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SWP Comment

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Carbon Dioxide Removal As an Integral Building Block of the European Green Deal

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The implementation of the new net emission targets for 2030 and 2050 as part of the European Green Deal is moving the deliberate removal of CO₂ from the atmosphere up the agendas of political decision-makers. In its latest report, the Intergovernmental Panel on Climate Change (IPCC) also recently reiterated that net-zero targets cannot be achieved without the deployment of carbon dioxide removal (CDR) methods. The political debate in the European Union (EU) about CDR has changed rapidly in recent years, with almost all political actors now calling for a new regulatory framework for CDR to become an integral building block of EU climate policy. However, fundamental conflicts are brewing over the question as to which removal methods and policy instruments should be implemented and which priorities should be set. There are signs of emerging political alliances on the EU level that will shape the Fit-for-55 legislation in the short term and pre-structure the debate on the design of climate policy between 2030 and 2040.

The implementation of the European Green Deal is becoming more concrete as the legislative processes that make up the Fit-for-55 package move forward. After the European Climate Law and the new targets for 2030 (net 55 per cent reduction of greenhouse gas [GHG] emissions compared to 1990) and 2050 (net-zero GHG emissions) were adopted in 2021, the European institutions and national governments began working on reforming all relevant climate policy legislation. An important issue to be addressed during this process are the measures for the deliberate removal of CO₂ from the atmosphere and its permanent storage in geological, terrestrial, or ocean reservoirs.

No net-zero without removals

Achieving the EU climate targets for 2030 and 2050 will require the development of carbon removal capacities that substantially exceed the reforestation efforts made so far. Without increased removal capacity, hard-to-abate residual emissions from agriculture, long-distance transport, and industry cannot be counterbalanced. The question as to which sectors and member states will be allowed to maintain residual emissions is the subject of an increasingly conflictual negotiation process.

The distributional effects of European climate policy have receded into the back-



ground of the public debate in view of the Russian invasion of Ukraine. However, there are no signs that the development of CO₂ removal policy will be delayed because of the war. The stronger focus on liquefied natural gas and hydrogen as part of the European energy supply could even lead to an increase in investments and an acceleration of the development of CO₂ transport infrastructure, which is also relevant for CDR.

Residual emissions in climate policy

It was not until the publication of the IPCC Special Report on the impacts of global warming of 1.5°C in 2018 and the EU's subsequent commitment to achieve climate neutrality by 2050 that explicit policy positions on CDR and hard-to-abate residual emissions began to emerge. According to the European Commission's scenarios, about 500 megatonnes (Mt) of CO₂ equivalents (CO₂eq) would need to be counterbalanced in 2050 (about 10 per cent of total GHG emissions in 1990) to achieve net-zero GHG emissions. Net CO₂ removals from land use, land-use change and forestry (LULUCF) averaged 293 Mt of CO₂eq for the EU as a whole in the last decade – with a downward trend. Even with a highly ambitious enhancement of these sinks, ecosystem-based methods such as (re)forestation and increased soil carbon sequestration alone will not be sufficient to counterbalance all residual emissions, especially if the removal potential and permanence of storage are reduced by accelerating climate change.

Within the European multi-level system, almost all actors now agree that CDR capacities must be greatly expanded. This consensus is also reflected in the newly adopted emissions-reduction target for 2030, which allows a limited amount of net removals from the LULUCF sector to be counted towards achieving the net 55 per cent target. However, there is still considerable disagreement about the concrete design of the policy instruments, the selection of removal methods, and the options for their certifi-

cation. This applies both to the legal acts that are part of the Fit-for-55 package and the architecture of EU climate policy for the period 2031-2050.

Commission as an ambitious agenda-setter

Since 2018, the European Commission has increasingly emerged as a driving force and agenda-setter in the CDR debate. In December 2021, the Commission outlined how it envisages future European removal policy with its Communication on Sustainable Carbon Cycles, which includes three core topics (carbon farming; industrial capture, use, and storage of CO₂; certification of removals). However, the decision-making power for the specific design and political implementation of carbon removal policy lies with the member states in the Council of the EU and the European Parliament (EP). Political preferences, alliances, and interests sometimes diverge widely within and between the two co-legislators, with the Fit-for-55 package being a prime example of this. The Commission therefore also has the role of sounding out possible compromises on these three topics in advance.

