What can be achieved by implementing the recommendations

Daniel Cassard, François Tertre, Jean Goncalves (BRGM), Frands Schjøth, Tjerk Heijboer, David Whitehead (GEUS), László Sőrés (MBFSZ), Andrej Vihtelič, Jasna Šinigoj, Katarina Hribernik (GeoZS), José Mogollón (CML Leiden), Beatriz Vidal-Legaz, Lucia Mancini (JRC - Ispra)

Brussels, ORAMA final Event, RMW 2019
November 22nd, 2019

ORAMA has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 776517
The place of ORAMA in the Knowledge Data Platforms ‘Galaxy’

- Data
  - Data optimization, harmonization & modelling

- Projects’ KDPs
  - ProMine
  - M4EU
  - Rare
  - ProSUM
  - SCRREEN

- Applications development
  - GeoERA

- Super ‘architectures’
  - M4EU Permanent Body
  - Automated E-MYB operational
  - RMIS 2.0
  - EGDI
  - European Commission
  - Urban Mine Platform API
  - OpenSearch API
Compatibility of improved datasets with the INSPIRE Directive and existing data models, and identification of necessary evolutions

A review of the Minerals4EU implementation of the INSPIRE MR data model

How to push these modifications into the INSPIRE validation process (text co-authored by BRGM & JRC)

The way to manage and use the UNFC classification: a specialization of OreMeasure + dedicated code list

Improvements of the INSPIRE MR and IUGS/CGI/ERML data models (submitted & accepted)

The harvesting of data aggregated at a national level, their flow, and the automation of the e-Minerals Yearbook

Preparatory work for T3.2

Architecture and code lists
A few examples: to add a new DataType ‘ProductCommodityMeasure’ for managing grades, correct cardinalities and remove ‘range’ from Quantity, to add a new specialization of ‘OreMeasure’ for ‘TotalProduction’. UNFC managed though a dedicated DataType and related code list.
<table>
<thead>
<tr>
<th>From</th>
<th>Topic</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.1</td>
<td>Data quality (proven, reliable)</td>
<td>Possibility to add references about sources in front of figures</td>
</tr>
<tr>
<td>D1.1</td>
<td>Uncertainties management</td>
<td>Possibility to use the property QuantityRange</td>
</tr>
<tr>
<td>D1.1</td>
<td>Calculated commodity content</td>
<td>Figures are given in tons of metal or oxide (e.g., WO3) with indication of the average grade of the commodity in the ore</td>
</tr>
<tr>
<td>D1.1</td>
<td>Commodities (names and classification)</td>
<td>Mapping done between ERML, INSPIRE and the e-MYB lists of commodities. Creation of a NEW commodity hierarchical code list for the e-MYB</td>
</tr>
<tr>
<td>D1.1</td>
<td>Requests from some ongoing projets to sub-divide some commodities (e.g., graphite)</td>
<td>Modification submitted to CGI</td>
</tr>
<tr>
<td>D1.2</td>
<td>To complete EarthResourceDimension for raw materials</td>
<td>Addition of volume (m³), bulk density... ‚similarly to WasteDimension</td>
</tr>
<tr>
<td>D1.2</td>
<td>To modify/upgrade CommodityMeasure in order to take into account raw materials physical properties (e.g., grain size, clarity) + QuantityRange</td>
<td>Will be managed through GeoSciML 3.0 Package ‚PhysicalProperties‘, available at: <a href="http://geosciml.org/doc/geosciml/3.0/documentation/html/">http://geosciml.org/doc/geosciml/3.0/documentation/html/</a></td>
</tr>
<tr>
<td>D2.2</td>
<td>No specific requirement regarding the ProSUM Unified data model</td>
<td>Near future modifications will essentially bear on vocabularies (code lists) in order to integrate more detailed and updated classifications</td>
</tr>
</tbody>
</table>
## M4EU Tool Stack guidelines

