Deliverable D1.3

First year report

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Notice

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PURPOSE

This report describes the major activities within the MICA project between December 2015 and January 2017 (14 months). The activities will be shown per work package (WP). This text will give a publically available summary of the achievements of the MICA project in the first two phases of the project; while further details can be found in the deliverables referred to in the text.

EXECUTIVE SUMMARY

WP2 mapped the stakeholders for the MICA project and defined the stakeholder Raw Material Intelligence needs and requirements and summarised them in a report with recommendations for all other work packages. WP3 finished the first inventory of the available data on Raw Materials, in which a structure for the metadata was produced based on ISO19115 requirements. This metadata structure is strongly linked to the platform established in WP6, while a workshop organised by WP3 and WP4 is being planned on data use and data uncertainty. WP4 and WP5 wrote factsheets as a comprehensive review of Raw Material methods and tools. WP4 also linked typical stakeholder questions defined in WP2 to methods to solve their problems, which will be a basis for the flowsheets developed together with WP6. WP5 defined the log-frame for Raw Material foresight studies and reflected on the scoping of Raw Material Intelligence policies at different levels. WP6 focused on a synthesis of stakeholder requirements, methods functionality analysis, translation of end users' queries in a graph of domain / sub-domain concepts and the development of the MICA platform ontology. WP7 created promotion material, a social media profile and a website and developed a dissemination strategy for the project. WP1 summarised the recommendations of the advisory board.

DELIVERABLE REPORT

1. Introduction

In the time frame covered by this report 18 deliverables were due for delivery, including this report. The deliverables summarise the work performed in six WPs, while WP6, who did not have a deliverable deadline yet, wrote an informal deliverable to the rest of the consortium to summarise their work so far.

2. Explanation of the work carried out per WP

2.1 Work package 1: Coordination

The objectives of WP1 are to perform daily management of the project and to maintain the contact with the advisory board.

WP1 has so far organised two plenary meetings, inviting all MICA participants (beneficiaries and linked third parties) and the advisory board. The Kick Off meeting was held in Copenhagen (2nd-4th February 2016) and the first General Assembly in Brussels (27th-29th September 2016). The next general assembly will be held in Paris (13th-15th June 2017), while a dissemination event in spring 2017 is being planned. Furthermore, the MICA management board met three times in a teleconference (February 2016, May 2016 and January 2017).

WP1 defined the ethical conditions, which the consortium will apply during their work. These are described in Deliverable 1.5, where it is explained how the consortium should deal with research involving human participants, with human participants that are volunteers for social or human science research, with the collection and/or storage of personal data, and the involvement of non-EU countries.

The MICA project has an Advisory Board consisting of external experts on raw materials. The establishment of the Advisory Board has previously been described (Deliverable 1.1). The role of the Advisory Board in the project is to advice on external developments relevant to achieving progress towards the expected impacts outlined in the proposal, to maximise exploitation benefits and to help with the dissemination of MICA results beyond the consortium. The MICA Advisory Board consists of 5 persons listed in Table 1.

Table 1: Name, title, organisation and type of organisation for the five members of the MICA Advisory Board.

Name	Title	Organisation	Type of organisation
Steven Fortier	Director	USGS, National Minerals Information Center	Survey
Christian Hagelüken	Director EU Government Affairs	Umicore	Industry
Karen Hanghøj	CEO, Managing Director	EIT Raw Materials	Applied research
Corina Hebestreit	Director	Euromines	Industry
Aurela Shtiza	Senior Scientific Advisor – Industrial Affairs & Environment	IMA Europe	Industry

The members of the Advisory Board are invited to the four MICA General Assemblies. After each meeting the members of the AB are invited to provide their advices in written form to the Coordinator. So far two General Assemblies followed by an Advisory Board Meeting have been held. The recommendations of the advisory board to the MICA consortium have been summarised in a report (Deliverable 1.2).

2.2 Work package 2: Needs

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

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

Task 2.1 mapped the pre-existing knowledge of the WP2 partners 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. Task 2.2 identified and classified stakeholders systematically thereby providing a sound basis for a broad and deep appraisal of stakeholder needs in Task 2.3.

Within the period covered by the report, from 01/12/2015 to 31/01/2017, all tasks in WP2 were carried out and all objectives were reached in line with the work package description of the DoA Annex I (Table 2).

Table 2: Overview of tasks within WP2.

No.	Task	Documentation
2.1	Inception	MS1 (month 4, internal document)
2.2	Stakeholder Mapping	D2.1 (month 10, public dissemination)
2.3	Stakeholder Needs Appraisal	D2.2 (month 14, public dissemination)

The following section present for each task the purpose, the activities and the beneficiaries' contributions and major key results.

Inception (Task 2.1 / MS1, reached in M4)

Purpose

The success of the MICA project relies heavily on a timely definition of stakeholder groups and their raw material intelligence (RMI) needs. Milestone MS1, the Inception Report, was an important input from WP2 to other work packages, such as Data (WP3), Methods (WP4), Policies (WP5) and the RMIC platform (WP6). Its purpose was to capture relevant stakeholder groups roughly and to share supposed key needs in RMI at an early stage of the MICA project. In addition, it suggested refinements of the systematic search of stakeholders (Task 2.2) and of their needs (Task 2.3).

Activities

Task 2.1 included four main activities; management and reporting being generic subtasks (I-II) and the others specific tasks (a-b), as described in Table 3.

Table 3: Overview of the subtasks in Task 2.1 in WP2.

No.	Subtask	Description
2.1 I	Management of Task 2.1	• preparatory teleconference (13th January 2016) • email conversation, commenting and document exchange to align mutual expectations of 9 beneficiaries and 4 LTPs
2.1 a	Preparation of WP2 Inception Meeting	• characterisation of 14 raw-material related activities (scope, stakeholders, stakes, specificities) • identification of supposed stakeholders' needs • introductory presentation • meeting agenda and interaction formats • organisation (venue and technical support)
2.1 b	WP2 Inception Meeting	• MICA internal gathering (4th February 2016) • amendment of relevant raw material related activities • preliminary stakeholder inventory • collection and classification of supposed stakeholder needs
2.1 II	Reporting	• production, commenting and integration of preparation material, WP2 Inception Meeting documentation, and WP2 related information retrieved from the 1st Management Board meeting, the 1st Plenary Meeting of the MICA consortium, and the 1st Advisory Board meeting

Progress towards results

The inception of stakeholder groups and of supposed stakeholder needs gathered pre-existing knowledge fast and broadly, so that a rough picture of what Task 2.2 and Task 2.3 would provide in more detail was available at an early stage of the MICA project (in month 4).

The central activity, the Inception Meeting, took place on the 4th of February 2016 (8:00-12:00) along with the MICA Kick-Off meeting.

First, an inventory of the scope of 14 raw material related activities mentioned in the proposal was made[1], because the stakeholder landscape is dependent on the scope considered, i.e. the thematic areas covered, the geographical boundaries and the time horizon (e.g. today, 2020, 2050). At the Inception Meeting, the scope was discussed and sharpened.

Second, the inventory of stakeholders had been pre-structured by definition of four broad categories (economic system, political system, knowledge system, socio-cultural system) and several subcategories of stakeholders in RMI. Stakeholder groups were amended by workshop participants in a World Café; four participant groups switching consecutively from table to table building upon the work of the groups(s) previously at the respective table. Finally, workshop participants were asked to distribute eight dots per person across the four tables signalling in whose stakes they are particularly interested in. 180 stakeholder groups were identified (including double-counting). In total 199 dots were assigned. 82 stakeholder groups received at least one dot.

[1] CRM_InnoNet, EGDI-Scope, EIT KIC Raw Materials, EO-Miners, EuroGeoSources, EURare, i2Mine, INTRAW, IRP WG Global Metal Flows, Minatura2020, Minventory, ProMine, ProSUM

Third, WP2 partners delivered briefs on supposed stakeholder needs, which were discussed and complemented during plenary discussion. Making supposed stakeholder questions explicit unveiled the mind-sets of WP2 partners what they expected the future RMIC platform users to have in mind. The 40 supposed stakeholder questions were related to needs, functional and non-functional requirements and a question that could be asked when stakeholders are approached by the MICA team. Inception Workshop participants decided not to rank or select the questions, but instead to classify them according to different criteria (explorative / normative, time, geographical scale and life cycle stages).

The findings of Task 2.1 are fully integrated into Tasks 2.2 and 2.3 and therefore not presented separately at this stage.

Stakeholder Mapping (Task 2.2 / Deliverable 2.1, completed in M10)

Purpose

In the MICA project, Individuals and organisations that could benefit from the envisaged RMIC platform are considered stakeholders. In addition to the usual subjects that are generally involved in RMI, special attention was paid to those who could be affected from RMI. The main purpose of Deliverable 2.1 was to provide a comprehensive inventory of relevant stakeholders to prepare for a systematic appraisal of stakeholder needs and to inform other work packages of the MICA project.

Activities

Task 2.2 included four main activities; management and reporting being generic subtasks (I-II), and the others specific tasks (2.2.1 and 2.2.2). These are given in Table 4.

Table 4: Overview of the subtasks in Task 2.2 in WP2.

No.	Subtask	Description
2.2 I	Management of Task 2.2	• time schedule for alignment of the different appraisal activities and roles of WP2 partners • teleconference (22nd April 2016), bilateral conversations, development of drafts, commenting and document exchange to align mutual expectations
2.2.1	Stakeholder identification	• development of identification and documentation guidelines and templates • conduct: R&I calls, consultations, industry associations, CSOs, conferences, country perspectives, World Café (cf. MS1), foresight and brainstorming • capture of stakeholder groups
2.2.2	Stakeholder analysis	• definition of stakeholder groups, refinements and reclustering • operationalisation of Mitchell and colleagues' typology to stakeholder classification • assignment of stakeholder groups to the presence of power, legitimacy and urgency
2.2 II	Reporting	• draft report • commenting • revision and finalisation

Results

Stakeholders in raw material intelligence were identified, defined and classified by means of a tailored methodology.

