European Commission

JOINT RESEARCH CENTRE (JRC)

RAW MATERIALS INFORMATION SYSTEM (RMIS)

RMIS Newsletter n.4 (March 2021)

This newsletter is a bi-annual summary of the main developments related to the European Commission's Raw Materials Information System (RMIS). It provides key highlights on raw materials knowledge support to policy.

JRC/EASME workshop on the Raw Materials Information System (RMIS)

Held virtually the 3rd of December, the 2020 **annual international RMIS workshop** has been, for the first time, jointly organized by the Joint Research Centre (JRC) and Executive Agency for Medium and Small-sized Enterprises (EASME). This workshop facilitated a technical dialogue to support knowledge transfer from EU projects (such a Horizon 2020 and EIT RM) into the RMIS.

The event gathered nearly 80 participants, including Directors from the JRC, EASME, DG GROW, DG RTD and EIT Raw Materials. It saw the active contribution from about 20 EU funded projects on raw materials. For further insights on the structure, content, and the follow-ups of the event, please consult the workshop report. Additional information is also provided in the last page of this newsletter.

The workshop helped identify feasible options for integration of key projects' outputs into the RMIS.

1. New EU Country reports available at the RMIS!

The EU Country Profiles module[1] in the RMIS provide **country-specific knowledge for non-food, non-energy raw materials**. Nineteen EU country profiles are currently accessible in the RMIS. Work is ongoing to complete the remaining ones in the coming months.

The module is undergoing a significant update and now includes a series of **country specific reports associated to each online EU country profile** (9 country reports are already available in the RMIS for download).

Figure 1. Cover pages of the published reports

These country profiles and associated reports synthetize key data, information and indicators related to raw materials. This is achieved by either using data from established providers (e.g., Eurostat, IMF, World Bank, UNIDO, UN Statistics) or by JRC elaboration, based on available official data (e.g., data on country's trade in raw material commodities, country's exports of mining equipment product groups, etc.).

The reports start with key insights for the specific country in the **Introduction,** followed by tables and charts with short definitions methodologies applied.

The structure mirrors the RMIS module scheme grouping the indices in nine thematic sections:

1. Key indicators
2. Investment and regulatory framework
3. Research, development and innovation
4. Resources and reserves,
5. Supply
6. Raw material use
7. Trade
8. Environment
9. Social & Policy

Key Indicators (section 1) and **Research, development and innovation** (section 3) include both selected economy-wide indicators (e.g., industrial competitiveness, contribution of mining sector to national economies, industry and manufacturing value added as share of GDP) and data on the economic performance

[1] https://rmis.jrc.ec.europa.eu/?page=country-profiles#/

of relevant industrial sectors (e.g. value added, employment, labour productivity, as well as magnitude of research and development expenditure).

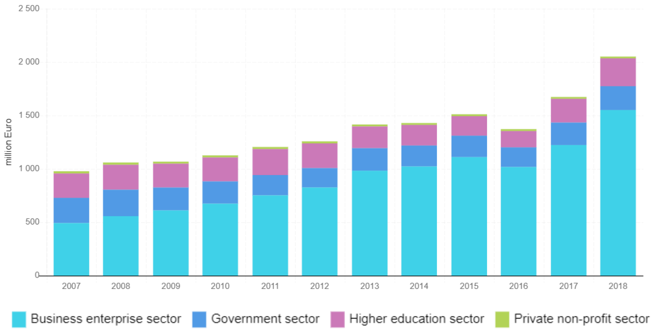

Figure 2. Example of Hungary's Gross domestic expenditure on R&D

Indicators on investments at country- and sector-level (e.g., share of total investment in GDP, [country's total flows and stocks of foreign direct investments[2]](https://rmis.jrc.ec.europa.eu/?page=fdi-stocks-and-flows-86abca#/) ; exploration budget in metals and mining), as well the specificities of countries' mining legislative frameworks are presented in **Investment and regulatory framework** (section 2). Data relating to country's estimated mineral resources and reserves are provided in **Resources and reserves** (section 4).

