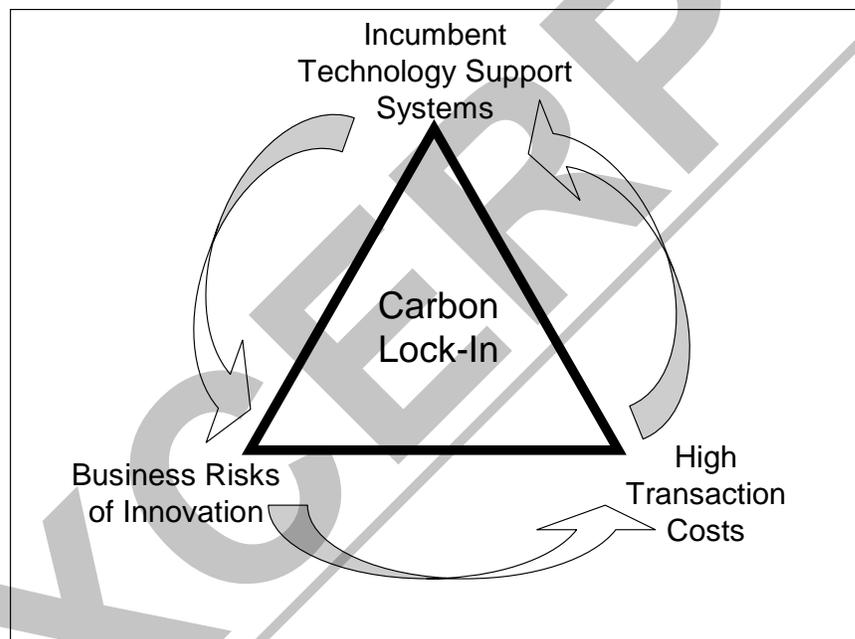


Carbon Lock-In: Barriers To Deploying Climate Change Mitigation Technologies



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Table 2.1. Typology of barriers to the commercialization and deployment of GHG-reducing technologies

Cost-Effectiveness Barriers	
External Benefits and Costs	External benefits of GHG-reducing technologies that the owners of the technologies are unable to appropriate (e.g., GHG emission reductions from substitutes for high GWP gases and carbon sequestration). External costs associated with technologies using fossil fuels (e.g., GHG emissions and health effects from small particles) making it difficult for higher priced, GHG-reducing technologies to compete.
High Costs	High up-front costs associated with the production and purchase of many low-carbon technologies; high operations and maintenance costs typical of first-of-a-kind technologies; high cost of financing and limited access to credit especially by low-income households and small businesses.
Technical Risks	Risks associated with unproven technology when there is insufficient validation of technology performance. Confounded by high capital cost, high labor/operating cost, excessive downtime, lack of standardization, and lack of engineering, procurement and construction capacity, all of which create an environment of uncertainty.
Market Risks	Low demand typical of emerging technologies including lack of long-term product purchase agreements; uncertainties associated with the cost of a new product vis-à-vis its competitors and the possibility that a superior product could emerge; rising prices for product inputs including energy feedstocks; lack of indemnification.
Lack of Specialized Knowledge	Inadequate workforce competence; cost of developing a knowledge base for available workforce; inadequate reference knowledge for decision makers.
Fiscal Barriers	
Unfavorable Fiscal Policy	Distortionary tax subsidies that favor conventional energy sources and high levels of energy consumption; fiscal policies that slow the pace of capital stock turnover; state and local variability in fiscal policies such as tax incentives and property tax policies. Also includes various unfavorable tariffs set by the public sector and utilities (e.g., import tariffs for ethanol and standby charges for distributed generators) as well as unfavorable electricity pricing policies and rate recovery mechanisms.
Fiscal Uncertainty	Short-duration tax policies that lead to uncertain fiscal incentives, such as production tax credits; uncertain future costs for GHG emissions.

Table 2.1. Typology of barriers to the commercialization and deployment of GHG-reducing technologies (Cont'd.)

Regulatory Barriers	
Unfavorable Regulatory Policies	Distortionary regulations that favor conventional energy sources and discourage technological innovation, including certain power plant regulations, rules impacting the use of combined heat and power, parts of the federal fuel economy standards for cars and trucks, and certain codes and standards regulating the buildings industry; burdensome and underdeveloped regulations and permitting processes; poor land use planning that promotes sprawl.
Regulatory Uncertainty	Uncertainty about future regulations of greenhouse gases; uncertainty about the disposal of spent nuclear fuels; uncertain siting regulations for off-shore wind; lack of codes and standards; uncertainty regarding possible future GHG regulations.
Statutory Barriers	
Unfavorable Statutory Policies	Lack of modern and enforceable building codes; state laws that prevent energy saving performance contracting.
Statutory Uncertainty	Uncertainty about future statutes including renewable and energy efficiency portfolio standards; unclear property rights relative to surface injection of CO ₂ , sub-surface ownership of CO ₂ and methane, and wind energy.
Intellectual Property Barriers	
High Intellectual Property Transaction Costs	High transaction costs for patent filing and enforcement, conflicting views of a patent's value, and systemic problems at the USPTO.
Anti-competitive Patent Practices	Techniques such as patent warehousing, suppression, and blocking.
Weak International Patent Protection	Inconsistent or nonexistent patent protection in developing countries and emerging markets.
University, Industry, Government Perceptions	Conflicting goals of universities, national laboratories, and industry concerning CRADAs and technology commercialization.

Table 2.1. Typology of barriers to the commercialization and deployment of GHG-reducing technologies (Cont'd.)

Other Barriers	
Incomplete and Imperfect Information	Lack of information about technology performance – especially trusted information; bundled benefits and decision-making complexities; high cost of gathering and processing information; misinformation and myths; lack of socio-technical learning; and lack of stakeholders and constituents.
Infrastructure Limitations	Inadequate critical infrastructure – including electric transmission capabilities and long-term nuclear fuel storage facilities; shortage of complementary technologies that encourage investment or broaden the market for GHG-reducing technologies; insufficient supply and distribution channels; lack of O&M facilities and other supply chain shortfalls.
Industry Structure	Natural monopoly in utilities disenabling small-scale competition; industry fragmentation slowing technological change, complicating coordination, and limiting investment capital.
Misplaced Incentives	Misplaced incentives when the buyer/owner is not the consumer/user (e.g., landlords and tenants in the rental market and speculative construction in the buildings industry) – also known as the principal-agent problem.
Policy Uncertainty	Uncertainty about future environmental and other policies; lack of leadership

