Methodology development workshop synthesis brief

Deliverable D3.1

MinFuture is funded by the Horizon 2020 Framework Programme of the European Union under Grant Agreement no. 730330. The contents of this document are the sole responsibility of MinFuture and can in no way be taken to reflect the views of the European Union

Authors

Astrid Allesch, TU Wien

With Thanks to

Martin Hirschnitz-Garbers, Ecologic Institute

Maren Lundhaug and Camilla Ackermann, NTNU

Manuscript completed in July 2017

This document is available on the Internet at: [optional]

Document title	Methodology development workshop synthesis brief
Work Package	WP3
Document Type	Deliverable D3.1
Date	04 July 2017
Document Status	Draft version 1.0

Acknowledgments & Disclaimer

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 730330.

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information. The views expressed in this publication are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Table of Contents

List of Figures

MinFuture partner institutions

CSIRO	Commonwealth Scientific and Industrial Research Organization
CUNI	Univerzita Karlova v Praze
DELOITTE	BIO Intelligence Service
ECOLOGIC	Ecologic Institute
IFEU	Institut für Energie und Umweltforschung Heidelberg
IGSMIE PAN	Polska Akademia Nauk Instytut Gospodarki Surowcami Mineralnymi i Energia
MinPol	Guenter Tiess - Agency for International Minerals Policy
MIT	Massachusetts Institute of Technology MIT Corporation
NERC	Natural Environment Research Council – British Geological Survey
NGU	Geological Survey of Norway
NTNU	Norges teknisk-naturvitenskapelige universitet
RU	The Ritsumeikan trust academic juridical person
SDU	Syddansk Universitet
TU Wien	Technische Universitaet Wien
UAB	Universitat Autònoma de Barcelona
UCAM	The Chancellor, Masters, and Scholars of the University of Cambridge

1 Introduction

The first MinFuture Workshop ('Methodology workshop') took place in Vienna from 8th June to 9th June 2017. It aimed to discuss how data on material cycles are generated, refined and aggregated to useful information.

Against this background, the methodology workshop served to discuss how MinFuture could support key data providers and users, e.g. through or in:

- mapping the system context of their activities and discussing at which point the system is introduced (Data source or data providers);
- highlighting the need to show different data sources used in terms of
    - their origin (whether they are reported or modelled) and
    - the uncertainties associated (because there hardly is any quality control available for checking the data, which companies report (as primary information/data sources) to governments/statistical offices (as secondary information/data sources); and
- discussing how different data providers interact on (informal vs. formal) information flows.

Four Sessions with presentations from internal and external partners were held:

1. **Mineral data collection by Geological Surveys**
2. **Obtaining and harmonising data on urban mines in research project**
3. **Material accounting and indicators**
4. **Physical National Accounts and international trade**

For each of these topics the presenters were asked to point out

- the scope and type of data being collected and the procedures for data collection in place;
- challenges with harmonization (within and between institutions) and approaches currently being used to facilitate the harmonization.

The introductory presentations were followed by discussions on how the MinFuture project could contribute (through systems analysis) to address these challenges – not to solve them, but to illustrate (based on case studies) how system approaches may be used most effectively.

2 Session I: Mineral data collection by Geological Surveys

2.1 Input - Presentations

2.1.1 Evi Petavratzi BGS: Mineral statistics

(see slides Day 1_ BGS_Petavratzi.pdf)

Main content:

Information about the British geological survey datasets and mineral statistics production

- Structure Data collection, data management, data publication,
    - Understanding data, How good is the data
- Conclusion – Mitigation
    - Develop a global network in Mineral
    - Work closer with all stakeholders to develop a system definition
    - Minimize data uncertainty
    - Access to adequate funding support

2.1.2 Tom Heldal NGU: Primary data - Geological Survey of Norway (NGU)

(see slides Day 1_ NGU_Heldal.pdf)

Main content:

Primary data Primary Geological Survey of Norway (NGU)

- Resources in the ground/exploration
- Mining/exploitation
- Production/processing of mineral based products
- Disposal, secondary resources (mess!)
- Harmonization
    - No standard/common procedure for collecting national data
    - Through European platform: each national database harvested and proccessed to harmonized spatial data

2.1.3 Leopold Weber Geologie Weber: National level Austria

(see slides Day 1_Geologie_Weber.pdf)

Main content:

Information about ongoing work in Austria related to geological statistics

- Information framework
  - Collection of data (e.g. geological maps, geochemistry, geophysics, mineral deposits)
  - Control and interpretation of the data
  - Maintaining a minerals information system (which data are needed?)
  - More than 6,000 mineral occurrences recorded
- Interpreting
  - A mineral district is the regional collectivity of mineral occurrences within the same tectonic unit, the same shape, the same mineral content (similar genesis)…
  - The chance to detect new occurrences decreases from the center of the district to the margin

2.2 Discussion of Key Points

- The goal of MinFuture is not to collect data but to support data providers and collectors. In this context, it is considered essential to
  - Define the database – system definition;
  - Look at best practices for collecting national data;
  - Making data/information gaps explicit to base recommendations on;
  - Illustrate how adding system context can support geological services in providing data and information.
- Who needs the data? For whom is the data collected?
  - Information is key: We need to make clear to policy makers that information about raw materials is important for various reasons, inter alia to foster the circular economy;
  - Policy makers do not necessarily use primary data and may not be interested in this, but they very much use the secondary data gathering and compilation from consultancies.
    - Here, a relevant question arising is what is a duplication of efforts and what is quality control?
- The biggest gaps and problems are seen in
  - The collection and harmonisation of data; and

- In not understanding
  - How the data are used;
  - What kind of data is needed;
  - the terms used.
- Therefore, data producers and data users need to talk to each other to identify and improve ways of data/information exchange.
- Data harmonization needs
  - One key organisation being in charge and taking the lead.
  - Overarching services that harmonize data.

3 Session II: Obtaining and harmonising data on urban mines in research projects

3.1 Input - Presentations

3.1.1 Rupert Meyers Yale: An overview of Yale STAF database

(see slides Day 1_Yale_Meyers.pdf)

Main content:

Preparing Yale's material cycles data for global distribution: An overview of the Yale STAF (Stocks And Flows) Database

- Developing a database to archive Yale's material cycle and criticality data (63 elements, >100,000 data entries);
- To do so, Yale has developed a general and comprehensive data structure for materials cycles data, the Unified Materials Information System (UMIS);
- Published data are transformed into the UMIS structure using 'templates', which are then archived into the database (MySQL), and will eventually be freely available (USGS).

3.1.2 Amund Løvik EMPA: PROSUM

(see slides Day 1_Empa_Lovik.pdf)

Main content:

ProSUM: Prospecting Secondary raw materials in the Urban mine and Mining wastes

- Inventory on CRMs from Urban Mines – Data harmonization, interoperability, modelling, triangulation and validation
  - Stocks, Flows
  - Maps, Trends

- Processing/Recycling Infrastructure

3.2 Discussion of Key Points

- The terminology needs to be clear, hence terms should only be changed or added if they create a value to our methodology.
    - Take Baccini & Brunner definitions as a starting point;
    - Be careful when introducing new terms;
    - MinFuture will not be using the categories of "products" and "components" as the ProSum project does.
- ProSum does not include the economic aspect
- Raw material information challenges encountered during populating the STAF database:
    - Individual datasets;
    - Typically inconsistently formatted;
    - Often incompletely documented;
    - Rarely describe multiple data types ($, kg, ...);
    - Messy for complex data analysis;
    - No standardized visual labeling system.

4 Session III: Material accounting and indicators

4.1 Input - Presentations

4.1.1 Lie Heymans and Philip Nuss EC

(see slides Day 1_European Commission_Nuss&Lie.pdf)

Main content:

Challenges related to monitoring the circular economy - Material accounting and related policy outputs

- The compilation of indicator sets poses challenges to policy makers. Here, the RMIS (Raw Materials Information System) shall provide support by
    - Acting as a platform for structuring EU raw materials data/information and for EU knowledge on raw materials;
    - Providing various data sources that are used in policy-related outputs;
    - Showing that (and where) data overlaps exist between policy-related outputs.