Supply (section 5) presents data on country's volume of imported goods, domestic extraction by broad category of materials, production value of selected mining and manufacturing sectors, and country's production of minerals.

Raw material use (section 6) focuses on utilization of raw materials, presenting data on country's volume of goods exported and domestic consumption by broad category of materials.

Trade (section 7) presents country data on trade in non-food, non-energy raw materials (i.e. [Top 20 non-food, non-energy raw material commodities imported in 2017[3]](https://rmis.jrc.ec.europa.eu/?page=trade-flows#/)), by relevant material category, by product cluster, and by selected Harmonized System chapter and subheading. Based on the methodology developed within the framework of [Raw Materials Scoreboard 2018[4]](https://rmis.jrc.ec.europa.eu/?page=scoreboard2018#/), this section also shows data on country's exports of mining equipment.

Environment section (section 8) includes tables and charts of selected environmental performance indicators in relevant industrial sectors, such as emissions of greenhouse gases and particulate matter, and generation of waste.

Finally, several social and policy indicators are included in **Social & Policy** (section 9); specifically: governance quality, policy perception, country risk and occupational safety.

2. Focus on 'CarE-Service' H2020 project: low carbon mobility, circularity and resource efficiency

What is CarE service H2020 project?

CarE-Service

The JRC supports the CarE-Service ("Circular Economy Business Models for innovative hybrid and electric mobility through advanced reuse and remanufacturing technologies and services" [5]) project, which aims to demonstrate **sustainability of innovative circular business models** for **electric** and **hybrid electric vehicles**. Such business models will be based upon new mobility services offered by car-sharing and renting companies. They will allow for the **re-use**, **remanufacturing** and **recycling** of **key-components** and **materials** of **electric vehicles** (EVs)[6] (batteries, metals, and techno-polymers) for applications in the automotive industry as well as other sectors. Additional information are availbale in the [RMIS mobility section[7]](https://rmis.jrc.ec.europa.eu/?page=mobility-7c1c33).

Reuse & Recycling opportunities within the Li-ion batteries value chain

Many challenges have pushed researchers and companies to study and develop innovative solutions enabling **Circular Economy** within the **Li-ion battery (LIB) value chain**[8]. The interest of such approach stems from the increasing LIBs market demand which impacts the cost/future availability of (critical) raw materials as well as the associated environmental burdens of the battery industry.

In the case of reuse and remanufacturing activities, the possibility to exploit residual properties in other less-demanding sectors is the main driving factor. Regarding the LIBs recovery in electric vehicles, the JRC in collaboration with Envirobat España, analysed the disassembly tasks aiming to create Standard Operational Sheets to support a human-robot collaboration during battery dismantling from pack level all the way to individual cells.

Further work on **LIB recycling** is carried out by the consortium members (STIIMA-CNR, Spanish National Research Council, Envirobat España). Recycling is advantageous for the **recovery of critical or valuable raw materials** (i.e. Cobalt) as secondary raw materials. Recycling also prevents spreading of hazardous substances to the environment. However, the huge variability of structures and compositions hampers the deployment of such practices across Europe. Scientific and technical progresses are needed to increase the maturity of the recycling process at industrial level.

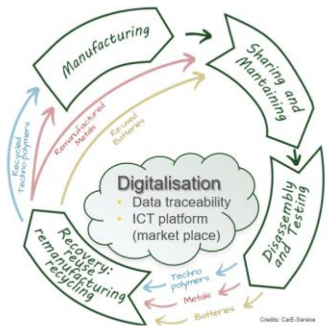

Figure 3. Scope of the CarE-Service H2020 project

Developing joint Circularity and Criticality assessment for a strategic value chain

The JRC also supports the environmental **Life Cycle Assessment** (LCA) activity led by Stellantis (previously Fiat Chrysler Automobiles). Such extensive LCA study focusing on the entire value chains of targeted car's components allows to quantify the environmental impact and potential benefits of the new services, technological re-use solutions and circular business models proposed in the frame of the project. This environmental impact assessment includes (i) re-use and recycling of Li-ion batteries; (ii) re-use of metal parts; (iii) techno-polymers reuse and recycling. It will be a first CarE-Service contribution to the analysis of the impact/benefits of circularity on climate change-