<table>
<thead>
<tr>
<th>G4.1.01 M4EU Tool Stack guidelines</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tool Stack Recommendation Guidelines</td>
<td>Overview of software</td>
</tr>
<tr>
<td>2. PostgreSQL version 10.7, PostGIS 2.5 &amp; M4EU DB</td>
<td>Installing of PostgreSQL, PostGIS and M4EU DB</td>
</tr>
<tr>
<td>3. Java SE Development Kit OpenJDK 8u202-b08</td>
<td>System implementation and setting up of Web Feature Service (WFS)</td>
</tr>
<tr>
<td>4. Apache Tomcat version 8.5.38 and Deegree version 3.4.3</td>
<td></td>
</tr>
<tr>
<td>5. GeoKettle (ETL) version 2.6-r192</td>
<td>Open source Extract, Transform and Load software</td>
</tr>
<tr>
<td>6. Enterprise Architect lite version 14.1.1427</td>
<td>Viewer to the provided UML and DB models for M4EU</td>
</tr>
</tbody>
</table>

## M4EU DB insert data guidelines

<table>
<thead>
<tr>
<th>G4.1.02 M4EU DB insert data guidelines</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mineral Occurrence insert data guidelines</td>
<td>Mineral Occurrence data</td>
</tr>
<tr>
<td>2. Mine insert data guidelines</td>
<td>Mine data</td>
</tr>
<tr>
<td>3. Mining Waste Extension insert data guidelines</td>
<td>Mining Waste Extension data</td>
</tr>
</tbody>
</table>

## Urban Mine Tool Stack guidelines

<table>
<thead>
<tr>
<th>G4.1.03 Urban Mine Tool Stack guidelines</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. G4.1.03.01 Publishing Urban Mine Maps</td>
<td>How to serve Urban Mine WFS</td>
</tr>
</tbody>
</table>

## Data Harmonization For Raw Materials

<table>
<thead>
<tr>
<th>G4.1.04 Data Harmonization For Raw Materials</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ORAMA_D1.4_Guidance To Harmonisation of Resource and Reserve data</td>
<td>PRM Resource and Reserve data</td>
</tr>
<tr>
<td>2. ORAMA_WP4_1_Guidance To Data Harmonization For SRM for Batteries</td>
<td>SRM for Batteries</td>
</tr>
<tr>
<td>3. ORAMA_WP4_1_Guidance To Data Harmonization For SRM for ELV</td>
<td>SRM for ELV</td>
</tr>
<tr>
<td>4. ORAMA_WP4_1_Guidance To Data Harmonization For SRM for Mining Waste</td>
<td>SRM for Mining Waste</td>
</tr>
<tr>
<td>5. ORAMA_WP4_1_Guidance To Data Harmonization For SRM for WEEE-PV Panels</td>
<td>SRM for WEEE-PV panels</td>
</tr>
</tbody>
</table>
Batteries

- D4.2_Training_Materials_Ispra_Batteries_TUB_FV.pdf

ELVs

- D4.2_Training_Materials_Ispra_ELVs_v190524.pdf

Primary Raw Materials

- Technical Guideance
  - D1.5.1_Technical Guidance Note United Nations Framework Classification (UNFC)_Final.pdf
  - D1.5.2_Technical guidance note Bridging document between CRIRSCO and United Nations Framework Classification (UNFC)_Final.pdf
  - D1.5.3_Technical Guidance Note Decision flow tools for classifying resource data according to the United Nations Framework Classification (UNFC)_Final.pdf
  - D1.5.4_Technical Guidance Note Practical Exercises in Reporting Resource and Reserve Data according to the United Nations Framework Classification (UNFC)_Final.pdf
  - D1.5.5_Technical Guidance Note worked example for conversion of UK polyhalite resource data to UNFC_Final.pdf
  - D1.5.6_Technical guidance note worked example for conversion of Spanish copper resource data to UNFC_Final.pdf
  - D1 5_FINAL.pdf
D4.2 Development of Training Materials Final

Mining Waste
- G4.1.03.01 Publishing Urban Mine Maps.pdf
- ORAMA_SRM_MIN_training material.pdf
- publishingUrbanMineMaps.v2.pdf

