakeholders (e.g. policy and decision makers, industry, investors, economic analysts, researchers and others) with information to find answers to their raw materials related questions and proposes options available for addressing associated problems.

The objective of WP2 *Needs: Stakeholder identification, appraisal and mapping of stakeholder requirements* is

- to provide a comprehensive inventory of relevant stakeholders, and
- to explore current stakes (interests/questions) in raw material intelligence.

Task 2.2 has identified and classified stakeholders systematically (Erdmann et al. 2016), to provide a sound basis for a broad and deep appraisal of stakeholder needs in Task 2.3. Task 2.1 has mapped the pre-existing knowledge of the WP2 participants about the stakeholder landscape and stakeholder needs to achieve a shared understanding of key raw material intelligence issues at an early stage of the MICA project.

Deliverable 2.2 provides a consolidated synthesis of the empirical stakeholder needs appraisal. This Stakeholder Needs Report documents Task 2.3 only.

- Section 2 presents the empirical appraisal concept tailored to the principal target groups identified in Task 2.2.
- Section 3 provides a synthesis of the results of the empirical appraisal activities.
- Section 4 critically reflects the empirical appraisal and suggests avenues for a redesign of the Main Ontology of the envisaged MICA Online Platform.

The Appendices contains descriptive information on the empirical appraisal activities. The Appendices provides supplementary material used for the empirical work.

This Stakeholder Needs Report is complemented by a spreadsheet file that maps some 700 needs and requirements to concepts captured within the eight raw material knowledge domains (down to level 2) of the Main Ontology.³ A revised Main Ontology is meant to address the stakeholders' needs and requirements to RMI gathered in this empirical appraisal.

³ Ontology Version of 29 July 2016.

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2. Appraisal concept

First, the conceptual approach is outlined. Then, it is operationalized in concrete empirical appraisal activities. Finally, the data analysis and mapping procedure is described.

2.1 Conceptual approach

The Stakeholder Mapping Report D2.1 (Erdmann et al. 2016) identified four tiers of stakeholders in the MICA project building upon Mitchell et al. stakeholder typology (see also Footnote 2 for an explanation of their stakeholder approach and Figure 4 on page 42 for a comprehensive mapping of stakeholder groups).

Tier 1: The MICA consortium consists of organisations that are considered to represent *definitive stakeholders* in RMI, i.e. they have power and legitimacy in the RMI discourse and their RMI needs should be gathered urgently. They include: geological surveys and other public research institutes, universities, research & technology organisations, intelligence institutions, professional organisations, mining and extraction industry, material production industry, recycling and material recovery industry, innovation initiatives, project management agencies, ministries of economic affairs and ministries of education & research.

Tier 2: *Dominant stakeholders* and *dependent stakeholders*, it is argued, should be considered in this comprehensive survey of raw material information needs. Dominant stakeholders have legitimacy and power in the RMI discourse, but are not represented in the MICA consortium. Dependent stakeholders with less power but equal legitimacy compared to dominant stakeholders are accounted for in accordance with the EU's Responsible Research and Innovation framework (EU 2012).

Among the dominant stakeholders are in particular the manufacturing industry as a user of materials and the re-manufacturing industry as key actors to mobilize material in stock for the purposes of recycling and material recovery. Governments formulating raw material policies also count among the dominant stakeholders.

Dependent stakeholders include in particular industry sectors potentially affected by minerals raw material intelligence (e.g. the bio-based industry, tourism industry) and civil society organisations (e.g. environmental NGOs, human rights NGOs).

Tier 3: *Discretionary stakeholders* may have legitimate claims in RMI. They are not in the focus of the MICA project, but they have been considered upon their request.

Tier 4: *Dormant stakeholders* and *dangerous stakeholders* might have limited legitimacy to benefit from MICA. Both stakeholder groups have not been targeted in the empirical appraisal, but they might be dealt with to ensure that the MICA services will be exploited in the intended ways. Dormant stakeholders were considered case by case.

⇒ Main **target groups** of the empirical needs appraisal are definitive, dominant and dependent stakeholders.

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The main aim of the empirical appraisal is to contribute to the design of the Main Ontology of the Envisaged MICA Online Platform. The empirical appraisal is one approach to uncover stakeholders' needs and requirements to RMI among others.

Figure 1 displays the empirical appraisal and other MICA related sources for the identification of raw material information needs that are to be considered when rebuilding the Main Ontology.

Sources	Subjects	Documentation
➡ Task 2.1: Inception	<ul style="list-style-type: none"> • supposed stakeholder questions formulated by MICA partners • compilation of key projects responding to information needs 	M1
➡ Task 2.2: Stakeholder Mapping	<ul style="list-style-type: none"> • topics of importance identified through analysis and mapping of R&I activities, consultations, industry associations, civil society organisations, conferences and country perspectives 	D2.1
➡ Task 2.3	Empirical appraisal	
surveys	<ul style="list-style-type: none"> • topics and questions of the respondents and their external stakeholders 	D2.2
interviews	<ul style="list-style-type: none"> • topics and questions of the affiliation 	D2.2
stakeholder workshop	<ul style="list-style-type: none"> • focus groups on knowledge domains identifying and refining topics and questions 	D2.2
➡ Advisory Board	<ul style="list-style-type: none"> • topics and questions from an AB member perspective (February 2016, September 2016) 	AB minutes
➡ EIP Raw Materials	<ul style="list-style-type: none"> • OG meeting (April 2016), SIP, Raw Material Commitments • material submitted by DG GROW and DG JRC 	SIP D2.1

Figure 1: MICA-related sources for the detection of raw material information needs

The Inception (Task 2.1) had yielded a MICA-internal milestone document (M1) that contributed to building the Main Ontology of the envisaged MICA Online Platform in its version 29 July 2016. It covers supposed stakeholder questions formulated by MICA partners and a compilation of key projects responding to raw material information needs.

The stakeholder mapping documented in Deliverable D2.1 (Task 2.2) reveals a broad range of topics addressed in R&I programmes and projects, consultations for raw material policy-making, mapping of industry associations and of civil society organisations, raw material related conferences and country perspectives on raw material information needs.

The two Advisory Board (AB) meetings gathered topics and questions from an AB-member perspective and sharpened the potential user spectrum of the envisaged MICA Online Platform.

The MICA project was presented at a European Innovation Partnership (EIP) Raw Materials Operational Group (OG) meeting accompanied by its Strategic Implementation Plan (SIP), Raw Material Commitments and material submitted by DG GROW and DG JRC after this meeting. Three empirical appraisal types have been employed in Task 2.3:

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- 3 online **surveys** to capture distributed stakeholders' positions broadly. The surveys mainly gathered topics and some questions, raised by the respondents and by their external stakeholders.
- 20 **interviews** (including other individual statements) to elicit key stakeholders' positions in depth. Both, specific topics and detailed questions were raised.
- 1 **multi-stakeholder workshop** to identify non-apparent stakeholder positions and to identify joint interests of a broad range of stakeholders. Participants explored raw material information needs in focus groups on certain raw material knowledge domains.

The main focus of the appraisal was on stakeholder needs, i.e. on the topics and questions to which they want to get information from the MICA Online Platform. In addition, functional requirements to the MICA Online Platform were asked for in the surveys and they popped up here and there during the stakeholder workshop and the interviews.

Figure 2 shows a morphological box for the three appraisal types and their characteristics. The three different approaches are pursued to generate raw material information needs from different perspectives in different contexts.

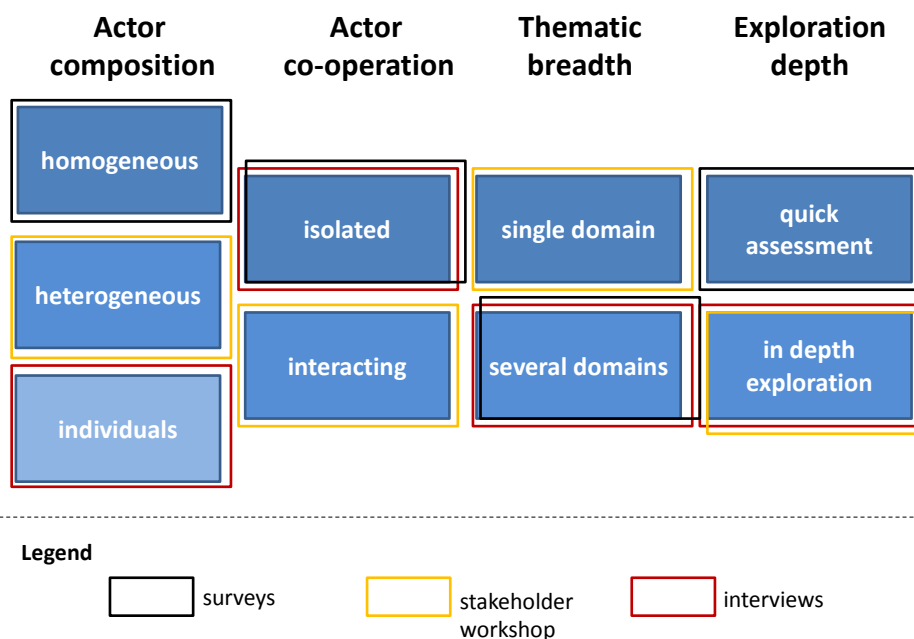


Figure 2: Morphological box for the three appraisal types and their characteristics

We refrain from prioritizing the stakeholders' positions according to any of the three empirical appraisal types.

⇒ The three empirical appraisal types (surveys, stakeholder workshop and interviews) **collect raw material intelligence stakes in a broad and multi-faceted way.**

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2.2 Operationalization

The various stakeholder groups are targeted in different ways. Figure 3 provides an overview of how stakeholder positions are gathered.

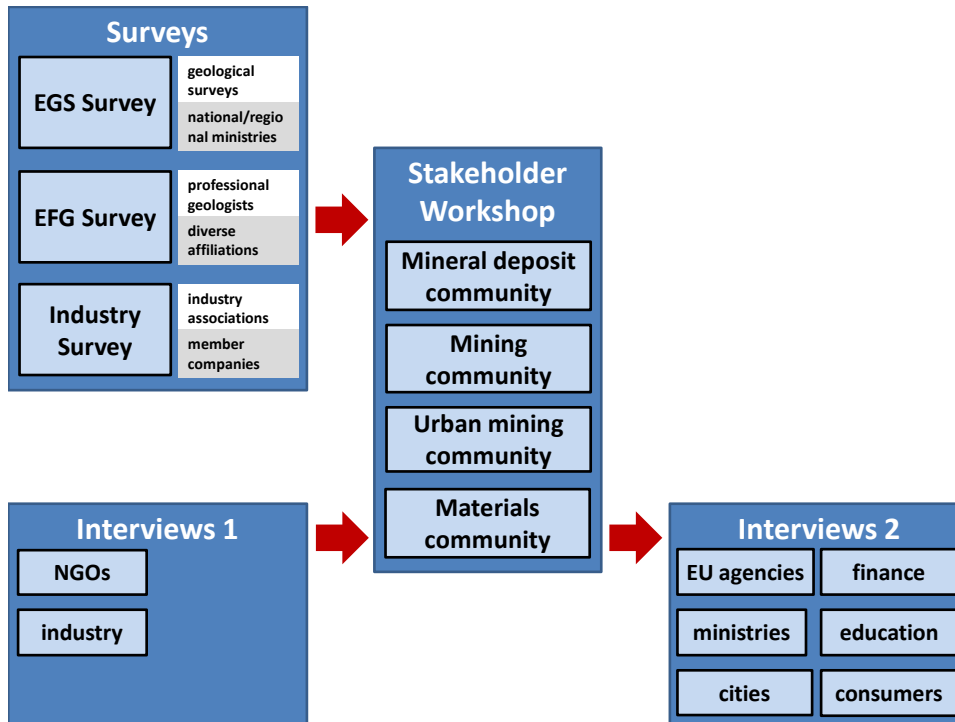


Figure 3: Phasing of empirical appraisal types to collect stakeholder needs and requirements to the envisaged MICA Online Platform. White-/grey-shaded boxes – direct/indirect approach.

At first, three online surveys were designed and conducted between June and September 2016.

- The EGS⁴ Survey was directly targeted at the EGS members, i.e. the national and regional geological surveys in Europe. The raw material information needs of the national and regional ministries were asked for, too.
- Likewise, the EFG⁵ Survey was directly targeted at the EFG members, i.e. professional geologists in Europe. They are employed at a wide range of affiliations such as exploration industry, mining industry and consultancies. The raw material information needs of their key clients were gathered, too.
- The Industry Survey approached industry associations directly via cold calling. The main target groups are raw material processing and recycling industries, because they were not reached adequately via the EFG Survey. Indirectly, the raw material information needs of the member companies were collected.

The questionnaires were co-designed by Fraunhofer ISI and other WP2 partners. Questionnaire development built upon the first AB Meeting and the first Consortium Meeting in February 2016

⁴ MICA project partner

⁵ MICA project partner

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as well as the MICA-internal Inception Report (Milestone I). The three survey drafts were pre-tested by various MICA-internal and -external persons.

The three surveys' questions (Qs) centered at the identification of topics and on emerging questions that should be addressed by the MICA Online Platform from a respondents' perspective. The EGS Survey and the Industry Survey also asked for current and future strategic issues. The EGS and EFG Surveys gathered functional requirements to the envisaged MICA Online Platform.

The EGS Survey and Industry Survey were launched via Questback's Enterprise Feedback Suite (EFS) online survey tool by Fraunhofer ISI, and the EFG Survey was facilitated via Google Surveys by EFG.

The first interview phase, taking place between June and September 2016, aimed to explore raw material information needs in depth:

- Interviews with industry included in particular a recycling company, industry associations dedicated to certain materials and trade associations with a broader remit.
- Interviews with NGOs included an interview with an environmental NGO, with a trade union and with a transparency & democracy NGO.

The interviews asked for raw-material related topics and questions of relevance, how information needs are met at the moment and what is needed additionally.

The multi-stakeholder workshop was held on 27 September 2016 at the Eurometeaux's premises in Brussels. It gathered 25 participants that were assigned to four focus groups:⁶

- The Mineral Deposit Community was mainly composed of geological surveys and geological information providers & promoters.
- The Mining Community included actors involved in the exploitation of mineral deposits such as consultancies advising investors to invest in mining ventures.
- The Urban Mining Community was made up of – among others – recycling companies, recycling initiatives and applied sustainability research institutes.
- The Materials Community predominantly consisted of the material production industry converting raw materials into materials for industrial use and the manufacturing industry using these materials.

The four focus groups were informed by topics and questions already raised and had the task to cast a multi-actor perspective on the selected four raw material knowledge domains. In addition, individual participants took the opportunity provided to express raw material information needs on the raw material knowledge domains not selected for collective discussion.

The second interview phase, from October to November 2016, had the purpose to close the raw material information gaps that were identified at the multi-stakeholder workshop and along the second AB Meeting and the second Consortium Meeting that took place end of September 2016.

⁶ The last three communities have been slightly relabeled for this Stakeholder Needs Report.

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The basic interview design was like in the first interview phase (see above). The second interview phase covers interviews with:

- EU agencies
- a national ministry engaged in the development of a mining region
- umbrella organisations for cities
- financial actors such as investment organisations and consultants advising investors⁷
- a secondary school teacher
- a consumer organisation and a prosumer (consumers acting as producers) organisation

The Ethics Deliverable DI.5 (Keulen et al. 2016) guided the involvement of people in the empirical needs appraisal as well as data processing and analysis. All contacted persons were informed about the goals and background of the MICA project, and that they would not face any consequences from rejection to engage in the empirical appraisal. All statements are therefore voluntary and in the context of the MICA project.

The three online surveys are anonymous so that no single statement could be assigned to a natural person. The contact data of the invitees are kept separate from the survey responses. In the case of the EGS Survey and of the EFG Survey the respective associations used their membership databases. In the case of the Industry Survey, the interviewees and the stakeholder workshop participants, publicly available contact data retrieved from the internet was used, stored for invitation purposes only, and finally deleted. Again, no single statement can be assigned to a natural person or single affiliation by displaying the results in this report for 'industry' (survey), 'communities' (stakeholder workshop) and 'clusters' (interviews) respectively.

The survey questionnaires, interview guidelines and multi-stakeholder workshop material are provided in the Appendices.

2.3 Data analysis and mapping

The outcomes of the empirical appraisal are processed, analyzed, classified and mapped. A draft report was discussed in a virtual meeting on 20 October 2016 by the WP2 partners, which was then further elaborated by Fraunhofer ISI and finally validated by the WP2 participants giving written comments.

The **data processing** includes the following activities:

- **Capture:** The survey tools collected response data automatically. The stakeholder workshop statements were written on post-its by the participants themselves, complemented by minutes of the oral discussions. The interviews were captured during conduct by taking notes. The stakeholder workshop and interview statements both were then digitized.
- **Cleaning:** The survey responses were cleaned by elimination of participants who did not respond to at least half of the questions posed. Those stakeholder workshop statements

⁷ In addition, a mining investment conference was attended by one MICA partner.

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that do not fall under the scope of WP2 were eliminated. The same applies to interview statements that do not express needs or requirements to RMI.

- Coding of appraisal data: All statements were given a code that assigns them to the empirical appraisal type, the concrete appraisal activity and which distinguishes the statements from one another by a suffix.
- Recoding of the Main Ontology (WP6): The Main Ontology (Version of 29 July 2016) was recoded including the domain, level 1 and level 2 to reduce the number of characters that are needed for a tagging of statements.
- Mapping of coded appraisal data to the Main Ontology (WP6): The coded data, i.e. the statements, were mapped to a recoded Main Ontology of WP6 down to level 2. It was searched for Main Ontology terms in the appraisal data and it was searched for appraisal data terms in the Main Ontology. Up to four mappings of a single statement to the Main Ontology were made.

The data processing results were stored in a spreadsheet file that contains over 700 statements.⁸ A large amount of qualitative and quantitative data has been collected and analyzed.

The core of the data analysis was about stakeholders' raw material information needs (Q3, Q4). The **basic analysis of quantitative data** was carried out in two major steps:⁹

- Frequency analysis: All quantitative data from the three online surveys were first analyzed through frequency analysis, question by question.
- Aggregate analysis: Questions that were part of several surveys were analyzed by aggregation of the respective data sets, and designation of the respective response shares in the surveys.

In addition, there were three **special analyses of quantitative data**:

- Context analysis: In the EGS Survey and the Industry Survey, current strategic issues (Q1) and future developments relevant for strategy development were collected (Q5). The analysis reveals with which mindsets the respondents actually see or will see RMI.
- Gap analysis: The need for improving access to raw material information (Q3) was mirrored against the usage of existing online platforms, including project websites, (Q2) to allow for a rough assessment if there are rather availability problems or navigation problems.
- Relevance analysis: The prioritization of the functional requirements to the envisaged MICA Online Platform was considered through weighting of their positions on a linear scale across respondents of the EGS Survey (Q6) and EFG Survey (Q5).

⁸ This number includes some minor double counting to allow for different stakeholders and different contexts in which a statement is uttered.

⁹ It is refrained from a filter analysis or bi-variant analysis because of limited response numbers within each survey.

Deliverable D2.2

The **analysis of qualitative data** incorporates the items for qualitative and quantitative data:¹⁰

- Content analysis: The individual statements were read in the context they were uttered and compared to other statements in the same or in another context.
- Cluster formation: In the process of mapping the single statements to the Main Ontology, semantic clusters were built intuitively bottom-up as first-order concepts (cf. Miles et al. 2014). Some semantic clusters didn't have an adequate expression in the Main Ontology pointing at a need for revision.

As a summary, the data processing and analysis yields three **qualities of data**:

- direct statements on needs (three surveys, stakeholder workshop, interviews)
- indirect statements on others' needs (three surveys)
- derived needs (interpretation of the MICA WP2 team)

It could be argued that a direct raw material information need, which is empirically confirmed by a large number of respondents, ranks higher than a single indirect interest stated only once. However, it is not within the remit of the empirical needs appraisal to undertake such weightings. We acknowledge the three data qualities as epistemic categories, but not as a guide for normative choices. In the following, we therefore do not distinguish these data qualities any more.

¹⁰ The treatment of quantitative data items also as qualitative data can be justified by the non-weighting of different statements and that sometimes respondents repeated qualitatively what was asked quantitatively.

Deliverable D2.2

3. Synthesis of results

This section presents the results of the three surveys, of the stakeholder workshop and of the interviews one after another in an interpretative form. Here, frequently occurring issues and novel issues are singled out accounting for the phasing of the three empirical appraisal types.

The descriptive results of the appraisal activities are displayed comprehensively in the Annex. The full set of empirical data gathered is also stored in a spreadsheet file. The extensive Annex is complementary to this section 3 *Synthesis of results* in order to document the full range of raw material information needs.

A note on style

- Domains are denoted in capital letters: e.g. Mineral Deposits (survey), Mineral Deposit Community (stakeholder workshop), Investment Cluster (interviews).
- Information gathered is denoted in italics in the plain text: e.g. *onshore resource potential* or *Where do we find the next megadeposit?* or it is encapsulated in a tinted box without further formatting.
- Response options are put into quotation marks: e.g. 'improve access'.

3.1 Surveys

Three online surveys (EGS Survey, EFG Survey and Industry Survey) were conducted between June and September 2016.

- The core of the raw material information need appraisals are questions 3 and 4. Each survey gathered raw material information needs from different target groups directly (Q3) and also asked for raw material information needs of the respondents' key stakeholders (Q4). Table 1 shows the direct and indirect target groups in more detail.
- Question 2 explores the usefulness (EGS Survey, Industry Survey) and frequency of use (EFG Survey) of existing raw material information platforms.
- Questions 1 and 5 of the EGS Survey and Industry Survey are about current strategic issues and future developments that could become strategically relevant by 2020.¹¹
- Question 6 of the EGS Survey and Question 5 of the EFG Survey are about functional requirements to the envisaged MICA Online Platform.

The Annex 6.1 provides a comparative overview of the set of questions in the three surveys.

Table 1: Three surveys for direct and indirect appraisal of raw material information needs

	EGS Survey	EFG Survey	Industry Survey
direct target groups	<ul style="list-style-type: none"> • national and regional geological surveys (EGS members) 	<ul style="list-style-type: none"> • professional geologists (EFG members from a wide range of affiliations) 	<ul style="list-style-type: none"> • industry associations
indirect target groups	<ul style="list-style-type: none"> • national and regional ministries • other stakeholders 	<ul style="list-style-type: none"> • key clients of professional geologists 	<ul style="list-style-type: none"> • member companies • external stakeholders

¹¹ Question 1 of the EFG Survey has been analyzed by EFG internally only.

Deliverable D2.2

The EGS Survey and the Industry Survey intended to approach institutions with strategic interests in RMI, while the EFG Survey targeted at individuals, presumably with rather operative than strategic RMI interests.

The EGS Survey and EFG Survey were facilitated by the MICA consortium partners EGS and EFG respectively, whereas the Industry Survey approached industry associations via cold calling by Fraunhofer ISI.

Table 2: Responsivity of the three surveys' target audiences

	EGS Survey	EFG Survey	Industry Survey
sample number	41	954	92
number of respondents	26	59	10
response rate	63.4 %	6.2 %	10.9 %

The EGS Survey got a very high response rate (Table 2) reflecting also the high level of engagement of geological surveys in the MICA project. The EFG Survey reached out to a wide range of professional geologists (European Geologist title holders), only some of which occupied with mineral raw materials. Considering that approximately 40 % of all European Geologist title holders work in mining, and that the survey was aiming at professionals working in the raw materials field, the response rate increases to 15.5 %. The Industry Survey has achieved a satisfactory percentage for cold calling. All in all 95 questionnaires were filled-in (almost) completely, yielding a remarkably broad picture of raw material information needs, especially when indirectly expressed needs of respondents' stakeholders are taken into account.

The results of the three surveys are presented one after another. Then, they are analyzed all together, including the functional requirements to the envisaged MICA Online platform (Q6).

3.1.1 EGS Survey

The EGS Survey included 6 questions. Please refer to Appendix I (page 88), for details.

1. How important are the following strategic issues for your geological survey?
2. How useful are the following raw material information platforms for your geological survey?
3. Which of the two improvement options [improve access to information, support responding to questions] do you consider as particularly important to your work?
4. Who are your key clients? Please fill in up to 3 most urgent, emerging raw material information needs of your national/regional ministries / Please fill in up to 3 most urgent, emerging raw material information needs of your other key clients
5. How important are the following future developments for your geological survey by 2020?
6. What are your most important technical requirements to the envisaged MICA online platform?

Out of the 26 respondents in the EGS Survey, 9 respondents refer to themselves as *strategic management*, while 17 others rather see themselves under *geological data, information and knowledge, research and public relations* respectively.

Deliverable D2.2

At least 15 respondents consider the suggested Current Strategic Issues (Q1) as important or very important, *budget pressure* and *public attitudes towards exploration and mining* most frequently quoted as very important.

Among the most salient Current Strategic Issues raised additionally by the respondents are:

Additional Current Strategic Issues (Q1)

- renewal of mineral resources experts (e.g. replenishment of staff, staff training and specialization, information platform dedicated staff)
- development of geological information system and e-commerce (e.g. form central archive of geological research, digitalization, information technologies in geology, standards for the interaction of geological information systems)

Most suggested Future Strategic Issues (Q5) is agreed upon broadly. Some items receive comparatively low levels of agreement: A *European bio-based economy* is considered important or very important only by 8 respondents, *Europe under threat* by 10 respondents and *regional economies in Europe* and a *global digital economy* by 15 respondents respectively. At the same time *social conflicts over mining*, *raw material abundance* and a *European Circular Economy* are most frequently assessed as important or very important.

Additional Future Strategic Issues, not covered elsewhere, are not raised.

Question 3 explores Needs for Improvement of Raw Material Information, namely which of the two options, 'improve access to information' and 'support responding to information needs', are considered particularly important to the respondents' work:

- For most topics in the realm of Mineral Deposits (Q3a), 20 or more respondents consider 'improve access', 'support responding' or 'both' particularly important. *Offshore resource potential* (n=17) and *investors and investment levels* (n=18) rate slightly below.
- *Above ground infrastructure* and *subsurface infrastructure* do not count among the particularly important topics for the majority of respondents (10 and 11 positive mentions respectively), whereas the other topics related to Anthropogenic Stocks (Q3b) would be clearly welcomed by 16 or more respondents.
- All suggested topics for Raw Material Supply and Demand (Q3c) and Other Fields (Q3d) are approved at least by 16 respondents.

The respondents also raised a number of issues qualitatively, some salient examples displayed below:

Deliverable D2.2

Mineral Deposits (Q3a) <ul style="list-style-type: none"> reports of geological exploration works (geological structures and formations, mineral endowment, minerals quality, historical information, deposit information such as access etc.) innovation in Greenfield exploration techniques 	Anthropogenic Stocks (Q3b) <ul style="list-style-type: none"> abandoned mine tailings chemical information, contamination electronic waste - collection rate, share of real and potential recovery
Raw Material Supply and Demand (Q3c) <ul style="list-style-type: none"> awareness in the major trends of European raw material development historical production data 	Other Fields (Q3d) <ul style="list-style-type: none"> mineral policies at global, EU, national and regional level resource classification and inventory (licensed and proven reserves of a commodity, registered mineral resources/reserves)

Weighting of the respondents' clients by their significance (Q4a) brings *national ministries, exploration and mining industry, earth science and regional ministries* (in declining order) to the fore.