[2] https://rmis.jrc.ec.europa.eu/?page=fdi-stocks-and-flows-86abca#/
[3] https://rmis.jrc.ec.europa.eu/?page=trade-flows#/
[4] https://rmis.jrc.ec.europa.eu/?page=scoreboard2018#/
[5] Complete description, main advancements and list of the consortium partners: https://www.careserviceproject.eu/
[6] https://rmis.jrc.ec.europa.eu/?page=mobility-7c1c33
[7] https://rmis.jrc.ec.europa.eu/?page=mobility-7c1c33
[8] https://rmis.jrc.ec.europa.eu/apps/bvc/#/

related impact for the mobility sector, as for example highlighted by the EU Circularity Action Plan[9] in the section "Circularity as a perquisite for Climate Neutrality". Such analysis will also deal with future resource demand and secure supply perspectives, with specific look at resource efficiency of Critical Raw Materials [10], thanks to second use or recycling practices[11].

3. Update and complement of the 'Material System Analysis' (MSA): 14 additional MSAs for critical raw materials and battery raw materials

The RMIS includes a section focused on **Material Flow Analysis** [12] (MFA). MFA is a powerful tool to analyse and understand material flows and stocks in a well-defined system. MFA results can be used to support different policy needs, in particular to support a more sustainable resource management, security-of-supply, and a better resilience. Based on the underlying MFA methodology, in 2015, the feasibility for **Material System Analyses**[13] (MSAs) was tested at EU scale and a roadmap was developed. In line with this initial study[14], MSAs were conducted for 28 raw materials. Following, additional analyses were conducted in 2018 for the bulk metals copper, aluminium, and iron[15].

In 2020, the **JRC** in collaboration with **DG GROW** revised the methodology to improve the quality of MSA results by introducing various modifications. The outcomes are summarised in the JRC Technical Report "Revision of the MSA Specifications"[16]. The most prominent improvement is the introduction of additional market stages between life-cycle stages to allow for more explicit representation of the physical foreign trade. Consequently, the risk of inconsistences in mass balances was decreased, and the EU production and consumption became determinable for each life-cycle stage, like extraction, processing and manufacturing.

The revised methodology was applied to **14 new MSAs**. Firstly, MSAs were conducted for selected materials relevant for the production of batteries and decarbonising technologies, i.e. cobalt (update), lithium (update), manganese, natural graphite (update), nickel[17]. Because of their importance for the future battery value chain in Europe, the related MSA data sets were harmonised among each other. Secondly, MSAs were conducted for selected materials that were listed as critical raw materials[18], but so far had not been covered by MSAs, i.e. barytes, bismuth, hafnium, helium, natural rubber, elemental phosphorus, scandium, tantalum, and vanadium. The MSAs were performed for five consecutive reference years, i.e. generally from 2012 to 2016. The degree of self-sufficiency was assessed for several stages. Recycling-rates were determined, including the end-of-life recycling input rate (EoL-RIR).

All the 14 materials analysed show a very strong dependence on imports along the value chain. For the five battery materials analysed, the EU is currently able to only slightly decrease its dependency on primary material using secondary materials recycled domestically. For the period covered by the MSA (2012-2016), results confirm that the battery sector has not been a dominant application for any of the five battery materials analysed.

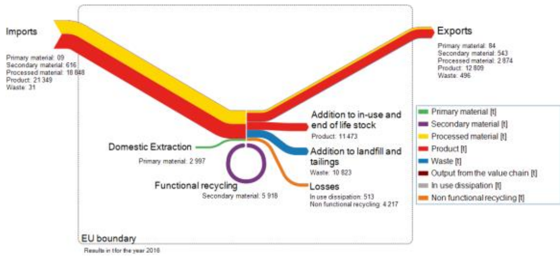

Figure 4. Simplified Sankey diagram of the flows of cobalt in the EU (without the UK), the imports of processed material include 10.3 kt of semi-processed material and 8.5 kt of processed material.

