Exploring the potential of carbon capture and storage-enhanced oil recovery as a mitigation strategy in the Colombian oil industry

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Study Summary
The use of CO$_2$ for enhanced oil recovery (CO$_2$-EOR) is a promising alternative for reducing the cost of carbon capture and storage (CCS). In this study, the technoeconomic potential of integrated CCS-EOR projects for reducing greenhouse gas emissions in the Colombian oil industry is estimated. For this purpose, a source–sink matching process is carried out, including CO$_2$ capture potentials in sources from the petroleum, cement, power generation, and bioethanol industries, as well as from CO$_2$ storage in oil fields suitable for EOR. The results indicate that a total of 142 million tons of carbon dioxide (tCO$_2$) could be stored and would deliver 465 million barrels through five CCS-EOR projects in four clusters identified around the country. The levelized cost for capture ranged between 12 and 209 Euros (€) per tCO$_2$, the cost of CO$_2$ during EOR operations ranged between 24 and 59 €/tCO$_2$, and finally, the cost of CO$_2$ transport ranged from 1 to 23 €/tCO$_2$. The CO$_2$ mitigation potential of CCS-EOR represents 25 percent of forecasted oil industry emissions in Colombia for the period 2025–2040. Compared with the intended nationally determined contribution target set by the Colombian government, CCS-EOR projects could contribute 7 percent of the total accumulated emissions reductions by 2040.

Why is this research important and why do the results matter?
- The country of Colombia accounts for 0.4 percent of global emissions but is committed to reduce their contribution by 20 percent by 2030.
- Besides the transport sector, the power generation, oil, and cement industries in Colombia emit the most CO$_2$ and can be considered as potential sources of CO$_2$ for EOR projects in Colombia.
- CO$_2$-EOR is an attractive option to reduce emissions, as it allows for the use and storage of captured CO$_2$ while maintaining oil production. Under the proposed scenarios, the study found that CCS-EOR projects could mitigate 24 percent of the CO$_2$ emissions for the oil sector in 2030, mitigating between 6 percent and 7 percent of the total accumulated emissions by 2040.

Link(s)
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