Interactions between international measures for Climate Action and Resource Efficiency (ICARE)

Online-seminar: "Identifying aspects and relevance of the climate-resource-nexus"; 29 September 2020, 14 to 17h00 CET

Summary of key discussions

There is increasing evidence that material efficiency and circular economy approaches significantly contribute to climate protection by helping to reduce GHG emissions from materials along their entire life-cycle. Extraction and production of natural resources account for almost 50% of global total GHG emissions (IRP 2019)[1]. Material efficiency approaches, such as lightweight construction methods, reduce both the need for raw materials and energy during mining and transport. For instance, material efficiency strategies (such as lightweight structures) can reduce 35% of lifecycle emissions from homes and 30% of lifecycle emissions from cars in G7 countries in 2050 (IRP 2019). Hence, investigating the nexus between resource use and climate change is important to understand both synergies and potential trade-offs. The online seminar served to identify relevant issues and further research needs regarding the nexus.

In the first input "**Insights from the scientific debate on the climate-resource-nexus**", Mandy Hinzmann from Ecologic Institute presented a review of scientific literature on the climate-resource-nexus (which forms part of an Ecologic Institute discussion paper available here). More than 50 literature pieces were identified via an online database search using search term combinations such as circular economy and climate protection; material efficiency and resource conservation. Authors of the publications mainly come from industrialised countries, working in research or supranational institutions (e.g. OECD, IRP, JRC). Most studies either do global or country assessments, and a large number of studies focuses on the energy sector. The review revealed three main thematic areas related to the nexus: (1) Resource demand for climate-friendly technologies – a trade-off because the low-carbon technology transition increases the demand for certain raw materials, particularly metals; (2) Greenhouse gas savings through resource efficiency – a synergy because material efficiency approaches can reduce GHG emissions; and (3) Links between Circular Economy & climate protection – synergies from circular strategies such as prolonging the product lifetime, re-use, recycling and waste avoidance, which can help reducing GHG emissions.

Dr. Thomas Gibon from Luxembourg Institute of Science and Technology (LIST) gave an input on the benefits, risks and trade-offs of low-carbon technologies for electricity production. With low-carbon electricity generation being key in efforts to combat climate change, there is emerging concern that expanding some novel technologies could cause a new set of environmental problems. While electricity generated from renewable energy (e.g. hydro, wind, solar and geothermal power) substantially reduce GHG emissions and also pollutants harmful to human health, expanding renewable energy production requires various metals and minerals, from bulk to precious. In a 100% renewable energy scenario, mineral

[1] IRP (2019). Global Resources Outlook 2019: Natural Resources for the Future We Want. Oberle, B., Bringezu, S., Hatfield-Dodds, S., Hellweg, S., Schandl, H., Clement, J., and Cabernard, L., Che, N., Chen, D., Droz-Georget , H., Ekins, P., Fischer-Kowalski, M., Flörke, M., Frank, S., Froemelt , A., Geschke, A., Haupt , M., Havlik, P., Hüfner, R., Lenzen, M., Lieber, M., Liu, B., Lu, Y., Lutter, S., Mehr , J., Miatto, A., Newth, D., Oberschelp , C., Obersteiner, M., Pfister, S., Piccoli, E., Schaldach, R., Schüngel, J., Sonderegger, T., Sudheshwar, A., Tanikawa, H., van der Voet, E., Walker, C., West, J., Wang, Z., Zhu, B. A Report of the International Resource Panel. UNEP. Nairobi, Kenya

resource demand would quadruple compared to a baseline scenario. Hence, careful assessments are needed to carefully choose the best possible mix of technologies according to local or regional conditions and provide a monitoring function for potential associated impacts. However, such assessments require indicators to capture different impacts, not least in relation to mineral depletion. Here, using criticality as an indicator needs a stringent definition of criticality: geological, economic or environmental scarcity. Environmental scarcity needs to look at environmental impacts of resource production, e.g. taking into account environmental effects of mining (such as eutrophication, etc.; the project EcoRess, funded by German Environment Agency, provides findings regarding environmental criticality). If those data are available, also mineral depletion can be modelled based on the underlying assumptions.

Careful multi-criteria assessments are also needed to look into the issue of recycling and of digitalisation. For example, while recycling of solar panels would reduce PV's life-cycle carbon footprint despite recycling requiring energy, for other products recycling might not be the first best solution from a sustainability perspective. Digitalisation brings with it specific material requirements, e.g. a smartphone contains between 30 and 40 elements, mostly in very low quantities, which makes them very difficult to recycle. Hence, improving eco-design of products becomes central so that they become easier to re-use, remanufacture or recycle. In general, in the past years the list of critical materials has grown, also with criticality definitions and assessments refined, for instance on the EU level.

After the break, Prof. Edgar Hertwich from NTNU highlighted in his presentation on the new IRP-report "Resource Efficiency and Climate Change - Material Efficiency Strategies for a Low-Carbon Future", that in order to limit the temperature rise to 1.5 °C we need a rapid drop in GHG emissions, much faster than what we achieved with COVID 19 lockdowns. In a value chain perspective, emissions from the production of materials amounted to 23% of global GHGs in 2015. Hence, material efficiency strategies in manufacturing, use, and waste management technologies can contribute to saving both raw materials as well as energy use and GHG emissions associated with their production. The report investigated the high-relevance areas buildings and cars. The systematic, quantitative analysis demonstrates that material efficiency strategies, including the use of recycled materials, could reduce 35% of lifecycle emissions from homes and 30% of lifecycle emissions from cars in G7 countries in 2050. In case that China goes ahead with the announced Strategy of becoming carbon neutral before 2060, then the scenarios used in the report become outdated and decarbonisation would take place much faster.

In order to foster material efficiency for climate protection, policy focus must shift from end of life and landfill diversion to the resource-efficient and circular design of houses and vehicles. Relevant policies include government use of building certification systems, green public procurement, removal of virgin resource subsidies, recycled content mandates, and virgin material taxation. Local circumstances play an essential role in determining which solutions are best to take. There is no one-size-fits-all solution. For instance, land-use regulations present a hindrance to material efficiency in the construction sector and removing or changing some rules could make a significant contribution to material efficiency. There are large synergies between resource efficiency and circular economy on the one hand and climate protection on the other hand. The sharing economy and downsizing emerged as the most relevant intervention levers, but owing to Covid-19, people's acceptance of sharing economy approaches – in particular carsharing – has been declining.

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