A first important sub-area of removal policy will consist of the promotion of so-called carbon farming. The aim here is to reward farmers and foresters for practices that enhance CO₂ removal. In addition to this, the initiative also aims at improving linkages between climate and agriculture policy and facilitating the attempt to “green” EU agriculture. According to the Commission's plans, the financial resources for this could come from, among other sources, the well-endowed budgets of the EU's Common Agricultural Policy and the cohesion funds. While the removal of CO₂ through forest management is already part of EU climate policy under the LULUCF Regulation, the carbon farming initiative aims to also address potentials for enhanced removals in the agriculture sector. In the future, new incentives could therefore be set for sequestering carbon in agricultural

soils; these removals could then contribute to the fulfilment of national obligations under EU climate policy.

The second strand of the Commission's approach to sustainable carbon cycles involves the industrial capture, use, or storage of carbon. The measures that have most commonly been discussed so far are capture from ambient air and subsequent storage (Direct Air Carbon Capture and Storage, DACCS) and the combination of bio-energy production and the subsequent capture and storage of CO₂ (Bio-energy with Carbon Capture and Storage, BECCS). Although more and more companies (from the steel, cement, and automotive industries, among others) are seeking to cooperate with the first few niche providers of these technologies, the actual removal capacities have been limited to date. The focus is therefore likely to initially be on expanding funding research; the development and demonstration of these technologies, for example through the Innovation Fund, which is linked to the EU Emissions Trading Scheme; and the European Framework Programme for Research and Innovation *Horizon Europe*.

Thirdly, an instrument for the certification of CDR methods is being sought. The goal is a scientifically robust set of rules and requirements for monitoring, reporting, and verifying (MRV) CO₂ removals. This instrument has a key role to play in the expansion of existing climate policy: not only because it could be used as a regulatory standard in the controversies about the permanence of various storage options. The envisaged certification system can also serve as the basis for the important distinction between the use and storage of CO₂ (Carbon Capture and Utilisation, CCU, and Carbon Capture and Storage, CCS) and CO₂ removal. While CCU and CCS applied to CO₂ from fossil fuels and industry can help to prevent CO₂ emissions from entering the atmosphere, only CDR methods such as DACCS and BECCS can achieve net-negative emissions. Only if these methods are certified in a plausible and robust way can they be used to counterbalance residual emissions, for example from the agricultural

or transport sectors. With the establishment of a certification system for the use and removal of CO₂, the EU would follow up on its pioneering reputation in climate policy: Neither in the United Kingdom (UK) nor in the United States (US) – which have both set up comprehensive programmes to promote innovation in the domain of CO₂ removal – has a comparable MRV scheme so far been established.

Beyond promoting innovation, the Commission is also pursuing the goal of setting new standards in the development and implementation of innovative policy designs and consolidating its standing as an international pioneer in climate policy. Whether the EU succeeds in this depends, on the one hand, on the precise design of the legislation. Differences in the degree of climate policy ambition among the 27 member states, national variations regarding the amount and composition of residual emissions, and diverging political preferences with regard to individual methods will cause manifold conflicts in upcoming legislative procedures. On the other hand, the EU will also be influenced by the aforementioned developments in countries such as the US, where innovation is now strongly driven by companies outside government funding programmes. Widespread use of CDR methods in the US and other countries would increase the pressure on the EU and its member states to expand their removal capacities as well. The first-time inclusion of a CDR section in the final declaration of the G7 climate, environment, and energy ministers under the German presidency demonstrates its increasing importance for leading industrial nations.

Sequencing of political processes

Overall, a sequencing of policy initiatives to promote and regulate CO₂ removal can be observed at the EU level. The reforms under the Fit-for-55 package for the period up to 2030 do not yet envisage any fundamental changes to the governance architecture relevant for CDR. The initial focus

here is on enhancing ecosystem-based sinks, increased funding for innovation, and the establishment of certification rules. In the course of the negotiations on the Fit-for-55 package, some specifications are to be expected. The EP's decisions in its first reading of the files are a first step in this direction: Members of the EP voted for, among other things, the possible inclusion of "negative emissions" in EU emissions trading, the importance of carbon farming and the possible consideration of CO₂ removals in marine and coastal ecosystems, and they have called for more clarity regarding the certification of technological removal methods. The extent to which CO₂ removals beyond established methods such as reforestation will find their way into EU climate policy by 2030 will be decided in the trilogue negotiations between the Council member states, the Commission, and the EP.