Emerging key questions relevant to the geological surveys by 2020 (Q4b) include:

National and regional ministries (Q4b) <ul style="list-style-type: none"> access to primary and secondary raw materials (e.g. land use, protected areas, infrastructure plans) information about a specific mineral resources objective and mineral resources from a specific area (e.g. prospectivity and safety of uranium in a certain area) transparent information related to concession: on license holders/exploration permits; social license to operate (exploration and mining) 	Other key clients (Q4b) <ul style="list-style-type: none"> availability of building & construction materials information about a specific raw material type/commodity (e.g. location of Titanium-bearing minerals, critical raw materials (CRM) substitution issues) circular (closed) raw materials utilization: new, effective and economic technologies for secondary metals; secondary raw materials inventory and data harmonization
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Summary: The EGS Survey has reached almost two thirds of the geological surveys organised under the umbrella of EGS. Respondents consider budget pressure and public attitudes towards exploration and mining, raw material abundance and a European Circular Economy as major strategic issues. Most needs for improvement of raw material information are broadly confirmed the topics ranging from onshore and offshore resource potential, Greenfield and Brownfield exploration, historical exploration and mining data, abandoned mining sites, raw material criticality, and supply and demand trends, to policies, reporting issues and stakeholder identification), but above ground infrastructure stock and subsurface infrastructure stock are not yet issues for the majority of respondents. Most important clients of geological surveys are – in declining order – national ministries, exploration and mining industry, earth science and regional ministries. The emerging questions raised by the respondents' clients are mainly related to primary and secondary raw material access, local availability of building & construction materials, concessions, specific minerals resource areas/objectives and raw material types, and closed raw material utilization.

Deliverable D2.2

3.1.2 EFG Survey

The EFG Survey included 6 questions. Please refer to Appendix 2 (page 97) for details.

1. Please let us know your opinion on EFG's media¹²
2. How often do you use these raw material information platforms?
3. Choose your needs for improvement of raw material information [improve access to information, support responding to questions] on the following themes
4. Who are your key clients? What are emerging questions raised by your key clients, which might influence your work significantly until 2020?
5. Please select up to 3 most important requirements that could make you an actual user of the MICA online platform

Out of the 59 respondents in the EFG Survey, 31 respondents state their affiliation as *consultancy/planning office* and 22 as *industry* (multiple answers possible). The most frequently mentioned principal thematic areas of work are *mineral exploration* (n=41), *earth sciences/applied geological sciences* (n=30) and *regional reconnaissance and prospection* (n=26).

Question 3 about improvement needs for raw material information yields these patterns:

- For all topics in the realms of Identification and Assessment of Mineral Deposits (Q3a) and of Exploitation of Mineral Deposits (Q3b), more than half of the respondents consider 'improve access', 'support responding' or 'both' particularly important. 28 respondents say that *offshore resource potential* is not relevant to their work.
- The responses for Anthropogenic Stocks and Recycling (Q3c) give a mixed picture: *Abandoned mining waste deposits and tailings* and *abandoned mines for future land use* are a particularly important topic for 47 and 43 respondents, *landfill mining* and the *material flows for the recovery of commodities* for 37 and 35 respondents and *subsurface infrastructure* and *above ground infrastructure* for 34 and 29 respondents.
- All suggested topics in Other Fields (Q3d) are approved at least by 39 respondents, *mineral policies* and *other policies affecting mineral extraction* receiving most answers, n=52 and n=48, with regard to being particularly important.

Some salient examples of issues raised qualitatively, are displayed below:

Identification and Assessment of Mineral Deposits (Q3a)	Anthropogenic Stocks and Recycling (Q3c)
<ul style="list-style-type: none"> • exploration works (e.g. mining industry, companies involved in research for mineral deposits, university research projects for selected commodities) • expertise available for selected countries 	<ul style="list-style-type: none"> • environmental impact plans • European research and innovation into treating tailings • legal aspects of mine waste ownership

Among the key clients (Q4a) most frequently mentioned are *exploration industry* (n=42), *mining industry* (n=38) and *geological surveys* (n=22).

¹² Question 1 of the EFG Survey has been analyzed by EFG internally only

Deliverable D2.2

Emerging key questions and topics raised by the professional geologists' key clients include:

Emerging information needs of key clients (Q4b)

Questions:

- where could we possibly find the next "mega deposit"? (size and location)
- where are the most suitable tailings? (size and location)
- what commodities will do best in the coming years?
- are the countries to be invested "mining pro"?
- what is the likely timeframe for permitting a new mine?
- what is the likely timeframe for re-opening an old mine?
- are there more cost effective exploration techniques?
- what help is available to set up a tailings reprocessing operation?

Topics:

- exploration and mining activities (e.g. in Europe)
- possibilities and outlook of financing of exploration projects
- property issues (e.g. security of tenement ownership)
- constraints to exploration and mining (social/environmental, land use, infrastructure, issues relating to water and groundwater, regulation)
- costs of extraction
- prediction of pricing of commodities
- raw material clients (e.g. European battery and electric vehicle producers)
- raw material economies (e.g. Nickel and Uranium)

Summary: The EFG Survey has enhanced the knowledge and understanding of raw material information needs of professional geologists as potential users of the envisaged online platform. They belong to four major organisation types: academia/university/research institute, consultancy/planning office, geological survey and industry. The need for improving access to raw material information as well as support responding to information needs is pointed out broadly in all response categories (including land use constraints, investment in exploration and mining, existing and planned mining ventures, mining operations and environment, health and safety (EHS) issues). Exploration industry and mining industry, followed by the geological surveys and policy makers are the main clients of the respondents. The emerging questions raised by the respondents' clients are mainly related to commodity pricing, financing, tailings operations, permitting, social constraints, environmental restrictions, security constraints, infrastructure, groundwater impact and access to public data.

3.1.3 Industry Survey

The Industry Survey included 5 questions. Please refer to Appendix 3 (page 109) for details.

1. How important are the following strategic issues for your industry?
2. How useful are the following raw material information platforms for your industry?
3. For which topics do you need better access to raw material information and/or support by responding to your specific raw material information needs?
4. Please fill in up to 3 emerging key raw material information needs of your members / Please fill in up to 3 emerging key raw material information needs of your external stakeholders
5. How important are the following future developments for your industry by 2020?

Deliverable D2.2

Out of the 10 respondents in the Industry Survey, 9 respondents refer to themselves as *strategic management*. Industry associations typically cover various parts of the value chain: *component and part manufacturing* (n=8) and *primary processing, secondary processing, material production and semi-finished goods* (n=7, each) most frequently mentioned.

At least 6 respondents consider the suggested Current Strategic Issues (Q1) as important or very important; *competitiveness* and then *circular economy, chemicals regulation, conflict minerals, ethical requirements* and *Sustainable Development Goals* most frequently quoted as very important.

Among the salient current strategic issues raised by the respondents are:

Additional Current Strategic Issues (Q1)

- trade regulation and policy (e.g. WTO, EU trade tariffs, anti-dumping issues, MFN decisions, China dumping, Chinese trade policy, shipment of waste)
- environmental regulation and policy (e.g. energy and climate; CO₂ emission; reform of the electricity markets, with a link to the revision of the EU Emission Trading Scheme)
- revision of regulation schemes (e.g. anti-slavery and child labour legislation may develop into something very important, similar to conflict minerals; the impact of over-regulation, particularly on SMEs)

Most suggested Future Developments relevant for the industry associations' strategy (Q5) are widely agreed upon. All topics, but a *European bio-based economy*, are considered important or very important by at least 6 respondents. Nobody assessed the topics *raw material competition* and *raw material abundance* and *instable economies and societies* and *environment- and health-driven global raw material use* as unimportant.

Additional future developments of strategic importance not covered elsewhere include:

Additional Future Developments of strategic importance (Q5)

- renewal of manufacturing experts (loss of manufacturing in Europe - future skills deficits)
- design/materials (use recycled material instead of primary material)

Question 3 asks, which of the two options, 'improve access to raw material information' and 'support responding to raw material information queries', are considered particularly important to the respondents work on topics in four knowledge domains:

- For all topics in the realms of Raw Material Supply and Demand (a) and of Material Production and Manufacturing (b), 7 or more respondents consider 'improve access', 'support responding' or 'both' particularly important.
- *Subsurface infrastructure* does not count among the important topics for the majority of respondents (4 positive mentions only), whereas the other topics related to Anthropogenic Stocks and Recycling (c), in particular *recycling, moveable product stock, material flows for recovery* and *agile remanufacturing* would be clearly welcomed by the respondents.
- All Other Topics suggested (d) are approved by at least by 7 respondents; but *investment cycles in exploration and mining* yields only 5 positive assessments.

Deliverable D2.2

The respondents also raised three major specifications qualitatively:

Specification of topics (Q3)

- emerging technologies: global future raw material demand
- intermediate products (e.g. glass fibre, carbon fibre, resins)
- minor metals / alloying elements (material flows, recycling rates, life cycle analysis)

Emerging key questions and topics relevant to the industry associations by 2020 include:

Members (Q4a)	Key external stakeholders (Q4b)
<ul style="list-style-type: none"> • life cycle analysis (LCA) • detailed information on the different recycling streams • class 7 (radioactive material) port and shipping requirements 	<ul style="list-style-type: none"> • innovation • conflict mineral due diligence

Summary: The Industry Survey has reached the strategic management of industry associations covering large parts of the value chain from material processing to recycling. Industry associations broadly emphasize the strategic relevance of trade and environmental policies and regulations. The need for improving access to specific raw material information as well as support responding to specific information needs is seen depending on the industry associations' positions in the value chain. Frequently mentioned topics of interest include material price development, raw material processing industry plants and structure, supply chains and regional industry clusters, stocks and flows of secondary resources, and technologies (e.g. agile re-manufacturing). The industry associations' members and key external stakeholders increasingly ask for life cycle analyses, recycling streams, innovations and conflict mineral due diligence.

3.1.4 Further analysis of survey data

The three surveys contain questions and topics that were posed to several different target groups. We have aggregated these responses to look for additional patterns in raw material needs which are presented below.

Four Current Strategic Issues (Q1) are shared by the EGS Survey (n=26) and by the Industry Survey (n=10). While *competitiveness*, *price volatility* and the *circular economy* are considered 'important' or 'very important' by 16-18 respondents, the *Sustainable Development Goals* (SDGs) stand out in combining 16 votes 'very important' compared to 8-10 respective votes for the other three strategic issues. The aggregate analysis of Future Strategic Issues (Q5) does not reveal significant new insights.

The EGS Survey (n=26) and EFG Survey (n=59) participants were both asked to select three out of nine technical requirements to the envisaged MICA Online Platform (Q6). The *data selection opportunities* (n=50) and *free download of tools* (n=46) were quoted most often. 69 % of EGS Survey respondents count *usability* among the most important technical requirements compared to 23 % of the EFG Survey respondents only. Response patterns are almost reversed for *methodological*

Deliverable D2.2

guidance, the EGS Survey respondents accounting for 23 % and the EFG Survey respondents for 48 %.

While the professional geologists, addressed as practitioners, were asked how often they consult existing information platforms (EFG survey), geological surveys (EGS Survey) and industry associations (Industry Survey), addressed as strategic institutions, were asked to assess the platform's usefulness (Q2).¹³

- A clear majority of EGS Survey respondents finds a number of platforms *useful* or *very useful*, in particular Minerals4EU (n=25), national platforms (n=24), EGD I (n=22) and EuroGeoSource (n=22). On the other hand, several platforms are less known: IRP Global Metal Flows (by n=12), CRM_InnoNet (by n=11) and the Raw Material Information System of JRC (by n=10).
- EFG Survey respondents tend not to use the suggested platforms *daily to weekly*. Adding *monthly to quarterly* usage of platforms brings national (n=31) and regional (n=20) platforms to the fore. Minerals4EU (n=25), EGD I (n=19), CRM_InnoNet (n=17) and the Raw Material Information System of JRC (n=16) show a tendency to be consulted at least quarterly.
- More than half of the Industry Survey respondents finds the CRM_InnoNet and INTRAW platforms *useful* or *very useful* (n=6 each), the remaining respondents (n=4) don't know the platforms.

EGS Survey and EFG Survey respondents both appreciate a number of geological platforms such as Minerals4EU, EGD I and national platforms. While the JRC's Raw Material Information System is often used by the EFG Survey respondents, it is largely unknown to EGS Survey respondents. On the other hand, CRM_InnoNet is often used by the mostly professional users of the EFG Survey and of the Industry Survey.

One can explore what has been assessed as 'improve access' and/or 'support responding' problems by the respondents (Q3). All in all it can be stated, that respondents mostly wanted 'both, improve access and support responding'.

- Mineral Deposits: 'Improve access' alone is a need for roughly a quarter to a third of EGS Survey and EFG Survey respondents taken together (n=85). Throughout all topics, EFG respondents state more frequently that they need better access to mineral deposit information than EGS Survey respondents. 'Both, improve access and support responding' is more often an issue of EGS respondents than for EFG respondents.
- Mine Development and Mining: 'Improve access' alone is a need for roughly a quarter to almost half of EFG Survey respondents (n=59). *Land use constraints, financing options for mining ventures, mining operations, existing and planned mining ventures and licensing procedures* all account for more than one third of respondents specifying 'improve access' alone. 'Both, improve access and support responding' are all between a quarter and a third of respondents needs.

¹³ The composition of the respondent structures shows that this distinction is not so easy to make. 18 out of 36 respondents of the EGS Survey and Industry Survey see themselves as *strategic management*. The same item was not collected in the EFG Survey.

Deliverable D2.2

- **Anthropogenic Stocks and Recycling:** ‘Improve access’ alone is a need for roughly a sixth to a third of EGS Survey, EFG Survey and Industry Survey respondents taken together (n=95). More than proportionately, EFG respondents state that they need better access to information for all topics, except *abandoned mining sites for future land use* which is rather an issue for EGS Survey respondents. Again, ‘both, improve access and support responding’ is more often an issue of EGS respondents than for EFG respondents.
- **Raw Material Supply and Demand:** ‘Improve access’ alone is a need for roughly a fifth to a third of EGS Survey and Industry Survey respondents taken together (n=36). ‘Both, improve access and support responding’ exceeds 50 % for *demand trends, supply trends and future criticality*. Industry Survey figures are too low to single out proportionalities in relation to the EGS Survey.

Finally, we can compare these insights into raw material information needs (Q3) to what the platforms, including project-related websites, (Q2) have to offer:

- Mineral Deposit information is mainly provided by EGDI, EuroGeosource, EURare, Minerals4EU, Minventory (also INTRAW, IRP WG Metals, ProMine, RMIS);
- Mine Development and Mining information is mainly provided by EO-Miners, i2Mine, INTRAW, Minerals4EU, ProMine (also EIT KIC, Minventory, RMIS);
- Anthropogenic Stocks and Recycling information is mainly provided by Minventory, ProSUM, IRP WG Metals (also EIT KIC, INTRAW);
- Raw Material Supply and Demand information is mainly provided by CRM_InnoNet, EIT KIC, RMIS (also EURare, INTRAW, IRP WG Metals, and others¹⁴).

Matching the services of these existing platforms with the improvements needs of the survey respondents leads to the following assessments:

Mineral Deposits: EGS Survey and EFG Survey respondents find especially the Minerals4EU, EGDI and national platforms useful or use them frequently. Also EuroGeosource, EURare, INTRAW, Minventory and ProMine are widely known. The lesser known IRP WG Metals and RMIS could fill in – at most – specific raw material information gaps. It can be concluded, that EGS Survey and EFG Survey respondents need additional information on minerals deposits that is not contained in these platforms.

Mine Development and Mining: A significant share of EFG Survey respondents does not use at all the platforms suggested. More than 50 % do not use EO-Miners, i2Mine, INTRAW, IRP WG Metals and commercial platforms and more than 40 % do not use EuroGeoSource, CRM_InnoNet, EGDI, EURare, ProMine and RMIS. In combination with the high level of ‘improve access’ needs that the EFG respondents stated, one can conclude first, that professional geologists do not exploit what is already there and that they need smarter and faster gateways to get what they need.

¹⁴ For example, the Minerals4EU platform provides on the one hand comprehensive data inventories on raw material supply, and on the other hand a report (Foresight Study – Thematic Report V: Developments on the raw material markets) containing demand information for few selected raw materials.

Deliverable D2.2

Anthropogenic Stocks and Recycling: Almost a third of EGS Survey and Industry Survey respondents do not know the Minventory, EIT-KIC and INTRAW platforms. The IRP WG Metals platform is unknown by more than 40 %. At the same time, 35.6 % of EFG respondents do not use the Minventory platform at all. Given the mixed picture with regard to ‘improve access’ needs, those who need platform support in the realm of anthropogenic stocks and recycling may already draw upon it, though not receiving information in the quality needed. The Urban Mine Knowledge Data Platform is currently under development within the ProSUM project, so that for End-of-Life Vehicles (ELV), Waste of Electrical and Electronic Equipment (WEEE), including batteries, and mining wastes the information situation might improve.

Raw Material Supply and Demand: The most relevant platforms linking raw material supply and demand, CRM_InnoNet, RMIS and IRP WG Metals, count among the least known ones to the EGS Survey and Industry Survey respondents. The situation is slightly better for EIT KIC, EURare and INTRAW which also host a lot of other information. The raw material information needs related to *demand trends, supply trends and future criticality* could be met to some extent already, but additional future-related information on these topics is required.

3.2 Stakeholder Workshop

The Stakeholder Workshop took place on 27 September 2016 (10.00-16.00) at the Eurometaux’s premises in Brussels. It gathered 25 different stakeholders in mineral intelligence both involved in and affected by the MICA project.¹⁵ After an introduction of the project and of the envisaged MICA Online Platform the first phase of the multi-Stakeholder Workshop presented and discussed the Stakeholder Report (D2.1) and the interim findings of the stakeholder needs appraisal in plenary. The second phase of the multi-Stakeholder Workshop elicited stakeholder needs in four focus groups, gathered individual stakeholder needs in other domains and reflected the findings in plenary. The agenda and list of participants are provided in Annex 6.2.

The four focus groups were built by four different communities reflecting four raw material knowledge domains:

- Mineral Deposit Community (D1)
- Mine Development and Mining Community (D2)¹⁶
- Anthropogenic Stocks and Recycling Community (D3)¹⁷
- Material Production and Manufacturing Community (D4)¹⁸

Each focus group was hosted by a table moderator and informed by a synopsis of topics and questions expressing stakeholder needs gathered so far (see Appendix 4, page 117)). The focus groups were given the task (1) to specify existing raw material information needs and (2) to raise novel raw material information needs.

¹⁵ The stakeholder workshop shared the beginning (the introduction of the project and of the envisaged MICA Online Platform) and the end (the synthesis of workshop findings) with the parallel Expert Workshop of MICA WP 4 on methods.

¹⁶ later labeled Mining Community

¹⁷ later labeled Urban Mining Community

¹⁸ later labeled Materials Community

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An additional opportunity was provided to raise raw material information needs individually and anonymously on four further knowledge domains:

- Raw Material Supply and Demand/Criticality (D5)
- Political and Legal Framework (D6)
- Environment and Health (D7)
- Social Accountability and Reporting (D8)

The moderators of the four focus groups reported the key findings in plenary that were then discussed as a whole.

3.2.1 Minerals Deposit Community

The Mineral Deposit Community included geological surveys at EU, member-state and non-European country level as well as geological data infrastructure representatives.

Major refinements and additions include:

Minerals Deposit Community

Questions:

- when will a certain resource be profitable to extract from this deposit?
- who is in charge for: how much building material is available locally for a certain construction project (sand, limestone, etc.)?

Topics:

- land use information, resource information and exploration information (academic, industry, public, etc.)
- information on by-products in known deposits
- information to fill the vacuum between final raw material consumption and secondary raw materials amounts

The focus group emphasized the double-edged position of geological surveys: both as producers and consumers of mineral deposit information (or at least mineral occurrences) and of historical information, and geological surveys are responsible for geographical referencing and integration.

3.2.2 Mining Community

The Mining Community, including mine development, comprised intelligence platform promoters & operators, professional associations, geological surveys as well as consultants. The discussion referred to a large extent to the questions already provided.

Major refinements and additions include:

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Mining Community

Questions:

- where are the sites? (disaggregated data)
- what are the inhibiting factors and risks to a mining venture?

Topics:

- overall cost of bringing a commodity to a user
- case studies of mining venture successes and failures
- facts sheets on how to approach financing case studies
- facts sheets on how to approach permitting case studies

In particular, the focus group suggested to spell out what the MICA Online Platform should be able to do and what it cannot do; for example it cannot provide details on confidential commercial costs or political stability information, but MICA may provide hints how to get the best information available.

3.2.3 Urban Mining Community

The Urban Mining Community, dealing with anthropogenic stocks, flows and recycling, included recycling and material recovery industry, sustainable industry, geological surveys active in tailings and recycling as well as representatives from applied sustainability research institutes. Buildings, WEEE, ELV, and mining wastes and tailings were discussed.

Major refinements and additions include:

Urban Mining Community

Questions:

- who provides registers of waste data?
- how can people be stimulated to contribute to a Circular Economy (lifestyles, nudging, regional differences)?

Topics:

- overview on/link to existing data bases and projects (ProSUM, CWIT, etc.)
- information about what is put on the market per region annually, including trade in semi-finished products' material content
- information about current product composition and inventory of stocks (in particular buildings)
- information about use time/life time
- information about fate and flows at End of Life (EoL), incl. exports/cross-border shipments
- overview of existing collection and recycling standards/certification schemes in different countries for specific waste streams (incl. unregulated markets)¹⁹
- categorizations of wastes and semi-finished products
- recycling efficiency, including losses

While today's mineral deposits (geological mine) have been built over the long history of the earth, anthropogenic stocks (urban mine) are fed by dynamically changing material inputs. Stocks and flows at each stage in the economy need to be characterized by its amount and composition

¹⁹ A company already looked into it.

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(e.g. physical and chemical properties; valuable, hazardous/toxic²⁰ and stream-contaminating content). Meta-information needs to be provided such as data accuracy (e.g. correctness, liability, guesstimates, how sourced?), granularity (at sub-national level, sectoral level), and being up to date (when sourced?).

3.2.4 Materials Community

The Materials Community, i.e. conversion of raw materials into materials for manufacturing, included industrial minerals and chemicals industry, manufacturing industry, technology platforms as well as representatives from universities.

Major refinements and additions include:

Materials Community

Questions:

- What materials are in what condition in what stock and in what region? (make use of digitalization such as data gathered by widespread sensors and Google Street View)
- What are global supply chains and who are the stakeholders involved?
- Do I deal with a critical raw material?

Information needs:

- alternative materials data (chemical, mechanical, cost, availability, new regulations, environment, health and safety (EHS), etc.)
- opportunities for secondary material use throughout the value chain

This focus group concluded, that MICA can't tell what a secure, responsible and sustainable supply chain is. It should provide information that is sufficient to make one's own opinion or direct to others' assessments (e.g. lists of critical raw materials). MICA should direct to trustable data only. Making use of digitalization to map the urban mine may involve privacy issues.

3.2.5 Statements on other topics

In the Open Space phase participants chose out of the four knowledge domains not treated in focus groups and attached their respective raw material information needs.

Two major questions each are extracted below:

²⁰ There are sufficient databases only looking into hazardous/toxic substances.

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Raw Material Supply and Demand/Criticality <ul style="list-style-type: none"> • are appliance makers right that any shortage will be met by substitutes? • how could a dynamic criticality measurement system look like that is simple and easily repeated? 	Political and Legal Framework <ul style="list-style-type: none"> • what repair/remanufacture/reuse legislation is in place? • how good is the level of legal enforcement in different countries/regions?
Environment and Health <ul style="list-style-type: none"> • what are the Technology Readiness Levels (TRLs) of recycling technology for new/emerging materials? • how reliable are data in existing LCA databases? 	Social Accountability and Reporting <ul style="list-style-type: none"> • where does the material come from? (transparent supply chain data including social and ethical information) • which suppliers are certified? (e.g. conflict mineral scheme)

3.2.6 Summary

The Stakeholder Workshop enabled the raw material information needs to be sharpened and has brought a number of additional aspects to the fore. Major amendments generated by the four focus groups are related to actors in charge of local raw material availability and waste registers, links to existing data bases and projects, information about by-products, inventory and composition of stocks, mining venture sites, profitability and risks, supply chains/value chains, material fate between primary production and its secondary production, and properties of alternative materials for the design stage.

The discussion emphasized that MICA should make clear what kind of information users of the MICA Online Platform can expect to avoid that the answer might be frustrating. The parallel Expert Workshop of MICA WP4 on methods found that a word in a question can change everything with regard to methodological guidance. There was dissent whether to use existing waste classifications (e.g. the WEEE Forum's disaggregation into products, components and materials: 10 categories and 54 codes) or to build other, e.g. lifestyle/activity-related classifications. Discussions revealed that consumer-oriented and investment perspectives could add significant value to the empirical needs appraisal. The mapping of all the ongoing and past activities in raw material intelligence was seen of great value.

3.3 Interviews

20 interviews explore raw material information needs in depth. Most interviews were conducted via telephone, one interviewee instantly referred to a written document expressing the raw material information needs of its affiliation, one person attended a conference to report her impressions on raw material information needs and two stakeholders submitted a written statement to our questions.

Roughly half of the interviews were conducted before and thus informed the Stakeholder Workshop. The other half of the interviews picked up recommendations along with the Stakeholder Workshop, the Second AB Meeting and the Second Consortium Meeting to fill in perceived gaps in the mapping of stakeholder needs.

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Four clusters of interview statements were built: investment, supply chain/value chain, raw materials in society, and urban mining and cities. Some interviewees belong to several affiliations. Salient statements are extracted and displayed in an integrated way.

3.3.1 Investment Cluster

The Investment Cluster combines individual statements of people attached to a consultancy advising potential investors on mining ventures, a public investment bank, a development association, a ministry of mineral resources and a national geological survey. The focus of the interviewees is on the financing mainly of exploration and mining ventures.

Raw material information needs raised by the interviewees of the Investment Cluster include:

Investment Cluster

Exploration:

- willingness to invest in exploration in different countries/areas
- radar for Greenfield/ Brownfield exploration projects (incl. contact data of persons, progress level, regulation in different areas/countries in particular when radioactivity is involved (shipment regulation, foreign affairs, vicinity of a town, etc.)

Feasibility:

- availability and economic costs of production factors: infrastructure and local service providers (e.g. power supply, water supply, transport), local work force, fee systems and financial burdens to investors in a country/area
- duration of the procedures for obtaining a license (prospection, exploration, research, mining) in different countries/areas
- government demands for processing the exploited raw materials within its own territory in other countries/areas
- commodity prices: 10-year forecasts (range, assumptions)/future supply and demand 'projections' labeling should be criticized, because they are in fact scenarios
- environmental risk assessment: scope of environmental impact assessment (EIA) reporting and modes of their approval in a country/area, presence of Green parties
- social risk assessment: level of social acceptance (around a siting area, country-level)

Mining:

- how does the industry work? mechanisms between investment in exploration, bringing a project to a point of exploitation and profit distribution
- technology development (exploration, mining, use)
- the amount that is estimated to be left from a specific raw material in the origin source
- financial models for regeneration of mining areas (up-front payments, insurance, etc.) in different countries/areas

Urban mining:

- capital demand and allocation for a circular economy (recycling, resource efficiency)

It is important to get independent, high quality information; if no such information is available this is also important to know.

Deliverable D2.2

3.3.2 Supply Chain/Value Chain Cluster

The Supply Chain/Value Chain Cluster combines the individual statements of people attached to a range of industry associations, a public research institute, a consultancy advising on material processing and a technology platform. The focus of the interviewees is on viewing raw materials from a demand perspective.

Emerging information needs in the Supply Chain/Value Chain cluster include:

Supply Chain/Value Chain Cluster

Trade:

- trade flows: up to metals, stockpiling (at the border), changes in trade flows due to changes in ownership of mines, who are the importers of conflict minerals?
- trade incentives and disincentives: tariffs, restrictions (perceived by the OECD database on export restrictions, EU Trade Commission or developing countries, e.g. EU trade barriers) and subsidies
- trade defense cases (collection), compliance of conflict minerals importers with regulations
- fair playing field for international trade; Is trade fair or not fair for the materials a designer want to use?

