IMPERIAL

Global CO_2 storage capacity: Modelling limitations of geography and injectivity

Supervisors: Dr Sam Krevor (s.krevor@imperial.ac.uk)

Department: Department of Earth Science and Engineering

Funding and Deadline: Deadline for applications is January 3, 2025. Funding through the Doctoral Training Centre in Green Industrial Futures, Departmental Scholarships or the President's scholarship depending on eligibility

The importance of carbon capture and storage in the mitigation of climate changes arises from the potential capacity for the injection of large volumes of CO_2 into suitable subsurface geologic formations (Krevor et al., 2023). The assessment reports of the Intergovernmental Panel on Climate Change estimate that in the average of scenarios where CO_2 concentration is stabilised at 450 ppm by 2100, storage demand approaches 15 Gt CO_2 per year by 2050 (Figure 1, Zhang. et al., 2024). However, these modeled estimates disregard potential limitations to achieving these rates and volumes of storage from either the geographic availability of subsurface storage reservoirs, or the pressure limitations to allowable rates of injection (Smith et al., 2024).

The PhD project will extend a suite of models developed in our research group to continue to evaluate the potential for geographic and reservoir injectivity constraints to lead to bottlenecks in the development of large scale CO_2 storage globally. Ultimately, we will construct models for plausible development trajectories that may be incorporated into energy systems models of the type used by the IPCC to outline techno-economic pathways for mitigating climate change.

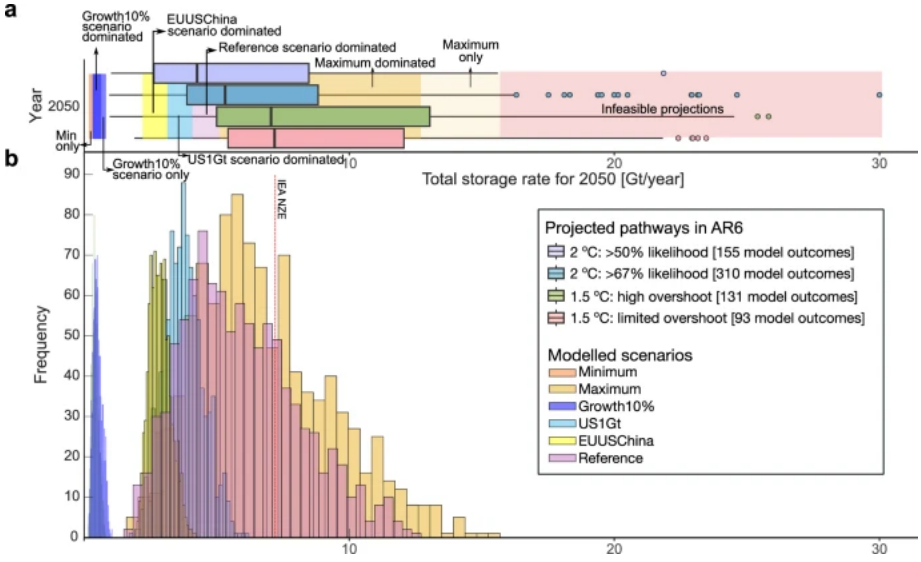

Figure 1. Plausible 2050 storage rates where CO_2 storage meets climate change mitigation targets outlined by the IPCC. From: Zhang, Y., Jackson, C., & Krevor, S. (2024). The feasibility of reaching gigatonne scale CO_2 storage by mid-century. *Nature Communications*, *15*(1), 6913

IMPERIAL

References:

Krevor, S., De Coninck, H., Gasda, S. E., Ghaleigh, N. S., de Gooyert, V., Hajibeygi, H., ... & Swennenhuis, F. (2023). Subsurface carbon dioxide and hydrogen storage for a sustainable energy future. *Nature Reviews Earth & Environment*, *4*(2), 102-118

Smith, A., Hampson, G., & Krevor, S. (2024). Global analysis of geological CO_2 storage by pressure-limited injection sites. *International Journal of Greenhouse Gas Control*, *137*, 104220

Zhang, Y., Jackson, C., & Krevor, S. (2024). The feasibility of reaching gigatonne scale CO_2 storage by mid-century. *Nature Communications*, *15*(1), 6913