

The Past, The Present, The Future: Unlocking Commercial Potential in CCS Hubs for Decarbonisation

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Abstract

Carbon Capture and Storage (CCS) has emerged as a pivotal solution for mitigating carbon emission and has become the priority of major policy makers, investors, and industry leaders. The development of CCS hubs offers potential cost efficiency with the utilization of shared transportation-sequestration infrastructure, as well as the scalability advantage for CCS employment. At the forefront of this advancement, the concept of CCS hub development exceeds just the technical considerations. Indeed, it involves an integration of environmental assessment, comprehensive subsurface evaluation, incorporation of required investment for cutting-edge technologies for carbon capture, and establishment of enabling regulatory policy and framework.

This study, with a global perspective, delves into the best practices for identification, development and implementation of CCUS. A state-of-the-art three steps workflow was designed to identify suitable sinks and couple them with viable source of emission.

United States, United Kingdom and Canada as the leading countries in both regulatory and CCS/CCUS experience were selected as the benchmarks and APAC countries, specifically Japan and Malaysia, were studied and compared with US and Canada. Many countries in Asia are diversifying their economies by exploring CCUS technologies to reduce their carbon footprint. The Kasawari project, for example, is designed to capture CO₂ from LNG unit utilizing membrane separation technology and injects it into M1 depleted gas. The project will turn into a hub in 2026 by injecting 3.3 Mt CO₂ per year connecting other sources of CO₂ such as Steel plants, refineries, petrochemicals and other industrial sites. Another example is the Tokyo Bay-Malaysia CCS project with a targeted capacity of 3 Mt CO₂ per year that would facilitate the concept of carbon market, regulatory and policies across borders.

For the selected countries, Marginal Abatement Cost Curve (MACC) were generated to provide the minimum required carbon incentives for reaching the net zero targets. Then, the concept of hub development is compared with project-based CCS in terms of completion timeframe, required financing as well as growth projections. Finally, for benchmarking of policy and regulatory, countries such as US, Canada, UK, etc. were reviewed to establish the necessary policies, incentives and regulations to facilitate the development of CCS.

The outcome and recommendations of this study will assist policy makers, investors, and operators in identifying the key considerations for development of CCS hubs to reach their net-zero target.