

“A New Carbon Capture and Storage Initiative in Saudi Arabia: Development of an Innovative GIS-based System for Managing Source-Sink Matching Scenarios”

Authors: Murad Barghouty¹, Saud Al-Fattah¹, Pierre Le Thiez², Damien Rambourg³, Alexandre Brugeron³, Hervé Quinquis⁴

¹ King Abdullah Petroleum Studies and Research Center, Saudi Arabia

² GEOGREEN, France

³ BRGM, France

⁴ IFP Energies nouvelles, France

Abstract:

This paper describes a Geographical Information System (GIS)-based Decision Support System (DSS) for the potential application of Carbon Capture and Storage (CCS) in Saudi Arabia. The purpose of this tool is to help identify, select, and evaluate source-sink matching scenarios for optimized CCS project development. The GIS takes into account all relevant CO₂ emitting industrial sectors (i.e. power, desalination, refining, cement, iron & steel, petrochemicals, and fertilizers), as well as the many constraints that may influence project development (e.g. zones allocated for oil and gas exploration and production, water supply areas, protected zones, urban areas, existing pipeline routes, and roads). The subsurface database is comprised of geological formations and flow-units (potential storage reservoirs and cap rocks) that can be viewed and manipulated in three-dimensions (3D) to simulate such aspects as individual formations' extent, thickness, and their interactions with the upper and underlying flow-units. The research project is part of the King Abdullah Petroleum Studies and Research Center (KAPSARC) program to provide a comprehensive analysis of CCS status worldwide, highlighting the potential for oil exporting countries to play a primary role in CCS technology deployment, and it contributes to the development of a framework for a future CCS program in Saudi Arabia.

For a given scenario, experts can identify suitable zones for CO₂ storage by superimposing all of the GIS information, which is structured in layers. Additionally, the system can determine the theoretical volume of CO₂ that can be stored, based upon calculation methods used by the Carbon Storage Leadership Forum (CSLF) and the US Department of Energy (DOE), and suggest optimal CO₂ transport routes for connecting one or several CO₂ emitters to the given storage site(s), while taking into account the different constraints or opportunities. Lastly, the paper provides an example case-study to highlight the key features of the GIS / DSS system. For demonstration purposes, the GIS has initially used publicly available information, but is ultimately designed to be integrated with actual data provided by relevant entities in Saudi Arabia.

Corresponding author : Pierre Le Thiez (plt@geogreen.fr)