MICA
Minerals Intelligence Capacity Analysis

The European Raw Materials Intelligence Capacity Platform (EU-RMICP)

February 3rd, 2016
*MICA Kick-off Meeting, Copenhagen*
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BRGM, EGS, GeoZS, GEUS, GTK, JRC and UJF/LIG

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The EU-RMICP

WP1: Coordination

WP2: Needs

WP3: Data

WP4: Methods

WP5: Policies

WP6: European RMI Platform Development

WP7: Dissemination and communication

Available data, e.g., from:
- the IKMS
- the EU-MKDP incl. the e-Minerals Yearbook
- the EU-UMKDP
- ...

Methods & tools such as:
- Statistics
- LCA
- MFA
- 2-4D modelling
- Foresight, forecast studies

Survey on stakeholder / end user needs

Best practices, analysis on related policy, regulations, trade, other issues... + International level

The EU-RMICP
1 – A statement of fact:

If specialists have – at least for some facets or sub-domains - the necessary knowledge on how to efficiently use all the data which are available to perform various studies, most of the stakeholders do not have the essential skills allowing such an efficient use of these 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.
WP6 objectives: a brief summary (2/3)

2 – 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 bunch of technologies for answering his/her question(s)/problem(s).

→ to reach this objective WP6 will create a database of methodologies and tools descriptions 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).
3 – How it will work? The concepts of FACT & FLOW SHEETS

➔ WP2 will provide a MAPPING of stakeholders’ needs /expectations.

➔ From this, WP4 and WP5 will deliver detailed descriptions of several methods and tools which are named here “FACT SHEETS”. From each fact sheet, WP6 will generate an inventory of the "functionalities" which can be seen as a fact sheet metadata.

➔ WP6, with the assistance of domain experts from WP3, WP4 and WP5, will set up a series of pre-established scenarios called here “FLOW SHEETS” (+ metadata) which will describe the sequences of operations (data, methods and tools needed) to answer complex queries. Metadata related to structured, semi- and non-structured data served by the IKMS (EURare), the EU-MKDP (Minerals4EU), the EU-UMKDP (ProSUM) and the Minventory website will also be used by the EU-RMICP.
End user query → MICA Central database

Flow sheet #2

Do: apply Method 1

Use:
- Tool x
- Data z
- Tool y

Ranked results

Flow sheet #1

Experts knowledge

DDG

Multidimensional ontology

EURMKB

IKMS

EU-UMK DP

EU-MKDP
Flow sheet example: methods, tools & data to use for answering a complex question

Possible sources & sequence of operations

- **DATA:** EURMKB (EU-MKDP Minerals Year Book)
- **FACT SHEET**
- **METHOD:** EURMKB (EU-MKDP Foresight Studies)
- **DATA:** EURMKB (IKMS [REE], EU-MKDP)
- **FACT SHEET**
- **DATA:** EURMKB (EU-UMKDP)
- **METHOD:** dynamic MFA
- **MODEL** (predictive): to be developed

Indexation of the flow sheet relatively to other domains, e.g., Recycling/Urban mine/Urban mine (metals)
The Search interface will be developed as a

Dynamic Decision Graph (DDG)

allowing:

(i) to visualize and navigate in the database content,

(ii) to refine the initial end user query and,

(iii) to identify the most appropriate flow sheet(s).

The graph will be based on a multidimensional ontology composed of domain and sub-domain ontologies, representing the 'field of questions' of the end users and which will be established in WP6 following the results of the survey made in WP2.
The mechanics behind (1/2)

The DDG will allow answering complex queries such as: "Could recycling play a significant role in future metal availability?"