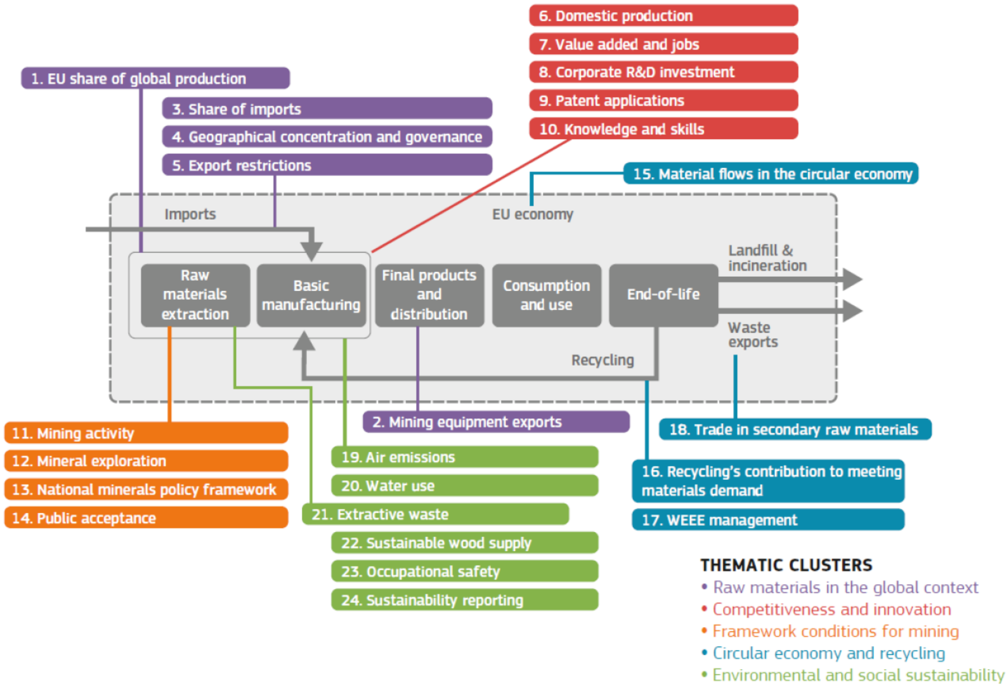

Figure 1: The Raw Materials Scoreboard at a glance

- Further questions addressed:
    - How compatible do you think the MSA framework is with current developments?
    - How could EC / RMIS support data harmonization?
    - How can we ensure that a common MFA methodology is suitable to such a wide range of materials?

4.2 Discussion of Key Points

Indicators:

- Indicators are extremely important, but their scope and availability is or can be limited
    - We do not have the data; we need a set of indicators that needs to be seen together –do not rely on one indicator;
    - Capturing systemic change with indicators is a challenge; we need to talk about the system and not about the indicators. How far can we use visualization of systems to talk to stakeholders? Should we help stakeholders to learn how to see systems and not parts of the system?;
    - The Raw Materials Scoreboard has created an awareness that the EC has not seen before.
- To create an indicator you need to have a good system (feedback loops) – people do not know how to change their indicator and make it better; you always need to go back to the system.

Sankey

- Sankey diagrams are widely used and highly appreciated;
- would be great to have a Sankey diagram in which you could see the system to further understand;
- You can monitor the system with the indicators, but you need the systems understanding to understand what we would like to understand, influence, and change.

Two directions

(1) There is a need for a simple overview (e.g. MSA study);
(2) Going to companies and teach them to report data in a more systems perspective.

5 Session IV: Physical National Accounts and international trade

5.1 Input - Presentations

5.1.1 Nancy Snyder UN Statistics: Trade Statistics Perspective

(see slides Day 2_UN_Snyder.pdf)

Main content:

- UN Comtrade scope
    - Official trade statistics of almost 200 countries/areas.
- The Harmonized System
    - The Harmonized System (HS) is a goods nomenclature developed by the World Customs Organization (WCO) to facilitate international trade and data collection & comparability.
- Quantity Data
    - UN Comtrade includes net weight and, when available, supplementary quantity.
- Bilateral Trade Asymmetries and harmonization with Production Data
    - UNSD maintains correlation tables between HS and CPC and between HS and ISIC, https://unstats.un.org/unsd/cr/registry/regot.asp;
    - However, the links between HS and CPC and ISIC are imperfect.

5.1.2 Monika Dittrich & Birte Ewers IFEU:

(see slides Day 2_IFEU_Dittrich&Ewers-pdf)

<u>Main content:</u>

Metal trade statistics and linking trade to the production of metals

- Statistics of trade in metals
  - Unequal geographic distribution of mined metals leads to high share of trade compared to extraction;
  - Relatively constant distribution of supplying and demanding countries in recent decades, but changes in intermediate processing steps;
  - Remarkable spread between importing and exporting countries and high import dependency in metals of those countries without sufficient domestic sources and high demand.
- Linking trade data to production data
  - How do we combine trade information with economic activities in countries?
    - Production statistics => Input-Output-Table (IOT) of country / region;
    - Trade statistics => national accounts (VGR);
    - Use further information on production (various sources incl. SBS etc), trade (dito) and recycling (dito) to reach high differentiation and thus high quality of IOT;
    - Include LCA-based statistics where there is no production in Germany/Europe;
    - Then: calculation of Raw Material Equivalents (RME) of imports and exports.