MSAs provide comprehensive datasets containing crucial knowledge to help the development and monitoring of EU polices, namely the recent EU list on Critical Raw Materials[19]. The review study, as well as the two MSA reports[20] can be found in the Foresight, strategic value & material flow tile of the RMIS.

4. Africa, Europe and the WEEE challenge

The Directive 2012/19/EU[21] on Waste of Electrical and Electronic Equipment[22] (WEEE) establishes that Member States have to monitor the amount of waste collected as well as the rates reused / recycled / recovered rates (diversitfied per category of WEEE). Progressively increasing targets are set[23].

At present, the Basel Convention[24] prohibits the exports of WEEE. However, a study[25] using GPS trackers has found that there is a "leakage" of broken devices from Europe to developing countries, particularly in Africa. The WEEE is typically mislabelled as used or goes undeclared.

In addition to WEEE, there is a large flow of used, functioning devices from Europe to Africa. Nigeria and Ghana are the major hubs of used electric and electronic devices that come from all over the world. Used devices contribute to closing the African digital divide. However, even the functioning devices become WEEE and need to be disposed of eventually. WEEE is disassembled by the African informal sector to recover spare parts and valuable materials. The remains are dumped in landfills and are often subject to floods and open-air burning. The consequences are both environmental, with contamination of soil and water, and health-wise, both for workers and for people living along contaminated sites or rivers. In this context, data are scarce and potentially misleading.

The RMIS team is currently developing **African country profiles** (expected to be visible in the RMIS by 2021 Q4). The circular economy section of these profiles will put together available data and knowledge to provide better understanding of these crucial aspects.

[9] EC (2020). Circular Economy Action Plan, For a cleaner and more competitive Europe. https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf
[10] https://rmis.jrc.ec.europa.eu/?page=crm-list-2020-e294f6
[11] https://rmis.jrc.ec.europa.eu/?page=circular-economy-monitoring
See also: https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/critical-raw-materials-and-circular-economy-background-report
[12] https://rmis.jrc.ec.europa.eu/?page=mfa-inventory-fc6a02#/
[13] https://rmis.jrc.ec.europa.eu/?page=msa
[14] https://rmis.jrc.ec.europa.eu/uploads/Final_2015_MSA_Report.pdf
[15] https://rmis.jrc.ec.europa.eu/uploads/MFA_Report_June2018_FINAL.pdf
[16] https://rmis.jrc.ec.europa.eu/?page=msa-reports-b922fd
[17] https://rmis.jrc.ec.europa.eu/uploads/material_system_analyses_battery_21102020_online.pdf
[18] https://rmis.jrc.ec.europa.eu/?page=crm-list-2020-e294f6
[19] https://rmis.jrc.ec.europa.eu/?page=crm-list-2020-e294f6
[20] https://rmis.jrc.ec.europa.eu/?page=msa-reports-b922fd
The MSA section is currently under revision and will be restructured in 2021.
[21] https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32012L0019
[22] https://rmis.jrc.ec.europa.eu/?page=electric-and-electronic-equipment-ba8f66
[23] https://rmis.jrc.ec.europa.eu/?page=from-waste-to-resources-2f4f0b
[24] http://www.basel.int/Implementation/Ewaste/Overview/tabid/4063/Default.aspx
[25] http://wiki.ban.org/images/f/f4/Holes_in_the_Circular_Economy-_WEEE_Leakage_from_Europe.pdf

5. RMIS news & development outlook

- A new section on Responsible Sourcing[26] has been added to the RMIS sustainability block. It summarizes the outcomes of a project on responsible sourcing of materials for batteries, those results are now published in a JRC report[27] and in a scientific article[28].

- Full revision and reconstruction of the Raw materials' profiles tile[29] with a modular approach by topics, starting with a dashboard of key indicators for each material. Expected release: spring/summer 2021.

- A new JRC science for policy report[30] discussing the role of rare earth elements in wind energy and electric mobility has been published. The report focuses on the elements needed for the manufacturing of permanent magnets, assessing the current situation, and providing supply and demand projections for the coming decade. More information available here[31].