WEEE PV Panels
- ORAMA_D4.2_TrainMat_PVPanel_Handout_2019-05-17.pdf
- ORAMA_D4.2_TrainMat_PVPanels_Exercise_2019-05-27.xlsx
- ORAMA_D4.2_TrainMat_PVPanels_Presentation_2019-06-10.pdf
- ORAMA_Simple Sampling Protocol.pdf
- ORAMA_SRM Introduction and WEEE slides.pdf
- ProSUM_Catalogue_UNU Keys 2017 03 30 2100.pdf
- UNU Key Correlation_HS Codes.pdf
- UNU Keys Classification.pdf
Webinars

- Mining Waste 30th September 2019 11:00 – 12:30 CEST
- PRM 2nd October 2019 13:00 – 15:00 CEST
- Batteries and ELVs 16th October 2019 14:00 – 15:30 CEST
- WEEE/PV panels 17th October 2019 14:00 – 15:30 CEST
To make the e-Mineral Yearbook sustainable: harvesting aggregated statistical data on primary resources at national level

To develop a new data model for harvesting and serving aggregated statistical data (the M4EU/ORAMA/e-MYB data model)

To map the M4EU commodity list over the BGS e-MYB commodity list (creation of a new INSPIRE compliant hierarchical Commodity code list)

To solve the problem of stable identifiers in the Harvesting database

Dedicated Web data entry form where each data provider will be able to enter data for their country

Web application where each data provider will be able to review harvested data for selected country for single deposit

The e-MYB model of the database implementation

For providers other than Geological Surveys
Data flow for automatic feeding the e-MYB

Optimised DB with pre-calculated values, feeding the portal's visualisations which are steered by web services.

Exploration, resources, reserves & production data
- Classical harvesting mechanism for Geological Surveys
- Deegree WFS
- Standardized data models (DM)

National Database Feeding
- ETL process

National Provider DB
- Provider's own format

Primary MR AGGREGATED STATISTICAL DATA

Diffusion DB (+ diffusion optimizations)

Exploration, resources reserves & production data

Harvesting DB DUMP
- e-MYB Harvesting DB (+ quality control)
- INSPIRE/ORAMA Web Feature Service

GeoZS

BRGM

Web service
- M4EU/ORAMA e-MYB DM

BGS WORLD MINERAL STATISTICS DB
- Data from other institutions
- Several data sources incl. Geological Surveys, BGS work of harmonization & consolidation

BGS WEBSITE DB
- Published production data
- BGS e-Minerals Yearbook
- IMPORT & EXPORT DATA purchased in bulk:
  - All countries: 1970-2002
  - EU countries: 2003-2014

BGS' copy of the Harvesting DB
- Quality control & presentation approved

Production data
- Production & trade data
Building ‘balanced’ Sankeys on the fly

Rational: There are currently hardly any well-structured statistics on the urban mine.

Using balancing and data harmonization techniques applied to a high-quality and a ‘normal’ dataset, T3.3 will compare the results and evaluate which level of simplification in data mining is still acceptable in relation to different applications.
Building ‘balanced’ Sankeys on the fly

EU data obtained from UNU (WP2.3) for copper and tantalum

Minerals4EU

Ore in ground

Ore Mining (extraction)

Domestic ore

Smelting Refining (metal)

Primary metal use

ProSUM

Ore

Mining (extraction)

Built Environment

Products

Components

Waste
Two actions were carried out simultaneously with the BGS and the JRC regarding two possible ways to represent environmental and social dimensions.

1. In cooperation with the BGS
   - To select some datasets (from 1 to 3) for their integration into the e-Minerals Yearbook. 3 applications have been developed.

2. In cooperation with the JRC
   - To augment the perimeter of the MICA ontology and its granularity with new concepts and to develop the related information sheets.
   - REINFORCE the e-MYB and the links between the MICA Expert System and the RMIS.

