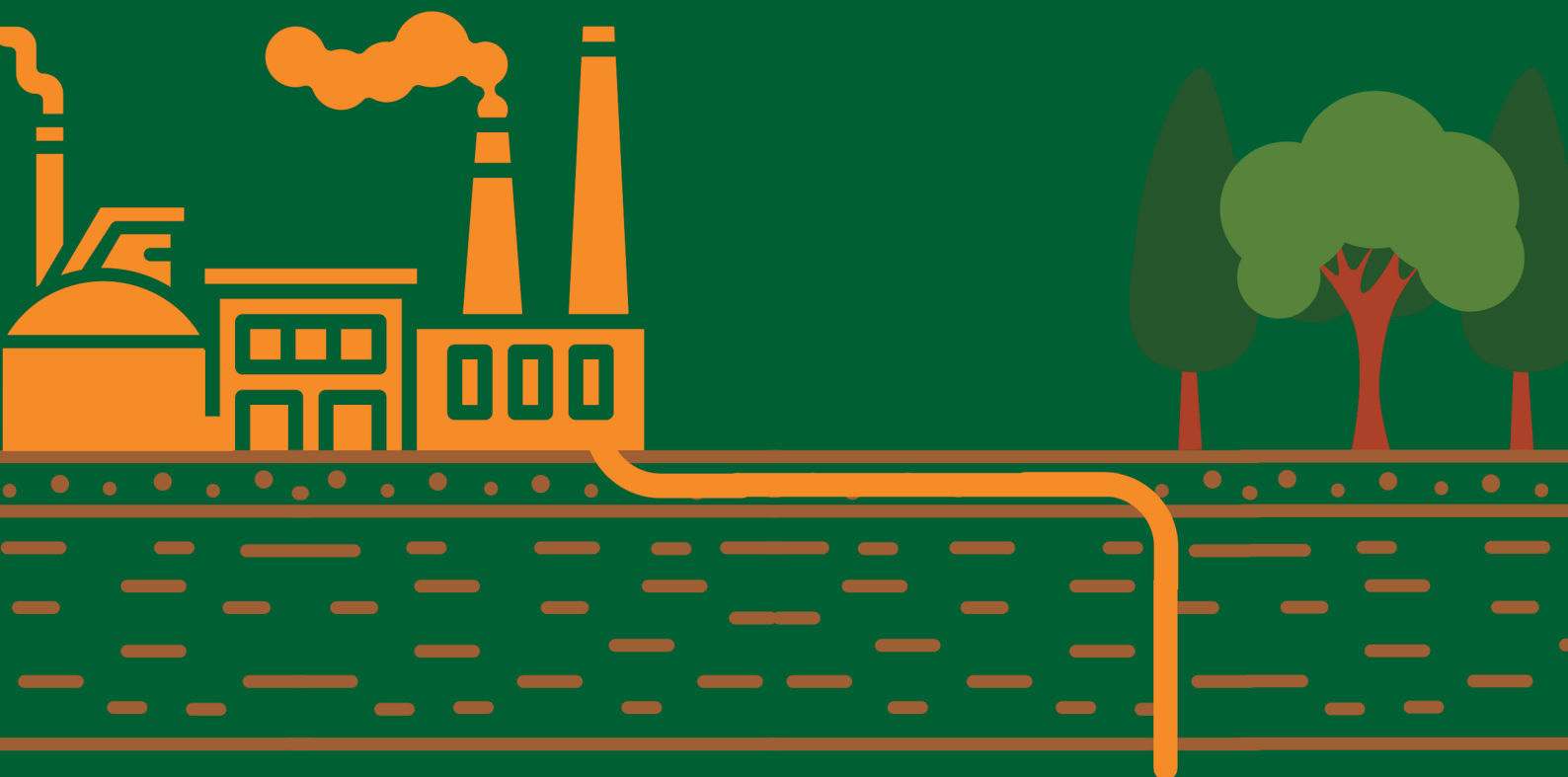


CARBON DIOXIDE REMOVAL IN DANISH CLIMATE POLICY

Summary

In this paper CONCITO provides four recommendations on how to include carbon dioxide removal in Danish climate policy

- Introduce a fixed negative CO₂ tax, which is awarded as a subsidy per ton of CO₂ permanently removed from the atmosphere
- Phase in a tax on the net emissions from burning biomass, which encourages a reduction in the consumption of biomass for combined heat and power, and at the same time ensures that subsidies for CDR are awarded where it has the greatest climate effect
- Introduce a support ceiling for CDR at the level of the sustainable amount of carbon available for negative emissions
- Define CDR and how these must be included in Danish climate targets in the short and long term.