The identification of stakeholder groups was based on eight different approaches:

- The approaches 1 'Research and Innovation (R&I) calls on raw materials', 2 'Public consultations on raw material policy / legislation' and 5 'Expert conferences on raw materials' yielded broad arrays of stakeholder groups involved in prominent raw material discourses.
- The approaches 3 'Private sector organisations' and 4 'Civil society organisations' mapped organisations identified through repositories and web-searches.
- The approach 6 'Country studies' provided an intuitive cross-cutting perspective on stakeholders from four national geological surveys (LTPs).
- The approaches 7 'World Café' and 8 'Foresight and brainstorming' widened the stakeholder perspective.

This systematic methodological approach to stakeholder identification and analysis was pursued to limit arbitrary choices and to be open for discoveries of unexpected stakeholders.

A total of 90 principal stakeholder groups in raw material intelligence were defined. The concrete entries within each stakeholder group covered various themes, organisation forms and geographical levels; illustrative examples with particular relevance to raw material intelligence were singled out. For each stakeholder group, the context of their identification was indicated.

The 90 stakeholder groups were classified according to a typology of seven stakeholder types formed by the presence of power, legitimacy and/or urgency in relation to the MICA project (Figure 1).[2]

[2] Mitchell et al. (Mitchell, R., Agle, B. & Wood., D. 1997: Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. In: The Academy of Management Review, 22(4) 853-886. doi: 10.5465/AMR.1997.9711022105) 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: Stakeholders' salience is the highest for definitive stakeholders combining all three attributes power, legitimacy and urgency. Among the expectant stakeholder category are dominant stakeholders (power and legitimacy without urgency), dependent stakeholders (legitimacy and urgency without power) and dangerous stakeholders (power and urgency without legitimacy). Among the latent stakeholder category are dormant stakeholders (power only), discretionary stakeholders (legitimacy only) and demanding stakeholders (urgency only). If no attribute is present, an actor group can be considered a non-stakeholder.

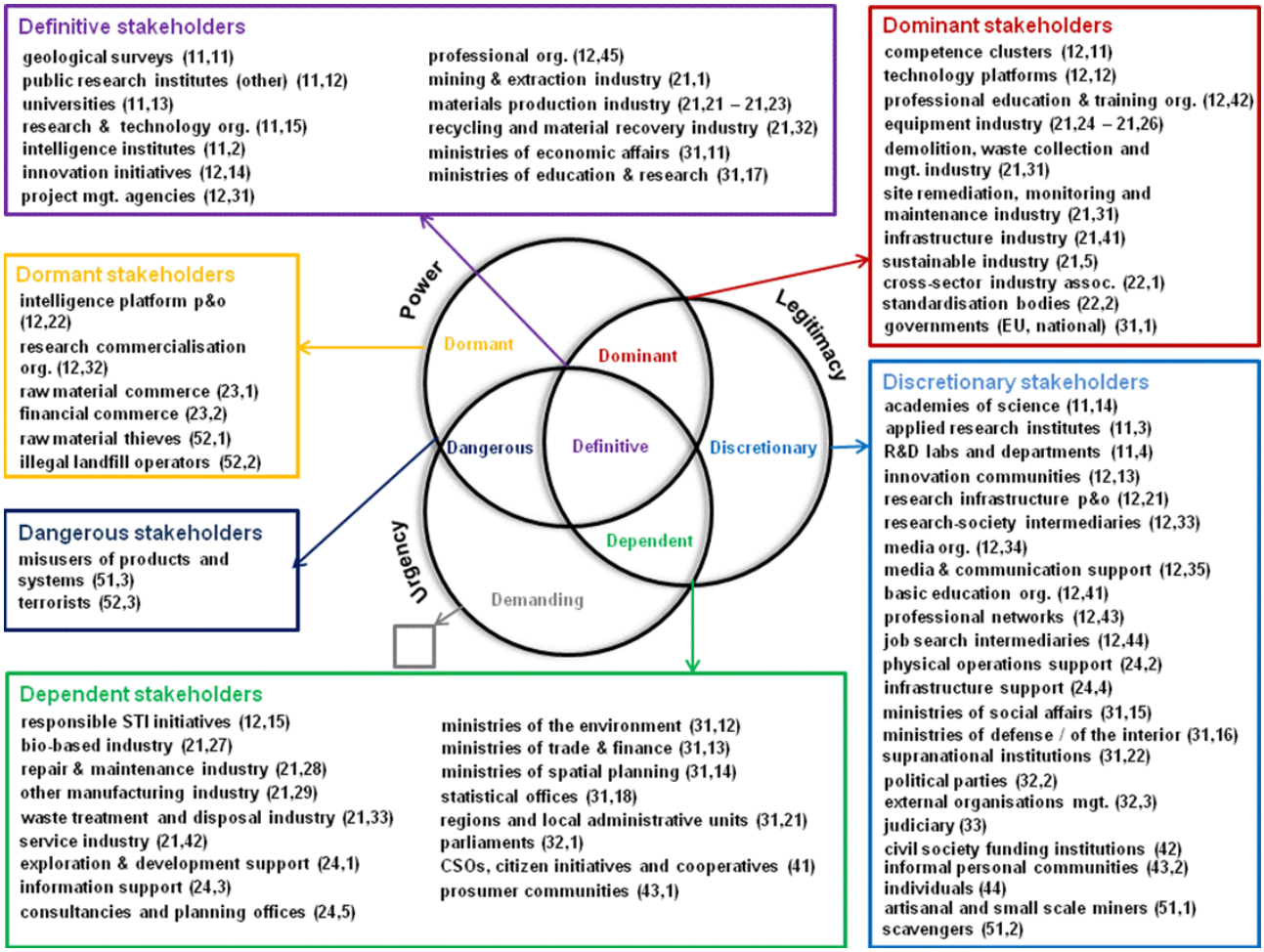

Figure 1: Assignment of 90 MICA stakeholder groups to 6 stakeholder types. For demanding stakeholders, no concrete stakeholder group is identified. The code numbers refer to the definition of stakeholder groups presented in section 4 of D2.1. Please note that this is a MICA perspective on stakeholder groups, explanations for the allocation of particular stakeholder groups are provided in the main text of D2.1. CSO – civil society organisation, mgt. – management, org. – organisations, p&o – promotors and operators, R&D – research and development, STI – science, technology and innovation. Source: MICA D2.1.

The stakeholder classification relates to the MICA project with its concrete funding conditions, beneficiaries and aims. The classification must not be misinterpreted as a valorisation or devalorisation of certain stakeholder groups, or that stakeholder groups are completely homogeneous. Its main purpose is to guide the focusing on the appraisal of raw material information needs of certain stakeholder groups as transparent as possible (cf. Task 2.3) and to support other MICA work packages.

Stakeholder groups were identified in different contexts allowing for a basic assessment of their roles in raw material intelligence.

Funding of research and innovation (R&I) on raw materials in Europe is provided mainly by a wide range of ministries and agencies at national and EU level and by the private sector, the latter usually not disclosing details on raw material knowledge needs. All kinds of organisations (from the knowledge system, to the economic system and political system to civil society) may do R&I on raw material related issues or influence the course of R&I projects on raw materials, for example via advisory boards. Professional associations exist for geologists and mining engineers, while urban mine explorers and recycling engineers are not supported by equivalent professional organisations at EU and global level.

Raw material related R&I advance the state of knowledge through scientific excellence, laying the foundations for the commercialisation of new products, systems and services and for the solution of concrete problems contributing, for example, to resource efficiency and wellbeing. A number of R&I activities have led to intelligence platforms that are still operated, among them raw material, environment and land use platforms and open data repositories, all available for further R&I and knowledge-based decision-making.

The inviting bodies to consultations on raw material policy-making / legislation in Europe not only include diverse ministries and agencies, but also parliaments, geological surveys and industry associations. As in the case of R&I calls, stakeholder groups from the knowledge system, economic system, political system and civil society are responding to such consultations.

Stakeholder consultations on raw material policy / legislation yield synopsis of stakeholder positions, suggestions for refinements, and trigger stakeholder sensitisation and activation. Recent key consultation fields with relevance to the raw material domain are R&I programming for H2020; eco-innovation policy, chemicals regulation and materials policy; nature conservation, ocean governance; circular economy action and legislation, waste management legislation; raw material strategies and responsible sourcing policies.

The private sector comprises all private enterprises and their industry associations. Enterprises, encompassing also enterprise groups, enterprise units and joint ventures of several enterprises, are tied together both horizontally at the same level of the value chain (for example, certain raw material associations lobby together for conditions beneficial to their sector) and vertically through the input-output relations of the economic activities across all sectors and levels of the value chain.

The mapping of 90 industry associations (and specification of their members) mainly at EU level yields a broad sketch of the entire economy (Figure 1). While the mining sector is represented by a few major industry associations (e.g. Euromines), the materials industry is split up into construction materials, e.g. the European Aggregates Association (UEPG); metals, e.g. Eurometaux; industrial minerals, e.g. the Industrial Minerals Association (IMA) Europe; and chemicals, e.g. the European Chemical Industry Council (CEFIC). The manufacturing and infrastructure industry using such materials then branches out into a large variety of industry associations. For the re-manufacturing part of the economy (demolition, waste collection and management, recycling and material recovery) again, a small set of industry associations represents the interests of its

members, e.g. the European Demolition Association (EDA), the European Federation of Waste Management and Environmental Services (FEAD) and the European Recycling Industries' Confederation (EuRIC). Cross-sector industry associations such as Business Europe complete the picture.

The in-depth analysis for aluminium from cradle to grave at national, EU and global level brought to the fore that there is an abundance of industry associations and players in aluminium globally and that single companies and industry associations cover different parts of the value chain often impeding an unambiguous assignment to a definite stakeholder group.

Civil society is the aggregated set of non-governmental organisations and institutions that manifest interests and will of citizens. The level of organisation ranges from informal contacts, to citizen initiatives to civil society organisations (CSOs) representing civil society interests. In relation to raw materials, civil society has been mapped only fragmentary to date.

The more than 50 CSOs included in our analysis of positions are heterogeneous in terms of their size and structure. Besides a rather small number of big CSOs, e. g. Greenpeace, Human Rights Watch or Amnesty International, many organisations are relatively small, some being only temporary initiatives. A number of umbrella organisations aggregate the interests of national CSOs at European-level.

