European Commission

JOINT RESEARCH CENTRE (JRC)

RAW MATERIALS INFORMATION SYSTEM (RMIS)

RMIS Newsletter n.3 (September 2020)

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.

The fourth list of **Critical Raw Materials** (CRMs) for the EU has been published!

The fourth list of Critical Raw Materials (CRMs) for the EU has been published on 3 September 2020, with a major contribution from the JRC.

The Communication can be accessed from the dedicated DG GROW web page. It explicitly foresees a further strengthening of the RMIS, and lays out:

- the challenges posed to a secure and sustainable supply of raw materials;
- presents the outcome of the 2020 criticality assessment – the 2020 Critical Raw Materials List for the EU;
- sets out an Action Plan of how to overcome said challenges.

A JRC team has elaborated the "Study on the EU's list of Critical Raw Materials (2020) - Final Report" and two dedicated reports containing "critical and non-critical raw materials factsheets" for all the 83 candidate CRMs. All these reports, as well as other info on the 2020 EU CRM assessment can be downloaded from the RMIS' CRMs section.

A CRM-dashboard was also recently included in the RMIS, reporting on the evolution of the assessment results (2011 to 2020) for all candidate raw materials selected for criticality assessment.

1. JRC supports the 2020 list of CRMs for the EU

The fourth list of Critical Raw Materials (CRMs) for the EU has been published on 3 September 2020[1], with a major contribution from the JRC[2]. The Communication lays out (1) the challenges posed to a secure and sustainable supply of raw materials; (2) presents the outcome of the 2020 criticality assessment – the 2020 Critical Raw Materials List for the EU[3]; and (3) sets out an action plan of how to overcome said challenges.

The New Circular Economy Action Plan[4] and the New Industrial Strategy for Europe[5], two of the main building blocks of the European Green Deal[6], have announced such an Action Plan on Critical Raw Materials (2020 list), as well as stressed on the role of CRMs to achieve a climate-neutral, circular and competitive economy.

The list of CRMs for the EU and the underlying criticality methodology are in fact key instruments in the context of the EU raw materials policy, a precise commitment of the Raw Material Initiative (2008). Since the publication of the first list in 2011 and subsequent updates (European Commission 2010, 2014, 2017), the EC criticality methodology has responded to the needs of governments and industry to better monitor raw materials and inform decision makers on how security of supply can be achieved through diversification of supply, resource efficiency, recycling and substitution. In order to prioritise needs and actions at the EU level, the list supports in negotiating trade agreements, challenging trade distortions and in programming the research and innovation funding under the Horizon 2020 and Horizon Europe schemes.

The JRC has been a key player since the revision of the EC methodology throughout 2015[7], where targeted improvements have been introduced, based on the most recent scientific developments

[1] COM/2020/474 final "Critical Raw Materials for the EU's Resource Security - The Supply and Sustainability Challenge"

[2] https://ec.europa.eu/jrc/en/news/jrc-assesses-critical-raw-materials-europes-green-and-digital-future

[3] 2020 Critical Raw Material list: Antimony, Baryte, Bauxite, Beryllium, Bismuth, Borates, Cobalt, Coking Coal, Fluorspar, Gallium, Germanium, Hafnium, HREEs, Indium, Lithium, LREEs, Magnesium, Natural Graphite, Natural Rubber, Niobium, PGMs, Phosphate rock, Phosphorus, Scandium, Silicon Metal, Tantalum, Titanium, Vanadium, Tungsten, Strontium.

[4] https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

[5] COM/2020/102

[6] COM/2019/640

[7] JRC Report. Assessment of the Methodology for Establishing the EU List of Critical Raw Materials, Publications Office of the European Union, Luxemburg, 2017, 978-92-79-69612-1, doi:10.2760/73303, JRC106997

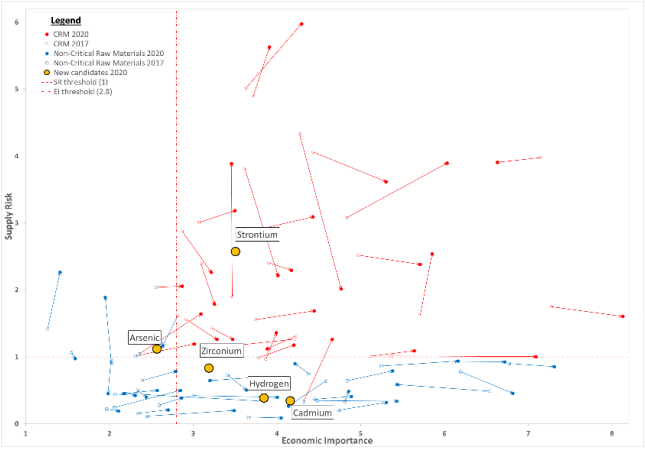
and international dialogue, as well as intensive interactions with stakeholders.

