

CARBON CAPTURE, TRANSPORTATION AND STORAGE: MODELING POTENTIAL INFRASTRUCTURE REQUIREMENTS IN EUROPE

Lukas Barner^{1,2}, Kornél Télessy², Franziska Holz^{1,3}

¹DIW Berlin, Berlin, Germany. ²Technische Universität Berlin, Berlin, Germany. ³NTNU, Trondheim, Norway

Extended Abstract

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Abstract Summary

While research on the technical aspects of carbon capture and storage is extensive, modeling efforts to determine future infrastructure needs or the optimal layout of such transportation infrastructure are rather scarce.

The model presented in this paper illustrates the optimal development of carbon capture, transportation and storage infrastructure in Europe until 2050, driven by the development of carbon prices within the EU-ETS and voluntary carbon markets. The model explicitly considers economies of scale with respect to capacity expansion of crucial elements in the supply chain.

Having established an adequate model formulation, we analyze the effects of allowing different sectors to participate in carbon capture activities, as well as permitting different types of storage locations. We further analyze different carbon price variations, reflecting the availability of alternative decarbonization options and willingness to pay for carbon removal by easier-to-decarbonize sectors.

Preliminary results indicate that network sizing is strongly sensitive to the assumed carbon price (and thus implicitly to the assumed cost of easier-to-decarbonize sectors). In addition, we find that optimal network topologies would look substantially different in case onshore storage becomes an option. Finally, we show that including more sectors (at carbon prices higher than their suspected abatement cost) reduces the average cost of hard-to-abate sectors. We attribute this effect to sharing infrastructure, which in turn is subject to economies of scale. Hence, if more sectors use carbon capture, transport and storage, infrastructure related costs reduce on a per-unit base.

We conclude that hard-to-abate sectors may have an incentive to induce participation of easier-to-decarbonize sectors (e.g., via lobbying), as it would substantially reduce their

share of network-related costs. Actors from easier-to-abate sectors, as well as policymakers should be aware of this effect and make sure to prioritize cheaper decarbonization routes.

Presenting Author Biography

Lukas Barner is a PhD student at DIW Berlin and TU Berlin