Summary and recommendations

Technologies that remove CO₂ from the atmosphere, so-called negative emissions, or carbon dioxide removal (CDR), will play an important role in combating climate change and complying with the Paris Agreement.

CDR can be divided into two different methods, namely nature-based and technological removals. The nature-based removals capture CO₂ from the air and store it in plants and soils, e.g. planting of new forests and growth in existing forests. The technological removals include capturing and storing CO₂ from bio-energy or capturing and storing CO₂ directly from the atmosphere or oceans.

There is a big difference between the various approaches, their technological maturity, permanence, scalability, costs, and sustainability, which must be taken into account in the regulation of CDR.

The regulation of CDR and inclusion in countries' climate policy, including in Denmark, is still at an early stage. However, it is important to introduce appropriate regulation now to ensure a reasonable deployment of CDR in Danish climate policy. There are good conditions to implement large scale CDR in Denmark in this decade.

The Danish Parliament has already made agreements that imply that CDR will play an important role in meeting the 70 percent target for 2030, and both the Danish Energy Agency's and CONCITO's analyzes indicate that CDR will play an even greater role in the longer term to achieve climate neutrality and net-negative emissions.

In the following, CONCITO's main points are summarized. The recommendations aim to ensure a faster and more balanced implementation of CDR towards 2030, e.g. taking into account constraints on biomass-availability and permanence issues.

CONCITO recommends that Denmark introduce a fixed negative CO₂ tax, which is awarded as a subsidy per ton of CO₂ that is permanently removed from the atmosphere.

In order to ensure a quick realization of the potential for CDR, better incentives are needed. Denmark has good conditions for capturing and storing CO₂ from a number of biogenic sources at a relatively low cost.

CONCITO, therefore, proposes to introduce a fixed negative CO₂ tax, which is awarded as a subsidy per ton of CO₂ permanently removed from the atmosphere.

The negative tax can follow the Danish CO₂ tax, which is expected to reach DKK 750/ton in 2030 (approx. 100 EUR/ton), which should be sufficient to fulfill a large part of the potential in 2030.

The advantage of a fixed negative tax is that it requires less administration, provides flexible timetables, and ensures better opportunities for cooperation among the actors, rather than competition for the existing funding schemes. There are three funding schemes for CCS and negative emissions in place, which plan to be implemented through a number of public tenders. The first tender will be decided in February 2023 and has a target of 0,4 Mt (CCS or CDR) in 2026.

In 2030, CONCITO estimates that CDR with high permanence can contribute to Denmark's climate goals by approx. 4 million tons, from CCS on waste incineration, biogas plants and industry. CONCITO estimates that most of this potential can be realized by introducing a fixed subsidy for negative emissions of up to DKK 750/ton (approx. 100 EUR/ton). 4 Mt in 2030 corresponds to approximately 20% of the required reductions between 2021-2030 to achieve the Danish climate target of 70 % reductions in 2030.

In the political climate deal for the agricultural sector from 2021, biochar is expected to contribute with 2 million tons of CDR in 2030. There is still no plan for scaling up this technology, which is central to realizing the ambitions in the agricultural agreement. In addition, there is a lack of clarity around how biochar can be stored in agricultural land and documentation for the permanence of this storage. It is possible that a fixed subsidy can also help realize part of the potential for biochar.