JRC role of scientific and technical support continued throughout the third EU criticality assessment, until the third list of CRMs for the EU was adopted in September 2017[8].

For what concerns the fourth EU criticality assessment, JRC role became even more prominent. Unlikely in the first three exercises, in which the assessments were outsourced to external consultants, the entire process of data collection, elaboration, dialogue with experts and stakeholders and reporting was done in-house by the JRC, in close coordination and under the supervision of DG GROW.

A JRC team has elaborated the *"Study on the EU's list of Critical Raw Materials (2020) - Final Report"*[9] and two dedicated reports containing *"critical and non-critical raw materials factsheets"*[10] for all the 83 candidate CRMs. All these reports can be downloaded from the RMIS' CRMs section[11], as well as from the RMIS Library[12].

In 2020, the list contains 30 materials as compared to 14 materials in 2011, 20 materials in 2014 and 27 materials in 2017. Bauxite, lithium, titanium and strontium are new on the list as compared to 2017, while helium is no longer critical. The screening process assessed more materials (83 materials as compared to 78 in 2017) and assessed 33 of them at extraction and processing stage.



Picture - 2020 Criticality assessment results compared to the 2017 assessment (Source: "Critical Raw Materials for the EU's Resource Security - The Supply and Sustainability Challenge")

2. New JRC foresight study for CRMs in the EU

Critical Raw Materials are essential for the EU to deliver on the climate ambition of the European Green Deal[13]**.** The objective of no net emissions of greenhouse gases by 2050 will require electrification efforts and the diversification of our sources of energy supply which in turn requires a huge increase in raw materials.

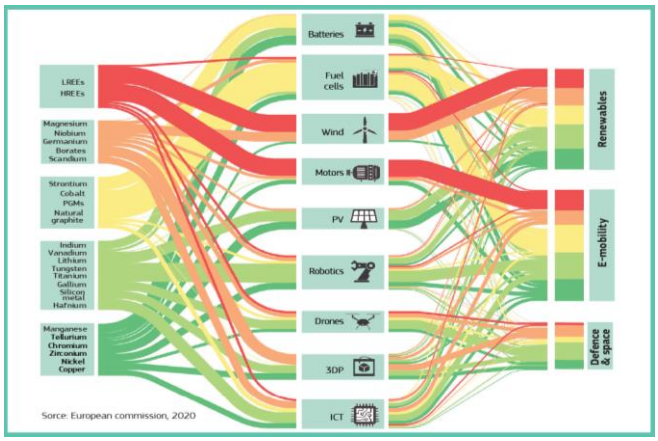
JRC published a foresight study[14]**,** which accompanies the fourth list of CRMs for the EU and translates the climate-neutrality scenarios for 2050[15] into the estimated demand for raw materials.

Such a JRC report provides a systematic analysis of supply chain dependencies for nine selected technologies [16] used in three strategic sectors: renewable energy, e-mobility, defence and aerospace.

The report indicates that for batteries for electric vehicles and energy storage, we would need up to 18 times more lithium and 5 times more cobalt in 2030, and almost 60 times more lithium and 15 times more cobalt in 2050, compared to the current supply to the whole EU economy. Demand for rare earths [17] used in permanent magnets, e.g. for electric vehicles, robots or wind generators, could increase tenfold. For our Hydrogen Strategy to succeed, we would need a reliable supply of platinum group metals for fuel cells and electrolysers. Critical Raw Materials are essential for shaping Europe's digital future. According to the foresight study, 120 times the current EU demand of the rare earth neodymium could be required to provide data storage for the global data sphere in 2025.