Materials/Design:

- frugal design (development of simplified products as is currently done for the developing world): lower cost and longer durability versus lower performance
- eco-design, labelling, etc., are gaining importance in the society
- recyclability information

Trace the creation of value/ assess sustainability through the economy:

- security-of-supply, including critical raw materials, as well as conflict minerals are increasingly important at the EU, member state, sector, and specific company levels
- understand supply chains (e.g. of conflict minerals, MICA might be a good gateway to the trade associations), monitoring and analyses of security and sustainability of supply of raw materials, what are the biggest producers? what are the biggest consumer applications?
- link between raw material and end-product: manufacturing steps up to the final product are an issue for alloying metals/minor metals/small sectors; statistical loss of alloying metals/minor metals
- information relevant for the poorly recorded recycling rate of alloying metals/minor metals
- contribution of raw materials in general and alloying metals/minor metals/small sectors in particular to the economy (jobs and growth, etc.), circular economy and sustainability
- repository of LCA data and LCA studies, assessment of their methodological leeway, sustainability assessments of raw materials (economic, social, environmental)

Regulation:

- new regulation and monitoring of implementation/enforcement in different countries/areas
- policy-support needs for the monitoring and analyses of security and sustainability of supply of raw materials (incl. consequential analyses related to scenarios for critical raw materials)
- how does a decision to restrict a material (e.g. REACH) affect the industry using that material?
- how does the Emission Trading Scheme (ETS) affect different commodities?

There is a need for independent data sources at global scale, but disaggregated as much as possible. A cross-cutting need is to get links to policies and ongoing projects (H2020, Tender, EIT KIC Raw Materials) and activities/initiatives (Raw Materials Policy, etc.).

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3.3.3 Raw Materials in Society Cluster

The Raw Materials in Society Cluster combines the individual statements of people attached to a trade union, a consumer organisation, a prosumer organisation (consumers also acting as producers), a transparency and accountability initiative, an environmental NGO and a secondary school teacher. The focus of the interviewees is on social accountability of the raw material sector and empowerment of civil society on raw material related issues.

The raw material information needs gathered include:

Raw Materials in Society Cluster

Corporate information (primary supply):

- mining companies: including corporate policies, managers, shareholders, networks
- financial information stripped down to regions or countries: data on revenue, other financial information
- social information: safety and social policies and practices, associated to time series and when relevant to GIS
- biodiversity information: broader ecosystem impacts, people's displacement, groundwater, tailings disposal

Sector information (primary supply):

- drivers of change affecting the mining sector
- process information (mining, milling, consumer product manufacturing, etc.)
- technological impacts on mining (soft data on automation, 4.0 industrial revolution)
- skill needs
- global trends in safety

Emerging issues for civil society organisations (primary supply):

- reduction of Greenfield sites: urban mining, restrictions of access to raw materials (definition of "No Go!" areas: competing land uses)
- infrastructure development for mining of low value, high volume commodities
- divestment from problematic minerals to strategic minerals and minerals relevant for sustainable technologies
- biodiversity mitigation hierarchy to be applied to new investments (more transparent and inclusive)
- what constitutes a fairer, more equitable distribution of benefits? what is in it for a certain stakeholder group? greater retention of value in resource rich countries through beneficiation
- conflict minerals: certification of material mined in conflict-affected regions to incentivise change instead of problem shifting; supply chain due diligence - feedback to sourcing and transport of raw materials
- baseline data to inform strategic planning: real-time; overview and zoom-in functionality - stakeholder analysis, geopolitical analysis, situation analysis; identify hot spots where resources have to be mobilized (in the sense of civil society activism)
- professionals with knowledge and experience to act as auditors of responsible mining standards
- black-lists of mining etc. companies that do not comply with environmental and social standards (i.e. comprehensive coverage of labor and living conditions: child labor, safety, death rates, conflict minerals, environmental damage doing harm to citizens (e.g. fishing), fair trade raw materials and products)

Material/design and procurement information:

- material composition of consumer products (e.g. REE content in mobile phones; what materials

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does a mobile phone contain? (navigation: mobile phone - battery - element - sources/origin - social and environmental impacts - ...)

- databases on materials with functional alternatives: material properties, costs, EHS properties (health, biodegradability, recyclability, environment, energy), renewability
- how can a prosumer ensure that the materials processed do not involve child labor or stir conflicts? Is there an option to procure fairly produced raw materials? if yes: contact data of traders/consumer consulting in this regard; what do I have to consider?
- color-coded Bill of Materials (BOM) for prototypes' material content: green - social and environmental friendly material available, yellow – alternatives' properties unknown, red - no alternatives available)
- waste-hierarchy oriented eco-design for prosumers, facilitate repair and reuse by provisions in the design (like easy dismantling or modular design), limits to repair and upcycling
- small recommendations/hand-outs for designers, innovators, makers, social businesses, small companies; which fair material is available? what do I have to do?
- buy new products: refer to independent product tests, energy efficiency classes, longevity tests, life cycle costing, resource savings, what do I need to have in mind to buy products that are recyclable?
- buy used products: buy second hand, donate used products to serious collectors, save money

Circular Economy:

- avoidance in terms of materials/waste (non-extraction), planned/programmed obsolescence, impacts of limited lifetime on raw materials/waste
- which wastes are generated in open workshops? qualitative and quantitatively; e.g. accumulation of 3D misprints & printing scrap, what is the environmentally optimal recycling path for waste generated in open workshops?
- when does it make sense to recycle processed or EoL-material locally? support of decentralized availability of recycling machines, smaller and more local material cycles; ecological break even points of recycling

3.3.4 Urban Mining and Cities Cluster

The Urban Mining and Cities Cluster combines the individual statements of people attached to a material recovery company, city associations and an environmental agency. The focus of the interviewees is on raw material information needs related to stocks and flows of materials in the technosphere.

Raw material information needs raised by the interviewees of the Urban Mining and Cities Cluster include:

Urban Mining and Cities Cluster

Procurement:

- green public procurement, sustainable procurement: work with cities drafting the technical specifications of products that contain critical raw materials and materials, local application of procurement guidelines

Waste management and recycling practices

- good waste management practices in cities (data base)
- innovative waste management and technologies in cities (data base)
- local, regional and national legislation on waste management and recycling (data base)

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- quality characteristics of the composition of secondary materials to coordinate demand and supply of recycled materials (data base)
- quality standards for secondary resources preventing use of secondary materials (e.g. primary concrete lobby)/no uniform standard across countries
- transboundary movements/waste trade (classification as hazardous to protect local industry, EU member-state classification systems, make it easier, harmonisation of product classifications (EU projects: North Sea Resources Roundabout, EU Innovation Deals),
- fast lane procedure to certified recyclers

Urban metabolism

- Material Flow Analysis (MFA) of cities to trace hazardous substances, critical materials and raw materials
- product and material compositions, e.g. critical material content in compounds, compound content in products, hazardous substance content in materials that hinder recycling (database)
- Estimates of (critical) raw materials in urban stocks and when they become available for the secondary market
- to what degree are we already circular? virgin material and waste statistics do not correspond, different metrics to measure a circular economy

Environmental assessment:

- CRMs and the environment: environmental criticality, environmental impact of CRMs, CRMs for environmental technology
- cradle-to-gate environmental impacts of materials (database)
- LCA of products and services accounting for repair, reuse and recycling
- environmental benefits from recycling compared to virgin material: known for aluminum, but very interesting for many other materials
- eco-design, refurbishing without melting it down: priority over substance recycling

Circular Economy

- options for local slag use: value of 5 €/t does not allow for transport
- economies of scale: capital intensive recycling plants need input from a large radius
- explore how regional and local actors (e.g. by creating and closing local value chains) can take an active role to achieve the vision of a circular economy model

3.3.5 Summary

The interviews have explored raw material information needs in depth. Interviewees interested in investment topics asked for area/country comparisons of exploration projects, propensities to invest, availabilities and costs of production factors and financial models for regeneration of mining sites. Supply chain/value chain information needs of the interviewees include trade-related, material/design-related, transparency and sustainability issues. A number of NGOs, consumer organisations, trade unions, environmental NGOs and transparency & democracy NGOs, share the need for transparent information of corporate actors/networks but differ with regard to the part of the value chain they are engaged in. Civil society actors wish to be on an equal level on raw material information with private and public sector actors through better access to such raw material information. The interviews on urban mining and cities specified the information needs with regard to stocks and flows, best waste management practices and actors in detail.

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4. Reflection and outlook

The empirical appraisal of needs and requirements related to RMI lead to a heterogeneous picture of a broad range of stakeholders' positions. These positions are captured in this Stakeholder Needs Report and a related spreadsheet file mainly in order to revise the Main Ontology of the envisaged MICA Online Platform. After a critical reflection of what has been achieved, major avenues for redesigning the Main Ontology are sketched.

4.1 Critical reflection

In this section, we review the coverage of stakeholders in the empirical appraisal, reflect nature and limitations of what we got as stakeholder positions, and discuss the effort related to the results of the different means employed to gather stakeholder needs.

4.1.1 Coverage of stakeholders

The aim was to reach mainly definitive, dominant and dependent stakeholders. Discretionary and demanding stakeholders could be considered when they showed up in the needs appraisal, and dormant stakeholders were treated in a case by case assessment.

Figure 4 provides an overview to which degree and how the stakeholders were reached.

Of the **definitive stakeholders**, geological surveys, professional organisations, material & extraction industry, materials production industry (construction material, metals, industrial minerals and chemicals), recycling & material recovery industry as well as (other) public research institutes and ministries of education & research all are reached through surveys and/or additionally the stakeholder workshop or interviews. Other definitive stakeholders' positions are accounted for extensively through AB and Project Consortium Meetings (a), EIP OG (b) and Deliverable 2.1 Stakeholder Report (c), which maps stakeholder needs depicted from documents (cf. also Figure 1).

Key **dominant stakeholders** such as the mechanical, electric & electronic and transport equipment industry, infrastructure industry, demolition, waste collection & management industry and governments were reached through the surveys directly. Competence clusters' and technology platforms' needs are gathered through interviews and the stakeholder workshop respectively. Professional education & training organisations are considered to be sufficiently covered through the professional associations' EFG Survey (geology) and ISIE membership (industrial ecology) of a MICA WP2 participant.

The mobilization of **dependent stakeholders** required substantial efforts. While the bio-based industry showed up in the form of one workshop participant and one survey respondent only, consultancies & planning offices' needs and requirements are collected through interviews and the stakeholder workshop. An extensive interview series captured the positions of an environmental agency, city organisations, CSOs and NGOs (transparency & democracy NGO, environmental

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NGO, trade union, consumer organisation)²¹ and prosumer communities. All were invited to the stakeholder workshop, but did not show up. Likewise responsible STI initiatives, repair & maintenance industry, waste treatment & disposal industry and parliaments did not respond to our invitations.

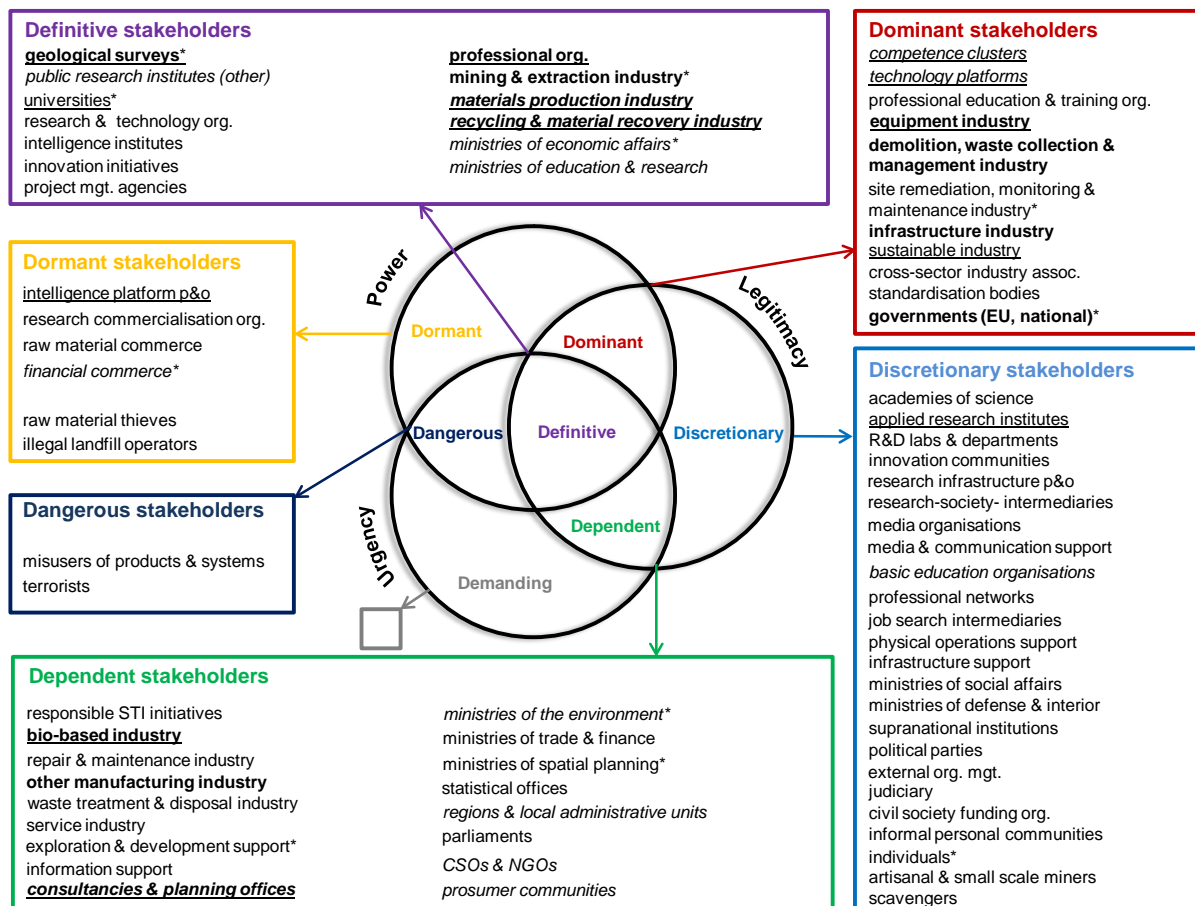


Figure 4: 90 stakeholder groups and how they were treated. It distinguishes the surveys (in bold), the stakeholder workshop (underlined) and the interviews (in italics). Indirect appraisal in the surveys is marked with an asterisk (*). Other ways of stakeholder need consideration include Advisory Board and Project Consortium Meetings (a), EIP OG (b) and Deliverable 2.1 Stakeholder Report (c), which maps stakeholder needs depicted from documents. The rationale for not treating some stakeholder groups is provided in the main text.

Given these difficulties in acquisition of dependent stakeholders, we also refrained from inviting the service industry (e.g. tourism industry affected by offshore mining), cross-sector industry associations, standardization organisations and ministries of trade & finance because activation of these stakeholders for the MICA project's purposes is expected to be extremely difficult.

²¹ Development aid & relief CSOs', social welfare CSOs' and human rights NGOs' needs are believed to be largely covered by the umbrella transparency & democracy NGO interviewed. World view organisations and other special interest groups are very unspecific and thus not considered.

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Information support organisations and statistical offices were not invited as their purposes are rather instrumental than having raw material intelligence needs in itself.

In addition to the direct involvement of dependent stakeholders, we gathered stakeholder needs indirectly through the surveys, in particular of exploration & development support organisations and ministries of spatial planning.

Dormant stakeholders were involved on a case by case assessment. Intelligence platform providers & operators contributed to the workshop. While interviews with investors and banks tapped into financial commerce issues, the raw material commerce stakeholders were invited but not responding. However, their positions are presumably covered to a significant extent through interviews with trade associations.

Discretionary stakeholders' positions include the workshop participation of an applied sustainability institute and an interview with a secondary education affiliation.

Dangerous and/or **urgent stakeholders** did not show up during the empirical needs appraisal.

The second AB Meeting counted industry (including SMEs), NGOs, EU policy makers and – to a lesser extent education and research – among the main potential users of the MICA Online Platform.

⇒ The empirical needs appraisal **reached stakeholders in RMI systematically and in large breadth**, despite its shortcomings here and there.

4.1.2 Methodological implications

The composition of various methods in the appraisal of raw material related needs has generated diverse information types of different quality. It was attempted to treat any of these statements as a legitimate claim in RMI. Therefore we refrain from judging and weighting of the bits and pieces. As any project, the MICA project is limited in its financial and human resources restricting the amount of work that can be actually done to identify and assess raw material information needs. Under these restrictions, the choices made deserve particular attention.

All in all, we are of the opinion that the picture of raw material needs and requirements is very comprehensive, but far from complete or perfect. Due to the other MICA Work Packages' information needs, the three surveys, the stakeholder workshop planning and the interview phase all fell into summer time, causing difficulties in reaching the right people for the right purpose at the right time. The broad scope of MICA made approaching stakeholders a perpetual challenge, because they filter their world according to their focused remits. All people could only be addressed through targeted information in making use of the broad knowledge and contact networks of the MICA WP2 partners.

We strived for a high transparency of stakeholder choices. The commitment to engage was high for the definitive and dominant stakeholder groups, while dependent stakeholders were not

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reached to the same extent. However, we conducted a series of interviews particularly with dependent stakeholders which explored their raw material related information needs in depth. The effort for the empirical appraisals can be mirrored against other means to leverage stakeholders and their needs. The quick and easy World Café has identified the majority of stakeholder groups already, however without gathering their stakes. The desk research done in the Stakeholder Mapping Report (D2.1) uncovered a lot of stakes that are already addressed in other arenas such as R&I programmes and consultations. Only the empirical appraisal is really suitable to identify emerging issues and to actually explore stakeholder needs. The surveys have added broad legitimacy for topics to be considered, the stakeholder workshop has delivered a focused perspective of diverse stakeholders and the interviews have given depth to the analysis of needs and requirements of particular stakeholders related to raw materials.

⇒ Taking into account the methodological approach and the research restrictions, the entire picture of needs and requirements related to RMI is considered **sufficiently diverse and comprehensive**.

4.2 Avenues for redesigning the MICA Ontology

As an outlook, avenues for redesigning the MICA Ontology in its version of 29 July 2016 are suggested. We can distinguish specification needs ('s'), expansion needs ('e') and clarification needs ('c'). Ten hypotheses point at major avenues for a further development of the MICA Ontology.

1. Differentiate existing concepts according to stakeholders' perceptions of the raw material field (s)

The material gathered gives hints as to how stakeholders see the raw material field. In particular the current and future strategic issues explored in two surveys may frame their perceptions in the coming years. In addition, a number of concepts can be rephrased, reframed and refined according to the manifold contributions.

2. Consider stakeholders' needs for navigating the numerous raw-material related actors, initiatives and projects at EU and other levels (c)

A frequently reoccurring need is to browse through all the raw-material related actors, initiatives and projects, in particular at EU level. Stakeholder engaged in policy-making at EU level would benefit from such a navigation opportunity. This perspective could be either integrated into the thematically structured Main Ontology, or be enabled through a separate entry point.

3. Assist tracing material fates between virgin raw materials and waste statistics (s)

The economic statistics start with primary raw materials and end with secondary raw materials, both singled out in their material form. Across a broad range of stakeholders (governments, industry, NGOs, research), there is a need to trace and map the material content (stocks and flows), up the value chain to consumption (concealed in intermediates, products) and down to recycling (concealed in historical stocks and waste). MICA could show the ways how to trace these material fates.

4. Account for technology/innovation (available/emerging) as a sub-concept of raw material related processes (c)

Here and there, stakeholders mention a need to be informed about available and emerging technologies/innovations. There is no salient need related to a particular part of the raw material

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domain, but the repeated emergence of technology/innovation information needs could point at a general requirement to the MICA Online Platform, which could be met by introduction of a sub-concept technology/innovation for raw material related processes.

5. Support supply chain/value chain analysis (s)

All kind of stakeholders would appreciate better access to information on supply chains and value chains. To date, stakeholders who can afford consultancies' reports and advice have to rely on their information, which is not validated through others. There is a clear need for a gateway to independent and reliable information that supports stakeholders in supply chain/value chain analysis up to the raw materials.

6. Introduce a material/design perspective on raw materials (e)

Raw materials are seen by designers or procurers from a demand perspective. In addition to material properties, a number of additional properties are gaining importance to foster secure, sustainable and responsible supply chains (e.g. EHS data, child labor). The moralization of material markets is also driven by prosuming communities (consumers also acting as producers), pioneering enterprises and ethical investment.

7. Assist stakeholders to find financial information on mining companies and networks (s)

Several dependent stakeholders ask for shedding light on company structures, financial flows, investments and revenue streams in particular on the primary raw material side and up the value chain to final product manufacturing. This need is motivated in the ambition to be at eye-level with the often professional actors in policy-making, agenda-setting and negotiations.

8. Account for trade as a well visible concept (e)

The issue of raw material trade pops up frequently, even without having approached raw material trading companies. Raw material trade includes the related physical and financial flows. As in the case of the material/design perspective on raw materials, downstream actors and societal actors perceive raw material from a demand perspective.

9. Sort out, if and how to address procurement, standards, skills, property issues and communication (c)

A number of themes brought up might be already embodied somewhere in the Main Ontology. It needs to be clarified whether the topics of procurement, standards, skills, property issues and communication shall be addressed at all; and if yes, if they should not be displayed better accessible to account for the several claims emanating from the empirical appraisal.

10. Provide orientation according to the Sustainable Development Goals (s)

Under the strategic issues, asked for in the surveys, the most often cited item as 'very important' is the Sustainable Development Goals (SDGs). They also emerged again and again in open questions. Setting the agenda for a broad range of governments worldwide, the categories provided by the SDGs may assist in restructuring the Main Ontology.

Deliverable D2.2

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6. Annex: Basic information and detailed results of the empirical appraisal activities

6.1 Surveys

Table 3 provides a comparative overview of the questions and tasks in the three surveys.

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Table 3: Comparative overview of the questions and tasks in the three surveys

EGS survey	EFG survey	Industry survey
How important are the following strategic issues for your geological survey? (very important, important, unimportant, I don't know)	Please let us know your opinion on EFG's media (I strongly agree, agree, disagree, strongly disagree, no opinion)	How important are the following strategic issues for your industry? (very important, important, unimportant, I don't know)
How useful are the following raw material information platforms for your geological survey? (very useful, useful, useless, I don't know)	How often do you use these raw material information platforms? (daily to weekly, monthly to quarterly, yearly or less frequent, not at all)	How useful are the following raw material information platforms for your industry? (very useful, useful, useless, I don't know)
Which of the two improvement options do you consider as particularly important to your work? (improve access, support responding, both, not relevant to our work) a) mineral deposits b) anthropogenic stocks c) raw material supply and demand d) other topics	Choose your needs for improvement of raw material information on the following themes (improve access, support responding, both, not relevant to our work) a) mineral deposits b) mine development & mining c) anthropogenic stocks and recycling d) other topics	For which topics do you need better access to raw material information and/or support by responding to your specific raw material information needs? (improve access, support responding, both, not relevant to our work) a) raw material supply and demand b) material production and manufacturing c) anthropogenic stocks and recycling d) other topics
Who are your key clients? Please sort the client groups by relevance to your geological survey's extent of work <ul style="list-style-type: none"> Please fill in up to 3 most urgent, emerging raw material information needs of your national/regional ministries Please fill in up to 3 most urgent, emerging raw material information needs of your other key client 	Who are your key clients? Please select up to 3 key clients of your work <ul style="list-style-type: none"> What are emerging questions raised by your key clients, which might influence your work significantly until 2020? 	<ul style="list-style-type: none"> Please fill in up to 3 emerging key raw material information needs of your members Please fill in up to 3 emerging key raw material information needs of your external stakeholders
How important are the following future developments for your geological survey by 2020? (very important, important, unimportant, I don't know)		How important are the following future developments for your industry by 2020? (very important, important, unimportant, I don't know)
What are your most important technical requirements to the envisaged MICA online platform? Please select up to 3 most important functional requirements.	Please select up to 3 most important requirements that could make you an actual user of the MICA online platform	

6.1.1 EGS Survey

Basic information

The EGS Survey took place between 22 June 2016 and 9 September 2016 using Questback's Enterprise Feedback Suite (EFS) online survey tool. The questionnaire was co-developed by Fraunhofer ISI, EGS and LNEG including several pretests. 41 EGS members, national and regional geological surveys were invited to participate. Out of these, 26 geological surveys responded (almost) completely. This yields a response rate of 63.4 %.

The respondents were asked to indicate the profile of their activity at the respective geological survey (Figure 5).

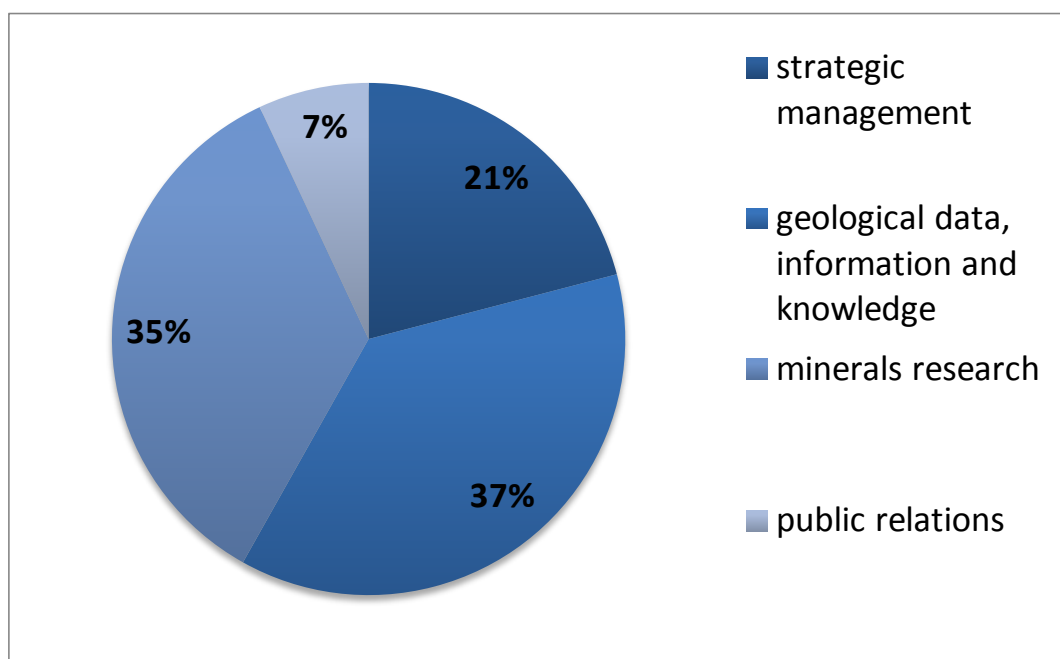


Figure 5: Distribution of occupancy profiles of the 26 respondents in the EGS Survey. Multiple answers were possible (n=43).

Only 9 out of 26 respondents assign themselves to the *strategic management*, whereas the most respondents' work profiles include *geological data, information and knowledge* (n=16) and *minerals research* (n=15). Thus, the original intention to reach the *strategic management* of geological surveys has been achieved to an extent lower than expected.

Results

The results were analyzed question by question. Taking into consideration the total response numbers we present the results graphically and in absolute numbers, and refrain from indicating percentages.

Deliverable D2.2

Q1 How important are the following current strategic issues for your geological survey?