CONCITO recommends phasing in a tax on net-emissions from burning biomass that encourages a reduction in the consumption of biomass for combined heat and power, and at the same time ensures that subsidies for CDR are awarded where it has the greatest climate effect

In practice, burning biomass is not CO₂ neutral, as the biomass would alternatively not have been converted into CO₂ immediately. Denmark has a large consumption of biomass at cogeneration plants, which i.a. entails the import of wood-based biomass with a questionable climate effect. There is, therefore, a need for a plan that ensures a significant reduction in the burning of biomass, as well as a biomass tax on net emissions from biomass, so that the price reflects the real CO₂ emissions of the different types of biomass, [which CONCITO has previously recommended](#). Such a tax, together with increased development of wind power, geothermal energy and heat pumps, will reduce the operating time of Danish biomass plants and further complicate the economics of CCS on biomass CHP plants.

In the current and first tender for CCS in Denmark (which can both be awarded to CCS on fossil and biogenic sources), the real CO₂ emission from biomass is not taken into account. Here, all types of biomass are treated equally, regardless of whether they are imported wood pellets, straw or biogenic waste, even if they have different climate impacts. This also entails a risk of leakage if Danish climate targets are met through the use of imported biomass, contrary to the Danish Climate Act.

CONCITO estimates that a subsidy for negative emissions of up to DKK 750/tonne does not make CCS on biomass cogeneration profitable. If an investment is made in CO₂-capture plants for biomass heat and power plants, it will, however, entail a risk of lock-in as the capital cost has been incurred and the operating economy is improved, regardless of whether the investment can be earned. Therefore, a fixed subsidy for CDR should be complemented by a incentives that decreases the high Danish dependence on biomass for combined heat and power plants.

CONCITO recommends that the fixed subsidy is introduced together with a funding ceiling on level with the sustainable amount of carbon available for CDR.

The potential for CDR from biogas, waste incineration and biochar is limited by the access to biogenic carbon. Biogenic carbon is a limited resource that, among other things, requires land. The more biogenic carbon Denmark will use to meet its climate targets, the less will be available to other countries.

There are thus limitations on how much biochar and CCS on biogenic sources should contribute to the Danish climate goals if the Danish climate effort is to be a model for the rest of the world.

CONCITO, therefore, recommends that Denmark introduces a support ceiling for biogenic negative emissions at the level of the sustainable amount of biogenic carbon that must be prioritized for negative emissions. The exact level needs to be analyzed more closely, but CONCITO estimates that there is a total potential of approx. 6 Mt CO₂ of biogenic CDR from CCS on biogas, waste incineration, industry and biochar in 2030. This can be achieved at the same time as the consumption of biomass for energy is reduced. This requires a significant reduction of wood-based biomass for cogeneration and individual heating.

If this potential can be realized with a support level of DKK 750/ton, it requires DKK 4.5 billion DKK/year in 2030 (EUR 0.6 Bn). This should therefore be seen as an upper limit for funding. The funding for CDR pool must be disbursed on a first-come, first-served basis to ensure an incentive to get started quickly. The decisive requirement will be that actors ensure CDR by 2030 at the latest.

Support for CCS on biogas must also be conditioned on plants not using maize, using a maximum of 4% energy crops and methane leakage not exceeding 1%.

CONCITO recommends that Denmark's climate policy defines negative emissions and how these must be included in meeting targets in the short and long term. Here, Denmark should distinguish between nature-based and technological removals, as there is a big difference between the permanence of the negative emissions that they deliver.

Nature-based CDR, such as CO₂ sequestration in soils and forests, can play an important role in mitigating climate change. However, the scaling of these solutions is limited by i.a. access to land that does not displace food production or impair biodiversity.

At the same time, there is great uncertainty about the permanence of uptake in forests and fields, i.a. due to the risk of changes in land use, drought and forest fires that risk sending CO₂ back into the atmosphere.

For the above reasons, it is important that nature-based solutions are regulated independently and in relation to other considerations including biodiversity, food production and other land use. Nature based removal should thus be encouraged by other means than the fixed subsidy suggested here.

Technologically removals, with a high degree of permanence, can play an important role in meeting Danish and global climate goals. In Denmark these solutions, CCS on biogenic point sources, including waste incineration and biogas plants, as well as new and less mature technologies, such as direct capture and storage of CO₂ from the atmosphere or storage of biochar from pyrolysis. The potential for technological removal from biogenic sources is limited by access to sustainable biomass.