Seven subgroups are considered most relevant with regard to claims in raw material intelligence:

- Transparency and democracy NGOs: There are a number of CSOs focusing on the general accountability of governments and enterprises to society. Most prominent activities on transparency and representation of interests in mining projects are multi-stakeholder initiatives. A comprehensive inventory of civil society claims in mining issues is provided by the Initiative for Responsible Mining Assurance (IRMA Draft 2.0, April 2016). It covers 2 business integrity requirements, 13 social responsibility requirements, 10 environmental responsibility requirements and 2 positive legal requirements.
- Development aid and relief CSOs: Among the development aid and relief organisations, only a small number makes raw material related statements towards European institutions. The umbrella organisation CONCORD and its member Action Aid have been relatively active in the past three years.
- Social welfare CSOs: Organisations advocating social welfare can be found, for example, in the fields of health, land rights and minority rights. Of those referring to raw materials, most are not represented by umbrella organisations; and many overlaps with other thematic categories exist.
- Environmental NGOs: Some environmental NGOs have developed into global brands, such as Greenpeace and the World Wildlife Fund for Nature (WWF). Organisations such as the European Environmental Bureau (EEB) and the International Union for the Conservation of Nature (IUCN) have developed significant capacity and capability to influence raw material policy-making.

- Consumer organisations: A big part of the consumer organisations does not focus on mining, but rather on later stages of the value chain. Consumer organisations expressing raw material related claims mostly concentrate on health and environmental impacts.
- Trade unions: Organisations representing the interests of workers at the European level are sectoral trade unions, for example in the mining industry, and cross-sectoral trade union confederations (e.g. IndustriAll).
- Human rights NGOs: Among human rights NGOs, statements relating to raw materials are dominated by Amnesty International and Human Rights Watch.

All in all the breadth of CSOs relevant to raw material intelligence is mapped in MICA for the first time, however far from being complete.

Expert communities in the field of raw materials come together at conferences on geology / mining and industrial ecology / recycling. The organisers of scientific or investor conferences comprise in particular professional organisations and consultancies, but also ministries and multi-actor initiatives. Some conferences have an institutionalised secretariat, such as the World Resources Forum and the MINEX Europe Forum. While the attendees cover a broad array of stakeholder groups from the four major domains (knowledge system, economic system, political system, civil society), the exhibitors often represent stakeholder groups with clear economic interests.

Scientific conferences on raw materials provide synopsis of the state of knowledge, suggest actions and facilitate networking, while investor conferences aim at matching miners and investors. Key topics debated recently are investment risk, resource management intelligence, supply chain analysis and risk, mining standards, mining and climate change, advancement of industrial symbiosis, industrial ecology for urban planning, recycling process solutions and business cases, and sustainable lifestyle research and action.

While the stakeholder groups in EU raw material policy-making have been mapped extensively,[3] such information on the national and subnational level is scattered and difficult to access. This country-level perspective on stakeholders in MICA accounts for the national and subnational level in the raw material knowledge domain.

The four countries explored, Hungary, Poland, Portugal and Sweden, share some most important stakeholder groups, namely geological surveys, universities, mining & extraction industry, ministries of economic affairs, ministries of the environment and regions and local administrative units. Only in this country perspective, the significance of the regions and local administrative units comes clearly to the fore. The four countries differ in the names and competences of the respective regional and local administrative units.

Countries follow very different raw material strategies which may imply different raw material information needs. For example, Denmark pursues a raw material plan with a clear focus on its

[3] cf. e.g., Tiess, G. 2011: General and International Mineral Policy. Springer: Wien.

own waters. Germany has acquired offshore mining rights and raw material diplomacy has enabled access to raw materials in Kazakhstan and Mongolia, both partners willing to reduce dependency on China.

In addition, hidden actors have been identified through analysis of foresight studies and brainstorming sessions. Hidden actors are often ignored by the incumbent raw material regime as their interventions either as informal actors (artisanal and small-scale miners, scavengers and misusers of products and systems) or as criminal actors (raw material thieves, illegal landfill operators, and terrorists) are not desired.

Stakeholder Needs (Task 2.3 / Deliverable 2.2, completed in M14)

Purpose

The knowledge of real and concrete stakeholders' needs and requirements is instrumental to design the RMIC platform in a way that stakeholders are actually interested in using it. While stakeholders' needs guide the concepts represented in the RMIC platform's ontology, stakeholders' requirements relate to technical and non-technical functionality of the envisaged RMIC platform. The main purpose of Deliverable 2.2 is to provide a broad synopsis of stakes in RMI expressed by different stakeholders that could be future users of the envisaged MICA online platform.

Activities

Task 2.3 included several main activities; management and reporting being generic subtasks (I-II) and the others specific tasks (2.3.1, 2.3.2 a, b, c and 2.3.3). These are given in Table 5.

Results

The main target groups of the empirical needs appraisal were definitive, dominant and dependent stakeholders (see explanations above to D2.1). 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, 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.[4] 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)).

[4] cf. European Commission 2012: Responsible Research and Innovation. Europe's ability to respond to societal challenges European Union. © European Union. doi: 10.2777/11739.

Table 5: Overview of the subtasks in Task 2.3 in WP2.

No.	Subtask	Description
2.3 I	Management of Task 2.3	• time schedule for alignment of the different appraisal activities and roles of WP2 partners • bilateral conversations, development of drafts, commenting and document exchange to align mutual expectations
2.3.I	Preparation of ten appraisal	• development of a concept how to reach which stakeholder groups • consolidation of the scope of the appraisal • specification of the respective appraisal objectives
2.3.2 a	Empirical appraisal – surveys	• development of questionnaires (draft, internal testing, online tool implementation, external pretesting, refinement, launch) tailored to the three target groups • gathering of contact data (in particular industry associations) • roll out, addressing of queries and sending of reminders • digital data capture
2.3.2 b	Empirical appraisal – interviews	• choice of target persons (first wave before the stakeholder workshop, second wave after the stakeholder workshop) • development of a generic interviewee approach email text and a questionnaire / documentation form • conduct and documentation
2.3.2 c	Empirical appraisal – stakeholder workshop	• choice of organisations and individuals • invitation process • preparatory material • organisation • implementation (plenary, focus groups) • documentation
2.3.3	Data analysis and validation	• analysis, classification and mapping of the outcomes of the need & requirement appraisal • teleconference for report drafting and consolidation of outcomes
2.3 II	Reporting	• draft report • commenting • revision and finalisation

Figure 2 provides an overview of how stakeholder positions were gathered.

Three empirical appraisal types (surveys, stakeholder workshop and interviews) were designed to collect RMI stakes in a broad and multi-facetted 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 three surveys were:

- 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.

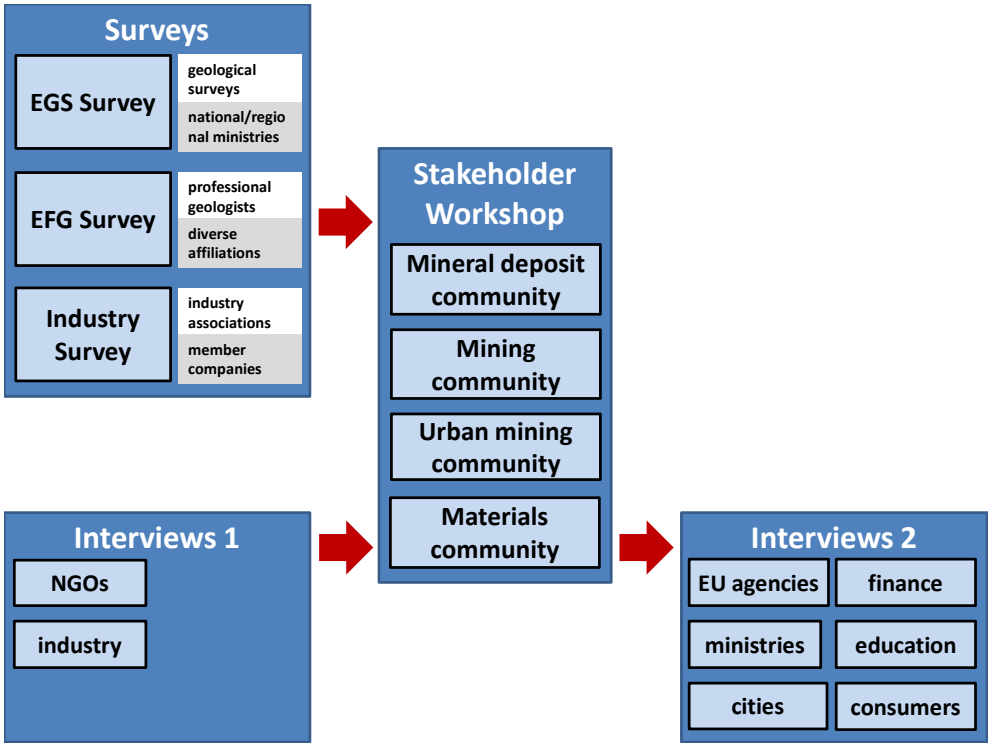

Figure 2: Phasing of empirical appraisal types to collect stakeholder needs and requirements to the envisaged MICA Online Platform. White-/grey-shaded boxes – direct / indirect approach.

The Stakeholder Workshop held on 27th 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 utilisation (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, 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 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 29th July 2016 were 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 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.

2.3 Work package 3: Data

WP3 aims to review and assess datasets relevant to raw materials intelligence that currently or in the future may be used to provide the evidence and knowledge required to support the needs of a range of stakeholders (e.g. decision and policy makers, industry, the research community and the general public).

WP3 does not generate new data, but review existing datasets and develops metadata records for these with the objective to:

- Contribute to the development of the MICA ontology, by providing information on datasets relevant to the domains and concepts constituting the key components of the ontology;
- Understand how existing datasets and combinations of different datasets could be used to satisfy stakeholder needs;
- Identify what gaps in raw material intelligence currently exist due to missing data;
- Attempt to assess the uncertainty of the identified datasets using the consortium expertise, but also through expert elicitation.

The role of WP3 is therefore fundamental to the MICA project as data and information comprise the foundation of raw materials intelligence.