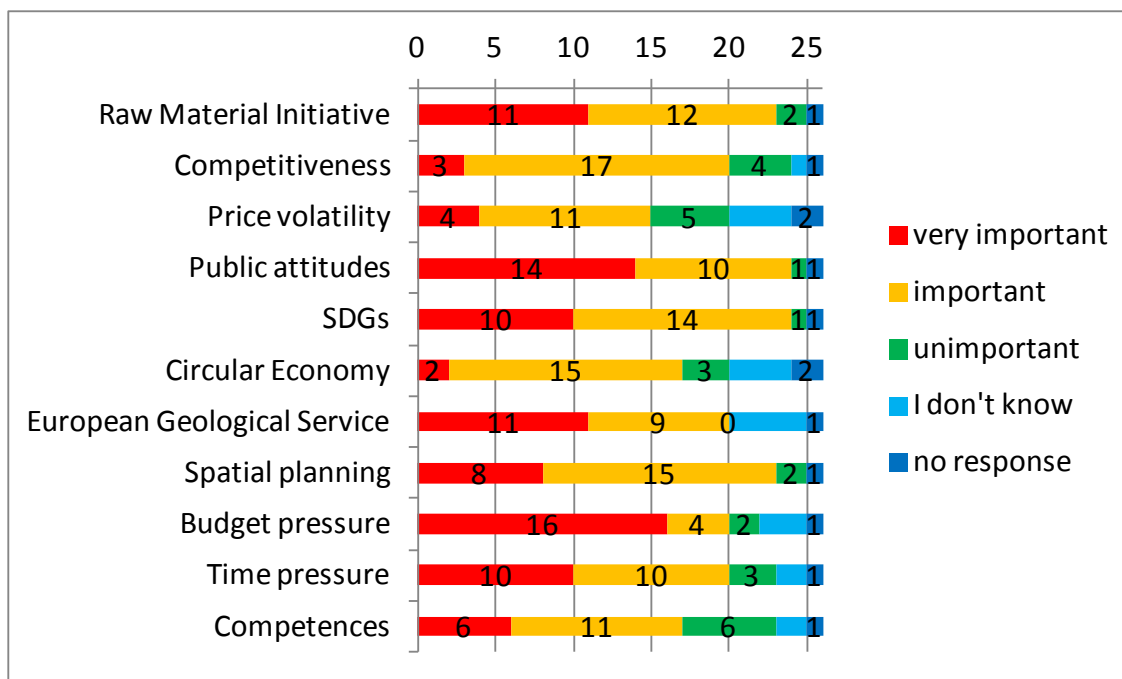


Figure 6: Importance of Current Strategic Issues for geological surveys (n=26). SDGs – Sustainable Development Goals. Items shortened (for original items: see Appendix I, page 88).

The suggested current strategic issues are widely approved by the respondents as 'important' or 'very important' (Figure 6). *Budget pressure* on the geological survey (n=16) and *public attitudes* towards exploration (n=14) are clearly seen most frequently as 'very important'.

Selected amendments:

- renewal of minerals resources experts
- development of geological information system and e-commerce

Deliverable D2.2

Q2 How useful are the following raw material information platforms for your geological survey?

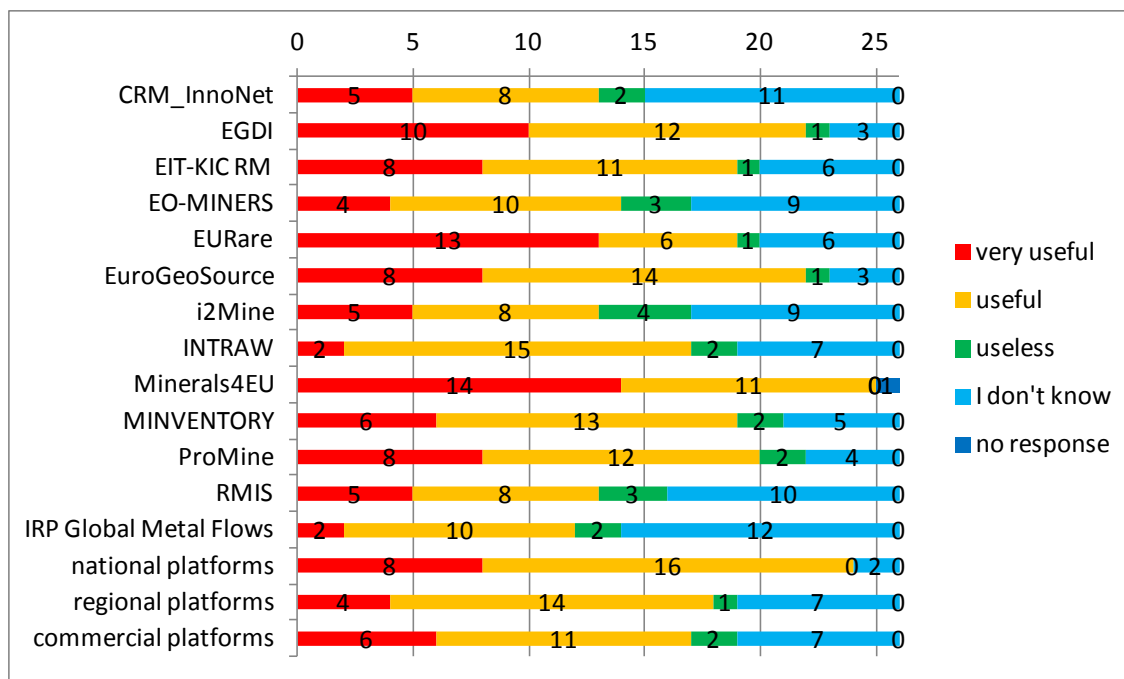


Figure 7: Usefulness of existing raw material information platforms for geological surveys (n=26). Items shortened (for original items: see Appendix I, page 88). For the project acronyms: see list of abbreviations and acronyms.

Respondents consider most of the raw material information platforms provided in the questionnaire as 'useful' or 'very useful' (Figure 7). The *Minerals4EU* and *EURare* platforms yield by far the highest approval rates in terms of 'very useful' (n=14 and n=13 respectively). It is striking that *IRP Global Metal Flows*, *CRM_InnoNet*, the JRC's *RMIS*, *EO-MINERS* and *i2Mine* are not known by many respondents (n=14 to n=9 in declining order).

Selected amendments:

- ProSUM
- USGS

Deliverable D2.2

Q3: Which of the two improvement options (improve access/support responding) do you consider as particularly important to your work?

Q3a: Mineral Deposits

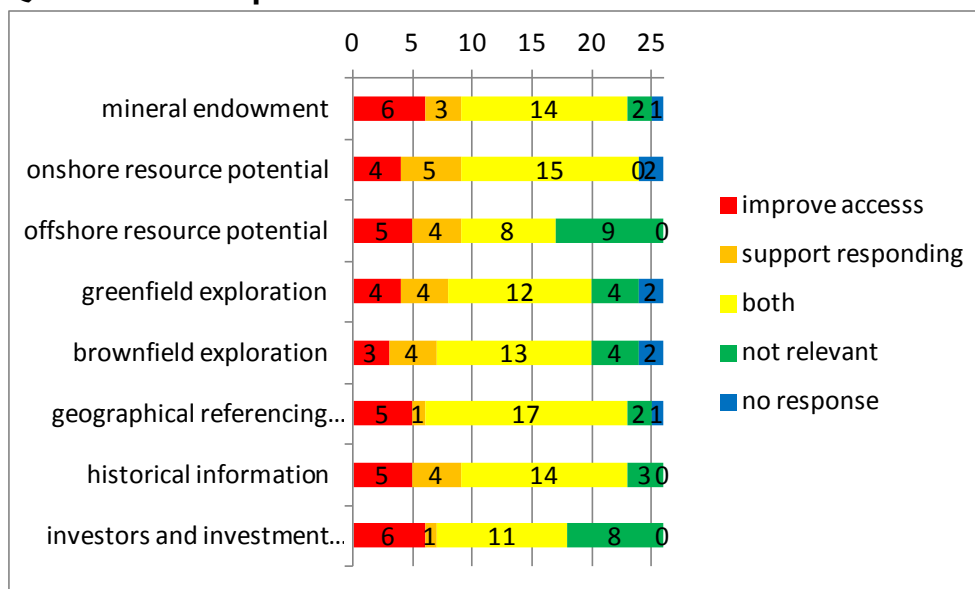


Figure 8: Improvements needs of geological surveys in the realm of Mineral Deposits (n=26). Items shortened (for original items: see Appendix I, page 88).

Most items in the realm of Mineral Deposits require 'both', improve access to raw material information and support responding to stakeholder questions (Figure 8). *Offshore resource potential* and *investors and investment levels* are topics not relevant to n=9 and n=8 respondents respectively.

Selected amendments:

- reports of geological exploration works
- innovation in Greenfield exploration techniques

Q3b: Anthropogenic Stocks

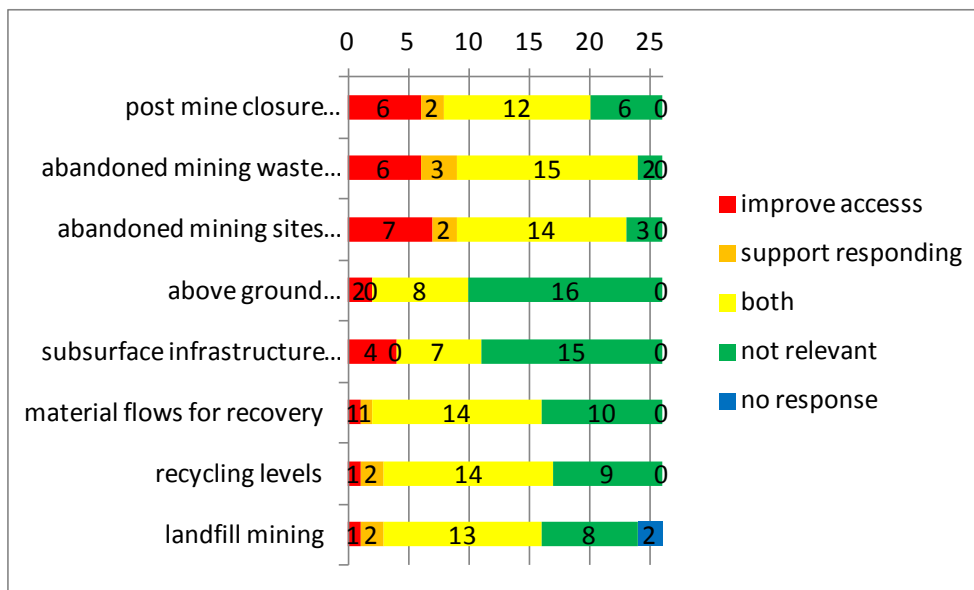


Figure 9: Improvements needs of geological surveys in the realm of Anthropogenic Stocks (n=26). Items shortened (for original items: see Appendix I, page 88).

Again, 'both', improve access to raw material information and support responding to stakeholder questions is an improvement need for the majority of respondents, except for *above ground infrastructure* and *subsurface infrastructure*, which are not relevant topics for n=16 and n=15 respondents respectively (Figure 9).

Selected amendments:

- abandoned mine tailings chemical information, contamination
- electronic waste – collection rate, share of real and potential recovery

Deliverable D2.2

Q3c: Raw material Supply and Demand

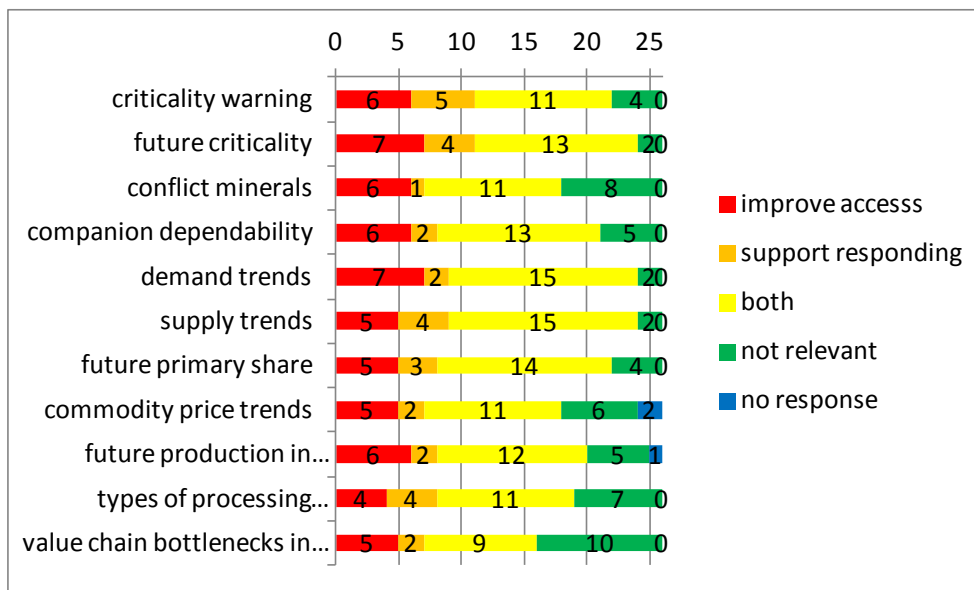


Figure 10: Improvements needs of geological surveys in the realm of Raw Material Supply and Demand (n=26). Items shortened (for original items: see Appendix I, page 88).

For all topics suggested 'both', improve access to raw material information and support responding to stakeholder questions occurs as the improvement need of most respondents (Figure 10). Value chain bottlenecks in Europe are an irrelevant topic for 10 respondents.

Selected amendments:

- awareness in the major trends of European raw material development
- historical production data

Deliverable D2.2

Q3d: Other Fields

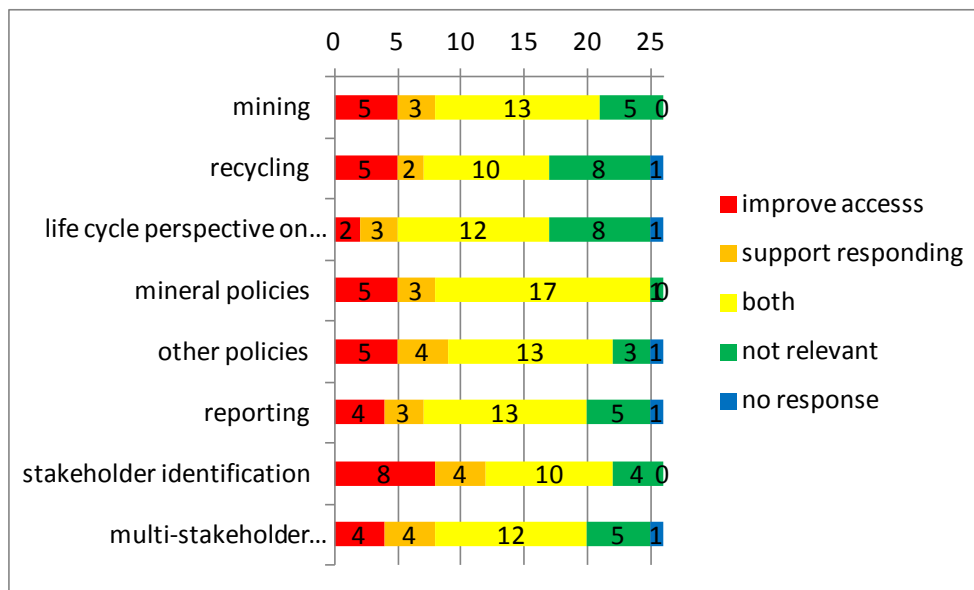


Figure 11: Improvements needs of geological surveys in Other Fields (n=26). Items shortened (for original items: see Appendix I, page 88).

The topics suggested in other fields also require ‘both’, improve access and support responding (Figure 11). Salient are the 8 respondents who see stakeholder identification merely as an access problem.

Selected amendments:

- minerals policies at global, EU, national and regional level
- resource classification and inventory

Deliverable D2.2

Q4a Who are your key clients? Please sort the client groups by relevance to your geological survey's extent of work

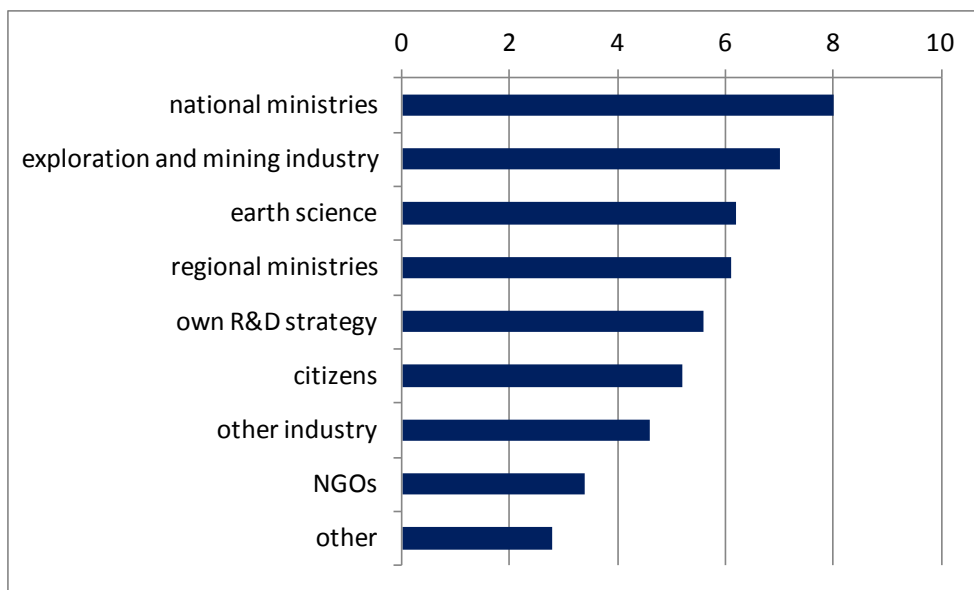


Figure 12: Relevance index of client groups in declining order for geological surveys (n=26). The number of assessments received for each position is weighted with the inverse position rank and summed up yielding the relevance index. Items shortened (for original items: see Appendix 1, page 88)

On average, national ministries are the most important client group for the responding geological surveys (Figure 12). They are followed by the exploration and mining industry, earth science and regional ministries.

Q4b What are emerging questions raised by your key clients?

Selected emerging questions (national and regional ministries):

- access to primary and secondary raw materials
- information about a specific mineral resources objective and mineral resources from a specific area
- transparent information related to concession

Selected emerging questions (other key clients):

- availability of building and construction materials
- information about a specific raw material type/commodity
- circular (closed) raw materials utilization

Deliverable D2.2

Q5 How important are the following future developments for your geological survey by 2020?

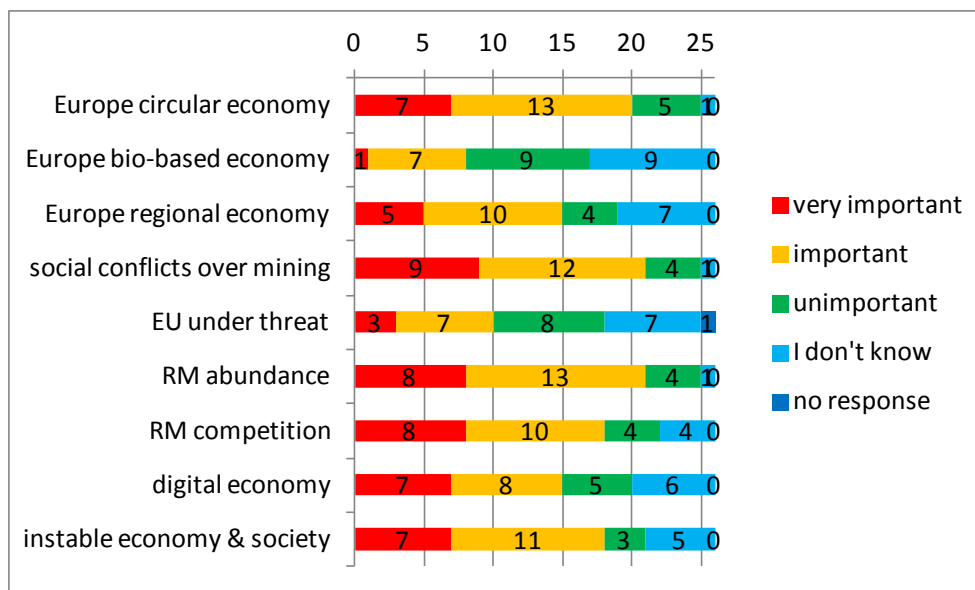


Figure 13: Importance of Future Developments that could become relevant for the strategies of geological surveys by 2020 (n=26). Items shortened (for original items: see Appendix I, page 88). RM – raw materials.

Most future developments suggested are seen as relevant to the development of geological surveys' strategies by 2020 (Figure 13). A *bio-based economy in Europe* and *EU under threat* are unimportant for n=9 and n=8 respondents. In addition, many respondents don't know the importance of these two items and of a *regional economy in Europe*. All in all, the future uncertainty is reflected in the hesitant or rejecting response patterns to a certain extent.

Amendment (the only one received):

- new technological developments requiring a different package of raw materials to produce these new technologies

Deliverable D2.2

Q6 What are your most important technical requirements to the envisaged MICA Online Platform? Please select up to 3 most important functional requirements.

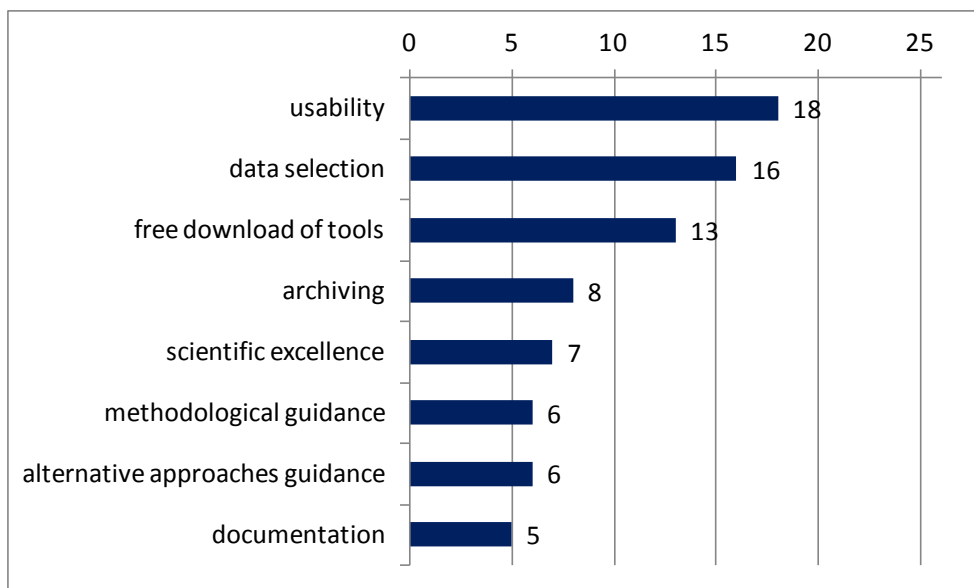


Figure 14: Importance of technical requirements to the envisaged MICA Online Platform by frequency of mentions through the geological surveys (n=26). Three out of nine given technical requirements could be selected. Items shortened (for original items: see Appendix 1, page 88)

Respondents of the EGS Survey mainly ask for usability of the MICA Online Platform (n=18) and in-built data selection features (n=16) (Figure 14).

Selected amendments:

- datasets need to be complete or gaps need to be indicated. Quality must be assured.
- explanation of terms, methods, etc.

6.1.2 EFG Survey

Basic information

This report details the outcomes of a survey designed for professional geologists as part of the works being developed by the MICA project. The survey has been conducted in the period from 21 June 2016 till 8 September 2016. The Google forms platform was used to prepare the questionnaire that was distributed via e-mail. The MICA survey and an Invitation letter (Appendix 2, page 97) together with the Mica data protection statement (Appendix 6, page 126) and a MICA leaflet were sent to participants in an e-mail message that included the link to the online survey.

The survey covered four main topics:

1. Use of raw material information platforms;
2. Needs for improvement of raw material information;
3. Emerging information needs of key clients;
4. Requirements to the online platform.

Deliverable D2.2

The universe surveyed comprised professional geologists, European Geologist (EurGeol) title holders. The EurGeol title is a professional title created by the European Federation of Geologists which recognizes the ability to deliver a high quality of services within the practice of geology. The title held by a professional geologist means that the holder has achieved suitable academic training and a level of professional experience, skill and competence to perform tasks within their professional practice. It also means that the geologist undertakes continuing education and training, demonstrating a personal commitment to stay up to date and informed within the sphere of their professional work. The EurGeols come from 21 European countries (UK, Ireland, Spain, Germany, France, Italy, Portugal, Finland, Hungary Belgium/Luxembourg, Sweden, Switzerland, Serbia, Netherlands, Czech Republic, Poland, Greece, Russia, Slovenia and Ukraine) as well as USA, Canada, Australia and South Africa covering different area of expertise such as: CO₂, Geological storage, Education, Engineering geology/Geotechnics, Geological heritage, Geothermal energy, Hydrogeology, Management, Minerals, Natural hazards, Oil and gas, Paleontology, Petrology, Sedimentology and Soil.

From the universe of EurGeols of 954 in total, 59 responses have been collected. This corresponds to a response rate of 6.2 %. This rate is considered as a normal value in market research surveys. Considering that approximately 40 % of all EurGeols work in mining, and that the survey was aiming professionals working in the raw materials field, the response rate increases to 15.5 %.

The age of the majority of the respondents (79.3 %) falls in the group of 40-60 years and older (Figure 15). This is in a line with the characteristics of the universe of EurGeols.

According to the responses, EurGeols work mostly in consultancy/planning office and industry, followed by the geological survey and academia/university/research, both in Europe and worldwide (e.g. Canada, Tanzania, Sudan, Peru, Morocco, DR Congo, China, India, Libya, Ghana, USA).

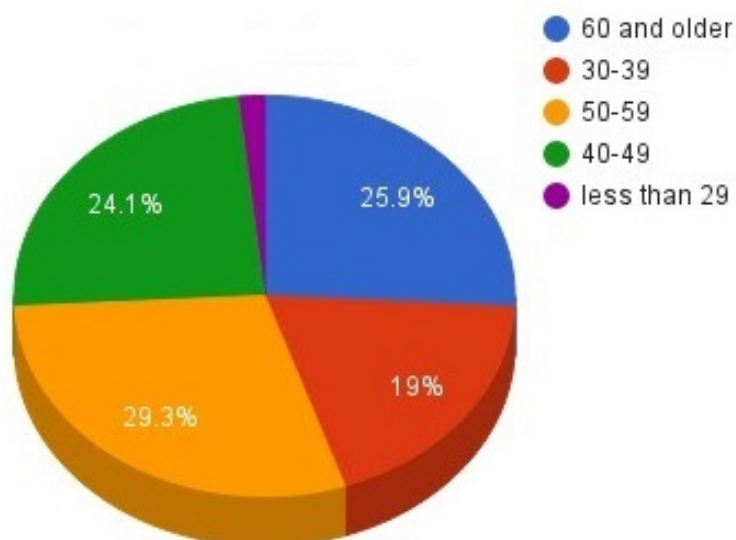


Figure 15: Age distribution of the respondents.

Deliverable D2.2

Four main groups of respondents have been established (Academia/University/Research institute, Consultancy/Planning office, Geological survey and Industry) according to their choice of the organisation type they work for (Figure 16). These will be considered for future analysis as ‘respondent categories’ (only one response has been received representing “public authority” and “other” which are not representative for this survey, thus not considered further):

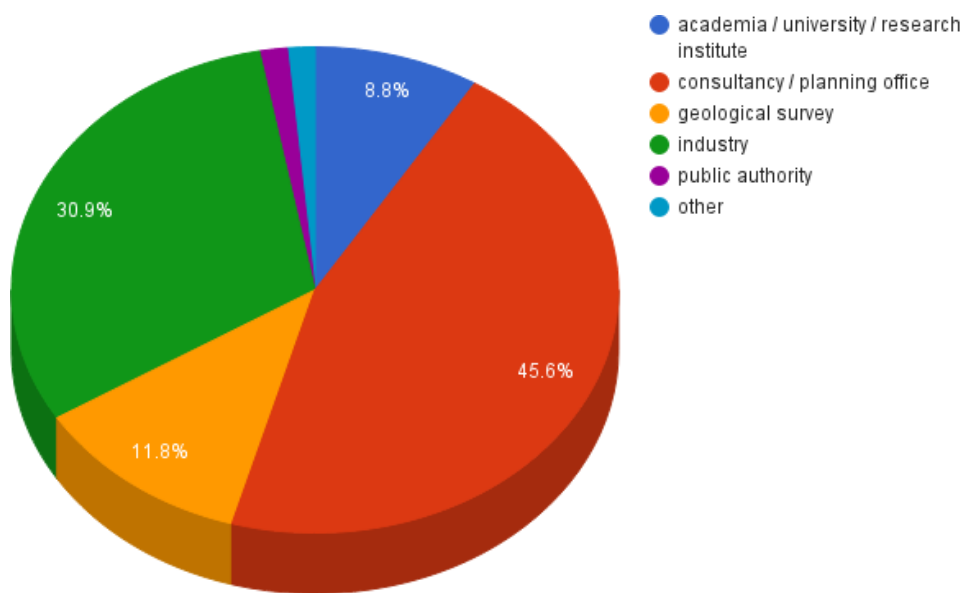


Figure 16: Four main groups of EurGeols based on organisation type they work for.