These examples show that a secure supply of raw materials, both from primary and secondary sources together with continued research and innovation policies for substitution and more sustainable product design, is a *sine qua non* for competitive and resilient EU industries, their recovery of the COVID-19 crisis and transition towards green and digital industries.

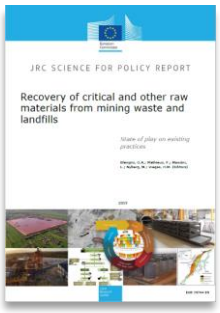
The report is now available in RMIS' CRMs section[18].



Picture – CRM in Strategic Sectors (Source: European Commission 2020)

3. CRMs from mining waste and landfills

A JRC *Science for Policy Report* was recently published on *"Recovery of critical and other raw materials from mining waste and landfills - State of play on existing practices"*.[19]



This report delivers on action #39 of the Circular Economy Action Plan [20] : "Sharing of best practice for the recovery of critical raw materials from mining waste and landfills". It builds on discussions held during two 2018 workshops and gathers together six examples of existing practices for the recovery of critical, precious, and other materials from extractive waste and landfills, highlighting technological innovations and contributions to a more comprehensive knowledge-base on raw materials.

[8] COM/2017/490
[9] https://rmis.jrc.ec.europa.eu/uploads/CRM_2020_Report_Final.pdf
[10] https://rmis.jrc.ec.europa.eu/?page=factsheets-2020-dfe63e
[11] https://rmis.jrc.ec.europa.eu/?page=crm-list-2020-e294f6
[12] https://rmis.jrc.ec.europa.eu/?page=library
[13] COM/2019/640
[14] JRC Report: Critical materials for strategic technologies and sectors in the EU – A foresight study
[15] "Clean Planet for All" Communication https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf
[16] Batteries; Fuel cells; Traction motors; Wind turbines; Photo-voltaics; Robotics; 3D printing; Unmanned aerial vehicles (UAV or drones); Digital technologies (ICT).
[17] For permanent magnets: Dysprosium, Neodymium, Praseodymium, Samarium; The remaining rare earths are: Yttrium, Lanthanum, Cerium, Promethium, Europium, Gadolinium, Terbium, Holmium, Erbium, Thulium, Ytterbium, Lutetium
[18] https://rmis.jrc.ec.europa.eu/?page=crm-list-2020-e294f6
[19] https://ec.europa.eu/jrc/en/publication/recovery-critical-and-other-raw-materials-mining-waste-and-landfills
[20] COM/2015/614

Four of six chapters address technological processes for the recovery of different materials from mining tailings and industrial waste, as in the case of the Penouta mine, the CHROMIC project, biohydrometallurgy at the Kasese mining site, and the REDMUD project. The remaining two chapters are focused on SMART GROUND and CRITICEL projects, both aimed at improving the knowledge base on critical, precious, and valuable secondary materials.

The report also provides various estimates of potential recovery of certain materials compared to their current demand. Lessons learnt from the practices include awareness that it is very unlikely that recovery processes can target one or just a few specific materials of great interest and disregard other elements or bulk matrixes. Especially in case of very low concentrations, most of the mineral resources and other bulk materials in which they are embedded must be valorised in order to increase economic viability and minimise waste disposal.

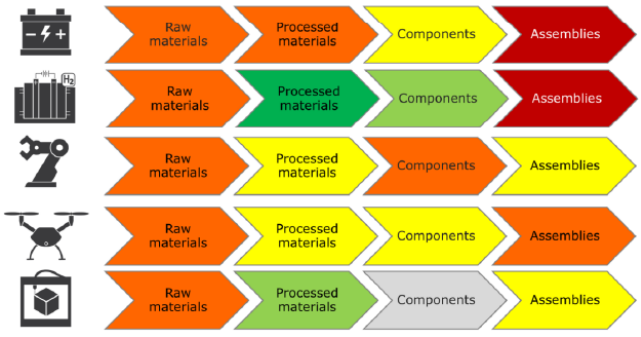
As recovery processes can be very energy intensive, environmental and land use related aspects are also particularly relevant in that environmental gains may also occur and, moreover, land space can be liberated and reused for new purposes and services. Finally, availability of data and information on secondary materials as well as a harmonised legislative framework within the EU appear to be crucial for the large-scale deployment of recovery practices.

