Non fossil emission cluster are crucial for CCS within the pulp and paper industry

With increasing CO_2 prices, CCS could become a cost effective option for reducing CO_2 emissions in pulp and paper mills. If all mills with annual emissions above 0.1 Mt CO_2 would implement CCS, the total capture potential would be 80 Mt/yr. The capture potential would still be 50 Mt/yr if only including larger mills in capture clusters based on fossil as well as biogenic emissions. However, if restricting the focus to fossil emission capture clusters, the potential for capture is low, only about 8 Mt/yr.

Bottom-up approach and an aggregated European potential

Johanna Jönsson studies different possible technology pathways for the European pulp and paper industry (PPI). Based on detailed analyses on a mill level the overall potential on a European industry level can be estimated, thus a bottom-up approach is applied. This approach has, for example, been used to estimate the CO_2 mitigation potential through the introduction of carbon capture and storage (CCS) within the European PPI. The European PPI is currently experiencing a structural change and, therefore, only mills estimated to have a long-term viability are included.

Infrastructure and size are decisive

The implementation of CCS is dependent on transport infrastructure and this aspect is accounted for by linking the geographical coordinates of the mills with the coordinates for other industrial capture clusters and potential storage sites; see Figure 1. The latter are an outcome of other research within the Pathways project. Further, it is reasonable to assume that the potential for profitable introduction of CCS is larger for mills with larger emissions than sites with smaller emissions. Based on these assumptions, a matrix was constructed containing six future cases for implementation of CCS in the European PPI; see Table 1.

Table 1. The six different future cases considered for implementation of CCS.

Mills with emissions	Capture done by all included mills	by mills in capture clusters	by mills in fossil capture clusters
>0.1 Mt CO_2/yr	A1	A2	A3
>0.5 Mt CO_2/yr	B1	B2	B3

CO_2 capture potential between 8 to 80 Mt

Figure 2 illustrates the CO_2 capture potential in the different cases and it can be noted that approximately 75% of all emissions derive from about one third of the mills (the ones with emissions >0.5 Mt/yr). These mills are mainly the kraft mills included in the study. Another result is that if CCS is only implemented for large point sources within the European PPI, the captured CO_2 will originate almost solely from biomass, see Figure 2. As can be seen in Figures 1 and 2, a large-scale introduction of CCS to reach significant CO_2 emission reductions in the European PPI requires an inclusion of the emission intensive Scandinavian kraft PPI in such a capture scheme. If only the mills located in fossil-fuel based capture clusters are included (as in cases A3 and B3), the capture potential is drastically reduced to about a fifth of the potential compared to when mills in both fossil- and biomass-based capture clusters (A2 and B2) are included.

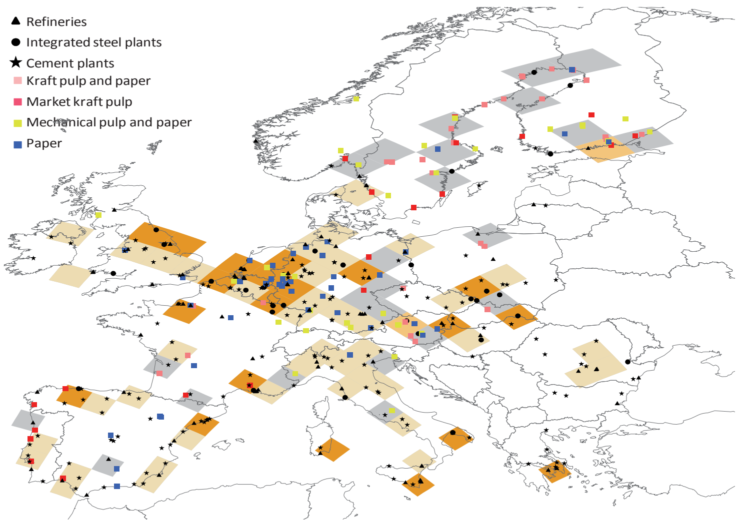

Figure 1. The geographical distribution of pulp and paper mills emitting more than 0.1 Mt CO_2/yr in relation to other large industrial point sources >0.5 Mt CO_2/yr. Possible capture cluster areas are represented by coloured squares (150x150 km); the orange squares represent clusters with more than 2 industries which together emit more than 5 Mt CO_2/yr and the yellow and grey clusters emit more than 1 Mt CO_2/yr.

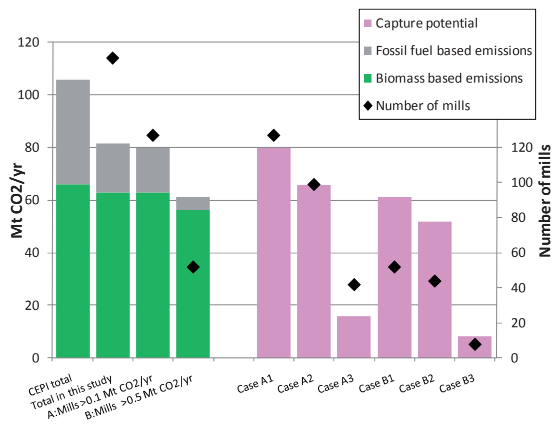

Figure 2. The distribution of included emissions divided by size and origin along with the potential for captured CO_2 emissions for the six studied capture cases presented in Table 1.

For further information:
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