Following the establishment of the planned certification instrument and for the period after 2030, more comprehensive CDR reforms in the EU climate policy architecture are to be expected. Political debates are expected to take place in the not-all-too-distant future: The discussion about a new overall EU climate target for 2040 will move onto the agenda soon after the conclusion of the negotiations on the Fit-for-55 package. The reason for this is, on the one hand, a requirement in the European Climate Law that the Commission should make a proposal for the new 2040 target within six months of the first Global Stocktake under the Paris Agreement in 2023. Moreover, in the run-up to the 2024 European elections, more political attention is likely to be focussed on the next intermediate target on the pathway towards climate neutrality. In this context, not only the level of ambition is likely to be disputed, but also the relative share of CDR to be used in achieving the target.

Portfolio of alliances and methods

As the political debate on CO₂ removals intensifies, new alliances are gradually forming among member states. Denmark, Sweden,

and the Netherlands, together with Norway, are pushing CCS and CDR. Sweden, in particular, is moving forward with the implementation and regulation of BECCS, an option that is appealing to the country due to an above-average use of biomass in industry and electricity production. The discussion about ecosystem-based approaches has advanced further in France and Poland, among other countries. There, ideas for the certification and remuneration of removals have been part of the climate policy debate for some time. However, the positions in many member states and in the EP are still fluid. The forthcoming legislative procedure on the certification instrument is expected to instigate the formation and consolidation of positions on different CDR options by individual member states and EP parliamentary groups.

It is not yet possible to say with any certainty which carbon removal methods will be prioritised in EU climate policy and where they will be implemented on a large scale. What is clear, however, is that in addition to ecosystem-based approaches – subsumed by the EU Commission under the term "carbon farming" – CCS-based methods such as DACCS or BECCS will also play a role. Furthermore, there is an emerging discussion on enhancing the carbon uptake potential of the oceans. In its Communication on Sustainable Carbon Cycles, the Commission points to the opportunities offered by blue carbon farming, for example through the regeneration and expansion of seagrass beds. However, the communication did not mention geochemical approaches to marine CO₂ removal, such as increasing the alkalinity of the ocean (Ocean Alkalinity Enhancement). Currently, both the Commission and the German government are funding large research consortia that are investigating the potentials and risks of a broad portfolio of ocean-based CDR approaches.

Consequences for Germany: The CCS renaissance

The German government's position will be important for the development of CO₂

removal policy at the EU level. This position has changed rapidly within the last two years. While the Climate Change Act of 2019 did not contain any reference to the necessity of removals, its amendment contains a quantified target for ecosystem-based carbon removal (Art. 3a). In its coalition agreement, the German government, which was sworn in in 2021, also acknowledged the need for “technological negative emissions” and announced the development of a long-term strategy for “dealing with the approximately 5 per cent of unavoidable residual emissions”. This brings politically uncomfortable questions into focus: In which sectors may these residual emissions be located? And what role will different *carbon management* approaches (CCS, CCU, and CDR) play in future climate policy?

Once highly controversial, CCS technologies are currently facing a renaissance in many member states. The debate is being driven, among other things, by the findings of modelled national decarbonisation pathways. In these studies, CCS plays a twofold role: On the one hand, it is an important component of CO₂ neutrality strategies in those sectors that are facing significant unavoidable process emissions, such as cement production. On the other hand, CCS is a component of the CO₂ removal methods BECCS and DACCS, to which great importance is attached in the discussion on future removal portfolios. Both functions of CCS are closely linked on the path to net zero: The more the level of residual emissions in industry can be reduced with the help of CCS, among other methods, the less CDR capacity will be needed to counterbalance these emissions.