A key conclusion is that recovery from extractive and industrial waste seems to be more advanced, and has a remarkably high potential to contribute to a sustainable and secure supply, whereas Enhanced Landfill Mining seems to be less developed and less promising in terms of CRMs recovery.

4. Materials Dependencies for Dual Use Technologies

The development of future technologies depends on inputs of raw materials in adequate quantities and qualities. While access to these inputs is crucial for the competitiveness of the civil sector, there are in addition strategic challenges to be addressed in the defence sector. Several technologies are attributable to both the civil and the defence sector. These technologies applied in both sectors are called "dual-use technologies".

In order to support the European Commission in the preparation of future initiatives fostering the sustainability of strategic supply chains, a study was commissioned to support the EU civil and defence industry in assessing and mitigating bottlenecks in the supply of materials needed for the development of emerging technologies important to Europe's defence and civil industries. The study executed an analysis on possible material bottlenecks along the supply chain for five selected dual-use technology areas, namely advanced batteries, fuel cells, robotics, unmanned vehicles and additive manufacturing (3D printing). These technologies were preselected based on a previous study (EASME, 2017) that explored the dual-use potential of key enabling technologies in which Europe should strategically invest.



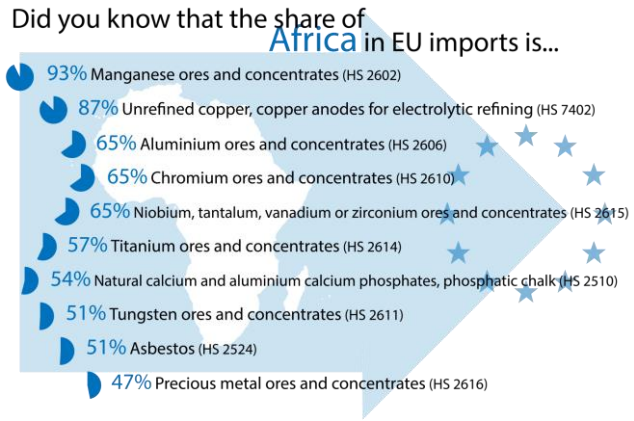
Picture - Qualitative assessment of supply risks of five selected technologies, from top to bottom: Lithium-ion batteries, fuel cells, robotics, drones and additive manufacturing. The severity increases from dark green via yellow and orange to bright red. (Source: JRC)

A dedicated methodology was developed to identify forthcoming supply risks along the supply chains of these five technologies, making use of knowledge about the composition of assemblies, components, and processed materials, as well as their geographic origin. The severity of the potential bottlenecks were classified, see figure 1. Based on these analyses, policy recommendations were provided, stressing foremost the importance of utilising the synergies between the civil and defence sectors in order to increase interest in common, dual-use research and investment opportunities.

The results with background information are published in the JRC Technical Report "Materials dependencies for dual-use technologies relevant to Europe's defence sector" and summarised in a JRC Science for Policy Report of the same title. These reports can be downloaded from a dedicated section in the RMIS [21].

The study examined how these technologies could address specific military needs and their differences in relation to civil needs, and identified opportunities for future defence research areas that could potentially serve as a basis for the design of research initiatives to be funded under the future European Defence Fund. Moreover, potential opportunities for common policy actions are also identified, notably: to strengthen Europe's position in the selected technologies' supply chains; to facilitate collaboration between stakeholders; to increase industry involvement, with special emphasis on small and medium-sized enterprises; to improve existing legislation; and to increase synergies between civil and defence sectors to speed up progress in promising research areas.

5. Forthcoming thematic tile focused on Africa and linked to the JRC's EU-Africa Platform



Picture – UN Comtrade accessed via WITS, JRC elaboration. Year 2019. Shares are computed from import values. Within HS 4-digit headings, only products at UNCTAD SoP "raw material" and "intermediate" stages are included.

The African continent is rich in natural resources, and this has historically been both a blessing and a curse. As Africa struggles to move forward from the colonial past, the extraction of resources is often plagued by human rights abuse, corruption, and environmental damages. At the same time, raw materials represent an opportunity for sustainable development. The EU, as a key trade partner of Africa, can be part of the shift towards a fairer and greener, more responsible sourcing of raw materials.

