

Background paper

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Approaches to carbon accounting

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Note

This background paper summarises the key statements and discussion points from various workshops held on this topic between March and September 2022, under the leadership of the aforementioned authors and with the participation of external stakeholders. This is not a Bioeconomy Council position paper. Its contents, views and conclusions do not represent recommendations for action or the results of studies carried out by the German Bioeconomy Council, rather they exclusively reflect the contents of the discussions conducted by and with experts.

Summary

A comprehensive assessment of the main components of biomass, carbon, is required in order to prioritise the use of renewable raw materials beyond ensuring food security, as envisaged – for instance – by the biomass strategy. Past studies do not fulfil this standard or only examine a selection of individual topics. The Bioeconomy Council (BÖR) therefore recommends conducting a meta-study in which national and international data available from previous observations and detailed studies can be systematically recorded, with ensuing key figures brought up to date and standardised using suitably derived data structures. In this background paper, the aforementioned authors finalise the structure of this study, which outlines the data necessary for implementing the bioeconomy strategy on the basis of facts.

Introduction

By adopting the Paris Agreement, the global community has set itself the goal of restricting global warming to a level far below 2 °C and taking measures to stop the rise in temperature, where possible, at 1.5 °C. The European Union aims to be the first greenhouse gas-neutral continent by 2050 and has already begun laying the groundwork with the Fit

for 55 legislation package. Germany's goal is to be net-zero by 2045 (Section 3 (2) of the Federal Climate Change Act [KSG]) and, after 2050, to achieve negative greenhouse gas emissions across all sectors.¹ Besides natural forms of carbon capture and storage such as forests and moors, this will also require measures for gradually replacing fossil carbon content by utilising biomass, secondary raw materials and CO₂ as well as carbon from the utilisation cycle as an alternative source of carbon.² With a combined approach like this, it will be possible to limit the use of carbon from biomass and thus minimise the associated land use to an environmentally compatible level. The following national and European strategies exemplify the high political significance of the topic.

Natural Biomass Strategy (NABIS)³

The purpose of the biomass strategy is to promote sustainable use of resources over the medium to long term, help protect the climate and biodiversity, and establish the conditions necessary for this in Germany. The goal of the biomass strategy is to establish a mix of tools that have a practical steering effect to ensure the production and use of biomass that is not only sustainable and resource-efficient, but also protects biodiversity and is climate-friendly. The idea is to demonstrate the extent to which sustainably produced or waste-based biomass can be used efficiently as well as outline potential applications and sectors. The strategic aim is to steer biomass flows, whilst considering food security, climate protection, biodiversity, environmental protection, energy security and the supply of raw materials.

National Circular Economy Strategy (NKWS)⁴

This strategy is intended to play a key role in reducing environmental pollution, protecting biodiversity and promoting national, European and global climate action. The intention is to reduce GHG emissions and energy consumption through increased recycling and significant use of secondary raw materials.⁵

¹ https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/230919_uba_pos_ccs_bf.pdf

² <https://www.biooekonomierat.de/media/pdf/stellungnahmen/biooekonomierat-broschuere-nachhaltig-umsetzen-DE.pdf?m=1684941445&>

³ Key points of a National Biomass Strategy (NABIS) (bmuv.de)

⁴ The National Circular Economy Strategy (NKWS): Fundamentals for the process of transforming to a circular economy (bmuv.de)

⁵ The German term 'Kreislaufwirtschaft' and 'circular economy', the corresponding term commonly used in the EU, are not exactly the same, even if that is how the EU concept is translated into German. The German term focuses on recycling waste, whilst the European term addresses the use and recycling of materials. The purpose of the Circular Economy Action Plan adopted by the European Parliament in February 2021 is to reduce the amount of waste and reinforce consumer protection – for example, with a 'right to repair'. The action plan also outlines binding targets for the use and consumption of materials and more sustainable product design by 2030, with the ultimate aim of achieving a carbon-neutral, environmentally sustainable, non-toxic and 100% cycle-based economy by 2050. In March 2022, the Commission published the first package of measures to accelerate the transition to a circular economy as part of the action plan. The proposals include promoting sustainable products, supporting the green transition, revising the Construction Products Regulation and developing a strategy for sustainable textiles.

Carbon management strategy

After presenting the evaluation report on the Carbon Dioxide Storage Act (KSpG),⁶ the German government announced a carbon management strategy for 2023. This strategy aims to define potential areas of use for carbon capture and utilisation (CCU) and carbon capture and storage (CCS) as well as identify the legal and economic parameters required for speeding up the process, including development of the necessary infrastructure.

Climate Action_sustainable carbon cycles⁷

In late 2021, the European Commission announced its plans to establish a legal framework for certifying the process of natural carbon sequestration and industrial carbon capture and storage. Optimisation of the processes involved in monitoring, reporting and evaluating carbon reduction is viewed as the first major step in strengthening markets, enabling proper use of carbon credits and creating incentives for carbon reduction and increased use of the cycle principle for carbon dioxide – all the while pursuing biodiversity targets across the board.

