Storing hydrogen vs. storing CO_2: what difference does it make to people? A DCE among the French population

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Achieving global net-zero targets requires expanding climate strategies to the deep subsurface, relying heavily on Carbon Capture and Storage (CCS) and Underground Hydrogen Storage (UHS). While carbon storage mitigates emissions in hard-to-abate industries and hydrogen storage serves as a seasonal battery for grid stability, both require substantial geological infrastructure. Existing literature highlights that the deployment of these technologies is rarely determined by technical or economic viability alone; rather, social acceptability acts as a definitive veto player. Public perception frequently demonstrates a disconnect between abstract support for climate mitigation and fierce local opposition to specific projects, a phenomenon widely documented in spatial literature as the NIMBY effect (Devine-Wright, 2009). However, the social acceptability of these underground technologies is complicated to study for two main reasons. First, the general public largely lacks awareness regarding carbon and hydrogen storage Alessandro et al. (2026), as the deep subsoil remains "invisible" to society. Second, it is methodologically challenging to accurately capture the complex factors that influence societal preferences (Tcvetkov et al., 2019; Buchner et al., 2025). Consequently, only a few empirical studies have directly examined how these diverging socio-technical narratives, and their associated risks, translate into concrete public preferences when individuals face realistic choices: namely, the discrete choice experiments (DCE) from Sharp et al. (2009) for CO_2 storage and Damette et al. (2022) for hydrogen storage, and a few others. These empirical studies examine the preferences for the two technologies in isolation, despite their shared physical constraints, geological risks, and financial hurdles. There is thus a distinct lack of comparative empirical studies analyzing how individuals navigate the trade-offs between these two technologies when they are proposed locally. To address this gap, this study is guided by the following research question: How do citizens form their preferences for unfamiliar energy transition technologies, and to what extent do they distinguish between hydrogen storage and CO_2 storage in terms of social acceptability?

To address this question, the study employs a Discrete Choice Experiment (DCE) administered to a representative sample of 2,006 French citizens in January 2026. This methodology forces respondents to make explicit trade-offs between storage technology types, site locations, safety risks, and financial costs. Additionally, the experimental design incorporates a split-sample information treatment to isolate the causal effect of climate framing, exposing a specific subgroup to messaging that highlights the environmental benefits of subsurface storage.

The empirical results effectively reveal a striking convergence in the social acceptability of both technologies. The French public evaluates both primarily through a shared heuristic of industrial risk, resulting in nearly identical baseline preferences. Furthermore, the findings challenge traditional spatial assumptions by identifying a "NIABY" (Not In Anyone's Backyard) phenomenon, demonstrating that increasing the distance from residential areas fails to mitigate generalized risk perception. However, the study proves that collective compensation and global environmental framing are highly effective policy levers for improving project legitimacy. Ultimately, this chapter makes several distinct methodological and theoretical contributions to the literature. It provides the first unified, comparative DCE evaluating carbon and hydrogen storage simultaneously, pioneering this assessment within the French context. By shifting the analytical focus from isolated, site-specific cases to a national level, the research offers a more generalizable perspective on how citizens navigate complex technical and economic trade-offs. Moreover, it explicitly quantifies social preferences for offshore versus onshore storage and introduces collective compensation as a novel choice attribute, advancing the spatial literature on NIMBYism by proving that tangible local incentives exert a significantly greater impact on social acceptability than global climate messaging.

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