A survey of oil and gas wells in the Texas Gulf Coast, USA, and implications for geological sequestration of CO_2

GCCC Digital Publication Series #09-06

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Keywords:
Regional study-Gulf Coast, Risk-well integrity

Cited as:
Nicot, J. -P., 2009, A survey of oil and gas wells in the Texas Gulf Coast, USA, and implications for geological sequestration of CO2: Environmental Geology, v. 57, p. 1625–1638. GCCC Digital Publication Series #09-06.

Abstract:

Subsurface sequestration of CO_2 in oil and gas provinces where permanence of hydrocarbon accumulations has proven the reliability of potential traps is rightly seen as a solid option for containment of CO_2 atmospheric concentrations. However, one of the most promising provinces for carbon storage in North America, the Texas Gulf Coast, has also been heavily drilled for more than a century, puncturing many otherwise perfectly sound seals (>125,000 wells over ~50,000 km^2). As a result, boreholes and, in particular, older abandoned wells could be major leakage pathways for sequestered CO_2. This article presents statistics on well spatial and depth distribution that have been drawn from public domain sources and relates these data to historical plugging and abandonment regulations in the Texas Gulf Coast. Surface-well density averages of 2.4 wells/km^2 can be locally much higher—but also much lower in larger areas. Average well penetration density drops to 0.27 and 0.05 well/km^2 below a depth of 2,440 and 3,660 m, respectively. Natural mitigating factors such as thief zones and heaving "shales" could also play a role in limiting the impact of these direct conduits to the shallow subsurface and surface.

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