However, the CCS debate is also on the rise because Norway, a partner with close political and economic ties to the EU, is offering to serve as a CO₂ storage provider. In addition to individual companies, some federal states have already started planning for CCS deployment. For example, the state of North Rhine-Westphalia has developed a carbon management strategy that includes plans for cooperation on CO₂ storage with the Netherlands, Norway, and Scotland.

Northern German federal states are increasingly positioning themselves as pioneers in research on marine carbon removal methods and CCS-relevant infrastructure. In Wilhelmshaven, for example, infrastructure for exporting CO₂ via ships is planned to be built. Although these initiatives have so far only been partially aimed at creating removal capacities, newly created infrastructure for CO₂ transport will be helpful in implementing future removal projects. Proximity to CO₂ pipelines will play an important role in the construction of DACCS facilities. To establish BECCS process chains, the use of biomass as an energy source would be particularly suitable in industrial installations connected to CCS infrastructure.

Political challenges at the EU level

In the course of the regulatory implementation of the European Green Deal and the net-zero target, intensive disputes are to be expected in the coming years. With a better overview of the projected residual emissions in individual sectors and member states, the expectations for an EU removal policy will become more concrete. Three challenges will shape future debates in Brussels and Berlin.

German and European decision-makers face the difficult task of safeguarding the political priority of emission reductions. An imprecise embedding of CDR in climate policy would risk undermining efforts to reduce emissions. The legislative procedures in the context of the Fit-for-55 package and the European Climate Law show that a clear separation of emission reduction and CO₂ removal is politically controversial. Against the background of emerging sectoral interests, the strategic focus should be placed on prioritising emission reductions in this early phase of removal policy. For this, it is also indispensable that a clear dividing line be drawn between CDR, which enables net negative emissions, and conventional CCU and CCS applications, which at best can help to achieve emission-neutral processes.

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The expansion of EU CDR policy to the agricultural sector by means of carbon farming is associated with both challenges and opportunities. Agriculture is the policy domain with the largest share of the EU budget and correspondingly well-established interest groups and conflict lines. Its greater involvement in EU climate policy could put additional strain on legislative procedures. Uncertainties as to which removal potentials are realistic in the long term and which infrastructures are suitable for monitoring are also problematic in this context. The opportunity lies in the fact that new sources of income for farmers and foresters envisaged by the Commission could contribute to more sustainable land use. At the same time, the planned incentive schemes could be used to facilitate compromises in larger package deals between the member states and the EP. A crucial political question is whether existing priorities for spending the Common Agricultural Policy budget will be changed, thereby intensifying distribution struggles, or whether additional funds will be made available to incentivise carbon farming.

A third set of political challenges will be to successfully implement the desired governance architecture for certification at the EU level, establishing a regular exchange with other CDR pioneers, and making CDR the subject of multilateral negotiations within the United Nations Framework Convention on Climate Change (UNFCCC). Since the EU will have to permanently improve its certification and incentive schemes, it should be interested in creating a platform where practical experience gathered from differently designed removal initiatives, for example from the US and the UK, can be shared. The CDR Mission, under the umbrella of the international research and development network Mission Innovation, could be one suitable venue for this. An indispensable step in the medium term is the expansion of the UNFCCC reporting

guidelines on annual GHG inventories to include a scientifically robust accounting of CDR, so that a broad portfolio of removal methods used in different countries can be taken into account. Such a process could also help to disperse the current limitation of the removal debate in the UNFCCC to the international market mechanisms in Article 6 of the Paris Agreement.

Both at the European and multilateral levels, agreement on a system for certifying and accounting for CDR is an indispensable step in establishing a credible CO₂ removal policy. In addition to defining criteria for the permanence of removals, the distinction between CCU, CCS, and CDR could also be clarified in political and regulatory terms.

As the member state with the highest level of GHG emissions, a comparatively energy- and CO₂-intensive industrial sector, and strong climate policy ambitions, Germany has a key role to play in tackling these challenges. In particular, the long-term strategy for residual emissions announced in the coalition agreement could be used to identify additional options for accelerating innovation and at the same time initiate an open and structured exchange with industry and organised civil society. The Fit-for-55 legislation and the upcoming debate on the EU 2040 target offer the German government an opportunity to implement its shifting position on *carbon management* not only domestically, but also to articulate it at the EU level and actively advance a European CO₂ removal policy.

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