Overview for FG2 - Circularity, and use of Raw Materials

Focus Group 2 was organized by the H2020 SENTINEL project with the objective to discuss about the nexus between raw materials and energy technologies and learnt about how some energy systems models (ESM) are working to integrate raw materials in their models. This is a topic that has progressively gained importance in the past years. The session started with the presentation about the ongoing work in the area of raw materials and circularity at the EC JCR. The session continued with two examples (MEDEAS-LOCOMOTION and SENTINEL projects) about how raw materials are being taken on board in ESM. Then the participants were split in four discussion groups to discuss about: data availability, the computation of raw materials and circularity, policy harmonization and the implementation of circular economy strategies within ESM. The session concluded with a discussion about aspects relevant for the EMP-E 2021.

Summary of presentations

Presentation 1: *2020 list of CRMs for the EU and JRC foresight study on CRMs in strategic sectors.* Prof. Gian Andrea Blengini (DG JRC).

- Main points: Access to resources is a strategic security question to meet EU's climate neutrality by 2050. Raw materials play a hugely important role in the transition towards a low carbon economy. One of the latest JRC reports includes the estimates of some raw materials for strategic technologies and sectors (EV batteries, fuel cells, wind, and PV among others).

Presentation 2: *Mineral requirements associated to energy transitions: the MEDEAS approach to identify availability risks*. Iñigo Capellán-Pérez, Group of Energy, Economy and System Dynamics of the University of Valladolid (https://geeds.eu)

- Main points: The transition to renewables will boost demand of some minerals to extract from mines. The primary requirements are larger than the current estimated reserves and resources, and pressure to extract minerals form new geographies will increase. ESM needs to integrate sustainability dimensions to provide robust policy advise. The materials module from the MEDEAS model is due to be expanded by the LOCOMOTION project by including better models for energy requirements to extract minerals and more robust indicators for mineral scarcity.

Presentation 3: *Development of an environmental and Bio-economic assessment for Energy System models: the case of ENVIRO*. Cristina Madrid López (ICTA-UAB, EU project SENTINEL).

- Main points: Within the SENTINEL platform, ENVIRO is a new module that aims to monitor raw materials and circularity. It uses life cycle assessment and metabolism data to understand the potential constraints in energy scenarios. Some of the challenges encountered for its development are the availability of data, a clear method for the computation of raw materials and circularity, and how to integrate/model circular economy strategies in ESM

What did we learn from FG2?

1. Dependence on critical raw materials (CRM) is likely to replace current fossil fuel dependency

The low carbon technologies are highly dependent on non-renewable and limited material resources. As the EU increases their share in renewable energy sources, it is likely that it becomes highly dependent on the materials needed for such technologies. For example, rare earth elements for magnets in wind turbines, or gallium, germanium and tellurium for solar Photovoltaics. Many of these materials are targeted by the EU as critical raw materials (CRM) partially because they have a high risk of supply disruption and their recycling is still low. Ensuring a secure supply of those resources is key to meet the EU climate neutral goals.

2. There is a need of data in a formalized format usable by Energy System Models to allow assessing the nexus raw materials-energy technologies.

There are studies accounting for the total material requirements needed for low carbon technologies, however such data is generally published in papers or reports, and not available on an electronic format that allows for their direct use in ESM. Making data available in a formalized format requires a high investment on data gathering, data validation, and data formalization in an electronic version.

3. Join effort from Academia and policy makers to build more useful models.

An improved dialogue between academia and policy makers will help deliver better models. Models from Academia can provide a more robust and detailed information which many times tends to be simplified in models used by policy makers (for example, the decline of ore grade in minerals for a period of time). Policy makers require models for some specific issues that are not covered well by academia (for example, supply risk from a geopolitical perspective). By having continual discussions on energy system models both parties could get the best out of each approach.

4. 'Newcomers' in the ESM aiming to model raw materials (any platform available?).

During the sub-group discussions, we identified many new researchers that would be active in the area of raw materials assessment linked to ESM. It will be good to identify possible on-line platforms where they can follow discussions on the topic raw materials and circularity within ESM.