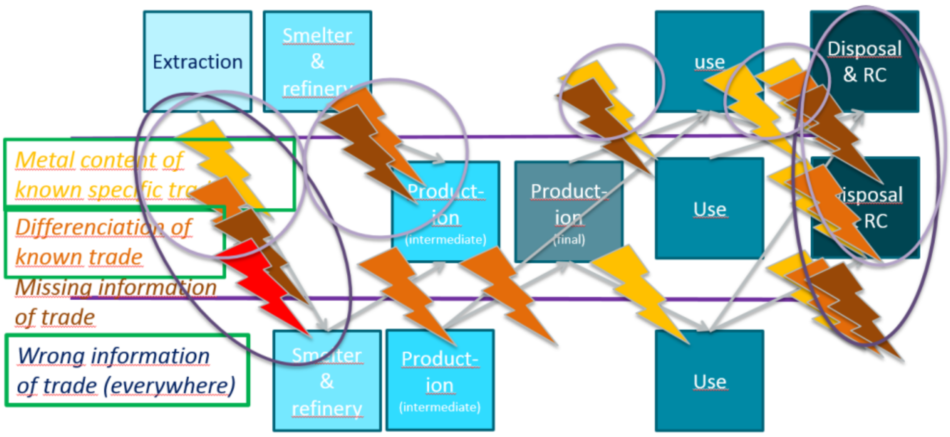

Figure 2: Aspects in trade data reporting that are most crucial & sensitive for result

5.2 Discussion of Key Points

- Confidentiality:
  - On the global level, less than 2% of the available data are confidential.
- Some databases have resolved the problem – putting the "puzzle" together, but only on the financial level
  - Re-export, some databases resolve this issue often just on the financial issue GTAP, BACHI, OECD.
- Uncertainty:
  - How accurate the e.g. copper content is, depends on the reporter
  - UN needs "experts" for feedback to improve the data and the system;
  - Uncertainty will contribute to wrong or inaccurate decisions/solutions;
- I-O tables
  - Do not directly link trade to production data; the country economy is too complex. Use I-O tables and further differentiate this into several metals;
  - How to fill the table:
    - By supply and use tables + different sources;
    - Looking at how the metals go through the economy;
    - Linking the different steps.
  - Cannot use trade statistics alone; they need to be complemented
    - Some countries (developing) have better trade statistics than production statistics;
    - Most other countries are relatively stable in regards to trade. Large difference between physical and monetary flows, physical flows are very stable.
- Differences between UN trade data and IO tables could be explained by different aggregation levels;
- You will always need experts to interpret and understand the data
  - IFEU does not use multi-regional IO tables because they do not need them for German results (Because lots of efforts would be needed to update to a multi-regional IO table);
- Where MinFuture can contribute:
  - Improve the metal content of different statistics;
  - Higher degree of differentiation
  - Improve wrong information
- MinFuture **cannot** provide missing information on trade

- MinFuture will not solve all the problems, but point out existing problems and maybe show some ideas for resolution based on an example.

6 Summary

The goal of MinFuture is to **develop a common methodology** to mineral raw material flows at global level, which can be agreed and used at international level. The goal is not to collect data but **to support data collectors**. Hence this methodology workshop served to discuss how MinFuture could support data collectors, providers and users by:

- mapping the system context;
- providing system definitions;
- defining a database; and
- making data/information gaps explicit.

MinFuture will not solve all problems, but **point out existing problems** and maybe **show some ideas for resolution based on examples** (e.g. best practice for collecting national mining data). The workshop pointed out that knowledge about data on material cycles is essential, especially to answer the questions: *How are the data generated, refined, aggregated, estimated, calculated or measured? Who are the respective data providers?*

Further, data harmonization is one of the biggest challenges. On the one hand, there is a need of an overarching service that harmonizes data; on the other hand official statistic providers need feedback to improve their data and systems. MinFuture will provide a basis to improve the quality of different statistics, achieve a higher degree of differentiation and improve wrong information. In particular, policy-relevant questions that address the systemic nature of material cycles should be included and linked with other materials, with energy use and with emissions.

MinFuture will focus on indicators that capture systemic changes. Indicators are extremely important, but their scope and availability is or can be limited. Hence, there is a need to **focus on the system** and not only on single indicators. Indicators help to monitor a system, but a **system understanding is essential** to recognise changes and influence the system dynamic. However, in this context data experts need to understand the system and the data. Different stakeholders (e.g. data producers and data users) need to talk to each other to identify and improve ways of data/information exchange.