Representation of environmental & social dimensions of extraction
Three datasets related to mining and quarrying were finally retained for demonstration. Automated download now possible using a REST request (https://ec.europa.eu/eurostat/web/json-and-unicode-web-services/getting-started/rest-request):

- **Greenhouse gas emissions (Environmental dimension)**
  
  
  Comment: Can be displayed in the e-MYB as a map and a chart, accompanied by a table.
  
  [Minerals4EU portal: http://minerals4eu.brgm-rec.fr/m4eu-yearbook/theme_selection.html]

- **Percentage of land use for mining and quarrying (Environmental & social dimensions)**
  
  [https://ec.europa.eu/eurostat/web/lucas/data/database]
  
  Comment: Can be displayed in the e-MYB as a map and a chart, accompanied by a table.

- **Employment data (Social dimension)**
  
  
  Comment: Can be displayed in the e-MYB as a map and a chart, accompanied by a table.
Characterization of datasets identified in WP1, related to environmental and social aspects of extraction – BGS & BRGM common work

http://minerals4eu.brgm-rec.fr/m4eu-yearbook/theme_selection.html
The MICA Main Ontology & domains in relation with environmental and social dimensions

- DS RAW MATERIALS POLICY & LEGAL FRAMEWORK
  - Circular economy
    - Resource efficiency policies
    - Recycling policy & legislation
    - Waste policies
  - Corporate social responsibility (DS RAW MATERIALS POLICY & LEGAL FRAMEWORK)
    - Environmental legislation
      - Environment health & safety policy
      - European Parliamentary resolutions
      - Local/communal by-laws
      - National environmental legislation
        - National emission legislation
        - National soil legislation
        - National water legislation
      - National environmental policies
      - Regional/provincial environmental laws
      - UN conventions
        - Airbus Convention
        - Basel Convention
        - HELCOM
        - MARPOL
        - OSPARCOM
      - Land use policy
        - Deposits of public importance
        - Designation areas (e.g., conservation (nature, culture, etc.))
        - Permitting/Licensing (Land use policy)
      - Mineral policy/strategy

- DS SUSTAINABILITY OF RAW MATERIALS
  - Compensation
  - Biodiversity compensation
  - Carbon trading
  - Impacts of specific processes/plants
    - Local environmental & health impacts
      - Air and water pollution
      - Ecosystem, biodiversity
      - Human health
      - Occupational health
      - Soil contamination
    - Regional/global environmental & health impacts
      - Climate change
      - Ocean pollution
      - Transboundary air pollution
  - Social impacts
    - Child labour
    - Gender issues
    - Local population
    - Responsible sourcing
    - Workers
  - Impacts over the life cycle
    - Environmental footprints of materials, products & services
      - Carbon footprint
      - Ecological footprint
      - Land footprint
      - Material footprint
      - Water footprint
    - Environmental impacts of materials, products & services
      - Aggregative indicators
      - Impact categories
        - Emissions of GHGs & pollutants (Impacts of materials, products & services)
        - Energy use (Impacts of materials, products & services)
        - Extraction of resources (Impacts of materials, products & services)
        - Final waste production (Impacts of materials, products & services)
        - Land use (Impacts of materials, products & services)
  - Knowledge sharing
    - Knowledge platforms
    - Training
      - Initial training
      - Life-long training
  - Resource efficiency
    - Eco-design
    - Frugal design
    - Indicators
  - Social licence to operate (SLO)
This is the graphical representation of the concepts, which allows you to easily explore the domain, and the different resources associated with. Using this graph you can also combine the various concepts to those matching your question. To this day narrowing down the resulting resources to those most relevant for you.

Please select one or more concepts that seem most appropriate for your question. You can then filter the results by the MICA knowledge categories.
Examples of improvements brought to the MICA Main Ontology. LinkedSheets related to these concepts describing the social & environmental approaches have been developed using the MICASheetEdidor (MSE) and uploaded into the DDG.
Thanks a lot for your attention!

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Frands Schjøth: fsc@geus.dk

Brussels, ORAMA final Event, RMW 2019
November 22\textsuperscript{nd}, 2019