- The JRC raw materials team actively supports the European Commission in relation to the ongoing strategic foresight activities on raw materials[32], which includes contributions to the first foresight report[33] and newsletter. Additional information available in the RMIS at the Overview&News tile[34] and at the dedicated page of the Foresight, Strategic Value Chains & Material Flows tile[35].

This is the newsletter of the Raw Materials Information System (RMIS) of the European Commission. It is hosted by the Land Resources Unit of the Sustainable Resources Directorate (JRC-D) of the Joint Research Centre (JRC) in Ispra, Italy. This newsletter is circulated to a broad selection of scientists and stakeholders. Please click here should you wish to be removed from the newsletter mailing list. The JRC manages e-mail addresses as personal data.

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For more information, check out the News page in the RMIS.

EASME corner

The 2020 JRC and EASME workshop on the Raw Materials Information System (RMIS)

European projects, such as Horizon 2020[36] projects and EIT-KIC[37] projects, are among the most important knowledge providers to the RMIS[38]. Through the RMIS, the DG JRC supports mapping, structuring and making further sense of this knowledge, so that raw materials knowledge needs identified by EU policy can be met rapidly and systematically; ensuring coordination, coherence, and quality-assurance, as well as verification through additional products that build-on/combine these project outputs. In support of this process, in 2018, the EC made it mandatory for certain Horizon 2020 projects to contribute to the further development of the RMIS. Knowledge flows from EU funded projects to the RMIS are expected to become increasingly important in the context of the forthcoming Horizon Europe[39] – the next R&I framework programme.

Held virtually on December 3rd 2020 and co-organised by DG JRC and EASME, the **yearly RMIS workshop** continues the well-established dialogue between the DG JRC and consortia of EU-funded projects. The overarching aim of the workshop was to facilitate a technical dialogue that can support a more efficient process of knowledge transfers from EU projects (H2020 + EIT RM kick) into RMIS, as well as to ensure that project's outputs contribute best to RMIS & EU policy objectives.

The workshop gathered nearly **80 participants**, including Directors from **DG JRC, EASME, DG GROW, DG RTD, and EIT Raw Materials**.
The plenary session was followed by the technical dialogue that was the core part of the event and continued with a session where 12 projects presented their activities and key outputs. Participants discussed:

- the most relevant knowledge needs on raw material value chains (both primary and secondary);
- how to increase awareness of project outputs and how best these can support the RMIS development priorities;
- how to facilitate technical dialogue (both IT and content-wise) for efficient knowledge transfer.

Additional information on the workshop objective, follow up steps, and the agenda, in the RMIS News&Events[40] tile are available the workshop report[41] and the presentations and recordings of the event.

[26] https://rmis.jrc.ec.europa.eu/?page=overview-and-context-657yu4
[27] https://ec.europa.eu/jrc/en/publication/responsible-and-sustainable-sourcing-battery-raw-materials
[28] https://www.sciencedirect.com/science/article/pii/S0301420721000325
[29] https://rmis.jrc.ec.europa.eu/?page=rm-profiles#/
[30] https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/role-rare-earth-elements-wind-energy-and-electric-mobility
[31] https://rmis.jrc.ec.europa.eu/?page=green-energy-transport-85d456
[32] https://ec.europa.eu/Info/strategy/priorities-2019-2024/new-push-european-democracy/strategic-foresight_en
[33] https://ec.europa.eu/Info/strategy/priorities-2019-2024/new-push-european-democracy/strategic-foresight/#next-steps
[34] https://rmis.jrc.ec.europa.eu/?page=rmis-news-c4dc3d
[35] https://rmis.jrc.ec.europa.eu/?page=crms-in-strategic-sectors-and-technologies-e8c632

[36] https://ec.europa.eu/programmes/horizon2020/en
[37] https://eitrawmaterials.eu/
[38] https://rmis.jrc.ec.europa.eu/
[39] https://ec.europa.eu/info/horizon-europe_en
[40] https://rmis.jrc.ec.europa.eu/?page=rmis-news-c4dc3d
[41] https://rmis.jrc.ec.europa.eu/uploads/2020_RMIS_WS_Report_FINAL_Online.pdf

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