This is why we are developing a new RMIS section dedicated to Africa and its specificities. In this new section you will be able to select an African country and discover what are its main raw material exports and their relevance to EU, who is doing exploration there and find several indicators and maps about the environment, circular economy, resource governance and working conditions. This RMIS development integrates and is done in collaboration with other projects such as the Africa Platform (Unit D.6), EDGAR GHG emissions data (Unit C.5) and DG ENV's work on Circular Economy in Africa.

[21] https://rmis.jrc.ec.europa.eu/?page=dual-use-materials-27d1f0

6. RMIS news & development outlook

- The 4th International RMIS Workshop will be held virtually on the 3rd of December 2020. Key focus will be on strengthening synergies and knowledge transfers between European projects on raw materials and the RMIS.
- A CRM-dashboard [22] was included in the RMIS, reporting on the evolution of the assessment results (2011 to 2020) for all candidate raw materials selected for criticality assessment.
- Development of additional 'EU country profiles'[23].
- Inclusion of a brand-new tile focused on Africa and linked to the forthcoming EU-Africa Platform developed by the JRC.
- Update and complement of the 'Material System Analysis (MSA)' [24] at RMIS of 14 raw materials including battery raw materials (i.e. cobalt, lithium, manganese, natural graphite, nickel); the final MSA reports and datasets will be available on RMIS in 2020 (or early 2021 at latest).

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.

Feedback: ec-rmis@ec.europa.eu. Follow the JRC and our activities on Twitter through @EU_ScienceHub; @EU_H2020.

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

EASME corner

Overview

Within Horizon 2020 (the R&I funding programme for 2014-2020), the raw materials actions are part of Societal Challenge 5 – climate action, environment, resource efficiency and raw materials - and are expected to contribute to the implementation of the Raw Materials Initiative, the Strategic Implementation Plan (SIP) of the European Innovation Partnership (EIP), and to the Sustainable Development Goals (SDGs), in particular to the SDG 12 'Ensure sustainable consumption and production patterns'.
The classification of the projects follows the three pillars of the SIP that reflect the nature of the actions, specifically: technology pillar, non-technology pillar, and International cooperation pillar.
At the same time for the classification of the projects, we used the types of action under H2020: Research and Innovation actions (RIA), Innovation actions (IA) and Coordination and Support actions (CSA).
The **EU CSA** projects besides responding to the actions of the SIP, are related to concrete actions, under two main action areas: **Framework conditions**, addressing the need for a secure and sustainable supply of minerals in Europe (e.g. MIN-GUIDE, MINATURA2020, MINLAND, MIREU) ad **Knowledge base**, contributing to the development of the EU knowledge base on primary and secondary raw materials (e.g. MICA, ORAMA, SCRREEN, VERAM)

A success story

One key action of **MINLAND** (*Mineral Resources in Sustainable Land-Use Planning*) was to promote a harmonised approach and good practice sharing among Member States in order to ensure a more effective access to raw materials.
MINLAND has identified and highlighted areas in which current mining policies interact with other strands of land use, establishing how best to optimise the process of their integration at different scales and levels across Europe.
MINLAND has collected and structured information from Member States and EU activities (stocktaking), performing in-depth analyses and industrial and policy case studies on challenges and solutions to safeguarding of mineral, land use solutions and tools, and connections between the different involved policies.
The project has compiled a comprehensive and practically applicable database concerning legislation, policies, case studies of exploration, mining and related policies.
"*We created a toolbox for different measures to help an integrated approach to policies around land planning and offered practical solutions to challenges, like the need for 3D planning since mining is often subsurface, and other things may take place on the surface".*To give stakeholders an idea of how to actually put these key findings into practice, the team has put its database and document repository online, including a Good Practice Guidance (www.minland.eu).
MINLAND has proved that **securing access to mineral resources should become a part of (long-term) strategic policies together with (global and) European incentives** as a low carbon economy together with sustainable development is not possible without a secure minerals supply.

[22] https://rmis.jrc.ec.europa.eu/?page=crm-dashboard-e90826
[23] https://rmis.jrc.ec.europa.eu/?page=country-profiles#/
[24] https://rmis.jrc.ec.europa.eu/?page=msa-reports-b922fd

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