Activities in Work Package 3

During this first 14 months of the MICA project, the majority of the work undertaken by WP3 was towards Deliverable 3.1. However, prior to the activities undertaken for Deliverable 3.1, WP3 developed an online survey. The survey identified key topics and themes of interest to the MICA project, explored data availability and requested from consortium experts to express their opinion and vision on the development of a metadata structure. The survey was undertaken during the kick-off of the MICA projects and the survey results were discussed in the WP3 workshop that took place during the kick-off meeting. The outcomes of this survey are summarised in the WP3 workshop report[5]. The survey and workshop align with the objectives of Task 3.3 Transforming data into information and knowledge and specifically with Task 3.3.1 (Consortium expert knowledge). The results of this survey were used by WP6 to develop the preliminary structure of the MICA ontology and list of Domains and Concepts.

The first deliverable of WP3 (D3.1, month 14) has now been submitted to the European Commission for review. Deliverable 3.1 describes the work undertaken in developing a draft inventory of data on raw materials. This aligns closely to Task 3.1, subtasks 3.1.1, 3.1.2, 3.1.3 and 3.1.4. The activities undertaken in this first year are described in detail in D3.1, the 'Informal Activity Progress Report on WP3' and the WP3 workshop report and summarised in Table 6.

Conclusions and future steps

WP3 is progressing well with the development of the MICA data inventory. A draft inventory consisting of several records is already in place. A metadata structure and template have been developed and approximately 180 metadata records that are related to the different domains of the MICA platform have been produced. WP3 is currently in the process of finalising the online MICA data portal and the online template.

[5] Idoine, N. & Petavratzi, E. (2016). WP3 Expert Consultation Survey on the definition of Mineral Intelligence related topics and data availability.

Table 6: Activities undertaken in WP3 in the first year of the MICA project.

WP3 activities	Activities description and progress	Link to Task
WP3 Expert Consultation Survey	- Online survey at the MICA kick-off to identify themes and topics of interest to MICA, data availability and ideas on the metadata structure - WP3 workshop at the MICA kick-off discussed the survey results with the MICA partners - Report on the WP3 workshop and the survey results were produced. - The themes and topics identified from the WP3 workshop and survey assisted to the development of the draft MICA ontology structure	T3.3
Development of a metadata structure	- Review of various metadata standards and selection of ISO 19115 as the standard to be used in WP3. - Development of a draft metadata template suitable for the purposes of MICA based on ISO 19115. - Review of the draft metadata template with WP3 partners and the project consortium during the first year MICA progress meeting (WP3 technical meeting). - Finalisation of the metadata template following the first year MICA progress meeting.	T3.1
Development of an online metadata inventory	- Converting the metadata template into an online form and inventory. - Transposing metadata records online. Please note that the development of the online metadata inventory is not specifically included in the DoA. However, it is considered essential to ensure a consistent approach for the development of metadata records by all partners, to allow easy access to data and facilitate the linking with the MICA platform.	T3.1
Linking to the MICA Ontology	- Assisting with the development of the MICA ontologies. - Developing fields in the metadata structure that utilise the vocabularies and structure of some of the MICA ontologies (e.g. CommoditiesScheme, TemporalScheme etc.). - Linking data to the Domains and Concepts of the main MICA ontology. - Developing a procedure for linking factsheets, docsheets and so on with the data inventory.	T3.1
Data gathering and developing metadata records	- Data review within the boundaries of MICA (constrained by the domains & concepts of the MICA ontology). - Preliminary data gathering and development of 180 metadata records so far using the spreadsheet template. - Second stage of data gathering is now on its way, which will involve more actively the WP3 partners and other partners from the MICA consortium that are willing to contribute to this task.	T3.1
Development of the Deliverable 3.1 report	- Drafting the Deliverable report - Communicating it to WP3 project partners for comments - Review and finalise the deliverable report	T3.1

Depending on the outcomes of WP2, new Domains and Concepts may be added in the MICA ontologies. In that case, additional datasets should be sought. The finalisation of the MICA ontologies is critical to WP3 as all metadata records require the inclusion of links to the MICA ontologies. The WP3 leader has been working closely with WP6 and contributed to the development of the structure of the main MICA ontology and will continue to do so in the coming months to ensure that the two work packages are aligned and the project is progressing towards the right direction

The next and future steps for WP3 are briefly described below:

- Continuation with data gathering to include more records in the inventory. All WP3 partners to be involved in this process. It is envisaged that the development of metadata records will be an ongoing activity throughout the life of the MICA project.
- Where possible, incorporate existing metadata records from other project libraries e.g. Minerals4EU, EURare, other. This will accelerate data collection.
- Transfer records from the spreadsheet template into the online inventory template.
- Data validation and review is another point made also during the MICA progress meeting. Ideally the records should be reviewed and validated to ensure information is recorded in a consistent manner and so that 'essential records' are not missed out. A discussion will be undertaken with WP3 partners to move this forward.
- Development of case studies on data uncertainty. Two case studies have been discussed and are in the development process at the moment. They will explore data uncertainty through expert elicitation. The aim of the case studies is to develop a general framework upon which an assessment of data uncertainty can be undertaken. There will be two small workshops taking place to develop these case studies. The first one is planned for the 8th February and it will be looking at Geochemistry data. The second workshop will most probably focus on mineral statistics and it will take place sometime in spring 2017. The case studies will be presented in the next progress report.
- Initiation of work required in Task 3.2. One of the key requirements of Task 3.2 is to link metadata records to tools and methods discussed in WP4. An ontology on tools and methods has been developed by WP6, which may be used as the basis to link data and methods.
- Delivery of a workshop together with WP4 at the next MICA progress meeting.

2.4 Work package 4: Methods

In the reporting period, Task 4.1 was scheduled to be finalised, and has indeed been finalised with the handing in of Deliverable 4.1 in October 2016 (slightly delayed) and Deliverable 4.2 in January 2017 (on schedule).

- Deliverable 4.1: Factsheets of methods for raw materials intelligence. By Tom Bide, Raimund Bleischwitz, Teresa Brown, Teresa Domenech, Florian Flachenecker, Claire Fleming, Charles Kirkwood, Lauran van Oers, Evi Petavratzi, Richard Shaw, Ester van der Voet. Uploaded on MICA website October 2016.
- Deliverable 4.2: Mapping of MICA methods to stakeholder questions. By: Ester van der Voet, Lauran van Oers & Ruben Huele. Uploaded on MICA website January 2017.

Task 4.1 contains an inventory of methods for raw material intelligence and an assessment of their potential usefulness for stakeholders in the raw materials field. Four categories of methods have been reported:

- Geological methods (coordinated by BGS)
- Industrial ecology methods (coordinated by UL-CML)
- Economic methods (coordinated by UCL-ISR)
- Forecasting methods.

The last category of methods has not been included in D4.1. Instead, it will be reported in WP5 which focuses on forecasting entirely. D4.1 contains extensive reports on roughly twenty methods, including references to standards and supporting databases, and also including a description of applications. These will be included in the MICA online platform (see WP6) as factsheets.

D4.2 contains an analysis of the applicability of the above mentioned methods to stakeholder questions. A list of 25 stakeholder questions was drafted based on Task 2.1, the MICA stakeholder analysis. The work was started off with a workshop. This workshop was organised partly as a joint WP2 / WP4 workshop, where both stakeholders and specialists in the area of the D4.1 methods were invited, and partly as an expert workshop where the methods specialists indicated how the methods could be used to answer stakeholder questions.

From the analysis, several things became clear:

- Industrial ecology methods are a valuable addition to the methods so far included in raw materials information systems, since they allow to integrate over value chains and link resource flows with (environmental) impacts;
- It probably has added value to combine geological methods and material flow analysis in a comprehensive assessment of geological and societal (urban) stocks;
- Quantitative attempts at global level forecasting are missing for resources, and would be very valuable to support resource policies and strategies of all kinds.

In the reporting period, a start has been made with Task 4.2, case studies. A template for the case studies has been agreed on and an allocation of topics over the partners contributing to Task 4.2 has been made. No delays are expected.

2.5 Work package 5: Policy

The objectives of WP5 are to:

a) put anticipatory raw materials intelligence (RMI) in its complex context of sectoral policies (mineral, environmental, energy, fiscal, foreign, development, security, spatial planning, water resources, investment, etc.) and regulations at national and international (EU) level, stakeholder needs, and practical data availability constraints;
b) undertake a stocktaking exercise on existing relevant scenarios and international planning documents;

c) map those scenarios against the data and tools that are to be analysed in WP3 and WP 4 in order to arrive at benchmarks for future foresight and planning processes;
d) assess future capacities needed at different levels – for industry, member states, regions, the EU and the role of the EU in international relations;
e) test those recommended capacities with stakeholders.

Work has progressed on Task 5.1 and 5.2. Task 5.3 will commence later in the project.

Task 5.1 – (Task leader: MinPol): Work under this task focused on the compilation of deliverable D5.1, which contains an assessment of the minimum set of tools / methods needed to develop a coherent and comprehensive mineral policy-making framework. To this end a wide range of tools applicable to gather and develop strategic and long-term raw material intelligence were reviewed. These reviews were also cast into factsheets to support the MICA Online Platform (c.f. WP6). In addition to the tools useful for developing RMI, the raw materials relevant policy-framework in the EU (c.f. MINLEX study) and for relevant global players, such as China, Africa, the BRICs countries, and at UN level were summarised and reviewed, based inter alia on contributions from GEUS. Calls for a move towards a more circular oriented economy will have an impact on raw materials demands and the implications are discussed on the basis of recent studies, such as PolFree, which has been reviewed by UCL. Finally, a proposal for a policy framework based on a system dynamics model is being presented.

A draft of D5.1 was put in front of the Consortium for discussion during a WP5 workshop organised in the context of the first General Assembly in Brussels on 29th September 2016. Deliverable 5.1 was finalised with the input from the various contributors. This work will serve as input into a RMI-MATRIX that allows the identification of best, medium and worst cases for RM policy development and which will be the subject of D5.4.