In general, the respondents are mainly working in the following thematic areas: a) mineral exploration; b) earth science/applied geological sciences; and c) regional reconnaissance and prospection (Table 4).

Table 4: Distribution of the principal thematic area respondents work in.

Thematic area	Number of responses	Percentage (%)
Regional reconnaissance and prospection	26	44.1
Mineral exploration	41	69.5
Planning of mining ventures	13	22.0
Development/engineering of mining ventures	10	16.9
Financing of mining ventures	5	8.5
Licensing of mining ventures	7	11.9
Mining operation	14	23.7
Mining support services (consumables, machinery, etc.)	0	0.0
Environment, health and safety (EHS) issues of mining	12	20.3
Long-term stewardship of mines	3	5.1
Land use planning	7	11.9
Earth sciences/applied geological sciences	30	50.8
Professional training	14	23.7
Other	8	13.6

Deliverable D2.2

Since multiple answers were possible to this question, around 93 % of respondents chose several thematic areas. A closer look into the above mentioned respondent categories shows different trends of the thematic areas they work in.

The respondents working for Academia/University/Research institute (6 responses) are mainly involved in a) earth sciences/applied geological sciences; and b) mining exploration (Figure 17).

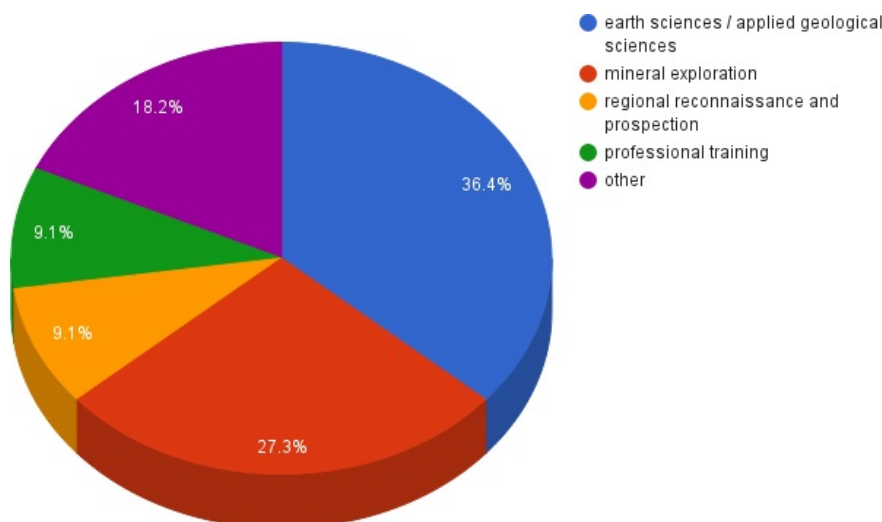


Figure 17: Distribution of the thematic areas respondents work in within the Academia/University/Research respondent category.

The respondents working for Consultancy/Planning office (31 responses) are mainly involved in a) earth sciences/applied geological sciences; and b) mineral exploration (Figure 18). Other thematic area indicated by this respondent category is environmental protection, monitoring and evaluation (two responses).

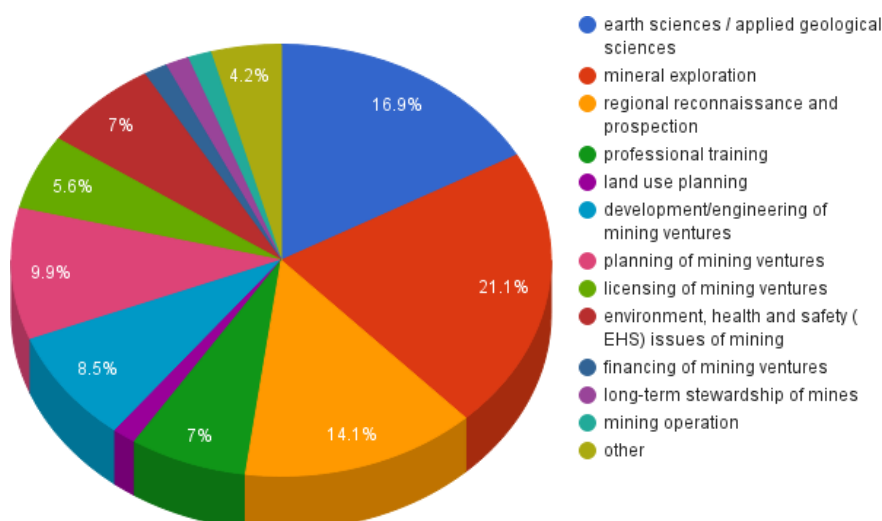


Figure 18: Distribution of the thematic areas respondents work in within the Consultancy/Planning office respondent category.

Deliverable D2.2

The respondents working for Industry (21 responses) are mainly involved in mineral exploration (Figure 19).

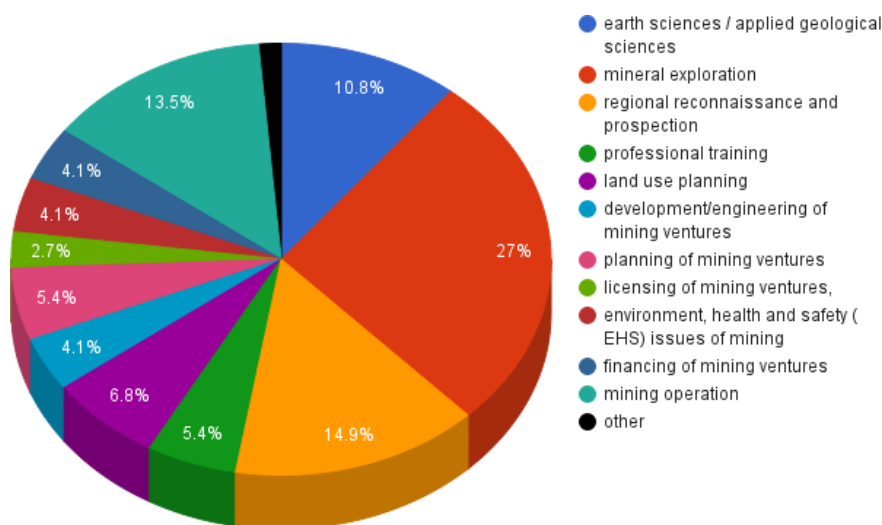


Figure 19: Distribution of the thematic areas respondents work in within the Industry respondent category.

The respondents working for Geological survey (8 responses) are mainly involved in a) regional reconnaissance and prospection; and b) EHS issues of mining (Figure 20).

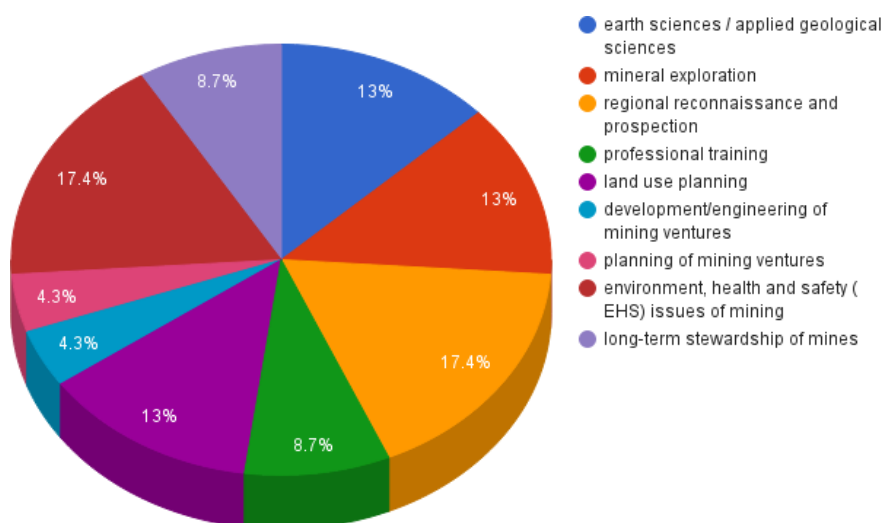


Figure 20: Distribution of the thematic areas respondents work in within Geological survey respondent category.

Results

The results were analyzed based on 4 groups of questions in the survey: 1) Use of raw material information platforms; 2) Needs for improvement of raw material information; 3) Emerging information needs of key clients; and 4) Requirements to the online platform.

Deliverable D2.2

Use of raw material information platforms (Q2)

At the beginning of the survey, the respondents were asked how often they use raw materials' platforms and several were offered to choose from, namely: EGDI- European Geological Data Infrastructure, EIT-KIC, EO-MINERS, EuroGeoSource, i2Mine, International Raw Material Observatory INTRAW database, Minerals4EU, MINVENTORY, EURare, ProMine and Raw Materials Information System.

In general, information showed that most of the respondents rarely use these platforms, mostly on the yearly or less frequent basis or not at all (Table 5). A similar trend has been observed also with usage of other international, national, regional or commercial platforms. The only exception from this rule is the MINVENTORY and national platforms which are used more frequently, mostly on monthly bases. Additionally, some respondent mentioned they also use other platforms such as EFG EurGeol tool, LinkedIn, Infomine Kitco and Mining Journal.

Table 5: Use of raw material information platforms

EU raw material information platforms	Frequency (number of responses)				valid answers	Frequency (percentage %)			
	daily to weekly	monthly to quarterly	yearly or less frequent	not at all		daily to weekly	monthly to quarterly	yearly or less frequent	not at all
EGDI – European Geological Data Infrastructure	2	15	17	25	59	3.4	25.4	28.8	42.4
EIT-KIC Raw Materials	1	18	16	24	59	1.7	30.5	27.1	40.7
EO-MINERS	0	14	22	23	59	0.0	23.7	37.3	39.0
EuroGeoSource	2	11	13	33	59	3.4	18.6	22.0	55.9
i2Mine	0	11	20	28	59	0.0	18.6	33.9	47.5
INTRAW	0	3	24	31	58	0.0	5.2	41.4	53.4
Minerals4EU	2	11	20	24	57	3.5	19.3	35.1	42.1
MINVENTORY	2	23	19	15	59	3.4	39.0	32.2	25.4
EURare	1	10	27	21	59	1.7	16.9	45.8	35.6
ProMine	1	9	23	26	59	1.7	15.3	39.0	44.1
Raw Materials Information System	0	12	21	26	59	0.0	20.3	35.6	44.1
other EU raw material information platforms publicly available	1	15	18	25	59	1.7	25.4	30.5	42.4
Other raw material information platforms									
IRP - International Resource Panel Working Group on Global Metal Flows	0	4	19	34	57	0.0	7.0	33.3	59.6
national platforms (e.g. national geosurveys)	7	24	15	12	58	12.1	41.4	25.9	20.7
regional platforms (e.g. regional geosurveys)	2	18	16	22	58	3.4	31.0	27.6	37.9
commercial platforms (e.g. Roskill Information Services)	3	5	17	32	57	5.3	8.8	29.8	56.1
other platforms	3	2	7	33	45	6.7	4.4	15.6	73.3

Needs for improvement of raw material information (Q3)

This section of the survey covered the needs of the raw material information improvement. The respondents could choose between different possibilities such as:

- improve access to information;
- support responding to information needs;

Deliverable D2.2

- both;
- not relevant to my work.

The needs of improvement of raw material information were tested from the perspective of four following categories:

a) **Identification and assessment of mineral deposits** including:

- a.1. Mineral endowment;
- a.2. Onshore resource potential;
- a.3. Offshore resource potential;
- a.4. Greenfield exploration;
- a.5. Brownfield exploration;
- a.6. Geographical referencing and integration of earth observation, geological, land use, socioeconomic and other data;
- a.7. Historical information.

More than 30 % of respondents think that improvement of the access to information related to Identification and assessment of mineral deposits is needed. The only discrepancy from this trend is the “Offshore resource potential” which 49.1 % of respondents consider not relevant to their work (Table 6). The respondents also used possibility to express another needs of improvement of raw material information if those were not offered on the list. They pointed out the importance of:

- Regulatory regimes and potential roadblocks for various commodity types (one response);
- Land use availability (one response);
- Expertise available for selected countries (one response);
- Consistent information provided to national, state and region agencies to ensure support during the exploration and exploitation (two responses).

Deliverable D2.2

Table 6: Needs for improvement of raw material information related to Identification and assessment of mineral deposits.

Category	Absolute figures					valid answers	Percentages (%)			
	no response	improve access	support responding	both	not relevant		improve access	support responding	both	not relevant
a.1 Mineral endowment	2	21	7	18	11	57	36.8	12.3	31.6	19.3
a.2 Onshore resource potential	1	21	8	20	9	58	36.2	13.8	34.5	15.5
a.3 Offshore resource potential	2	14	6	9	28	57	24.6	10.5	15.8	49.1
a.4 Greenfield exploration	0	19	9	21	10	59	32.2	15.3	35.6	16.9
a.5 Brownfield exploration	0	20	8	21	10	59	33.9	13.6	35.6	16.9
a.6 Geographical referencing and integration of earth observation, geological, land use, socioeconomic and other data	0	21	9	20	9	59	35.6	15.3	33.9	15.3
a.7 Historical information	1	23	10	20	5	58	39.7	17.2	34.5	8.6

Deliverable D2.2

b) **Exploitation of mineral deposits** including:

- b.1. Land use constraints;
- b.2. Investors and investment levels;
- b.3. Existing and planned mining ventures;
- b.4. Financing options for mining ventures;
- b.5. Licensing procedures;
- b.6. Mining operations (miners, production);
- b.7. Environment, health and safety (EHS) issues;
- b.8. Closure requirements;
- b.9. Post mine closure responsibilities.

More than 40 % of respondents think that improvement of the access to information related to “Land use constraints” is needed (Table 7). On the contrary, “Financing options for mining ventures” are not relevant for their work. Respondents also used the possibility to express another needs of improvement of raw material information if those were not the offered list. They pointed out the importance of:

- Industrial minerals (one response);
- Future needs of nontraditional industrial minerals (one response).

Deliverable D2.2

Table 7: Needs for improvement of raw material information related to Exploitation of mineral deposits.

Category	Absolute figures					valid answers	Percentages (%)			
	no response	improve access	support responding	both	not relevant		improve access	support responding	both	not relevant
b.1 Land use constraints	2	24	8	15	10	57	42.1	14.0	26.3	17.5
b.2 Investors and investment levels	1	14	10	15	19	58	24.1	17.2	25.9	32.8
b.3 Existing and planned mining ventures	0	23	8	17	11	59	39.0	13.6	28.8	18.6
b.4 Financing options for mining ventures	1	14	4	17	23	58	24.1	6.9	29.3	39.7
b.5 Licensing procedures	0	22	6	19	12	59	37.3	10.2	32.2	20.3
b.6 Mining operations (miners, production)	0	23	8	17	11	59	39.0	13.6	28.8	18.6
b.7 Environment, health and safety (EHS) issues	0	17	12	16	14	59	28.8	20.3	27.1	23.7
b.8 Closure requirements	0	17	8	18	16	59	28.8	13.6	30.5	27.1
b.9 Post mine closure responsibilities	0	17	9	17	14	59	28.8	15.3	28.8	23.7

Deliverable D2.2

c) **Anthropogenic stocks and recycling** including:

- c.1 Abandoned mining waste deposits and tailings;
- c.2 Abandoned mines for future land use (contamination, geological safety, etc.);
- c.3 Above ground infrastructure stock of commodities (buildings, railways, etc.);
- c.4 Subsurface infrastructure stock of commodities (water pipes, underground energy cables, etc.);
- c.5 Material flows for the recovery of commodities (demolition waste, industrial residues, etc.);
- c.6 Landfill mining for the recovery of commodities.

More than 30 % of respondents think that improvement of the access to information related to “Abandoned mining waste deposits and tailings” is needed (Table 8). On the contrary, 50 % of the respondents consider “Above ground infrastructure stock of commodities (buildings, railways, etc.)” not relevant to their work. Respondents also used the possibility to express another needs of improvement of raw material information if those were not the offered list. They pointed out the importance of:

- Environmental impact plans (one response);
- Legal aspects of mine waste ownership (one response).

Deliverable D2.2

Table 8: Needs for improvement of raw material information related to Anthropogenic stocks and recycling.

Category	Absolute figures					valid answers	Percentages (%)			
	no response	improve access	support responding	both	not relevant		improve access	support responding	both	not relevant
c.1 Abandoned mining waste deposits and tailings	1	19	8	20	11	58	32.8	13.8	34.5	19.0
c.2 Abandoned mines for future land use (contamination, geological safety, etc.)	1	13	8	22	15	58	22.4	13.8	37.9	25.9
c.3 Above ground infrastructure stock of commodities (buildings, railways, etc.)	1	12	6	11	29	58	20.7	10.3	19.0	50.0
c.4 Subsurface infrastructure stock of commodities (water pipes, underground energy cables, etc.)	1	14	9	11	24	58	24.1	15.5	19.0	41.4
c.5 Material flows for the recovery of commodities (demolition waste, industrial residues, etc.)	3	16	7	12	21	56	28.6	12.5	21.4	37.5
c.6 Landfill mining for the recovery of commodities	2	14	8	15	20	57	24.6	14.0	26.3	35.1

Deliverable D2.2

d) **Other fields** including:

- d.1 Life cycle perspective on environment, health and safety (EHS) impacts of exploration and mining;
- d.2 Mineral policies at global, EU, national and regional level;
- d.3 Other policies affecting minerals extraction (regional development, trade, etc.) at global, EU, national and regional level;
- d.4 Reporting (accountability to shareholders, employees, local communities and the general public);
- d.5 Stakeholder identification;
- d.6 Effective multi-stakeholder engagement.

Almost 40 % of respondents think that improvement of the access to information related “Mineral policies at global, EU, national and regional level” is needed (Table 9). Respondents also used the possibility to express another needs of improvement of raw material information if those were not the offered list. They pointed out the importance of:

- Making project more visible on European market (one response);
- Establishment of the European central stock exchange (one response).

Deliverable D2.2

Table 9: Needs for improvement of raw material information related to Other fields.

Category	Absolute figures					valid answers	Percentages (%)			
	no response	improve access	support responding	both	not relevant		improve access	support responding	both	not relevant
d.1 Life cycle perspective on environment, health and safety (EHS) impacts of exploration and mining	0	16	6	17	20	59	27.1	10.2	28.8	33.9
d.2 Mineral policies at global, EU, national and regional level	1	23	13	16	6	58	39.7	22.4	27.6	10.3
d.3 Other policies affecting minerals extraction (regional development, trade, etc.) at global, EU, national and regional level	2	21	10	17	9	57	36.8	17.5	29.8	15.8
d.4 Reporting (accountability to shareholders, employees, local communities and the general public)	3	16	10	17	13	56	28.6	17.9	30.4	23.2
d.5 Stakeholder identification	3	18	10	15	13	56	32.1	17.9	26.8	23.2
d.6 Effective multi-stakeholder engagement	1	16	12	14	15	57	28.1	21.1	24.6	26.3

Deliverable D2.2

Emerging information needs of key clients (Q4)

In this section of the survey the EurGeols were asked to provide information on their clients and particular what are the emerging questions raised by them which could influence on the EurGeols work until 2020. Several categories were offered (Table 10) with possibility to choose up to three answers. In general, the most regular clients belong to the exploration industry, followed by mining industry, geological surveys and consultancies/planning offices. Additionally, investors (two responses), international donors (one response), finance institutions (one response) and company stakeholders (one response) were also pointed out as potential clients.

Table 10: Key clients of the respondents.

Key clients	Number of responses	Percentage (%)
Geological surveys	22	37.3
Environmental agencies	13	22
Mining authorities	15	25.4
Land use authorities	7	11.9
Consultancies/planning offices	18	30.5
Academia/universities/research institutes	10	16.9
Exploration industry	42	71.2
Mining industry	38	64.4
Raw material processing industry (e.g. metal smelters, cement production)	11	18.6
Civil society	11	1.6
Policy makers (ministries, parliaments, parties, etc.)	12	20.3
Other	6	10.2

Considering the four respondent categories, different key clients can be distinguished per each category. The respondents working for Academia/University/Research institute (6 responses) mentioned a) exploration industry; b) geological surveys; and c) mining industry as their key clients (Figure 21).

Deliverable D2.2

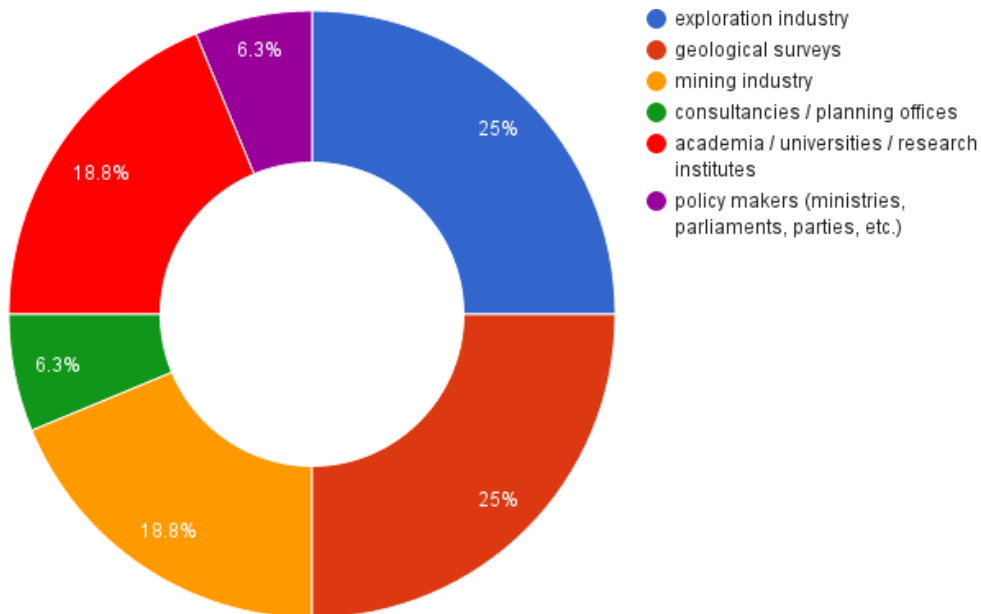


Figure 21: Distribution of the key clients within Academia/University/Research institute respondent category.

The respondents working for Consultancies/planning offices (6 responses) mentioned a) mining industry; b) exploration industry; and c) consultancies/planning offices as their key clients (Figure 22).

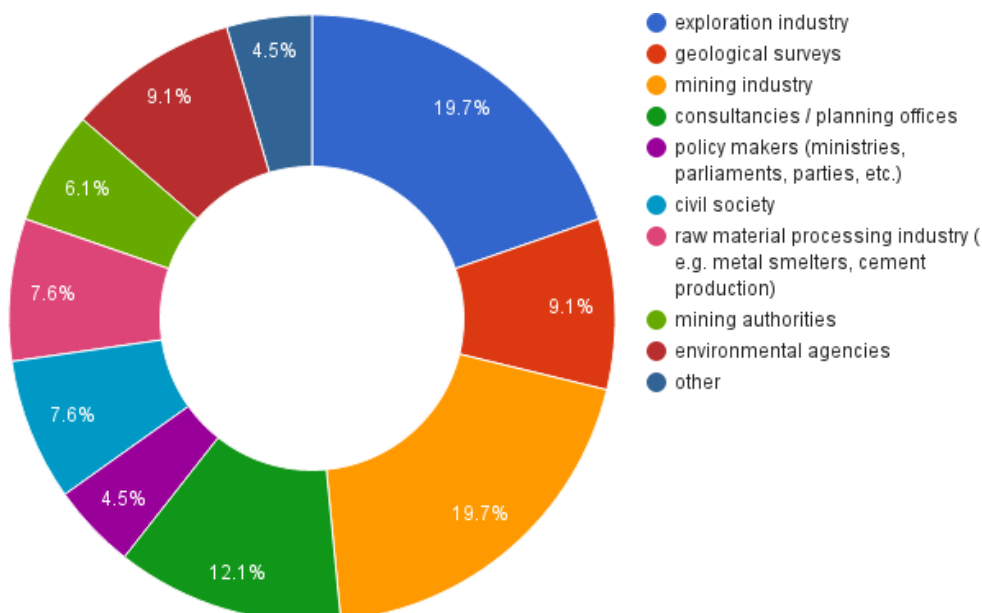


Figure 22: Distribution of the key clients within Consultancies/planning office respondent category.

The respondents working for Industry (21 responses) mentioned mining industry, exploration industry and geological surveys as their key clients (Figure 23).

Deliverable D2.2

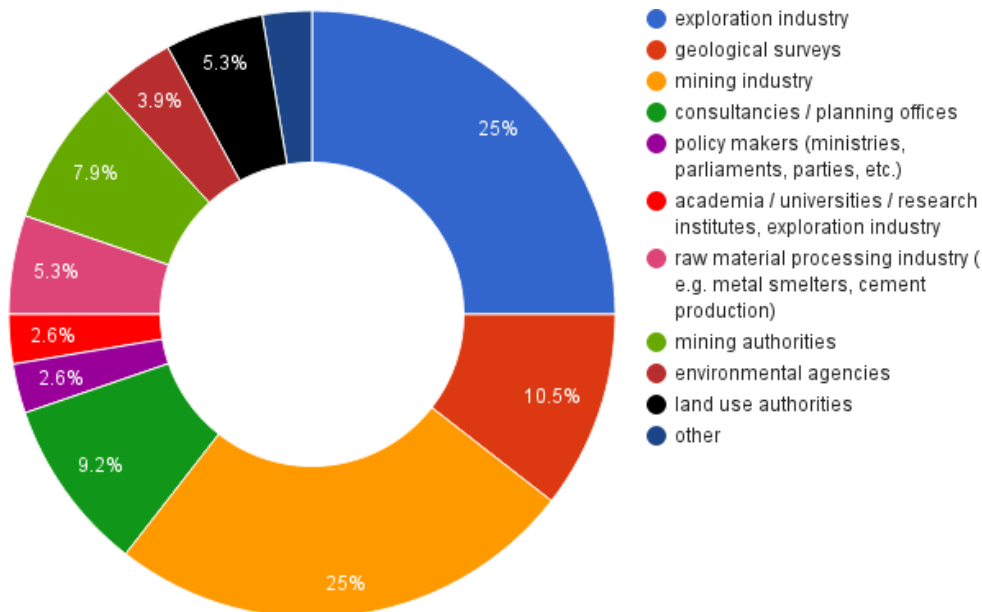


Figure 23: Distribution of the key clients within the Industry respondent category.

The respondents working for Geological survey (8 responses) mentioned a) mining industry; b) policy makers; and c) exploration industry as their top clients, although, comparing to other respondent categories, the distribution of the key clients here looks more homogeneous (Figure 24).

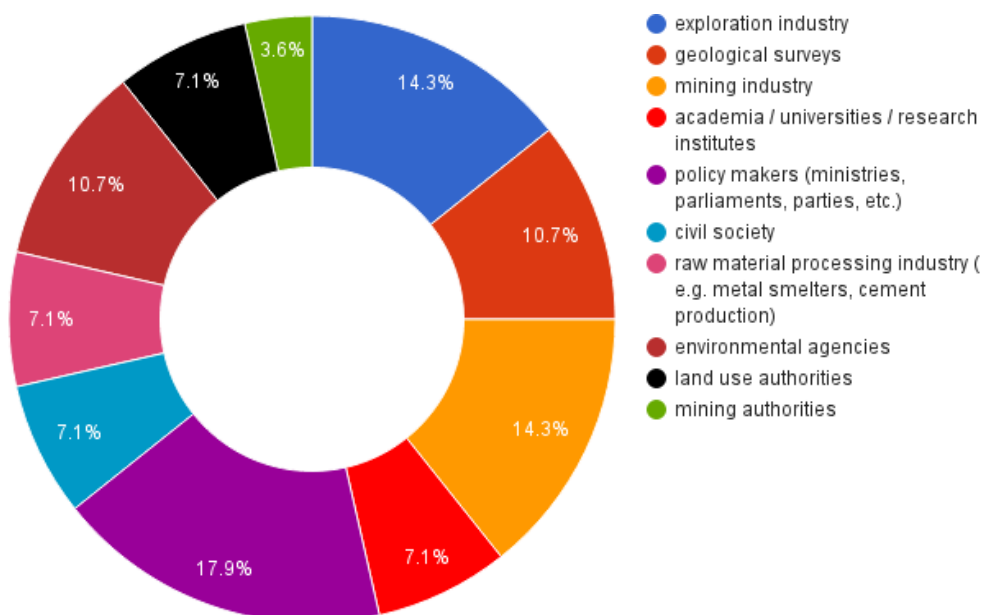


Figure 24: Distribution of the key clients within the Geological survey respondent category.