This will generate the following sequence of operations:

<table>
<thead>
<tr>
<th>Behaviour of the stakeholder</th>
<th>Click on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logically looks for 'Recycling', main term of the initial question and specifies the question</td>
<td>✅ Concept Recycling / Urban mine</td>
</tr>
<tr>
<td>Specifies the question, introducing the term ‘Metals’</td>
<td>✅ Sub-concept Recycling / Urban mine / Urban mine (metals)</td>
</tr>
<tr>
<td>Specifies the question, taking into account the forward-looking dimension</td>
<td>✅ Concept Economics / Forecast</td>
</tr>
<tr>
<td>Identifies the adapted flow sheet(s)</td>
<td>✅ Select, read and download the flow sheet(s)</td>
</tr>
</tbody>
</table>
The mechanics behind (2/2)

The Dynamic Decision Graph mechanics principles are the following:

At the inception:
1 – All domains and all super concepts are visible (activated)
2 – All flow sheets are activated but not visible

A click on a concept:
- Leaves all ontologically-related concepts visible and
- Leaves all flow-sheet-related concepts visible and
- Makes visible related sub-concepts (if any) and
- Switches off (disables) all other non-related concepts and
- Disables all non-related flow sheets

- At each stage, remaining activated flow sheets can be visualized in a new window. These flow sheets are ranked by relevance, in function of the series of selected concepts / sub-concepts.

- A (sub-) concept may remain visible (activated) because it inherits the properties of the super (father) concept.
A simplified view (limited number of domains) with all the ontological links between ‘super’ concepts activated (not visible inside the graph interface).
Same view showing all the flows sheets indexed with the concepts of the domain ontologies, and activated (not visible inside the graph interface).
The Dynamic Decision Graph as it appears to the end user at the inception.
Selection of a concept: unrelated concepts and flow sheets disabled.
Specifies the question and selects a sub-concept. Certain sub-concepts stay highlighted (activated) because the selected sub-concept inherits the properties of the super concept (or 'father' concept) located above.
Specifies the question taking into account the forward-looking dimension. Unrelated concepts and flow sheets are disabled. Only one flow sheet matches with the end user request.
## Who will do what?

<table>
<thead>
<tr>
<th>WP6 tasks / sub-tasks</th>
<th>Leader</th>
<th>Supporting Team</th>
<th>Contribution from other WPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6.1 Synthesis of stakeholders requirements and analysis of methods functionalities</td>
<td>GTK</td>
<td>BRGM, EGS, GeoZS, GEUS, LIG</td>
<td></td>
</tr>
<tr>
<td>- T6.1.1 Synthesis of stakeholders requirements</td>
<td>GTK</td>
<td>BRGM, GeoZS, GEUS, LIG</td>
<td>WP2, 3, 4, 5</td>
</tr>
<tr>
<td>- T6.1.2 Analysis of methods functionalities. Creation of FACT &amp; FLOW sheets + metadata</td>
<td>GTK</td>
<td>BRGM, EGS, GeoZS, GEUS, LIG</td>
<td>WP3, 4, 5</td>
</tr>
<tr>
<td>T6.2 Ontologies</td>
<td>LIG</td>
<td>BRGM, GEUS, GTK</td>
<td></td>
</tr>
<tr>
<td>T6.3 Development of the Dynamic Decision Graph (DDG) for visualization, navigation &amp; selection</td>
<td>JRC</td>
<td>BRGM, LIG, GEUS, GTK</td>
<td></td>
</tr>
<tr>
<td>T6.4 Search and ranking</td>
<td>LIG</td>
<td>BRGM</td>
<td></td>
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<tr>
<td>T6.5 Development of the central database of the EU-RMICP</td>
<td>GEUS &amp; GeoZS</td>
<td>BRGM, GTK, JRC, LIG</td>
<td></td>
</tr>
<tr>
<td>T6.6 Integration to the EU-MKDP / EURMKB</td>
<td>BRGM</td>
<td>GeoZS, GEUS, GTK</td>
<td></td>
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</tbody>
</table>
Building the EURMKB and the EGDI - Our contribution

The EGDI (European Geological Data Infrastructure)

The IKMS (Integrated Knowledge Management system) (REEs)

The EU-MKDP (Minerals Knowledge Data Platform)

The EU-UMKDP (Urban Mining Knowledge Data Platform)

The EU-RMICP (Raw Materials Intelligence Capacity Platform)

The EURMKB (European Union Raw Materials Knowledge Base)

Minventory

EU Raw materials statistics on resources...

MICA

Minerals4EU

The EU-MKDP (Minerals Knowledge Data Platform)

ProSUM

The EU-UMKDP (Urban Mining Knowledge Data Platform)

Dynamic Decision Graph

Shared harvesting system

ERA-NET

Permanent Body

ProSUM & Minerals4EU NETWORKS
Thank you!

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