Task 5.2 – (Task leader: LPRC): This task is concerned with the development of strategic approaches to minerals intelligence. A core task was the development of a so-called Logframe Matrix for strategic approaches and foresight studies. The Logframe formed the basis for the review and assessment of range of foresight studies on raw materials that had been undertaken around the world. This review was undertaken to identify best practices and benchmarks in EU and non-EU countries. Based on an extensive literature search a group of case studies was selected for a more detailed review in function of their respective main goals, background, and methods used. A comprehensive classification based on the Logframe was implemented in order to extract relevant information from these studies. From this assessment a range of foresight methods and combinations thereof was distilled as being most suitable for application during foresight exercises in the raw materials domain. This assessment will serve as input for drawing up a critically reviewed methodology catalogue, keeping in mind the possible purposes of raw materials foresight and the suitability of methods. In turn it will support the delivery of a Raw Materials Foresight Guide as a final product, providing guidance for conducting and evaluating a raw materials foresight exercise.

The work has been written up as Deliverable 5.3.

2.6 Work package 6: The MICA platform EU-RMICP

WP6 objective

If specialists have – at least for some facets or sub-domains – the necessary knowledge on how to efficiently use all the data which is available via several Knowledge Platforms to perform various studies, most of the stakeholders do not have the essential skills allowing such an efficient use of this data for solving problems they may meet. Actually, (i) they neither have a clear and global vision of all the methods and tools that can be used, (ii) nor know-how to implement these methods and tools, their limits of use (requisite characteristics of the initial dataset, scale, accuracy…), (iii) how to choose the best available technique (BAT) to obtain the expected result(s) and/or, if necessary, (iv) how to combine or link together several of these techniques.

The objective of the MICA project is to fill this gap in the chain of use of data and to allow the end user to select in a seamless way the best available set of technologies for answering his / her question(s) / problem(s).

To reach this objective WP6 will create a database of methodologies and tools descriptions (these descriptions are called here 'factsheets' and 'flowsheets', the first ones describing single methods / tools, and the second ones describing how to link several methods (and the data) for answering complex queries) with an ontology-based interface to visualize the database content and the relationships between the different techniques, and to search for the most appropriate method(s) and tool(s). This is the concept of the Raw Materials Information Capacity Platform (EU-RMICP), with its interface, a Dynamic Decision Graph (DDG); see Figure 3.

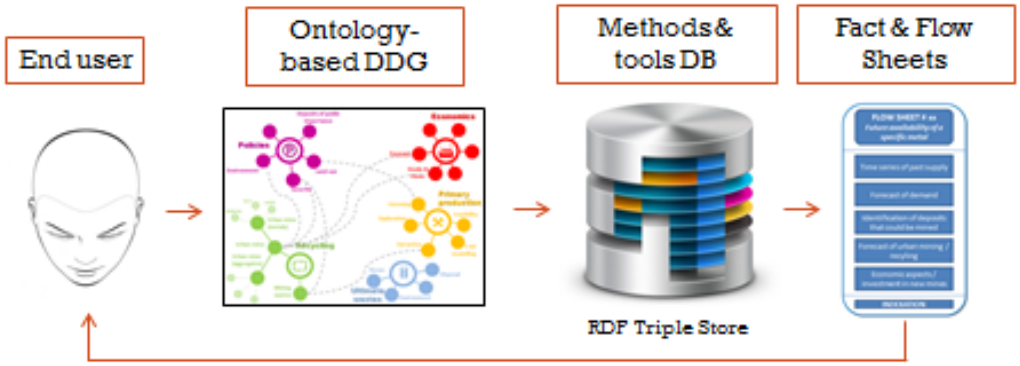

Figure 3: Overview of the EU-RMICP, with its ontology-based DDG, the database of Methods and Tools (a RDF TripleStore) and the result of a query, in the form of a fact- or flowsheet.

Development of the MICA ontology

In MICA, the Main Multidimensional Ontology represents the Domain of questions an end user may have about Mineral resources / Raw materials. Its development results from a collaborative and iterative action within the project, involving partners from WP2, WP3, WP4 and WP5 under the leadership of BRGM. This development was based on the survey performed by WP2 during the kick-off meeting in Copenhagen (February 2016), and involving all experts from the project. The results of this work are thus not representative of what a large panel of end users (e.g.,

politicians, representatives of the Commission, from governmental agencies, NGOs, academia, and the Grand Public) may think or would have asked. This is the reason why the Main Ontology has been recently (i) updated taking into account the results of the D2.2 which this time integrates the real and concrete stakeholders' needs and requirements (not only experts views), and (ii) improved, both in terms of perimeter and depth / granularity.

The Main Ontology covers 7 Domains: D1 Primary resources, D2 Secondary resources, D3 Industrial processing and transformation, D4 Raw materials economics, D5 Raw materials policy and legal framework, D6 Sustainability of raw materials and D7 International reporting. This ontology presently (end of January 2017) contains 308 concepts and sub-concepts; see Figure 4.

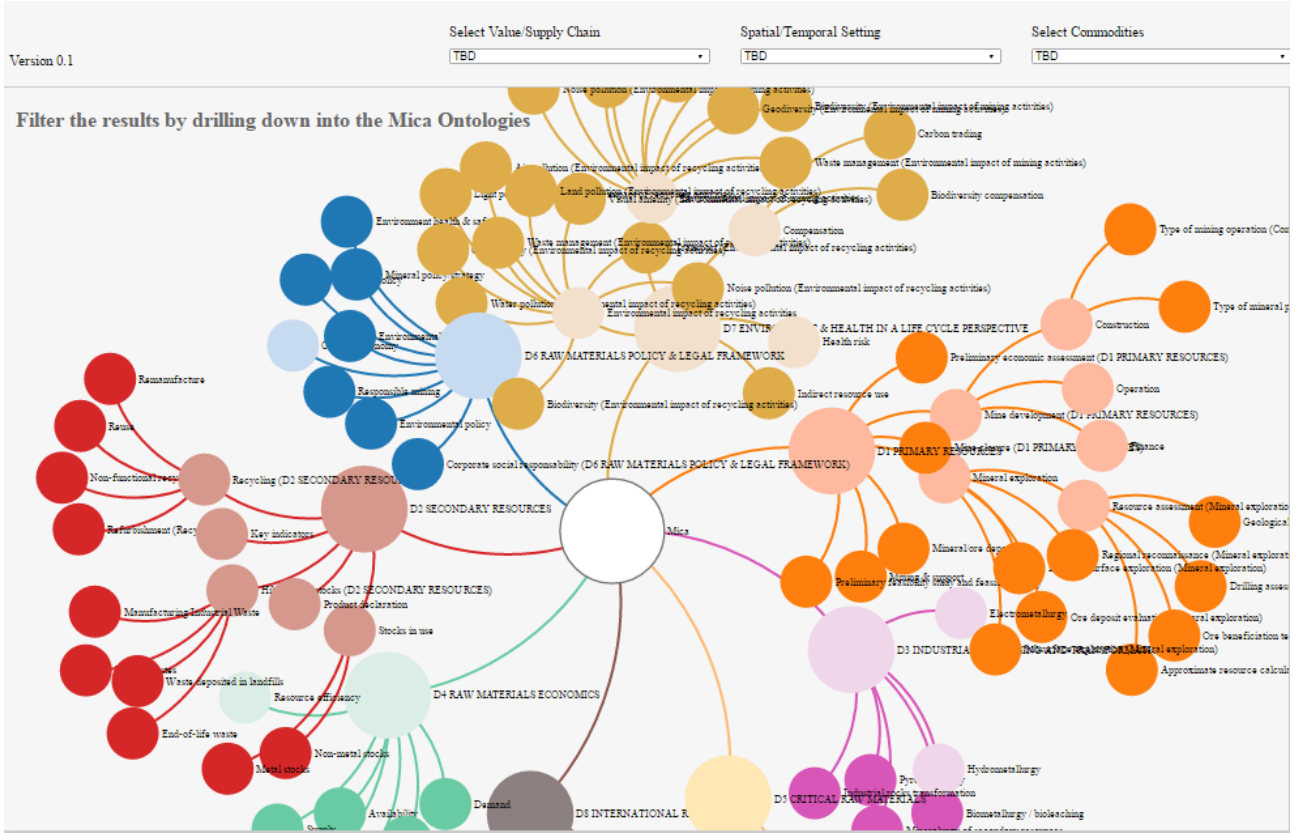

Figure 4: Overview of the Main Ontology in the DDG prototype (latest modifications of the ontology not taken into account) with the development of several sub-concept levels for some domains. Note in the upper part of the DDG the transverse ontologies which allow speeding the process and identifying more precisely the relevant fact- and flowsheets.

In addition to the Main Ontology, several Transverse ontologies covering more general topics have been developed in order to make the navigation on the DDG more efficient: these transverse ontologies are: (i) Commodities, (ii) Data (allowing to inject data sources in the fact- and flowsheets), (iii) Spatial, (iv) Temporal, (v) ValueSupplyChain and (vi) Methods (direct link to specific method). A specific link 'EUR-Lex' has also been introduced for linking relevant European

legislation, which will directly point toward the EUR-Lex site (http://eur-lex.europa.eu/homepage.html?locale=en), using the unique EU legislation identifier CELEX.

Factsheets, docsheets and flowsheets production

Factsheets are used to describe in detail a method or a tool, giving all the necessary information to the end user on how to implement this method for resolving a problem. Docsheets can be seen as a complementary source of information, explaining some concepts (which are not methods or tools) such as for example substitution and criticality an end user may appreciate to find during his navigation on the Dynamic Decision Graph. Flowsheets can be seen as 'cooking recipes' allowing to answer complex queries an end user may have and which necessitates to link in a certain order several factsheets and related data.

Factsheets and flowsheets will indicate which type(s) of data are necessary for running the method(s) and their source(s). WP3 is in charge of the inventory of data / data sources and will provide WP6 with metadata related to these data sources. Each metadata will be internally indexed (i) to the fact- / flowsheet using this source and (ii) to the domain(s) / concept(s) / sub-concept(s) to which it may be useful.

A factsheet template has been created in cooperation with WP4 in order to ensure that method descriptions are homogeneous (Figure 5).

