CO2 impact assessment methodologies for recycling technologies for applicants and funding programme owners

A Policy Learning Platform peer review

30./31. January 2024, Frankfurt a.M.

Final Report

1. Brief presentation of the beneficiary and its motivation to host a peer review

The world is grappling with the significant challenge of climate change, emphasizing the urgent need for emission reduction across all sectors. Most countries have enacted laws and regulations to meet climate goals, exemplified by the "Hessisches Klimaschutzgesetz" (Hessian Climate Protection Act, HKSG), which mandates climate neutrality by 2045. Hesse took the lead as the first German state to implement such a law.

As policymaker and public administrator, the Ministry of Economic Affairs, Transportation, Housing and Rural Areas for the state of Hesse plays a pivotal role in supporting the implementation of these laws. The task involves creating favourable conditions and making state funds accessible to contribute to a more climate-friendly economy.

The allocation of state funds is strategic and directed towards businesses that pioneer efficient production techniques to reduce their carbon footprint. However, evaluating the efficiency of these techniques requires quantifying the emissions caused by competing measures in businesses. Accurate calculation of CO2 emission savings is essential to identify and support the most efficient technologies and processes.

To address the challenge of establishing a common method for decision-making in the allocation of state funds supporting material efficiency, the states of Hesse, Baden-Wurttemberg, Hamburg, Rhineland Palatinate, and Bavaria collaborated in 2020 to develop ESTEM. Since 2023, the Association of German Engineers (VDI) has been working on transforming ESTEM into a VDI standard (VDI 4800, Blatt 3).

ESTEM is a standardized approach to calculating the equivalent climate impact of measures promoting efficient material use in small and medium-sized enterprises (SMEs). Given the significance of the "Mittelstand" in the German economy, there is a shared interest among all German states in supporting SMEs to lower CO2 emissions and ensure their future competitiveness. However, SMEs often lack the financial resources to utilize expensive CO2 calculation tools or existing market methods, which also lack simplicity, comparability, and a common database.

From the state government's perspective, comparability is crucial in funding or supporting projects with the goal of decreasing CO2 emissions. However, the exact methodology for setting up a new policy is a challenge, which needs good preparation. Aside from the funding of resource efficient production, the state plans to support new recycling technologies in order to enable the Hessian economy to develop a more circular approach. This brings new challenges in calculating CO2 emissions, since recycling processes differ from simple linear resource efficiency projects. Therefore, the Ministry of Economics of Hesse decided to contact the policy learning platform in order to receive support from other experts who can help find balanced and viable solutions for the policy challenges. A peer review with the participation of six international experts and many local stakeholders has been prepared by the policy learning platform and was held from the 30th to the 31st of January 2024 in the City of Frankfurt.

2. Specification of the policy challenge encountered

The Hessian government plans the "Ressourcenwendepaket“ (Resource transition package), aiming to advance recycling technologies on a large scale. This underscores the importance of measuring and evaluating emissions in this sector and highlights the need for a unified framework.

Given ESTEM's success in the engineering sector and the field of efficient material use, the goal is to extend its methodology to other sectors, especially in the context of recycling technologies.

Recycling firms may produce local emissions, and even while new recycling technologies are researched, these local emissions might surpass those local emissions connected to imported virgin materials. However, these local emissions contribute to a global reduction of emissions by substituting imported virgin material and their CO2 backpack.

Moreover, obtaining a clear picture of which phases of the value chain can be acknowledged when calculating a project's CO2 output remains elusive for most sectors. Reliable data to quantify emissions at each step of the value chain is challenging to obtain, especially for imported materials. Metals, for instance, are often traded on the stock market, making it impossible for a purchasing firm to know the origin and production/refining conditions.

While the ESTEM tool includes the life cycle of a product, its transferability to the recycling sector is unclear. This poses a significant challenge that needs further exploration.

In order to enable the host in setting up a transparent, fair and targeted policy framework the following questions were discussed during the peer review:

1. What should be the base for comparing the CO2 impacts of different proposals? E.g absolute savings, relative savings, distance from a benchmark or threshold, etc.
2. What are the system boundaries for assessing the whole life cycle of a product/process/project? E.g. true cradle-to-grave including imported emissions?
3. Which data can and should be used for the calculation of CO2 emissions?
4. How to judge recycling processes (reprocessing) when waste and energy is used to create re-usable output, causing emissions?
5. How should these two effects be weighed against each other?
6. How should the CO2 footprint of remanufactured products be calculated?

3. Participants

Interreg Europe & Policy Learning Platform

- Katharina Krell, Interreg Europe Policy Learning Platform
- Magda Michaliková, Interreg Europe Policy Learning Platform
- Thorsten Kohlisch, Interreg Europe Policy Learning Platform
- Verena Priem, Interreg Europe Joint Secretariat

Peer experts

- Amy Peace, Innovation Lead - Circular Economy, Materials and Manufacturing, Innovate UK, UK
- Clyde Falzon Bouvett, Team Manager Operations, Environment & Resources Authority, MT
- Eva Sevigne, Environmental Management of Navarra, GAN, ES and Imperial College London Network of Excellence in Sustainability through Life Cycle Approaches, UK
- Gertrud Aichberger, Energy & Environment, FFG - Austrian Research Promotion Agency, AT
- Lars Friberg, Climate strategist, Innovation management, VINNOVA, SE
- Warren McIntyre, Programme Manager, Zero Waste Scotland, UK

Beneficiary organisation and German stakeholders

Hosts: Ministry of Economic Affairs, Transport, Housing and Rural Areas of the State of Hessen