What the aforementioned strategies have in common is that they increase the focus on specific areas of the carbon value chain – with the occasional support of scientific studies. However, this approach simply falls short in the face of increasing demand for renewable carbon and different management approaches across different sectors. Even as the demand for food increases, the chemical, textile, construction and energy sectors will require higher quantities of carbon from biomass, CO₂ and waste materials. But at the same time, carbon is also essential for natural climate protection and CO₂ removal. With upstream and downstream value chains so closely interlocked and intertwined – for example, when processing agricultural raw materials into basic chemicals – it would be absolutely essential to view carbon cycles as a whole. If sectors, industries and companies were to focus exclusively on carbon emissions, as proposed by the European Union's Green Deal and other frameworks, and rely on tools such as emissions trading, that would simply not be enough to support a transition away from the use of fossil carbon sources in the economy.

Whilst there are established models and approaches for evaluating and quantifying carbon emissions, there is a gap in the comprehensive assessment of terrestrial carbon, aquatic carbon, the carbon present and bound in industrial products and cycles, and the carbon necessary for conversion. But this form of assessment, in particular, is necessary for green investments and defossilisation initiatives such as alternative energy projects, development of bio-based and cycle-based products, the use of degradable materials and chemicals, the use of renewable energies and other activities designed to hold carbon in cascade utilisation for as long as possible. This is essential when it comes to comparing the present and future demand for carbon of different stakeholders with the

⁶ BMWK - Evaluation report on the Carbon Dioxide Storage (KSpG)

⁷ https://climate.ec.europa.eu/eu-action/sustainable-carbon-cycles_en

limited quantities of carbon available – particularly carbon sourced from agriculture and forestry – and then developing the associated strategic measures.

Efficient climate protection, strategic public and private investments, and carbon availability planning therefore require an analysis of the current situation and potential which focuses on the entire value-added chain and can help political decision makers and regulatory authorities develop future carbon management systems.

The Bioeconomy Council therefore urges⁸ the German government to commission an overarching study which enables comprehensive examination of carbon cycles. Both national (e.g. for all the aforementioned strategies) and international data should be systematically collected, with the resulting key figures compiled and updated as well as parameterised using appropriately derived, uniform data structures (e.g. carbon concentration in % C, carbon stocks in tC*ha⁻¹ and C sequestration rates in tC *ha⁻¹ * year⁻¹).

Below, the aforementioned authors outline the structure of such a study, which is broken down into five work packages:

WP 1 Development of a current overview of relevant national and international studies and their parameterisation

The purpose of the first work package is to analyse the latest studies available, with a key focus on primary and secondary studies. But for the sake of completeness, relevant meta-studies need to be included in the literature review. This prioritisation should be considered when selecting studies. The analysis focuses on studies that contain statements on the status quo of terrestrial carbon, aquatic carbon and carbon present in products and cycles as well as the application (food, feed, materials and energy).

The studies must be presented as a synopsis in accordance with scientific standards, which should contain the following information:

- The authors and institutional background (publishing institution, client, publication format)
- Date of publication, assessment period, location of publication
- Scope
- Purpose of publication (scientific, commissioned study, organisation study, etc.)
- Subject matter: sector/industry/technology/application/process type/product group
- Geographic focus (regional, national, global)

⁸ The Bioeconomy Council's initial recommendations for implementing the National Bioeconomy Strategy (biooekonomierat.de)

- Data set
- Indicators used
- Study type (life cycle assessment, etc.)
- Core statement, key findings

Result: A structured overview of current studies which fulfils the requirements.

WP 2 Systematic comparison and analysis of studies

After carrying out the parameterisation, the most relevant studies should be systematically compared, analysed in depth and evaluated. This step needs to be coordinated with whoever has commissioned a study. The aim is to provide a straightforward, overview-like summary and form of classification that identifies key (potentially even opposing) trends in the findings, with a particular focus on highlighting any open questions and uncertainties.

Result: A systematic, parameterised evaluation of the study situation along with a list of open questions and uncertainties.

WP 3 Overall assessment based on the parameterised study results

If the parameterised data set allows, an overall assessment needs to be prepared on the basis of the study results which provides information about the provision, use and destination of carbon across multiple industries and sectors.

Result: An overall assessment which summarises the parameterised data derived from the individual studies. If this is not possible with the data available, the result will be a clear presentation of the current, urgent need for research on approaches and steps that could make this possible. The implementation of these steps and approaches is not the subject matter of this project.

WP 4 Evaluation of national policy strategies and action plans

The German government's Bioeconomy Council serves as an advisor to the departments involved in the plan for implementing the national bioeconomy strategy. It will be necessary to analyse supply and demand and examine the forms of carbon use and recycling defined by politicians before any regulatory recommendations can be made for prioritising methods for using and recycling compounds containing carbon, for example. Impact

chain analysis should be conducted for specific current environmental and sustainability agendas and action plans to reveal what kind of impact a one-to-one implementation of the associated intervention logic would have on the provision, use and consumption of carbon. The findings for certain agendas and action plans should be compiled in an overall assessment.

Result: Impact chain analysis revealing what kind of impact national policy strategies and action plans directly or indirectly related to carbon could have on the provision, availability, use, processing and recycling of carbon if implemented.

WP 5 Comparison of available data and conclusions

Based on the evaluations conducted (WP 2 and WP 3), the fifth and final work package is intended to compare political demands with the current literature-based data situation and, on this basis, prepare the corresponding conclusions for recommendations and discretionary courses of action.

Result: Comparison of political and literature-based data for providing, using and recycling carbon and the development of corresponding conclusions for possible courses of action.