Factsheet

Scope (conceptual model & main characteristics)
...
Range of relevant applications or topics
...
Data needs, databases
...
Model used
...
System and/or parameters considered
...
Time / Space / Resolution /Accuracy
...
Indicators / Outputs / Units
...
Treatment of uncertainty, verification, validation
...
Main publications / references
...
Related methods
...
Key relevant contacts
...
INDEXATION

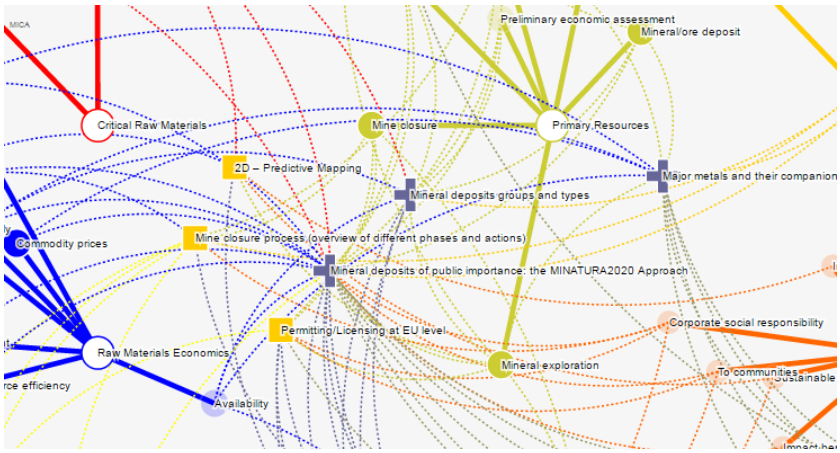

Figure 5: Left: Structure of a factsheet, showing the different rubrics and the Indexation section. Right: In order to be retrieved and selected during the navigation over the ontology within the DDG, factsheets (blue crosses) and docsheets (orange squares) are annotated and indexed over the Main ontology (and transversal ontologies too). The lines materialize the links between factsheets and docsheets with various concepts and sub-concepts.

Factsheets and docsheets are essential pieces of the RMICP. However, several domains of the ontology are not 'covered' by WP4 which focuses on industrial ecology and economics. WP6 thus contributes to elaborate factsheets and docsheets more related to geology, primary and secondary resources etc. Twenty or so of these documents have already been prepared.

The production of flowsheets will start in the forthcoming weeks, and will be based on the WP2 survey made in Copenhagen, updated with the exploitation of D2.2 (see above).

EU-RMICP Architecture

The tool which has been developed is a web of data architecture and is implemented in JAVA. Figure 6 shows the main architectural components of EU-RMICP. The MICA Knowledge base is composed of factsheets, docsheets, flowsheets (upcoming) and their semantic annotation files, the MicaModel and the MicaOntology. The MICA Ontology is converted by the VocBench Ontology Editor to SKOS-XL files which are stored and managed using SKOS language in the MICA Knowledge base. Annotation files are applied to factsheets, docsheets and flowsheets, to produce a set of RDF triples (an RDF graph). A factsheet and docsheet annotator was specially developed for the project to annotate the factsheets and docsheets with the ontology through a web interface. The annotation module generates an RDF representation based on the MicaModel ontology for the fact- and docsheets, and stores it in the TripleStore in conjunction with the .pdf and .docx files. All RDF data is stored within EU-RMICP using Fuseki TripleStore technology. Users can query RDF graphs using DDG which converts high-level DDG queries in SPARQL (the query language of the MICA query engine). As part of the query evaluation process, the MICA query engine uses SPARQL endpoint.

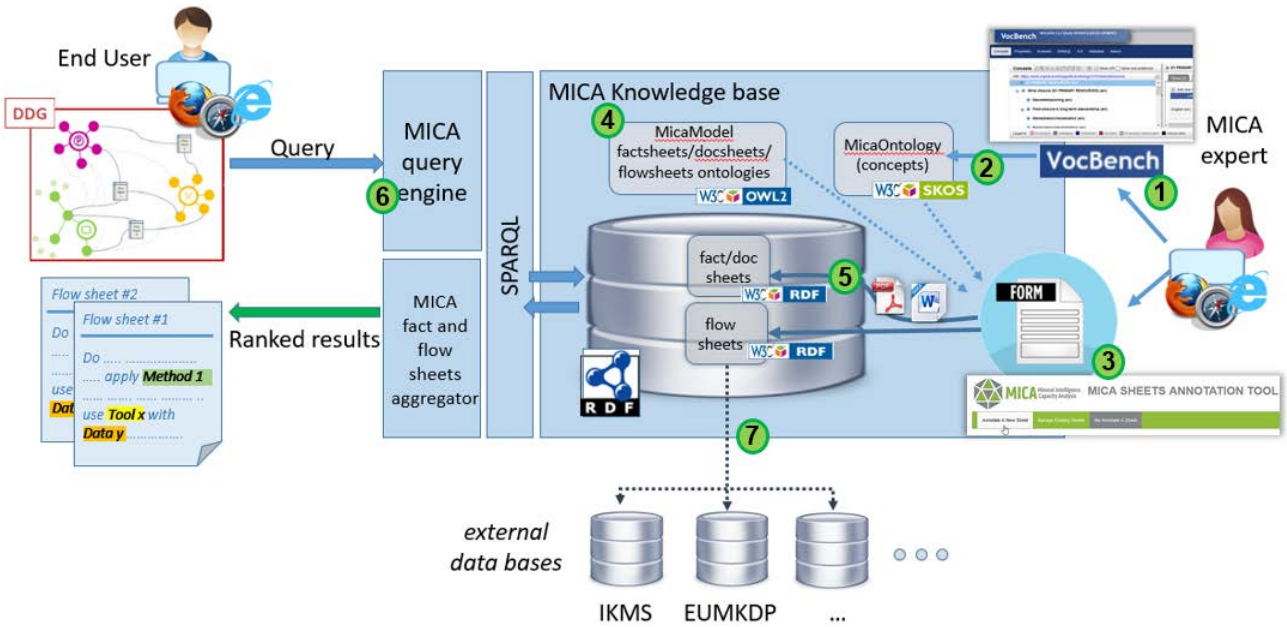

Figure 6: (1) VocBench Ontology Editor to build the MICA Multidimensional Ontology, (2) to create SKOS MICA Multidimensional Ontology, (3) MICA sheets Annotation tool, (4) Model of factsheets, docsheets in OWL, (5) RDF graph, (6) MICA Query Engine, (7) to annotate external databases and resources.

Figure 7 shows the main classes and properties defined in the MICA Multidimensional Ontology for representing Main Ontology D1 Primary resources and D6 Sustainability of raw materials. Each concept is described with a SKOS predefined property (skos:prefLabel, skos:definition, etc.), skos:broader properties connecting concepts and sub-concepts.

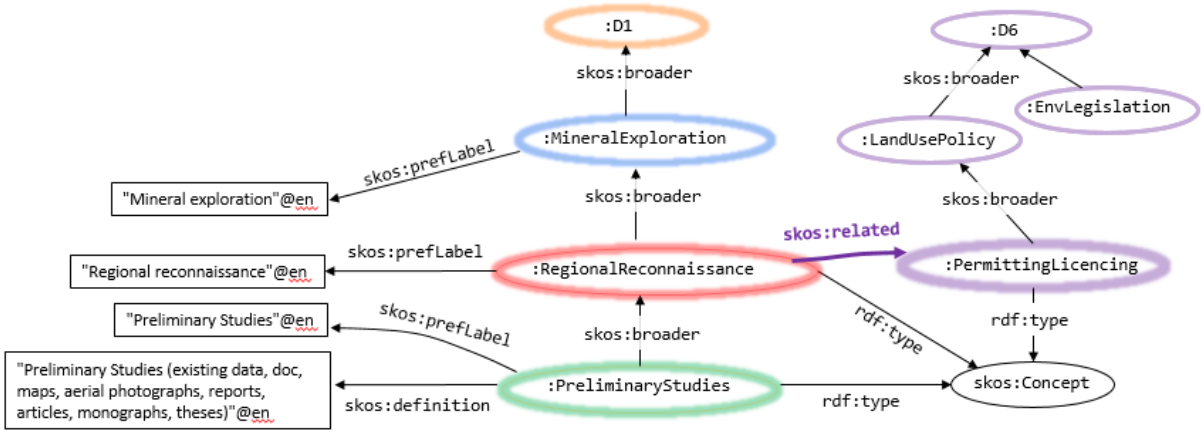

Figure 7: D1 has the sub-concept primary resources which is specialised by MineralExploration, RegionalReconnaissance, PreliminaryStudies concepts. The skos:related property is used to link two concepts that are not hierarchically related (e.g., RegionalReconnaissance with PermittingLicensing.

Factsheets and docssheets are semantically annotated and converted into MICA RDF graphs stored in the TripleStore. The main way to access sheets, and in near future, data resources (see WP3), is using the DDG query to select concepts of the Multidimensional Ontology. These concepts annotate sheets. The process of queries is similar to graph filter selection and returns the set of matching sheet collections. In the following example, described in Figure 8, the query finds all sheets with an annotation of *Mining wastes* (note that this D2 concept is linked to methods).

Prototype of the Dynamic Decision Graph

The first prototype (static) of the Dynamic Decision Graph (DDG) was presented during the MICA General Assembly in September 2016. The first online DDG prototype (based on PHP and the JavaScript visualization library D3.js) that fully utilises the RDF Triple store was published at the end of 2016 (Figure 9).