- Sebastian Hummel, Policy Advisor
- Jan Oliver Schmitt, Policy Advisor
- Dr. Mandy Pastohr, Head of Department (Welcome session)
- Franziska Richter, Head of Unit (Welcome session)

Stakeholders

- Dr. Felix Kaup, Industrial Technologies, Hessen Trade & Invest
- Dr. Meyer-Ziegenfuß, Ministry of Environment State of Hessen
- Boris Kinkel, Ministry of Environment State of Hessen
- Sofie Sämann, Ministry of Environment State of Hessen (Climate Action Plan)
- Dr. Markus Fritz, Fraunhofer Institute, Scientific Advisor of the Climate Action Plan Hessen
- Stefanie Markwardt, Ministry of Environment State of Thuringia

4. Policy Recommendations

During the peer review, the following recommendations regarding the formulated questions were developed with the help of the experts:

1. For comparing the CO2 impacts of different proposals, a balanced approach between the overall policy goals and the intended target group is recommended. Depending on this, some cases may favour the measurement of absolute CO2 savings, but other cases may demand the consideration of relative savings. Because of that, some experts prefer to use a mix of both approaches to reach absolute reduction goals as well as general economic policy goals like creating “Lighthouses” and supporting SMEs.

2. Companies often find end-of-life calculations challenging, but they are generally recommended. To simplify, companies can use general assumptions for a product's lifecycle and only conduct detailed calculations for "cradle-to-gate" stages. Using standardized boundaries, ideally based on global or European data, is beneficial. Moreover, it is recommended to tailor the scope to the company's scale (local or international) and sector.

3. Use existing data and a consistent calculation method. Balance the amount of data required with what is available. Simplify the process using a dashboard and indicators. Consider using ranges instead of detailed numbers. Exclude infrastructure costs. Take energy source and other greenhouse gases into account. Use a default database with the option for additional data. Pay attention to regional "hot spot" data and focus on problem areas. For sensitive data or small projects, use generic information or local solutions with a simple carbon accounting approach.

4. Start with clear assumptions and a generic model for recycling process assessment. Rank materials and compare pathways for virgin and waste materials. Consider energy use in reusable products based on their lifetime and account for a region's energy mix in environmental assessments. Compare the GHG emissions of produced recycling material against the emissions created by producing virgin material. Consider aspects beyond CO2 emissions, such as resource use, material quality and regional waste generation.

5. Carefully assess the various impact factors, including water usage and energy. It is recommended to simplify resource savings to embedded carbon and considering system boundaries in recycling processes. The experts stress the importance of energy efficiency, renewable energy sources, and CO2 reduction. A Life Cycle Assessment (LCA) study should be divided into sub-processes for individual GHG emissions analysis. Global emissions, material use, and multi-criteria decision-making with weightings based on scarcity, regional considerations, and political goals are highlighted. Balancing emissions and material recovery is crucial, particularly in a carbon-neutral energy future.

In the end, the following criteria for a suggested selection process were discussed:

- The selection process for sustainable projects should prioritize a mission-driven approach, focusing on the big picture of the region to decide where to allocate funding. While CO2 emissions are an important factor, there are always trade-offs and it is a political decision where to focus funding. A holistic approach means improving the environment in one direction without harming it in another direction
- The selection process should use multi-criteria decision-making to weigh different criteria and support a decision.
- One advisor should be responsible for calculating the CO2 emissions for all projects to ensure a consistent baseline.
- Transparency is important, but partial transparency is recommended, with applicants only receiving marks on global criteria.
- Bonus points may be awarded for special contributions to some goals, and additional technical assessments may be required.
- A selection committee should be formed and agree on all important criteria. The policy goals for the applicants should be transparent.
- Targeted codes/portfolio management may be used to deliberately widen the scope of the funded projects, and "calls" may be made for different sectors/technologies.
- Local waste metrics should be used to identify the biggest waste-sources.

5. Possible calendar of implementation

Looking at the policy recommendations during the peer review, a balanced approach for measuring the CO2 impact of projects seems to be viable for Hesse. All of the recommended measures are useful and will be considered for the planned methodology for selecting project proposals in the “Ressourcenwendepaket” funding programme.

For now, the implementation of the developed recommendations requires political decisions and with them the allocation of the necessary funds in order to start implementation. To enable these decisions, a policy recommendation has been made to the Minister of Economics and a political decision awaits.

Following the political decision, the implementation of the new programme will commence and a start is expected for early 2025.

6. Conclusions

The peer review concluded that the originally intended quantitative tool for evaluating CO2 emissions in recycling processes would be ideal, but there are valid reasons why such a one-size-fits-all solution does not currently exist and probably will never exist.

The size of the planned funding program is limited and developing a complex and costly evaluation or scoring system may not be the appropriate choice. Qualitative evaluation criteria are more realistic and allow for the rewarding of multiple criteria. A score-card that utilizes multi-criteria decision-making seems like a useful approach. However, there are always trade-offs to consider. The CO2 impact is not the only desired political outcome of the funding program. There are political trade-offs between regional value creation and retention policy goals and CO2 targets. There are also trade-offs within the environmental impact, between CO2 and other environmental impacts.

In summary, the peer review concluded that clear regional policy goals are important. The region should determine what aspects it wants to focus on. Until there is a clear big picture, it will be difficult to align funding programs. Once the policy goals are clarified for the program, communication of the objectives and the type of impact and approaches sought after should be done. The necessary criteria for setting up a project selection process based on a balanced scoring system were discussed during the peer review and additional information was provided by the experts.

With this technical background the host is now able to initiate the necessary political decisions in order to start with the process of implementing the final funding programme. The final process will be well thought out based on the valuable input of the different European experts and local stakeholders.

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