Based on the question of the survey, *What are emerging questions raised by your key clients, which might influence your work significantly until 2020?*, the responses have been analyzed according to the respondent categories. The questions raised by the clients were the base for the identification of

Deliverable D2.2

the key words in each category. The Table 11 summarizes the main questions raised by the clients of each respondent category. Additionally, key words, which could be used in the WP 6 ontology level 2, are also listed.

Table 11: Summary of the main questions raised by respondents' clients together with key words.

Respondent categories	Question raised by their clients	Key words
Academia/University/Research Institutes (6 respondents)	<ul style="list-style-type: none"> Prediction of pricing of commodities Possibilities and outlook of financing of exploration projects Are the countries to be invested "mining pro" 	<ul style="list-style-type: none"> commodity pricing financing permitting
Consultancies/planning office (31 respondents)	<ul style="list-style-type: none"> What is the EU position regarding the securing of mineral resources on its territory? What help is available to set up a tailings reprocessing operation? Where are the most suitable tailings? What is the likely timeframe for permitting a new mine? What is the likely timeframe for re-opening an old mine? Constraints to exploration and mining (social/environmental) Environmental, infrastructure and security constraints What is the likely timeframe for permitting a new mine and/or re-opening the old one What help is available to set up a tailings reprocessing operation? 	<ul style="list-style-type: none"> tailings operations permitting financing social constraints environmental restriction security constraints infrastructure groundwater impact
Industry (21 respondents)	<ul style="list-style-type: none"> What commodities will do best in the coming years? Will there be any shortage of any mineral raw materials? Where could we possibly find the next "mega deposit"? Are there more cost effective exploration techniques? Easy access to public reporting of resources and reserves Clear information on environmental restrictions Evolution of the mining and metal market Funding Marked needs Cost of extraction Future needs, occurrence, deposits and extraction of lithium Uranium and nickel economy 	<ul style="list-style-type: none"> commodity pricing financing access to public data environmental restriction extraction costs lithium uranium nickel
Geological survey (8 respondents)	<ul style="list-style-type: none"> Access to critical raw materials for our national industry Conflict of interest with regards to land use policies 	<ul style="list-style-type: none"> critical raw material permitting

Deliverable D2.2

Requirements to the online platform (Q5)

At the end of the survey, respondents also provided their opinion on possible features of the future MICA platform and named 3 most important requirements for them to become the actual users of the MICA online platform. The following options were offered and the responses are summarized in Table 12:

- Each stakeholder question and the respective platform response should be documented in a transparent and traceable way;
- It should be possible to select between the latest data available, the most reliable data available, the most comprehensive data available and to select between freely and commercially available data;
- The online platform should provide effective guidance to geologists how to employ the methods suggested;
- The online platform should contain all tools suggested with a free download function;
- The suggested sequence of operations to answer a question, i.e. a combination of information on data sets and methods & tools, should meet the scientific state of the art;
- The online platform should provide additional guidance in case it suggests various ways to meet a raw material information need;
- The queries and responses by the online platform should be achievable in text, spreadsheet and database format;
- The online platform should display the output in an easy to understand and attractive graphical format.

Table 12: Summary of the main questions raised by respondents' clients together with key words.

MICA online platform requirements	Number of responses	Percentage (%)
a) Question and the respective platform response should be documented in a transparent and traceable way	11	19.3
b) Data selection (latest data available, the most reliable data available, the most comprehensive data)	34	59.6
c) Effective guidance to geologists how to employ the methods suggested	29	50.9
d) Tools suggested with free download function	33	57.9
e) Suggested sequence of operations to answer a question	10	17.5
f) Additional guidance in case it suggests various ways to meet a raw material information need	10	17.5
g) Queries and responses by the online platform should be achievable in text, spreadsheet and database format	19	19
h) Online platform should display the output in an easy to understand and attractive graphical format	24	24

According to the responses, the MICA platform should provide the possibility to select between the latest data available, the most reliable data available, the most comprehensive data available and to select between freely and commercially available data (option b)), the platform should provide effective guidance to geologists how to employ the methods suggested (option c)) and the platform should contain all tools suggested with a free download function (option d)).

6.1.3 Industry Survey

Basic information

The Industry Survey took place between 22 June 2016 and 9 September 2016 using Questback's Enterprise Feedback Suite (EFS) online survey tool. The questionnaire was developed by Fraunhofer ISI including a pretest with other departments and an industry consultant working on raw materials and environmental compliance for enterprises. 92 industry associations identified in the stakeholder mapping (Erdmann et al. 2016) were invited to participate. Out of these, 10 industry associations responded (almost) completely. This yields a response rate of 10.9 %, which is adequate for cold calling.

The respondents were asked to indicate the profile of their activity at the respective industry association (Figure 25).

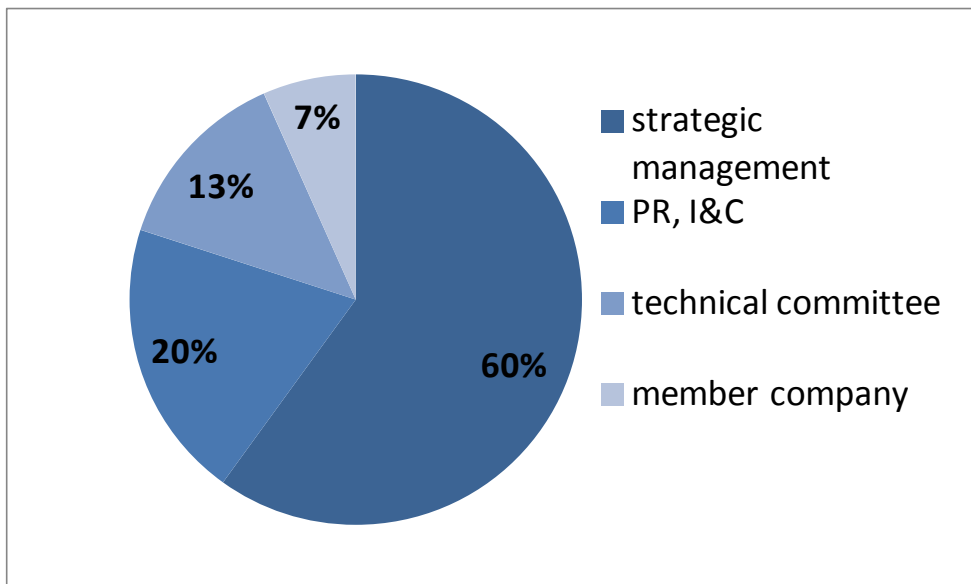


Figure 25: Distribution of occupancy profiles of the 10 respondents in the Industry Survey. Multiple answers were possible (n=15). PR – public relation, I&C – information and communication

All, but one respondent (n=9) assign themselves to the *strategic management*, which is an excellent coverage of the intention to reach the *strategic management* of industry associations.

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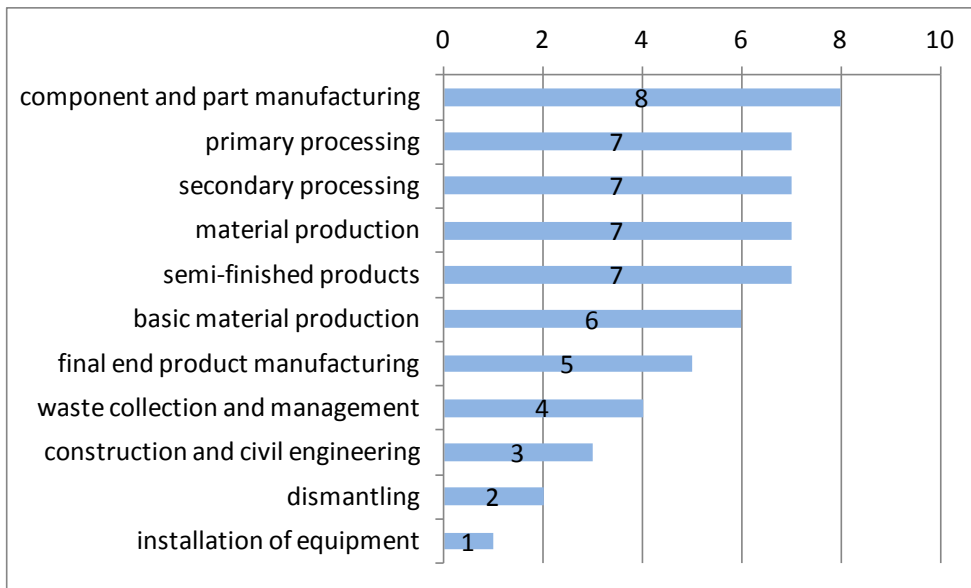


Figure 26: Coverage of different parts of the value chain of the 10 respondents in the Industry Survey. Multiple answers were possible (n=57).

The industry associations responding cover a wide part of the value chain (Figure 26), including primary and secondary processing (n=7 each) and component and part manufacturing (n=8). Coverage is weak for dismantling (n=2) and installation of equipment (n=1).

Results

The results were analyzed question by question. Taking into consideration the total response numbers we present the results graphically and in absolute numbers, and refrain from indicating percentages.

Deliverable D2.2

Q1 How important are the following current strategic issues for your industry association?

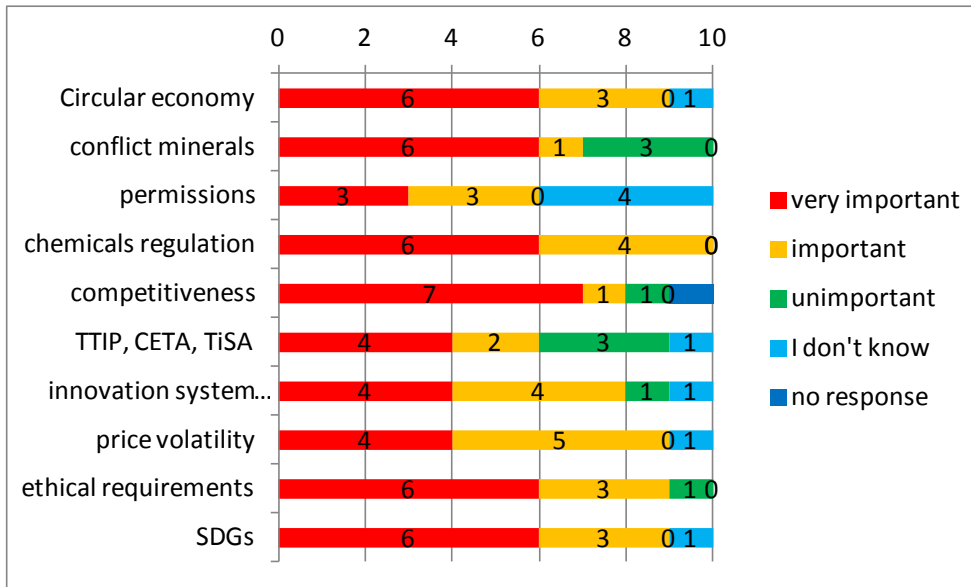


Figure 27: Importance of Current Strategic Issues for industry associations (n=10). SDGs – Sustainable Development Goals. SDGs – Sustainable Development Goals; TTIP, CETA, TISA – international trade agreements under discussion during the survey. Items shortened (for original items: see Appendix I, page 88).

The suggested current strategic issues are widely approved by the respondents as ‘important’ or ‘very important’ (Figure 27). *Permissions of new industry facilities* received four times an ‘I don’t know’ presumably because this is rather a member company issue than an industry association issue.

Selected amendments:

- trade regulation and policy
- environmental regulation and policy
- revision of regulation schemes

Deliverable D2.2

Q2 How useful are the following raw material information platforms for your industry association?

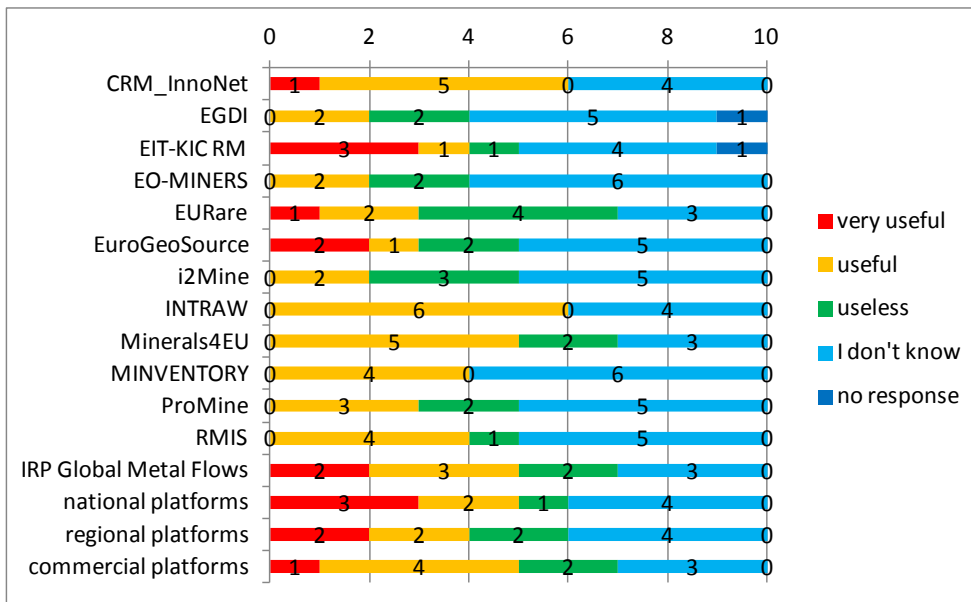


Figure 28: Usefulness of existing raw material information platforms for industry associations (n=10). Items shortened (for original items: see Appendix I, page 88). For the project acronyms: see list of abbreviations and acronyms.

A significant share of the raw material information platforms suggested is unknown to roughly half of the respondents (Figure 28). In particular *CRM_InnoNet* and *INTRAW* are seen as useful by 6 respondents. Only two items, the *EIT-KIC Raw Materials* and unspecified *national platforms* get a 'very useful' from three respondents.

Selected amendments:

- ERAMIN-EU Critical Raw materials RM Scoreboard
- USGS
- Yale University publications

Deliverable D2.2

Q3: Which of the two improvement options (improve access/support responding) do you consider as particularly important to your work?

Q3a: Raw Material Supply and Demand

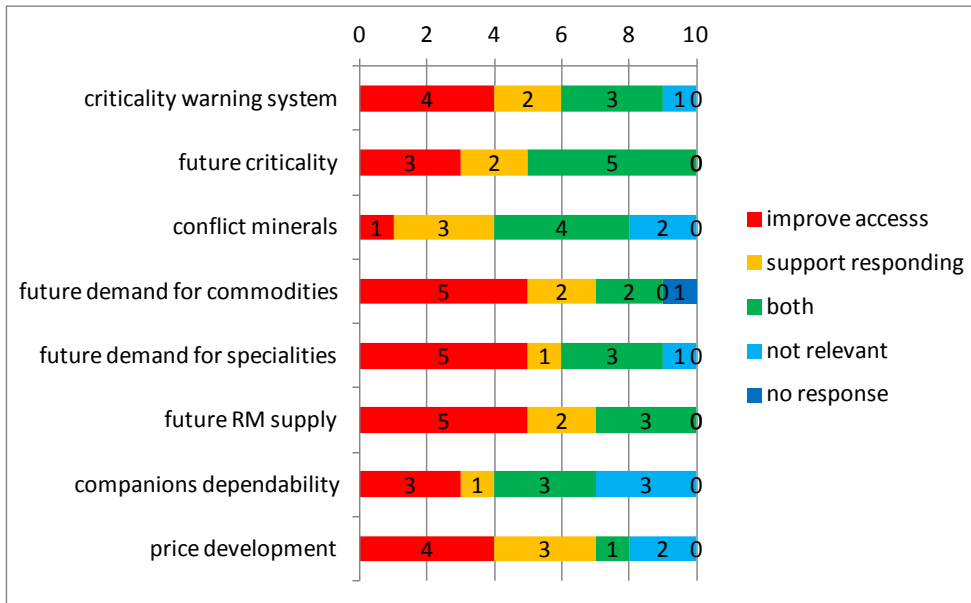


Figure 29: Improvements needs of industry associations in the realm of Raw Material Supply and Demand (n=10). RM – raw materials. Items shortened (for original items: see Appendix I, page 88).

For a significant share of topics in the realm of Raw Material Supply and Demand there are clear needs to ‘improve access to raw material information’, among them *future demand for commodities* and *future demand for specialities* and *future raw material supply* (n=5 each) (Figure 29).

Amendment:

- global future raw material demand of emerging technologies

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Q3b: Material Production and Manufacturing

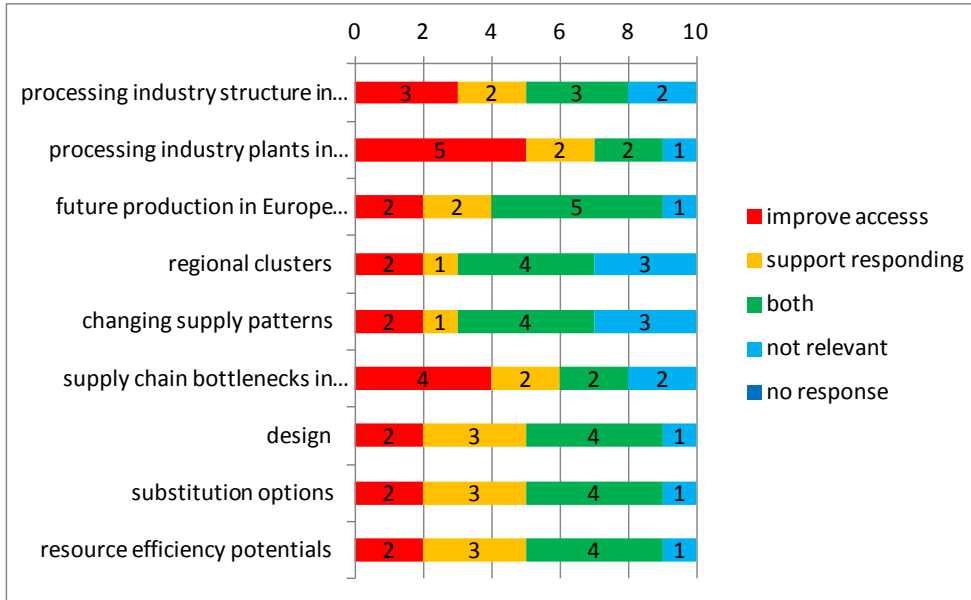


Figure 30: Improvements needs of industry associations in the realm of Material Production and Manufacturing (n=10). Items shortened (for original items: see Appendix I, page 88).

In the realm of Material Production and Manufacturing five industry associations state a clear need for ‘improving access to raw material information’ for *processing industry plants in Europe*, still four industry associations for *supply chain bottlenecks in Europe* (Figure 30). Besides, industry associations often need ‘both’, improve access and support responding for the other topics.

Amendment:

- intermediate products

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Q3c: Anthropogenic Stocks and Recycling

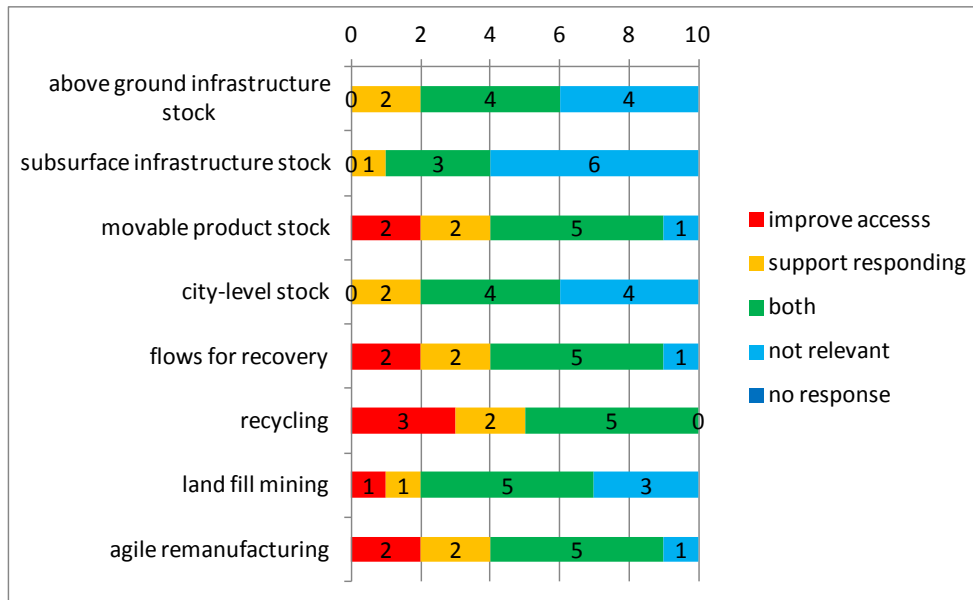


Figure 31: Improvements needs of industry associations in the realm of Anthropogenic Stocks and Recycling (n=10). Items shortened (for original items: see Appendix I, page 88).

Most topics entail the need for 'both', improve access and support responding. *Subsurface infrastructure stock* (n=6), *above ground infrastructure stock* and *city-level stock* (n=4 each) are unimportant for several responding industry associations (Figure 31).

Amendment:

- material flows, recycling rates and LCA of minor metals

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Q3d: Other Fields

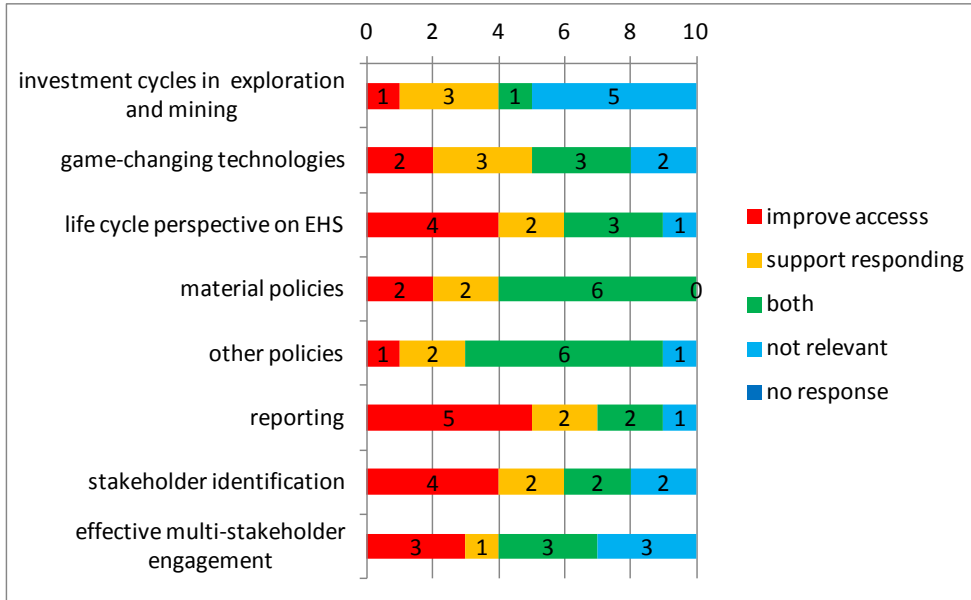


Figure 32: Improvements needs of industry associations in Other Fields (n=10). Items shortened (for original items: see Appendix I, page 88).

Many topics suggested in other fields require 'both', improve access and support responding, in particular material policies and other policies affecting materials (n=6 each) (Figure 32). Salient are the 4-5 respondents who see *stakeholder identification*, *life cycle perspective on EHS* and *reporting* mainly as an information access problem.

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Q4 What are emerging questions raised by your key clients?

Selected emerging questions (members):

- Life Cycle Analysis
- detailed information on the different recycling streams
- class 7 (radioactive material) port and shipping requirements

Selected emerging questions (key external stakeholders):

- innovation
- conflict mineral due diligence

Deliverable D2.2

Q5 How important are the following future developments for your industry association by 2020?

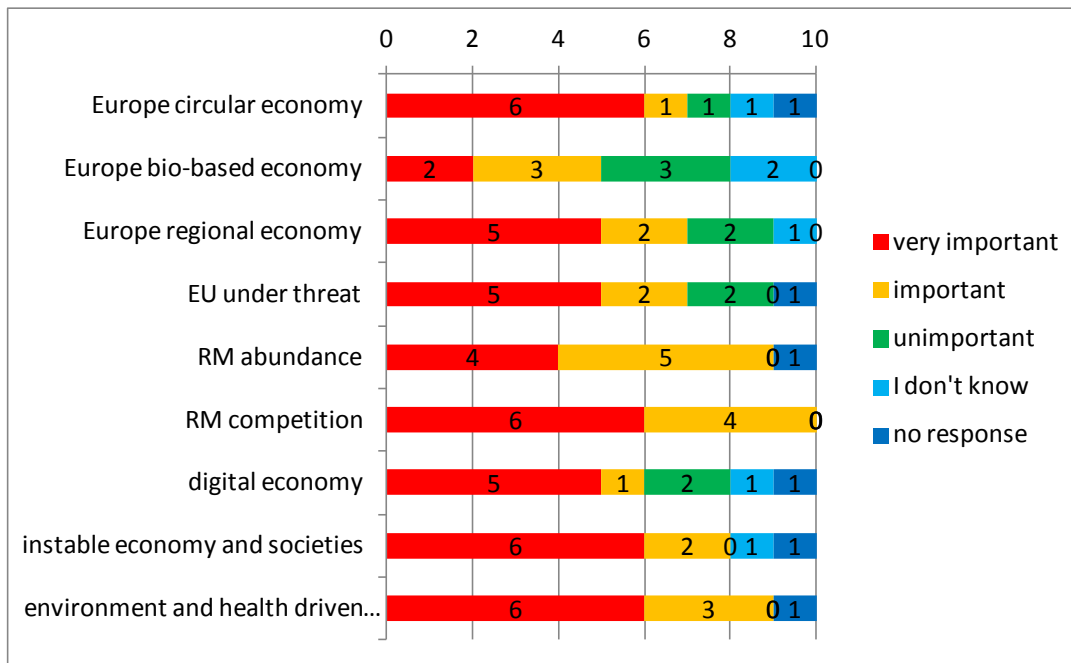


Figure 33: Importance of Future Developments that could become relevant for the strategies of industry associations by 2020 (n=10). RM – raw materials. Items shortened (for original items: see Appendix I, page 88).

Most future developments suggested are seen as relevant to the development of geological surveys' strategies by 2020 (Figure 33). A *bio-based economy in Europe* is unimportant for n=3 and not assessable for n=2 respondents.

Selected amendments:

- renewal of manufacturing experts
- design/materials of primary or secondary origin

6.2 Stakeholder Workshop

Basic information

The stakeholder workshop took place at 27 September 2016 at Eurometeax's premises along with MICA's Second Consortium Meeting.

Figure 34 shows the Agenda and Table 13 the list of participants. In addition, information material was provided for the focus groups (see Appendix 4, page 117).

Deliverable D2.2

- Welcome and introduction (10:00-10:30)
- Demonstration of the MICA Online Platform (10:30-11:15)
- **Interim findings: stakeholder mapping and stakeholders' needs in raw material intelligence (11:30-12:45)**

Lunch break

- **In-depth elicitation of needs in raw material intelligence (13:30-15:00)**
- Synthesis: Key avenues for further refinement of the MICA project (15:00-16:00)

Figure 34: Agenda of MICA's WP 2 Stakeholder Workshop (27 September 2016, Eurometaux premises in Brussels).