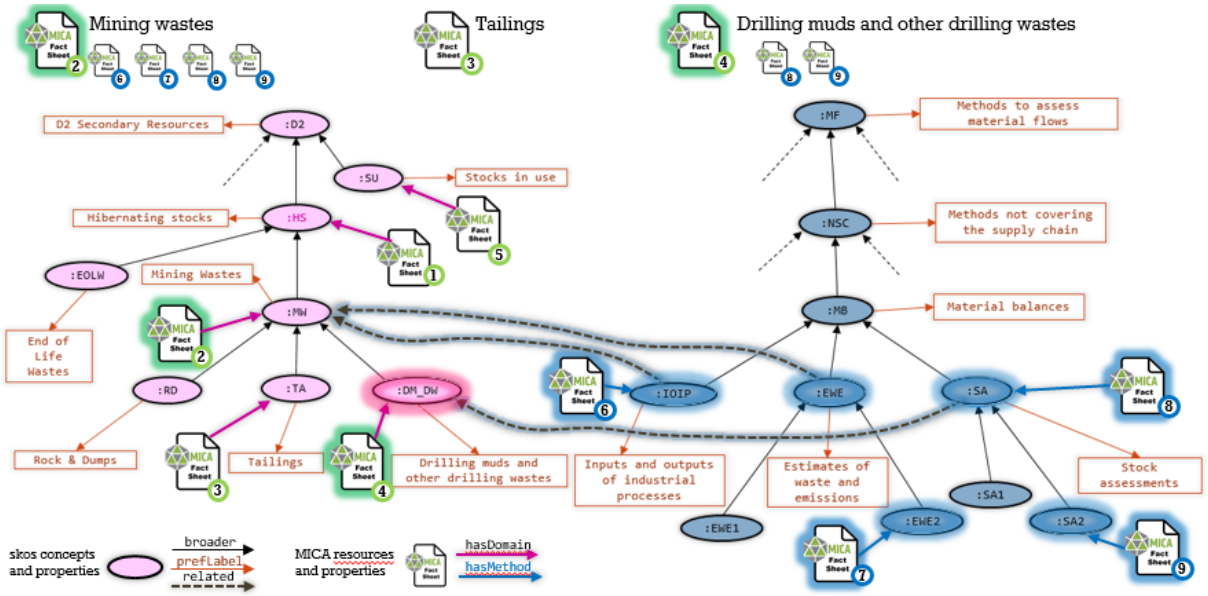

Figure 8: Using the concept hierarchy to retrieve factsheets and relevant methods. In this example, the query retrieves all factsheets related to "Mining Wastes" (2) and factsheets dealing with related methods (6) (7) (8) (9). Drilling muds and other drilling wastes (4) are associated with methods (8) (9).

Figure 9: The first online prototype of the Visual Dynamic Decision Graph application showing the main MICA concepts and on the user click more detailed sub-concepts as well as factsheets, docsheets, flowsheets, data, legislation filtered by the selected concept.

The functionality of the DDG prototype that is now being tested by WP6 partners is limited. However, the new version of the DDG prototype is being finalised and will be shown and discussed by the WP6 partners during the WP6 Technical Workshop 10th February 2017 in

Orleans, France. The landing page of the DDG prototype (Figure 10) gives the access to three major ways of accessing and using the MICA knowledge base stored in the RDF TripleStore. The proposed ways are:

1) Using the Visual Dynamic Decision Graph as a starting point;
2) Complex direct search where a user writes any text and gets back relevant, sorted MICA information components;
3) The interactive – wizard like – application where a user is guided to get the most relevant (depending on the completeness of the MICA knowledge base content) answer to his / her issue.

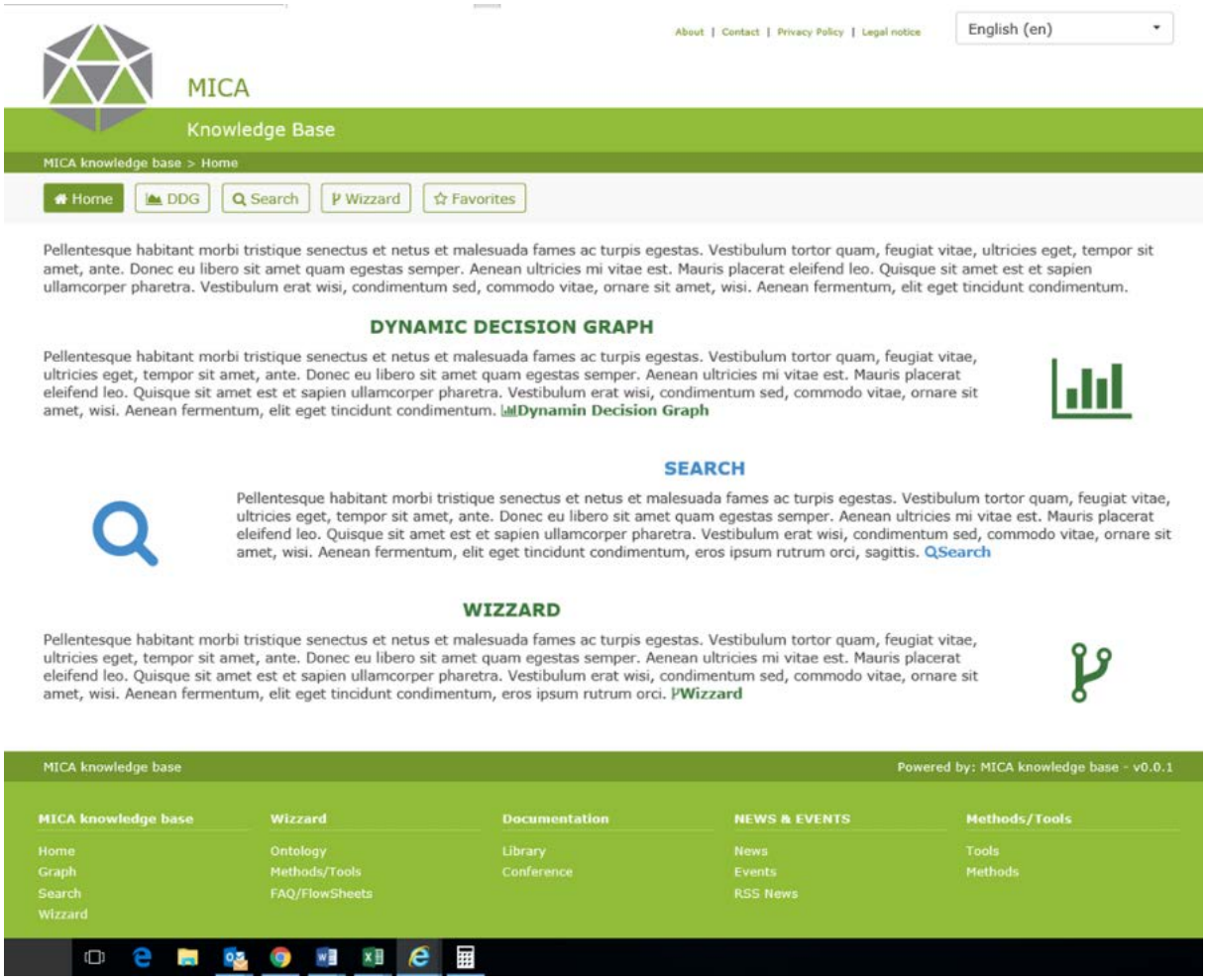

Figure 10: Proposed MICA DDG landing page for accessing three applications to search, visualise and use the content of the MICA knowledge base.

2.7 Work package 7: Dissemination

Dissemination activities within the MICA project have a significant role on expanding and communicating project's potential and outcomes. Considering the extension of MICA's audience

and variety of communication tools in use, the dissemination strategy design has been divided into three key periods:

i. an initial phase, set between M1 and M6 – devoted mainly to develop the communication strategy and the graphical identity;
ii. an intermediate phase, going from M7 to M26 being devoted to develop the Communication and Dissemination tools and awareness Activities;
iii. a final phase, which starts M14 and will last until the end of the project. It will focus on the exploitation activities.

To date (M14), several dissemination tools have been developed aiming at an effective flow of communication among stakeholders. The stakeholders for dissemination of MICA's final results can be identified in the categories found in Table 7.

Table 7: Stakeholders with an interest in MICA's final results.

Stakeholders	
Policy makers	**EU level** DG Grow, DG ENV, DG Trade, JRC, RTD, FISMA EU Parliament **National level** Ministries (Environment, Energy, Economy, Industry, Research Science and Technology), Consultants in raw material **Local Level** Municipalities, Administrative, Regulatory and Licensing Authorities,
Geoscience data providers	National Geological Surveys
Public organisations	Professionals Universities Research Institutes Expert Community International Council on Mining and Metals (ICMM) International Union of Geological Sciences (IUGS), Commission for the Management and Application of Geoscience Information (CGI) Geoscience Terminology Working Group (GTWG).
Private sector	Commercial and investment companies Exploration and mining companies, processing, trade, waste treatment companies and Finance
Civil society organisations	General Public Social welfare and environment organisations, media
Related projects & initiatives	ProMine, EuroGeoSource, EURare, Minventory, Minerals4EU, ProSUM, I2Mine, MINATURA2020, EGDI Bridge, IRP Working Group on Global Metal Flows. INTRAW, VERAM, SMART GROUND

Overall, the dissemination of the MICA project pursues the following objectives:

- Build up on the Minerals Intelligence Network created by the Minerals4EU project and expand it further by identifying additional target audiences, considering MICA's outcomes and all communities implicated on mineral raw materials supply in the EU and beyond, from public authorities to industry users or consumers;

- Increase EU's raw materials knowledge for the benefit of different stakeholders and widely disseminate information on the project and its progress by using the most suitable communication channels and by developing tailored messages for each target group;
- Maintain contacts and support the EU bodies for facilitating decision making at EU level.

During the first year, the following deliverables have been produced:

- D7.1 Graphical Identity (M5)
- D7.2. Teasers and promotion materials (brochures, gadgets, media kit, website, poster) (M8)
- D7.3 Communication Strategy, developing linkages with relevant past, on-going and future initiatives (M11)
- D7.4 MICA social network, based on LinkedIn Groups and Twitter (M14)

D7.1 Graphical Identity (M5)

The Communication activities started with the development of consistent and functional graphical identity that is essential for the project to be recognised, remembered and respected. The creation of MICA's logo was the first step in designing project's identity and "brand image". The logo is currently present in all dissemination materials – both printed and virtual – used by all partners in internal and external communication/dissemination events.

The second step on setting the project's identity was the design of a word (.docx) and power point template (.pptx) for partners to use at any presentation / event related to the project. Such templates have been shared with all partners and can be downloaded at the content repository hosted by: http://intranet.mica-project.eu:8080/Account/Login.

