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A METHOD TO CALCULATE THE POSITIVE EFFECTS OF CCS AND CCU ON CLIMATE CHANGE - ZEP REPORT

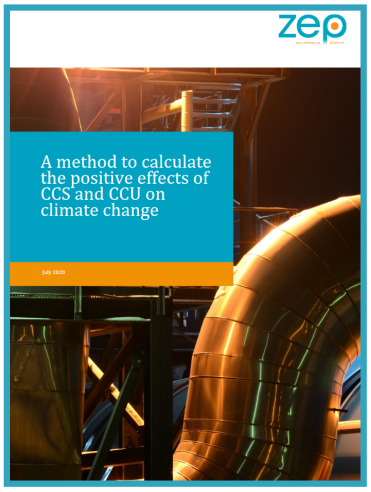
Carbon Capture and geological Storage (CCS) will play a major role in the decarbonisation of European society, especially for energy-intensive industries. The (re)use of captured CO2 emissions (CCU) will become more important in the debate on solutions to achieve a climate-neutral Europe as further scientific evidence describing their climate mitigation potential becomes available.

This report introduces three fundamental characteristics for the classification of CCU and CCS technologies for climate change abatement. Each characteristic has its own Key Performance Indicator (KPI).

Mitigation effect: CO2 to the Atmosphere (C2A) – This factor measures the CO2 emitted into the atmosphere and describes the net effect on the atmosphere per tonne of CO2, intended to be captured and subsequently used or stored permanently.

Net energy consumption: Net Energy Factor (NEF) – The net energy factor reflects how much extra energy needs to be added to the CCU and CCS technologies compared to the energy needed for the production process alone. The energy use and the linked emissions will be key.

Implementation period – Technologies that are available now can already contribute to the climate neutrality ambitions. New technologies and improvements in existing technologies will come and reduce costs and improve the energy efficiency of CCUS in the future. Four periods have been identified to characterise the timeframe to 2050.



The abatement potential of any CCS or CCU technology is dependent on:

- The source of the CO2: geological/fossil, biogenetic, atmospheric.
- The phase to which the CO2 is being converted: geological storage, short-term living product, long-term living product, fuel, atmosphere, etc.
- The energy source used for the conversion.

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EU Taxonomy for Sustainable Finance – What is considered "green" will develop over time

The two technical KPIs (C2A and NEF) in combination, plus the time period in which the technology is to be ready for commercial implementation, indicates a development of technologies in time.

- In the first period, a few technologies will be commercially available.
- In later periods, many new technologies with better performance and the same lower Net Energy Factor will appear and the lead in carbon capture application.
- In the last period, new technologies with even higher performances and NEF will appear. Combined with a continuous reduction of the emission factor, also for the electricity need, developments will be seen.

Key message: From a sustainability perspective, an upward trend over time of the combination of C2A and NEF will be seen and should be recognised in the European Taxonomy for Sustainable Finance.

Conclusions

A simple, fast assessment of the positive effects of CCU and CCS technologies on climate change has been developed on the bases of three key performance indicators.

1. **CO2 to Atmosphere Factor** indicates for technologies the positive contribution to climate change mitigation in units of CO2 emissions prevented, reduced, or (permanently) sequestered.
2. The **Net Energy Factor** indicates the additional energy needed for the use of each technology.
3. The **Time Period** indicates the timeframe when commercial use is feasible.

The combination of the three factors puts each technology and its implementation in the perspective of others. Each technology has its own merits, advantages, and disadvantages.

The three KPIs combined do not indicate which technology is or is not to be used but creates an overview of all possibilities within a certain timeframe. For example, a high Net Energy Factor might be an advantage when renewable energy supplies are available at irregular times, or a higher CO2 to Atmosphere factor is currently acceptable as other and better technologies are not available.

Download *A method to calculate the positive effects of CCS and CCU on climate change*

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