There was a common introduction to the MICA project and a demonstration of the MICA Online Platform for the WP2 Stakeholder Workshop and the WP4 Method Workshop.

Then, the WP2 Stakeholder Workshop participants discussed the interim findings of WP2 presented by Fraunhofer ISI.

After lunch, four focus groups were built, each one treating a raw material knowledge domain in depth. At the end, individuals had the opportunity to drop other RMI needs in raw material knowledge domains not chosen for collective discussion.

Finally, the results of the WP2 Stakeholder Workshop and the WP4 Method Workshop were synthesized in plenary.

Deliverable D2.2

Table 13: List of participants of MICA's WP 2 Stakeholder Workshop (27 September 2016, Eurometaux premises in Brussels).

First Name	Last Name	Affiliation
Jan-Olof	Arnbom	SGU
Vincent	Aubert	Toyota Motors Europe
Guillaume	Bertrand	BRGM
Vanja	Bisevac	INTRAW/EFG
Teresa	Brown	BGS-NERC
Andy	Clifton	Rolls-Royce
Claudia	Delfini	EGS
Lorenz	Erdmann	Fraunhofer ISI
Eberhard	Falck	MinPol
Steven	Fortier	USGS
Christian	Hagelüken	Umicore
Sari	Katalin	MFGI
Dirk	Lauinger	NTNU
Pascal	Leroy	WEEE Forum
Erika	Machacek	GEUS
Björn	Moller	Fraunhofer ISI
David	Ovadia	Blenheim Natural Resources
Bjarni	Pjetursson	EGDI/GEUS
Henk	Pool	CEFIC
Lidia	Quental	LNEG
Barbara	Radwanek-Bak	PGI
Michael	Ritthoff	Wuppertal Institut
Nancy	Savall	EGS
Mark	Simoni	NGU
Patrick	Wall	VERAM/EGS

Results

The qualitative results of the Stakeholder-Workshop are summarized in section 3.2 and extensively captured in the supplementary spreadsheet file.

6.3 Interviews

Basic information

The interviews took place in two phases:

- The first interview phase from June-September 2016 explored NGOs and industry associations' positions in depth.
- The second interview phase was designed to close gaps identified along the Second Consortium Meeting, the Second AB Meeting and the Stakeholder Workshop all taking place in the last week of September 2016.

Interview candidates were identified by making use of the Stakeholder Report (Erdmann et al. 2016) and additional web-searches.

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Interviews were mostly conducted by telephone, a few statements to the questions posed were submitted in written form, and a WFP2 partner joint a conference on financing to report her impressions about raw material information needs. All these activities are covered under interviews expressing individual views on raw material information needs.

Interviewees are not disclosed as they were guaranteed anonymity.

Results

The qualitative results of the interviews are summarized in section 3.3 and extensively captured in the supplementary spreadsheet file. They are not published in a disaggregated way for reasons of anonymization.

Deliverable D2.2

Appendix: Supplementary material

Appendix I: EGS Survey – invitation letter and questionnaire

EGS Survey - Invitation Letter

<Subject:> EGS survey on raw material information needs of its members/MICA project

Dear #Person #Title #Last Name,

the MICA Project aims to improve the provision and delivery of raw material information to stakeholders in Europe through a powerful, user-friendly online platform. It focuses on mineral raw materials (metallic, industrial and construction minerals). The MICA online platform will integrate different data sets, methods and foresight tools in a single platform. To this end MICA carries out a careful analysis of stakeholder needs.

EuroGeoSurveys (EGS), The Geological Surveys of Europe, is a partner of MICA and is now running a survey among its members on geological surveys' information needs, in co-operation with the Fraunhofer Institute for Systems and Innovation Research (ISI).

You are receiving this request to take part in this survey because your views are vital to enhance our knowledge and understanding of raw material information needs of geological surveys as potential users of the envisaged online platform. The results will be used to account for the needs of the EGS members in the design and services of the MICA online platform (see MICA leaflet attached and website <http://www.mica-project.eu>).

The online survey will be open until July 22th, 2016. It should take not more than 15-20 minutes to complete. Your responses will remain strictly confidential and will only be used for the purposes of this study (see MICA data protection statement attached). We will provide to all participants in the survey a copy of the results, and we thank you in advance for your help in this effort.

To begin the survey, please follow your personalized link: #link

If you require any further information about the study or have any technical problems with the survey website, please do not hesitate to contact us directly by email.

Yours sincerely,

#Person EGS

EuroGeoSurveys

Phone: #phone number | Email: # email address

Lorenz Erdmann

Fraunhofer Institute for Systems and Innovation Research ISI

Phone: +49 721 6809 313 | lorenz.erdmann@isi.fraunhofer.de

Deliverable D2.2

EGS Survey - Questionnaire

Druckversion

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Fragebogen

1 Start

MICA project: information needs of geological surveys

Welcome to the survey on raw materials information needs. This survey is designed for geological surveys and it is part of the works being developed by the MICA project.

The MICA project aims to improve the provision and delivery of raw material information to stakeholders in Europe through a powerful, user-friendly online platform. It focuses on mineral raw materials (metallic, industrial and construction minerals) and anthropogenic stocks of secondary raw materials.

Your input will contribute to making project outputs more useful to yourself and others, and also to defining research needs for future work. The survey should take not more than 15-20 minutes to complete.

Your responses will remain strictly confidential and will only be used for the purposes of this study.

To start the survey, please click "continue"

2 Q1: Current Issues

Current strategic issues

EuroGeoSurveys (EGS) represents the national and regional geosurveys in Europe. We constantly review and refine our activities to assist our members in meeting their raw material information needs and leverage your Earth science knowledge to support the EU's competitiveness, social well-being, environmental management and international commitments.

How important are the following strategic issues for your geological survey?

Please tick the respective box.

	very important	important	unimportant	I don't know
The EU's Raw Material Initiative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Competitiveness of the European primary raw material supply sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volatile raw material prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public attitudes towards exploration & mining (e.g. land use, environment, health & safety issues)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sustainable Development Goals (impacts on the raw material strategy of our country/region)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Circular Economy Action Plan of the European Commission (incl. revision of waste directives)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A common European Geological Service to support national and EU institutions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spatial planning : new strategies, legislation and acts (surface, subsurface, offshore)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Budget pressure on our geological survey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Time pressure on our geological survey to respond ever more quickly to clients' requests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Competences of our geological survey beyond Earth sciences (e.g. raw material economics, map anthropogenic stocks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please list up to 3 other very important strategic issues for your geological survey.

http://ww4.efs-survey.com/www/print_survey.php?syid=65189&__menu_node=print 11.07.2016



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3 Q2: Use of raw material information platforms

Use of raw material information platforms

Geological surveys are both providers and users of raw material information. A number of raw material information platforms have emerged that you might already know. We intend to incorporate some of them in the MICA online platform.

How useful are the following raw material information platforms for your geological survey?

Please tick the respective box for EU platforms.

	very useful	useful	useless	I don't know
CRM_InnoNet – Substitution of critical raw materials (www.criticalrawmaterials.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EGDI – European Geological Data Infrastructure (http://www.egdi-scope.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EIT-KIC Raw Materials – turning the challenge of raw materials dependence into a strategic strength for Europe (http://eitrmaterials.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EO-MINERS – Earth Observation to improve best practice in mining (http://www.eo-miners.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EURare – development of a European Rare Earth Element (REE) industry for uninterrupted supply of REE raw materials and products (http://www.eurare.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EuroGeoSource – aggregated geographical information on geo-energy and mineral resources (http://www.eurogeosource.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i2Mine – the Intelligent Deep Mine of the Future (http://www.i2mine.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INTRAW – Fostering international cooperation on raw materials (http://intra.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Minerals4EU – provides data, information and knowledge on mineral resources and production around Europe (http://www.minerals4eu.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MINVENTORY – directory of statistical data holders on stocks and flows of primary and secondary raw materials (https://ec.europa.eu/growth/tools-databases/minventory/content/minventory)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promine – stimulate the extractive industry to deliver new products to manufacturing industry (http://promine.gtk.fi)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RMIS – Raw Material Information System http://rmis.jrc.ec.europa.eu)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

other very useful EU raw material information platforms:

Please tick the respective box for non-EU platforms.

	very useful	useful	useless	I don't know
IRP International Resource Panel Working Group on Global Metal Flows (http://www.unep.org/resourcepanel)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
national platforms (e.g. national environmental information systems)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
regional platforms (e.g. regional land use planning portals)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
commercial platforms (e.g. Roskill Information Services)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

other very useful non-EU raw material information platforms:

4 Q3: Needs for improvement of raw material information

Needs for improvement of raw material information

http://www4.efs-survey.com/www/print_survey.php?syid=65189&__menu_node=print 11.07.2016

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Today geological surveys have to identify particular different sources in order to meet their raw material information needs. The development of the MICA online platform aims to

1. **improve access to information:** different data sets (e.g. EU-wide geological data, socio-economic data, etc.) and methods & tools (e.g. 3D models, scenario tools for future land use) are made available in a single platform.
2. **support responding to information needs:** stakeholders first ask questions (e.g. from whom will we get how much raw material in a circular economy?), and then the platform suggests sequences of operations to answer the questions, i.e. it delivers combinations of information on data sets, methods & tools.

We want to know how you assess these two improvement options in four knowledge fields.

Which of the two improvement options do you consider as particularly important to your work?

Please tick your needs in the field of **mineral deposits**.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to our work
mineral endowment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
onshore resource potential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
offshore resource potential	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
greenfield exploration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
brownfield exploration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
geographical referencing and integration of earth- observation, geological, land use, socio-economic and other data)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
historical information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
investors and investment levels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please specify up to 3 other very important raw material information needs in the field of mineral deposits:

5 Q3.2: Needs for Improvement of raw material information

Please tick your needs in the field of **anthropogenic stocks**.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to our work
post mine closure responsibilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
abandoned mining waste deposits and tailings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
abandoned mining sites for future land use (contamination, geological safety, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
above ground infrastructure stock of commodities (in buildings, railways, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
subsurface infrastructure stock of commodities (in water pipes, underground cables, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

http://ww4.efs-survey.com/www/print_survey.php?syid=65189&__menu_node=print 11.07.2016



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material flows for the recovery of commodities
(demolition waste, industrial residues, etc.)
recycling levels of commodities (collection rate, share of
recycling in total production, etc.)
landfill mining for the recovery of commodities
(materials, environment, etc.)

☐ ☐ ☐ ☐

☐ ☐ ☐ ☐

Please specify up to 3 other very important raw material information needs in the field of anthropogenic stocks:

6 Q3.3: Needs for improvement of raw material information

Please tick your needs in the field of **raw material supply and demand**.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to our work
early warning system for criticality (indicators, monitoring etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
future criticality of minerals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
conflict minerals (origin, certification, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
dependability of companions from major commodities (e.g. molybdenum from copper)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
demand trends for commodities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
supply trends for commodities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
future share of primary supply in total supply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
commodity price trends	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
future primary and secondary production in Europe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
types of raw-material processing industries developed in Europe in the near future	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
value chain bottlenecks in Europe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please specify up to 3 other very important raw material information needs in the field of raw material supply and demand:

7 Q3.4: Needs for improvement of raw material information

Please tick your needs **in other fields**.

improve access to
information (1)

support
responding to
information
needs (2)

both: improve
access (1) and
support
responding (2)

not relevant to
our work

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mining (finance, concession, development, operation, closure, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
recycling (collection, logistics, waste management, material recovery processes, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
life cycle perspective on environment, health and safety (EHS) impacts of exploration and mining	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mineral policies at global, EU, national and regional level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other policies affecting minerals extraction (regional development, trade, etc.) at global, EU, national and regional level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
reporting (accountability to shareholders, to employees, to employees, to local communities, to the general public)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
stakeholder identification	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
effective multi-stakeholder engagement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please specify up to 3 other very important raw material information needs:

8 Q4: Emerging raw material information needs


Emerging information needs of clients

The MICA online platform aims to assist you in meeting emerging raw material information needs.

Who are your key clients?

Please sort the client groups by relevance to your geological survey's extent of work:

citizens
earth science
exploration and mining industry
national ministries
other industry
own research and development strategy
non-governmental organisations
regional ministries
other: please specify below *



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* Other client group:

What are emerging questions raised by your key clients, which might influence your future work by 2020 significantly?

Please fill in up to 3 most urgent, emerging raw material information needs of your **national / regional ministries**.

Please fill in up to 3 most urgent, emerging raw material information needs of your **other key clients**.

9 Q5: Future strategic issues

Future strategic issues

A number of future developments are under way that may require strategic responses of your geological survey having implications for your raw material information needs.

How important are the following future developments for your geological survey by 2020?

Please tick the respective box.

	very important	important	unimportant	I don't know
Europe striving for a circular economy , other world regions for traditional mining	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Europe striving for a bio-based economy , other world regions for a minerals-based economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
European regions striving for regional economies , other world regions for global markets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soaring social conflicts over exploration and mining in Europe (land use conflicts, scandalization of mountain top removal, offshore accidents, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EU under threat - fragmented European integration -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A world of raw material abundance (falling raw material costs, frontier mining, new technologies, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A world of increased competition for raw materials (volatile and long-term increase in raw material costs, clashing of national interests, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A global digital economy (hyper connectivity and big data, relocation of value chains, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instable world economy and societies (financial crisis, migration, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other very important future developments:

10 Q6: Requirements to the online platform

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Functional requirements to the online platform

The MICA online platform will host and combine different data sources and data types, methods and tools to respond to geological surveys' (and other stakeholders') raw material information needs. Your information needs may range from simple routine questions to single complex questions. The online platform shall be as powerful and user-friendly as possible.

What are your most important technical requirements to the envisaged MICA online platform?

Please select **up to 3** most important functional requirements.

- ☐ Each stakeholder question and the respective platform response should be documented in a transparent and traceable way.
- ☐ It should be possible to select between the latest data available, the most reliable data available, the most comprehensive data available and to select between freely and commercially available data.
- ☐ The online platform should provide effective guidance to technical experts how to employ the methods suggested.
- ☐ The online platform should contain all tools suggested with a free download function.
- ☐ The suggested sequence of operations to answer a question, i.e. a combination of information on data sets and methods & tools, should meet the scientific state of the art.
- ☐ The online platform should provide additional guidance in case it suggests various ways to meet a raw material information need.
- ☐ The queries and responses by the online platform should be archivable in text, spreadsheet and database format.
- ☐ The online platform should display the output in an easy to understand and attractive graphical format.

Please fill in up to 3 other most important functional requirements:

11 General information

General information

Please tick your position at the geological survey:

- ☐ strategic management
- ☐ geological data, information and knowledge
- ☐ minerals research
- ☐ public relations

other - please specify:

Do you have further comments?

12 Beenden

You have reached the end of the survey.

Please submit your questionnaire by clicking on "continue".
Afterwards, no changes are possible any more.

13 Endseite

You have successfully submitted your responses.

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Thank you very much for your participation!

The MICA Team

Deliverable D2.2

Appendix 2: EFG Survey – invitation letter and questionnaire

EFG Survey - Invitation Letter

Dear Colleague,

The MICA Project aims to improve the provision and delivery of raw material information to stakeholders in Europe through a powerful, user-friendly online platform. It focuses on mineral raw materials (metallic, industrial and construction minerals). The MICA online platform will integrate different data sets, methods and foresight tools in a single platform. To this end MICA carries out a careful analysis of stakeholder needs.

The European Federation of Geologists (EFG) is a partner of MICA and is now running a survey among its members on geoscientists' information needs, in co-operation with the Fraunhofer Institute for Systems and Innovation Research (ISI).

You are receiving this request to take part in this survey because your views are vital to enhance our knowledge and understanding of raw material information needs of professional geologists as potential users of the envisaged online platform. The results will be used to account for the needs of the EFG members in the design and services of the MICA platform (see MICA leaflet attached and website <http://www.mica-project.eu>).

The online survey will be open until July 22nd, 2016. It should take not more than 15-20 minutes to complete. Your responses will remain strictly confidential and will only be used for the purposes of this study (see MICA data protection statement attached). We will provide to all participants in the survey a copy of the results, and we thank you in advance for your help in this effort.

To begin the survey, please follow your personalized link: [MICA Survey](#)

If you require any further information about the study or have any technical problems with the survey website, please do not hesitate to contact us directly by email.

Yours sincerely,

Vanja Bisevac

The European Federation of Geologists

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Lorenz Erdmann

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EFG Survey - Questionnaire

MICA project: information needs of geologists

MICA project: information needs of geologists

Welcome to the survey on raw materials information needs. This survey is designed for geologists and it is part of the works being developed by the MICA project. The MICA project aims to improve the provision and delivery of raw material information to stakeholders in Europe through a powerful, user-friendly online platform. MICA focuses on mineral raw materials (metallic, industrial and construction minerals) and anthropogenic stocks of secondary raw materials.

Thank you very much for your willingness to participate. Your input will contribute to making project outputs more useful to yourself and others, and also to defining research needs for future work. The survey should take not more than 15-20 minutes to complete. Your responses will remain strictly confidential and will only be used for the purposes of this study.



MICA Mineral Intelligence
Capacity Analysis

EFG Communication <Question 1/5>

The EFG is a not-for-profit organisation whose purpose is to represent the professions of geology in Europe, especially to the European Union and its various bodies. We communicate regularly with our members through GeoNews, EFG's monthly newsletter, the biannual European Geologist Journal and social media.

Please let us know your opinion on EFG's media:

(tick the appropriate box)

1. Mark only one oval per row.

	I strongly agree	Agree	Disagree	Strongly disagree	I don't have an opinion
GEONEWS - The new layout facilitates reading	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
GEONEWS - The newsletter is too long	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EUROPEAN GEOLOGIST JOURNAL - Thematic issues are appealing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LINKEDIN - The information provided on EFG H2020 projects is sufficient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
TWITTER - EFG tweets are relevant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Use of raw material information platforms <Question 2/5>

<https://docs.google.com/forms/d/13Gg6uzZq9pUTbCBIFbY0DSfWVhzyNn6dlB4R2sf76jg/edit>

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MICA project: information needs of geologists

Geologists are both providers and users of raw material information. Beyond the geological portals you are well familiar with, a number of European raw material information platforms have emerged. We intend to incorporate some of them in the MICA online platform.

2. a) How often do you use these EU raw material information platforms?

Mark only one oval per row.

	daily to weekly	monthly to quarterly	yearly or less frequent	not at all
EGDI – European Geological Data Infrastructure (http://www.egdi-scope.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EIT-KIC Raw Materials – turning the challenge of raw materials dependence into a strategic strength for Europe (http://eitrawmaterials.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EO-MINERS – Earth Observation to improve best practice in mining (http://www.eo-miners.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EuroGeoSource – aggregated geographical information on geo-energy and mineral resources (http://www.eurogeosource.eu/)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i2Mine – the Intelligent Deep Mine of the Future (http://www.i2mine.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
INTRAW – Fostering international cooperation on raw materials (http://intraw.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minerals4EU – provides data, information and knowledge on mineral resources and production around Europe (http://www.minerals4eu.eu/)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
MINVENTORY – directory of statistical data holders on stocks and flows of primary and secondary raw materials (https://ec.europa.eu/growth/tools-databases/minventory/content/minventory)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EURare –development of a European Rare Earth Element (REE) industry for uninterrupted supply of REE raw materials and products (http://www.eurare.eu/)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ProMine –stimulate the extractive industry to deliver new products to manufacturing industry (http://promine.gtk.fi)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Raw Materials Information System (http://rmis.jrc.ec.europa.eu/)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
other EU raw material information platforms publicly available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. In case you chose "other EU information platforms", please specify.

.....

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MICA project: information needs of geologists

4. b) How often do you use other raw material information platforms?

Mark only one oval per row.

	daily to weekly	monthly to quarterly	yearly or less frequent	not at all
IRP - International Resource Panel Working Group on Global Metal Flows (http://www.unep.org/resourcepanel)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
national platforms (e.g. national geosurveys)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
regional platforms (e.g. regional geosurveys)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
commercial platforms (e.g. Roskill Information Services)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
other platforms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. In case you chose "other platforms", please specify.

.....

Needs for improvement of raw material information <Question 3/5>

Today geologists have to identify particular different sources in order to meet their raw material information needs. The development of the MICA online platform aims to:

(1) Improve access to information: different data sets (e.g. Europe-wide geological data, socio-economic data) and methods & tools (e.g. 3D models, scenario tools for future land use) are made available in a single platform.

(2) support responding to information needs: stakeholders in Europe first ask questions (e.g. how large is the resource potential for a commodity considering land use constraints), and then the platform suggests sequences of operations to answer the questions, i.e. it delivers combinations of information on data sets and methods & tools.

We want to know which of these two improvement options you consider as particularly important in four knowledge fields.

a) Identification and assessment of mineral deposits:

(choose your needs for improvement of information on the following themes)

Deliverable D2.2

MICA project: information needs of geologists

6. Mark only one oval per row.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to my work
mineral endowment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
onshore resource potential	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
offshore resource potential	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
greenfield exploration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
brownfield exploration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
geographical referencing and integration of earth observation, geological, land use, socioeconomic and other data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
historical information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Please specify other urgent raw material information needs for identification and assessment of mineral deposits (up to three):

.....

8.

.....

9.

.....

b) Exploitation of mineral deposits:

(choose your needs for improvement of information on the following themes)

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MICA project: information needs of geologists

10. Mark only one oval per row.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to my work
land use constraints	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
investors and investment levels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
existing and planned mining ventures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
financing options for mining ventures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
licensing procedures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
mining operations (miners, production)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
environment, health and safety (EHS) issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
closure requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
post mine closure responsibilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. Please specify other urgent raw material information needs in the field of the exploitation of mineral deposits (up to three):

.....

12.

.....

13.

.....

c) Anthropogenic stocks and recycling:

(choose your needs for improvement of information on the following themes)

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14.

MICA project: information needs of geologists

14. Mark only one oval per row.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to my work
abandoned mining waste deposits and tailings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
abandoned mines for future land use (contamination, geological safety, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
above ground infrastructure stock of commodities (buildings, railways, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
subsurface infrastructure stock of commodities (water pipes, underground energy cables, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
material flows for the recovery of commodities (demolition waste, industrial residues, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
landfill mining for the recovery of commodities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Please specify other urgent raw material
information needs in the field of
anthropogenic stocks and recycling (up to
three):

.....

16.

17.

d) Other fields:

(choose your needs for improvement of information on the following themes)

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MICA project: information needs of geologists

18. Mark only one oval per row.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to my work
life cycle perspective on environment, health and safety (EHS) impacts of exploration and mining	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
mineral policies at global, EU, national and regional level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
other policies affecting minerals extraction (regional development, trade, etc.) at global, EU, national and regional level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
reporting (accountability to shareholders, employees, local communities and the general public)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
stakeholder identification	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
effective multi-stakeholder engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. Please specify other urgent raw material information needs on other fields (up to three):

.....

20.

.....

21.

.....

Emerging information needs of key clients <Question 4/5>

Who are your key clients?

Please select up to three key clients of your work:

<https://docs.google.com/forms/d/13Gg6uzZq9pUTbCBIFbY0DSIWVhzyNn6dlB4R2ef76jg/edit>

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MICA project: information needs of geologists

22. Tick all that apply.

- ☐ geological surveys
- ☐ environmental agencies
- ☐ mining authorities
- ☐ land use authorities
- ☐ consultancies / planning offices
- ☐ academia / universities / research institutes
- ☐ exploration industry
- ☐ mining industry
- ☐ raw material processing industry (e.g. metal smelters, cement production)
- ☐ civil society
- ☐ policy makers (ministries, parliaments, parties, etc.)
- ☐ other

23. If you choose "other", please specify.

.....

What are emerging questions raised by your key clients, which might influence your work significantly until 2020?

Please mention up to 5 most urgent, emerging raw material information needs of your key clients.

24.

.....

25.

.....

26.

.....

27.

28.

Requirements to the online platform <Question 5/5>

The MICA online platform will host and combine different data sources and data types, methods and tools to respond to geologists' (and other stakeholders') raw material information needs. Your information

<https://docs.google.com/forms/d/13Gg6uzZq9pUTbCBIFbY0DSIWVrzyNn6dlB4R2ef76jg/edit>

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MICA project: information needs of geologists

needs may range from simple routine questions to single complex questions. The online platform shall be as powerful and user-friendly as possible.

29. Please select up to 3 most important requirements that could make you an actual user of the MICA online platform.

Tick all that apply.

- ☐ Each stakeholder question and the respective platform response should be documented in a transparent and traceable way.
- ☐ It should be possible to select between the latest data available, the most reliable data available, the most comprehensive data available and to select between freely and commercially available data.
- ☐ The online platform should provide effective guidance to geologists how to employ the methods suggested.
- ☐ The online platform should contain all tools suggested with a free download function.
- ☐ The suggested sequence of operations to answer a question, i.e. a combination of information on data sets and methods & tools, should meet the scientific state of the art.
- ☐ The online platform should provide additional guidance in case it suggests various ways to meet a raw material information need.
- ☐ The queries and responses by the online platform should be archivable in text, spreadsheet and database format.
- ☐ The online platform should display the output in an easy to understand and attractive graphical format.

30. Please specify other urgent requirements to the MICA online platform:

General information

Please let us know more about you.

What's the type of organisation you work for?

31. Tick all that apply.

- ☐ industry
- ☐ geological survey
- ☐ public authority
- ☐ academia / university / research institute
- ☐ consultancy / planning office
- ☐ other

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MICA project: information needs of geologists

32. If you choose "other", please specify:

.....

Please tick the principal thematic area(s) you work in:

(you can choose more than one)

33. *Tick all that apply.*

- ☐ regional reconnaissance and prospection
- ☐ mineral exploration
- ☐ planning of mining ventures
- ☐ development/engineering of mining ventures
- ☐ financing of mining ventures
- ☐ licensing of mining ventures
- ☐ mining operation
- ☐ mining support services (consumables, machinery, etc.)
- ☐ environment, health and safety (EHS) issues of mining
- ☐ long-term stewardship of mines
- ☐ land use planning
- ☐ earth sciences / applied geological sciences
- ☐ professional training
- ☐ other

34. If you choose "other", please specify:

.....

35. **Please list the countries where you normally work**

36. **What is your current age?**

Tick all that apply.

- ☐ less than 29
- ☐ 30-39
- ☐ 40-49
- ☐ 50-59
- ☐ 60 and older


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MICA project: information needs of geologists

37. Do you have any further comments?

Thank you for participation in this survey! We are looking forward to sharing the results with you!

If you tick the "submit" button, no further changes of your responses will be possible. If you want to change your responses, you should click the "back" button(s).

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Appendix 3: Industry Survey – invitation letter and questionnaire

Industry Survey - Invitation Letter

<Subject:> Survey on raw material information needs of industry associations/EU project “MICA”

Dear #Person #Title #Last Name,

the EU- funded MICA project aims to improve the provision and delivery of raw material information to stakeholders in Europe through a powerful, user-friendly online platform. It focuses on metals, industrial minerals and construction materials both of primary and secondary origin. This MICA online platform will integrate different data sets, methods and foresight tools in a single platform. To this end MICA carries out a careful analysis of stakeholder needs.

The Fraunhofer Institute for Systems and Innovation Research (ISI) is a MICA partner and conducts a survey among industry associations representing the materials, manufacturing and recycling industries with the aim to identify their raw material information needs.

#You# are receiving this request to take part in this survey because your views are vital to enhance our knowledge and understanding of raw material information needs in particular of European industry as potential users of the envisaged online platform. The results will be used to account for the needs of the different industry sectors in the design and services of the MICA online platform (see pdf attached and website <http://www.mica-project.eu>).

The online survey will be open until July 22nd, 2016. It should take not more than 15-20 minutes to complete. Your responses will remain strictly confidential and will only be used for the purposes of this study (see MICA data protection statement attached). We will provide to all participants in the survey a copy of the results, and we thank you in advance for your help in this effort.

Please convey this Email to a suitable person in your association.