D7.2. Teasers and promotion materials (brochures, gadgets, media kit, website, poster) (M8)

An informative poster to be presented at events was designed and shared with all partners to be printed according to their needs. The poster can be printed in a A3 version or a A2 version and is available under MICA's repository. So far, the poster has been used to present the project in the following events:

- 7th session of the UNECE Expert Group of Resource Classification (EGRC), held in Geneva 27-29 April 2016. The project was represented by Katalin Sári, researcher of the Geological and Geophysical Institute of Hungary (participating as a linked third party in the project).
- "Exchange of best practices on mining policies and technologies: challenges in the current state of the global economy" organized in the framework of EU-Advanced mining countries Raw Materials Diplomacy event 2016, held in Brussels 28-29 June. The poster was submitted by EuroGeoSurveys.

An informative brochure has been produced to be distributed at events that have been attended. The brochure is available on the MICA website in pdf format in the publication section. The HD resolution of the brochure for printing can be downloaded from the MICA's repository. 2000 brochures have been printed and more than 1600 have been distributed at the following meetings:

- European Geosciences Union General Assembly, held in Vienna, 17-22 April 2016;
- EGS National Delegates Forum, held in Nottingham, 12-13 September 2016;
- MICA General Meeting, held in Brussels, 28-29 September 2016;
- EGS General Assembly, held in Ljubljana, 11-12 October 2016;
- GEO-XIII Plenary, held in St Petersburg, 9-11 November 2016.

A banner has also been produced to support the above dissemination materials.

During the initial dissemination phase a project website (www.mica-project.eu) has been set up. The website is composed of the MICA logo, of a banner with the aim to catch the attention of the people and suggests the main purpose of project, supported by the payoff located under the banner, of five boxes that provide you a quick overview of the project. The website has been constantly updated with news, photos, articles and other documents relevant to the project.

Aiming at not being merely an informative platform MICA's website has developed to become an integrated platform which articulates both the necessity of communicating the project to the wider public and the necessity of having a private / shared content platform between partners. Through an easy login process the consortium member can enter the Content Repository, under the menu "MEMBER AREA" where it is possible to upload draft and final versions of documents to be delivered. This content repository guarantees an "on-time" flow of information.

The content in the repository is constantly updated during the implementation of the project. This is useful to share draft documents, references, images and any type of information of interest. To assure a dynamic discussion between partners, end users and beneficiaries in general, an interactive page named "Question & Answer" has been created and hosted by MICA's website. The page is managed by the dissemination coordinator.

Social Networks have also been set up. They are important channels on the dissemination of projects results and outcomes. A Facebook and a Twitter profile for MICA have been implemented in order to quickly disseminate MICA related news to a wider audience.

Dissemination to peers in research is being achieved through presentations at conferences and events. To date, a few contributions have already been made, though it is anticipated that the most significant publications will occur when technical results become progressively available, from June 2017 onwards. Few articles have been published:

- Press release: RAW MATERIALS INTELLIGENCE TO SERVE STAKEHOLDERS NEEDS - in the occasion of the launch of the project (http://mica.eurogeosurveys.org/?page_id=202). It has been made available on the website and sent to all partners.
- Article: MICA at the UNECE Expert Group of Resource Classification (EGRC), share a common ground (http://mica.eurogeosurveys.org/?p=304)
- Article: European Innovation Partnership on Raw Materials Operational Groups meeting (http://mica.eurogeosurveys.org/?p=285)

To date, MICA has been presented in the conferences / events shown in Table 8.

Table 8: Overview over the conferences and events where MICA has been presented.

Event	Date	Location	Topic	Attended by	Stakeholders
EGS MREG meetings	November 24 2015	Vienna	Mineral Resource	GEUS	Data providers
EGS National Delegates Forum	15-17 February 2016	Brussels	EGS activities	EGS	Data providers
EGS General Assembly	15-16 March 2016	Brussels	EGS activities	EGS	Data providers
European Geosciences Union General Assembly	17-22 April 2016	Vienna	Earth, planetary and space sciences. A forum where scientists can present their work and discuss their ideas with experts in all fields of geoscience.	EGS	Geoscientists
European Innovation Partnership (EIP)'s Operational Groups	14 April 2016,	Brussels	Raw Materials Initiative and the EIP Strategic Implementation Plan (SIP)	Fraunhofer	Policy makers
7th session of the UNECE Expert Group of Resource Classification (EGRC),	27-29 April 2016	Geneva	Classification of Fossil Energy and Mineral reserves and resources	MFGI	Geoscientists
EGS MREG meetings	June 1-2 2016	Athens	Mineral Resources	GEUS	Data providers
EGS National Delegates Forum	12-13 September 2016	Nottingham	EGS activities	EGS	Data providers
EGS General Assembly	11-12 October 2016	Ljubljana	EGS activities	EGS	Data providers
GEO-XIII Plenary	November 2016	St. Petersburg		EGS	Geoscientists and Policy Makers

The aim of attending the conferences and meetings was to disseminate information on MICA to different stakeholders: data providers, geoscientists, policy makers, etc. A dissemination workshop has been organised during the MICA General Assembly held in Brussels September 2016. The workshop has been developed with the support of the Exploitation Manager. The workshop has been attended by the MICA consortium that includes 16 partners and 15 linked third parties from a total of 22 European countries and external guests.

The aim of the workshop was to identify the main stakeholder groups, to prioritise deliverables for each stakeholder group and to identify the key dissemination messages.
The main outcome was:
the main stakeholders are 1) experts in a wider sense within Raw Material topics (who have some previous knowledge), and 2) policy makers, the industry (in particular SMEs), NGOs with an

interest in the topic (such as consumer organisations), and students might have an interest to use the MICA platform.
The main messages were: the project will provide:

- better knowledge
- better decisions
- better environment

D7.3 Communication Strategy, developing linkages with relevant past, on-going and future initiatives (M11)
The Communication Strategy is the guideline for communication and exploitation activities. The Plan identifies all the channels, audiences, information and content to be disseminated by the project. It aligns key messages for different audiences, the frequency with which communications will take place, milestones for communications, quality controls and performance indicators, as well as responsibilities for undertaking these activities.

The implementation of this plan will optimise stakeholder engagement, building trust in the project from stakeholders, and emphasizing the potential benefits that MICA can deliver. The MICA Communication Strategy and Dissemination Plan is systematically reviewed and updated on the occasion of each consortium meeting.

D7.4 MICA social network, based on LinkedIn Groups and Twitter (M14)
The social media is embedded in a broader dissemination plan with the aims to structure the dissemination activities that will be conducted. The tools are contributing to the achievement of project objectives. In particular: to spread information about the project, its activities and results; to raise awareness about the project; to trigger discussions and engage people; to reach out to the project's target groups; to ensure a high visibility of the project, its activities and achievements also on a policy maker, industry and social level. To date, level of interactions is low, but it is anticipated that the most significant information, suitable to be published on these tools, will occur when technical results become progressively available, from June 2017 onwards.

3. Impact of the MICA project

WP2 has delivered a stakeholder inventory (D2.1) and an empirical appraisal of stakeholder needs (D2.2) that exceeds all previous activities in the raw material field. Its systematic approach, level of detail and comprehensiveness provide a sound basis for other strategic activities in the raw material intelligence domain. In addition to the most obvious stakeholders such as geological surveys and professional geologists, urban mining actors, and a broad array of industry associations and civil society organisations have been reached. This stakeholder inventory will allow an enhanced impact of research and innovation activities through better identification of R&I priorities.

Combined with the mapping of the Raw Material policy by WP5 MICA is providing a framework for the recommendation of R&I priorities. WP5s science-based analysis of existing regulations and sectorial policies is a large contribution to facilitate efficient and appropriate management, planning and adaptation of decisions leading to a more evidence-based policy and appropriated, cost-effective management in the EU and at lower levels.

WP6 is finalising the development of the different ontologies, the development of the different tools for updating the ontology (via VocBench dedicated application) and for entering and indexing doc / fact / flowsheets (via an in-house MICA application) in the TripleStore, and the development of the set of applications (DDG) to access, visualize and use the content of the MICA Knowledge base stored in the RDF TripleStore. These are the essential steps in the establishment of the EU-RMICP. Through the EU-RMICP, all information related to data, and methods (WP3 and WP4) are provided by MICA, helping stakeholders to identify the best possible decisions. The EU Raw Material Knowledge Base (EURMKB) components are based on distributed data-architectures involving data contributions and commitments from all European countries through their National Geological Surveys and other institutions. The MICA platform EU-RMICP facilitates decision-making at EU, national, regional and local levels and in the minerals industry. Furthermore, it maintains strong and sustainable relationships with the countries concerned in Raw Materials. The factsheets and flowsheets developed within the MICA domain ontology will help identify tools and data currently available to handle questions regarding stable and competitive supply of raw materials from EU sources.

4. Deviations from Annex 1

Task 2.3, fewer than expected external participants showed up at the stakeholder workshop, which was more than compensated by conducting 20 instead of 4-6 interviews / small group meetings. Three surveys were conducted in line with the upper boundary of the DoA (2-3 surveys).

5. Progress beyond the state of the art

WP2 has delivered a stakeholder inventory (D2.1) and an empirical appraisal of stakeholder needs (D2.2) that exceeds all previous activities in the raw material field. Its systematic approach, level of detail and comprehensiveness provide a sound basis for other strategic activities in the raw material intelligence domain.

WP3 has been developing an online MICA data portal and template, which will ensure direct access to data records and a consistent approach to metadata records being developed.

WP4 made a head start with Task 4.2, the case studies. A framework and outline for the case studies is prepared, and the number of case studies has increased beyond the four that have been indicated in the proposal.

The system dynamics model proposed by WP5 as the basis for raw materials policy development takes account of the wider socio-economic context in the EU and thus will provide for a more sustainable supply of the EU with the mineral raw materials needed.

The WP6 approach for the ontology and dynamic decision graph developed inside MICA is totally new, and makes this project quite similar to a research / innovation project. In practice, this project is laying the foundations of a Raw Materials Expert System. The interest is that the results can be used and upgraded by new projects for different potential applications. The perimeter of the ontology and its depth / granularity can be easily extended and the mechanics behind can be used for expertise / decision-making in other domains / sub-domains linked to raw materials.

6. Summary

The MICA project has progressed as far as was planned when the project was designed. There are no major delays in the project or major tasks that could not be performed. Four reports were slightly delayed, without an impact on the progress within the project, as results already were shared internally. Fourteen reports were delivered on time, some of them several months in advance. The project as a whole is on schedule and there are no major concerns regarding the completion of the project.