To begin the survey, please follow the personalized link: #link

If you want several people to fill in the questionnaire, please send us a request for another personalized link with the email address of the recipient.

Please do not hesitate to contact us directly by email in case you require any further information about the project or have any technical problems with the survey.

Yours sincerely,

Lorenz Erdmann for the MICA team
Fraunhofer Institute for Systems and Innovation Research ISI
Phone: +49 721 6809 313 | Email: MICA@isi.fraunhofer.de

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Industry Survey - Questionnaire

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Fragebogen

1 Start

MICA project: raw material information needs of industry associations

Welcome to the survey on raw materials information needs. This survey is part of the EU-funded project MICA and specifically designed to gather the needs of industry associations representing the materials (incl. raw material processing), manufacturing and recycling industries.

The MICA project aims to improve the provision and delivery of raw material information to stakeholders in Europe and beyond through a powerful, user-friendly online platform. It focuses on metals, industrial minerals and construction materials both of primary and secondary origin (<http://www-mica-project.eu>).

Your input will contribute to making project outputs more useful to yourself and others, and also to defining research needs for future work. The survey should take not more than 15-20 minutes to complete.

Your responses will remain strictly confidential and will only be used for the purposes of this study.

2 Q1: Current Issues

Current strategic issues

Industry associations represent the interests of their member companies in particular at EU level and assist them in meeting their information needs in changing regulatory environments, dynamic markets and towards diverse societal claims.

How important are the following strategic issues for your industry?

Please tick the respective box.

	very important	important	unimportant	I don't know
Circular Economy Action Plan of the EC (incl. revision of waste directives)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conflict minerals (proposal for a EU regulation on imports)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Permission of industrial facilities in the EU (review of Best Available Technique Reference documents)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REACH and non-REACH (review of chemicals regulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Competitiveness of the European industry under current raw material supply conditions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TTIP, CETA, TISA (impacts on raw material trade)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Capability of the European innovation system to deliver high value novel materials & products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volatile raw material prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ethical requirements to European industry (e.g. responsibility for supply chain, own operations, end-of-life impacts)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sustainable Development Goals (SDS) (impacts on raw material supply)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please list up to 3 other very important strategic issues for your industry.

3 Q2: Use of raw material information platforms

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Use of raw material information platforms

A number of raw material information platforms have emerged that you might already know. We intend to incorporate some of them in the envisaged MICA online platform.

How useful are the following raw material information platforms for your industry?

Please tick the respective box for EU platforms.

	very useful	useful	useless	I don't know
CRM_InnoNet – Substitution of critical raw materials (www.criticalrawmaterials.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EGDI – European Geological Data Infrastructure (http://www.egdi-scope.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EIT-KIC Raw Materials – turning the challenge of raw materials dependence into a strategic strength for Europe (http://eitrawmaterials.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EO-MINERS – Earth Observation to improve best practice in mining (http://www.eo-miners.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EURare – development of a European Rare Earth Element (REE) industry for uninterrupted supply of REE raw materials and products (http://www.eurare.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EuroGeoSource – aggregated geographical information on geo-energy and mineral resources (http://www.eurogeosource.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i2Mine – the Intelligent Deep Mine of the Future (http://www.i2mine.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
INTRAW – Fostering international cooperation on raw materials (http://intraw.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minerals4EU – provides data, information and knowledge on mineral resources and production around Europe (http://www.minerals4eu.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
MINVENTORY – directory of statistical data holders on stocks and flows of primary and secondary raw materials (https://ec.europa.eu/growth/tools-databases/minventory/content/minventory)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ProMine – stimulate the extractive industry to deliver new products to manufacturing industry (http://promine.gtk.fi)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
RMIS – Raw Material Information System of the EC-JRC (http://rmis.jrc.ec.europa.eu)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

other very useful EU raw material information platforms:

Please tick the respective box for non-EU platforms.

	very useful	useful	useless	I don't know
IRP International Resource Panel Working Group on Global Metal Flows (http://www.unep.org/resourcepanel)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
national platforms (e.g. national geosurveys)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
regional platforms (e.g. regional geosurveys)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
commercial platforms (e.g. Roskill Information Services)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

other very useful non-EU raw material informations:

4 Q3: Needs for improvement of raw material information

Needs for improvement of raw material information

Today industries have to identify particular different sources in order to meet their raw material information needs.

The development of the MICA online platform aims to

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1. **improve access to information:** different data sets (e.g. EU-wide raw material production data, socio-economic data, etc.) and methods & tools (e.g. life cycle analysis, scenario tools for future material demand) are made available in a single platform
2. **support responding to information needs:** stakeholders first ask questions (e.g. from whom will we get how much material in a circular economy?), and then the platform suggests sequences of operations to answer the questions, i.e. it delivers combinations of information on data sets, methods & tools.

We want to know how you assess these two improvement options in four knowledge fields.

Which of the two improvement options do you consider as particularly important to your work?

Please tick your needs in the field of **raw material supply and demand**.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to our work
early warning system for criticality to our industry (indicators, monitoring, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
future criticality of raw materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
conflict minerals (origin, certification, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
future demand for commodities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
future demand for specialities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
future raw material supply (primary and secondary share, sources, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
dependence of companions from major commodities (e.g. molybdenum from copper)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
raw material price development (short-, medium- and long-term)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please specify up to 3 other very important raw material information needs in the field of raw material supply and demand:

5 Q3.2: Needs for improvement of raw material information

Please tick your needs in the field of **material production and manufacturing**.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to our work
raw-material processing industry structure in Europe (types developed, investors, investment levels)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
raw-material processing plants in Europe (sites, raw material sourcing, energy supply, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
future primary and secondary material production in Europe (amounts, actors, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
regional clusters (mining, processing and transforming raw materials into high value products)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
impacts of changing raw material supply patterns on value chains	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
supply chain bottlenecks in Europe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
design of materials, products and infrastructure (supporting raw material information, substitution options)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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resource efficiency potentials for European industry

☐ ☐ ☐ ☐

Please specify up to 3 other very important raw material information needs in the field of material production and manufacturing:

6 Q3.3: Needs for improvement of raw material information

Please tick your needs in the field of **anthropogenic stocks and recycling**.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to our work
above ground infrastructure stock of commodities (in buildings, railways, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
subsurface infrastructure stock of commodities (in water pipes, underground cables, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
movable product stock of commodities (vehicles, consumer electronics, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
city-level stock of commodities (location, quantity, purity, buildings passport, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
material flows for the recovery of commodities (demolition waste, industrial residues, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
recycling (waste collection rates, share of recycling in total production, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
landfill mining for the recovery of commodities (materials, environment, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
agile remanufacturing (handle input variety, flexible adaptation, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please specify up to 3 other very important raw material information needs in the field of the anthropogenic stocks and recycling:

7 Q3.4: Needs for improvement of raw material information

Please tick your needs in **other fields**.

	improve access to information (1)	support responding to information needs (2)	both: improve access (1) and support responding (2)	not relevant to our work
Investment cycles in exploration & mining (time length, finance options, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
game-changing technologies for industry (share operational field data with suppliers, additive manufacturing, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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life cycle perspective on environment, health and safety (EHS) Impacts of raw materials

material policies at global, EU, national and regional level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other policies affecting European industry's material base (regional development, trade, etc.) at global, EU, national and regional level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
reporting (accountability to shareholders, to employees, to local communities and to the general public)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
stakeholder identification	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
effective multi-stakeholder engagement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please specify any other very important raw material information needs (up to 3):

8 Q4: Emerging raw material information needs

Emerging raw material information needs

It may be important for your industry association to identify first the emerging raw material information needs of your key clients. The MICA online platform aims to assist you in meeting such emerging raw material information needs.

What are emerging topics, which might influence your future work by 2020 significantly?

By 2020, we expect our **members** to raise these emerging topics:

By 2020, we expect our **key external stakeholders** to raise the following topics:

9 Q5: Future strategic issues

Future strategic issues

A number of future developments are under way that may require strategic responses of your industry having implications for your raw material information needs.

How important are the following future developments for your industry by 2020?

Please tick the respective box.

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	very important	important	unimportant	I don't know
Europe striving for a circular economy , other world regions for traditional mining	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Europe striving for a bio-based economy , other world regions for a minerals-based economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
European regions striving for regional economies , other world regions for global markets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EU under threat – rising disintegration tendencies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A world of raw material abundance (falling raw material costs, frontier mining, new technologies, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A world of increased competition for raw materials (volatile and long-term increase in raw material costs, clashing of national interests, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A global digital economy (hyper connectivity and big data, relocation of value chains, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instable world economy and societies (financial crisis, migration, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environment and health issues drive raw material use globally (climate change, children's environmental health, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Spalte 1

Other very important future developments

10 General information

General information

Please tick the **part(s) of the value chain** that your industry association covers:

- ☐ processing of primary raw materials (e.g. blast furnace processing iron ore)
- ☐ processing of secondary raw materials (e.g. electric arc furnace processing steel scrap)
- ☐ basic material production (e.g. metals, burnt lime, etc.)
- ☐ material production (e.g. production of alloys, cement, composites, etc.)
- ☐ semi-finished products (e.g. coils, ingots, etc.)
- ☐ component and part manufacturing
- ☐ final end-product manufacturing
- ☐ construction and civil engineering
- ☐ installation of equipment
- ☐ dismantling (buildings, infrastructure, industrial facilities, etc.)
- ☐ waste collection and management

other: please specify

Please tick **your position**:

- ☐ strategic management of industry association
- ☐ public relations, information and communication of industry association
- ☐ technical committee / technical working group
- ☐ member company

other: please specify

Do you have further comments?

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Please tick the following two boxes.

	No	Yes
I want to get the results of the survey	<input type="checkbox"/>	<input type="checkbox"/>
You can contact me in case you have further questions for clarification	<input type="checkbox"/>	<input type="checkbox"/>

If you have ticked one or two boxes with 'Yes', please drop your email address:

11 Beenden

You have reached the end of the survey.

Please submit your responses by clicking on "continue".

Afterwards, no changes are possible any more.

12 Endseite

Deliverable D2.2

Appendix 4: Information material provided at the Stakeholder Workshop

D1 Mineral deposits

Topics	Subtopics
geo information	geological , geophysical, geochemical and mineral resources maps and databases; national/regional /district scale (1:50.000), geological research archive, geological structures and formations; published and unpublished, open geodata
land use information	current land use and land use plans, urban planning, area development; protected areas (e.g. natural areas, cultural areas, recreational areas, indigenous people); infrastructure plans (from government to municipality level, which municipalities where?); groundwater capacity and competition, underground waters; access (land use availability, restrictions), safeguarding of potential deposits and prospects
deposit information	mineral occurrences: size, location, quality data and mineral endowment of deposits; consistent information provided to national, state and region agencies, access to consultants; geological information, interpretation and modeling
resource classification and documentation	onshore and offshore resource potential, resources and reserves (registered; licensed/proven); per deposit, in Europe; aggregate national datasets and databases from various sources, statistics easy access to public reporting
exploration information	existing data on greenfield and brownfield exploration; exploration permits, license holders; funding opportunities for exploration; constraints to exploration (see: land use information (above), D7 Political & legal framework, D8 Social accountability & reporting)
historical information	drill core archives (national); compilation of historical data on raw material occurrences
geographical referencing and integration	of earth observation, geological, land use, socio-economic and other data

D1 Mineral deposits

1. How large is the **possibility to find enough new resources** in any given area to open new mines (e.g. Greenland)?
2. Where are the **most promising future mining areas** (geological interpretation and modelling, R&D focus, feasibility of prospective deposits, proposal for strategic use of mineral resources)? Where could we possibly find the next "**mega deposit**"?
3. How much **building material is available** locally for a certain construction project (e.g. sand, limestone)?
4. Which **information on exploration works** is available (licensing, reports, mining industry/universities/companies involved, expertise available in a certain country)?
5. Which **innovations in greenfield exploration** will be available soon (e.g. more cost effective)?
6. Which **information** is available about a **specific** raw material type, **specific** mineral resources objective, mineral resources from a **specific** area (fact sheets)?
7. What are the possibilities and realistic prospects of **financing** exploration projects?
8. How can I get **expertise/assistance from EU or other geological surveys** for the exploration of deep deposits of mineral resources?

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D2 Mine development & mining

Topics	Subtopics
constraints to mining	social/environmental/geological/technical constraints; small, complex, difficult access; see also constraints to exploration (D1 mineral deposits, D7 Political & legal framework, D8 Social accountability & reporting)
encouragement of mining	potential for expansion in Europe, economic viability; small-scale mining; technical and legal support, cross-border initiatives
Investment in mining	investors and investment levels; financing options for mining ventures
existing and planned mining ventures	exploitation / mining concessions; licensing procedures, ownership of mines, property protection, security of tenement; See also D7 Political & legal framework
mining operations	mining companies, production amounts, (current and historical); mining efficiency in times of low commodity prices, improvement of extraction rates
environment, health and safety issues	waste minimisation, waste utilization (e.g. quarry/marble) mine closure requirements, post mine closure responsibilities (environmental impact plans) Tailings: see also D3 Anthropogenic stocks & recycling , D7 Environment & health
Trends and issues	technological trends in mining processes, automated deep mining, integrated system for metals processing and refining, optimisation measures, technology overhaul needs, employment; new sustainable concepts and solutions for mining,

D2 Mine development & mining

1. What is the overall **risk** of exploration and mining of mineral X in country Y?
2. What do we know about the **accessibility** of commodity X in country Y for mining?
3. How will the **political situation** in country Y develop with regard to mining in the next couple of years (e.g. REEs that contain Uranium in Greenland)?
4. Will **commodity prices** stay high enough to be able to effort the next phase of exploration?
5. What is the **cost of extraction** for mining commodity X?
6. Growing interest in **infrastructure developments** – especially for low value high volume commodities. Which infrastructure needs to be built to transport minerals in the future? Where are they built? What materials will be needed therefore?
7. What are the possibilities and realistic prospects of **financing** mining projects?
8. How long is the likely **timeframe for permitting** a new mine / to re-open an old mine?

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D3 Anthropogenic stocks & recycling

Topics	Subtopics
above ground infrastructure stock of commodities	in buildings, railways, etc.
subsurface infrastructure stock of commodities	in water pipes, underground cables, etc.
movable product stock of commodities	vehicles, consumer electronics, etc.
city-level stock of commodities	location, quantity, purity, buildings passport, etc.
material flows relevant for the potential recovery of commodities	waste materials (demolition waste, industrial residues, etc.), material composition; waste uses
recycling	recycling levels of commodities ,waste collection rates (e.g. WEEE), share of recycling in total production, real and potential recovery rates; differences between recycling rates (calculation methods, closed vs. open recycling, input vs. production share, etc.); input properties, recyclability data
re-manufacturing	effective and economic technologies for recycling and recovery, agile remanufacturing (handle input variety, flexible Adaptation), etc.; output properties, improved downstream processing of mixtures
landfill mining for the recovery of commodities	waste fractions (site, location on landfill, materials contained in quality and quantity), environment (accessibility, degree of inertisation, etc.)
abandoned mines	waste deposits and tailings: potential for secondary use, chemical information sites for future land use: contamination, geological safety, etc. See also: D1 Mine development and mining, D7 Environment & health

D3 Anthropogenic stocks & recycling

1. How does the **urban environment interact with the subsurface**?
2. How much secondary material of commodity X is in **stock** (inventory per stock type, data harmonisation)
3. Where and when do **stocks occur as wastes and scraps** in which **quality and quantity**?
4. What are the **characteristics** of different **recycling streams** in detail?
5. When and where is how much **secondary raw material needed** and for what purposes (e.g. slags in concrete)?
6. Which **quality standards to secondary raw materials** are in place in which location?
7. What European **research** is available on the **treatment of tailings** for material recovery? Where are the **most suitable tailings** for reprocessing? What help is available to set up a **tailings reprocessing operation**?
8. What is the **waste resource potential** for secondary use in a circular economy?

Deliverable D2.2

D4 Material production & manufacturing

Topics	Subtopics
raw-material processing industry in Europe	structure: types developed, competition, relocation, types vanishing; investment: investors, investment levels; plants: sites, raw material sourcing, energy supply, etc.
future primary and secondary material production in Europe	amounts, primary and secondary share; actors (companies, intermediaries, etc.); materials and intermediates such as cement, resins, composites, NdFeB magnet material
regional clusters	mining, processing and transforming raw materials into high value products; projected local demands and expansion possibilities for local supply (e.g. construction)
supply chain / value chain issues	impacts of changing raw material supply patterns on value chains; bottlenecks in Europe (loss of manufacturing, future skills deficits); flexible and delocalized approaches for intensified processing
design of materials, products and infrastructure	supporting raw material information, eco-design; substitution options, risks and costs of new materials support SMEs
resource efficiency potentials for European industry (processing, manufacturing)	energy efficiency, energy pricing; material efficiency, no net loss; self assessment tools, energy and resource management systems in the process industry
external trends	game-changing technologies (industry 4.0, additive manufacturing, etc.); socio-technological innovation, customer-driven small series production; business challenges and opportunities in a circular economy

D4 Material production & manufacturing

1. What information is available to **support materials choices** comprehensively (e.g. informed criticality choices)?
2. Who are **the biggest producers and users** of any material (e.g. W, Co, Ta), component (e.g. battery) or OEM (e.g. electric vehicles) in Europe / globally?
3. Which companies strive for cost **competitiveness and innovation respectively** (investment focus in times of low raw material prices)?
4. How will **digitalisation / industry 4.0** affect raw material supply and demand patterns?
5. How is the **global supply chain / value net** of a certain commodity?
6. How do **material requirements** develop for certain technologies?
7. Can particular construction activities be adequately supplied with **local construction materials**? What is the **local context** of production **using critical materials** in the respective products?
8. What is the **contribution** of commodity x **to the economy** (value creation, circular economy, etc.)

Deliverable D2.2

D5 Raw material supply and demand / criticality

Topics	Subtopics
early warning system for criticality	Critical minerals as defined by the EU / USGS to our industry / to a territory; indicators, monitoring, etc.
future criticality of raw materials	future supply and demand (see below), abundance / competition for raw materials; EU, global level, industry
conflict minerals	origin, certification, etc. See also D8 Social accountability and reporting
trends in raw material demand	amounts at European and global level, industry sector (commodities, specialties); material trends, material standards, new application fields of materials, new production lines of materials, competing materials (see also D4: Material production and manufacturing); emerging technologies, developments requiring a different package of raw materials (e.g. Li, Co, Ta, W, U, Ni, glass fibre, carbon fiber, resins, non-traditional industrial minerals)
trends in raw material supply	amounts at European and global level, industry sector (commodities, specialties); evolution of the mining and metal markets [geosurveys]; primary and secondary share, sources, competitiveness of Europe's primary sector, etc.,
dependence of companions from major commodities	e.g. molybdenum from copper
raw material price development / trends	prediction of commodity prices (short-, medium- and long-term prices); price volatility

D5 Raw material supply and demand / criticality

1. Will there be **any shortage of any mineral raw materials** (supply / demand projections) [consultancy] – where, when and for whom?
2. What data is available for **minor metals and minerals** (issue of small sectors; production, end-use / reliability and costs of data)?
3. How does the **economy of certain commodities / wastes** work (e.g. Ni, U, metal scrap markets) (understand and enhance functioning)?
4. How do the **markets** for material X develop (spatial, temporal)? Which **trends and developments** drive the markets (producer-user relations, exporter/importer, legal aspects, innovation, etc.)?
5. How reliable and consistent are **minerals data for stock exchanges, commodity markets and financial systems**?
6. **What commodities will do best** in the coming years (market needs)? [consultancy]
7. How is the **access to primary and secondary raw materials** relevant for a certain territory or industry?
8. How long will **overcapacities in China** sustain? What will happen afterwards?

Deliverable D2.2

D6 Political and legal framework

Topics	Subtopics
Sustainable Development Goals	environment and health issues drive global raw material use
Raw materials policy and regulation	Raw Material Initiative, (pan-)European Geological Service; conflict minerals regulation; regulations for exploration and mining (minerals act, minerals permits), national / regional
Areas policy and regulation	international ocean governance (offshore mining), bio-based economy; Natura2000, nature conservation, national / regional Spatial planning, land use, property rights See also D1 Mineral deposits (availability/restrictions)
Industry, economy and trade policy and regulation	EC's policies on digital economy, regional economy, electricity market reform, electromobility market framework; industrial emissions directive, European Pollutant Release and Transfer Register, Emission Trading Scheme ETS review; environmental fiscal reform; WTO regulation, most favored nation decisions (esp. China), data on trade and trade restrictions (OECD database, EC trade commission); EU trade tariffs, shipping and port requirements for radioactive material; Chinese trade policy and regulations, market economy status, dumping; also NZ and CN
Materials policy and regulation	Chemicals regulation (REACH impacts on raw material supply; big investment for Europeans but no so big control at the borders and no equivalent measures outside of Europe; non-REACH review)
Circular economy policy and regulation	EC Circular Economy package and national / regional regulation: waste framework directive, waste lists (Which countries classify which products as hazardous?), waste shipment regulation (Which countries allow easy shipping of EOL products?), landfill directive, product responsibility; amendment mining waste directive; incentives and barriers for the circular economy, markets in the circular economy, lifestyle changes

D6 Political and legal framework

1. What is the impact of different primary and secondary raw material supply options on the **Sustainable Development Goals**?
2. What is the **national mineral strategy / EU position** regarding the securization of mineral resources on its territory?
3. What are the **regulatory regimes and potential roadblocks for mining** of commodity X in country Y (e.g. will cyanide in Au make permitting possible in Brazil)? Are the **countries** to be invested "**mining pro**"?
4. Is **trade fair for commodity X**? (level playing field: independent disaggregated data, trade flows, tariffs, subsidies, stockpiling, energy prices, etc.)
5. What are the most relevant "**trade defense cases**" (reliable data to convince the EC)
6. Which **environmental and health regulation** is **applicable** to mining and materials production in country/region Y? How are different commodities impacted by the revision of the **Emission Trading Scheme**?
7. What is the **impact of overregulation**, particularly on SMEs?
8. What are **regulatory bottlenecks** to recover materials by the process industry?

Deliverable D2.2

D7 Environment & health issues

requirements	subtopics
Clean technologies	Environmentally friendly extraction and separation technology
water	Water use and consumption: quality, quantity; impacts of mining on water, groundwater and marine ecosystems (mine water discharge into the sea)
waste	waste minimisation; mining waste (legal aspects of ownership, amounts, management techniques); end-of-life waste; See also D3 Anthropogenic stocks & recycling, D6 Political & legal framework;
air	greenhouse gas emissions, air quality, noise, vibrations,
Resource efficiency	relation to climate change and land use; See also D4 Material production and manufacturing
areas	protected areas, nature conservation (NATURA2000), biodiversity outside officially protected areas See also D6 Political & legal framework
toxics	cyanide, mercury management
Environmental impact assessment	life cycle perspective on EHS impacts of mining and recovery of materials from waste; LCA, footprinting of raw materials, MFA for waste; recycling rates; See also D3 Anthropogenic stocks & recycling, D5 Raw material supply & demand, criticality

D7 Environment & health issues

1. What **LCA** data and studies are available (repository, methodological leeway compared to LCA standard, footprint of materials, link product systems and raw materials)?
2. What is the **environmental impact of primary supply** of commodity X compared to its **secondary supply**?
3. How large are the **environmental improvement potentials** for primary and secondary raw material supply?
4. How do environmental and health related measures **affect the life cycle costs of a mine or material production facility**?
5. Where are and where will be „**no go areas**“ for mining from an environmental perspective (efforts for a stringent definition)?
6. Who are the **stakeholders** in this field to be gathered in multi-stakeholder initiatives?
7. What are the best metrics in the calculation of concepts such **No Net Loss/ Net Gain** in the translation of raw material (Natural Capital) into more sustainable opportunities?
8. How **safe** is mining of certain commodities (e.g. Uranium) in a certain natural environment (e.g. Greenland)?

Deliverable D2.2

D8 Social accountability & reporting

requirements	subtopics
ethical requirements	social conflicts over mining; public attitudes towards mining
business integrity	legal compliance; revenue and payments transparency
social responsibility	fair labor and terms of work, occupational health and safety; emergency preparedness and response, security arrangements; human rights due diligence and compliance, mining and conflict-affected or high-risk areas; community health and safety, community and stakeholder engagement, obtaining community support and delivering benefits, free, prior and informed consent (FPIC); cultural heritage, resettlement; grievance mechanism and access to other remedies
positive legacies	(environmental and) social impact assessment; reclamation and closure

note:

- **IRMA:**
2 business integrity requirements, 13 social responsibility requirements, 10 environmental responsibility requirements, 2 positive legal requirements
- environmental responsibility and environmental impact assessment: D7

D8 Social accountability & reporting

1. How can the multitude of **assurance and certification schemes** be rationalized? (also compliance with different standards)
2. Will the Initiative for Responsible Mining Assurance (**IRMA**) Standard (Draft April 2016) requirements drive the raw material information needs? (CSO)
3. How can **recognition** of responsibly produced materials be gained by the **downstream** commodity companies?
4. Which are the **public attitudes** towards mining in any given area?
5. Which **knowledge** has to be made available and communicated to whom to establish trust?
6. What has to be done to get a **social license to operate** (exploration, onshore and offshore mining, recycling facility)?
7. What constitutes a '**fairer**' **distribution** of benefits from resource exploitation?
8. What would be the impacts of **enforced anti-slavery and child labour legislation** on primary and secondary raw material supply?

Appendix 5: Interview guideline

Introduction:

The MICA project aims to improve the provision and delivery of raw material information to key stakeholders. We have identified your organisation as such a key stakeholder group. You can benefit most from the envisaged MICA online platform, if you raise your particular raw material information needs. That's why we want to find out, what you really need.

The conversation is planned for approximately 20 minutes. Your views will be analysed and expressed only in aggregated anonymized form.

Section I - Topics

- 1) What are your major raw-material related topics?
- 2) Are there any emerging topics that are gaining importance?
- 3) How can MICA support the raw material information needs for topic x? What kind of information must it contain (e.g. data on actors, investment volumes, spatial resolution)

Section II - Questions

- 4) Who are your key stakeholders that need raw material information?
Please specify, who that is.
- 5) What are emerging questions raised by your key stakeholders (out to 2020)?
What do they want to know in more detail?
- 6) What do you want to know for your own specific purposes (out to 2020)?
Please specify, what exactly.

Is there another kind of information that indicates the emerging raw material information needs of your stakeholders?

Deliverable D2.2

Appendix 6: MICA data protection statement



What is MICA?

The MICA project is an EC-financed research project that aims to develop a Raw Material Intelligence Capacity Platform that can help answer a broad range of stakeholder questions on raw materials. This MICA online platform identifies data, methods, tools and policies related to stakeholder questions and shows the steps to take towards an answer. Further information is available in the brochure attached (see pdf) and on the website (<http://www.mica-project.eu>).

Why participate in the MICA survey?

The MICA project aims to improve the provision and delivery of raw material information to stakeholders in Europe through a powerful, user-friendly online platform. To this end, a number of surveys are conducted. You are receiving this request to take part in this survey because your views, as a potential user of the envisaged online platform, are vital to enhance our knowledge and understanding of raw material information needs. The results of the survey will be accounted for in the design and services of the MICA online platform. Your participation is voluntary and you are free to withdraw any time. A refusal to participate will not have any consequences for you.

How is data protection ensured?

The MICA project complies with the EU directive on data protection and with any updates it might receive during the life time of the project. Contact information (name, phone number and professional email address) has been collected only for the purpose of selecting participants for the survey. All your responses are confidential. Any project results will be published in anonymised form only, with no means of linking them to individual people or organisations.

The information you provide is stored on secure computers, with access only by the immediate research team. You are guaranteed that no personal details such as your name, telephone number or email address will be revealed to people outside the project. All email communication will be archived during the life of the project and used only for the purposes of the MICA project. Retention of personal data is limited to the final documentation of the survey. After this period the personal data will be destroyed.

Informed consent

By taking part in the survey you confirm your informed consent. If you require any further information about the study, have further questions or have any technical problems with the survey website, please contact us directly by email (see invitation letter).