Executive Summary

This report sheds light on the effectiveness of carbon management policies in terms of their effect on the economy and/or sector-level emissions and economic performance and adds to the growing volume of other empirical studies. Studies based on empirical evidence of the effectiveness of different carbon policies were sparse and hard to find, with most researchers taking a qualitative approach to the evaluation of the various systems in place.

This Canadian Energy Research Institute (CERI) study takes the quantitative approach and analyzes the impact of major carbon management initiatives across the globe. It reviews the design, analyzes the impact, and identifies the lessons learned from key carbon management policies/systems for the four case studies in terms of their impacts on emissions efficiency, emissions reduction, and economic output.

The four case studies include the European Union Emissions Trading System (EU ETS), California (linked with Quebec) Cap-and-Trade System, British Columbia (BC) Carbon Tax System, and Alberta (AB) Specified Gas Emitters Regulation (SGER)[1].

Overall, the emissions trading system (ETS) policy was found to be more effective at reducing greenhouse gas (GHG) emissions than the Carbon Tax policy or a Hybrid policy. Evidence suggests that while gross domestic product (GDP) is also negatively impacted in the EU case, the magnitude of the effect on GDP is smaller than the effect on overall emissions; in other words, the impact of the ETS is larger on emissions than on the economic growth. California-Quebec Cap-and-Trade analysis suggests that the system is effective at reducing emissions and thus increasing emissions efficiency without negatively impacting the economic growth.

BC carbon tax policy boosted economic activity but had no effect on emissions. Since the objective of regulatory policy is to reduce emissions, our results suggest that the carbon tax policy in British Columbia failed to achieve its goal. In fact, oil prices have been found to have a bigger effect on emissions in BC than carbon tax. Alberta SGER policy did not reduce GHG emissions as well. In fact, the SGER policy had a statistically significant positive impact on GHG emissions. Consistent with other literature, we find a positive correlation between GDP and GHG emissions indicating that an increase in economic activity generally increases GHG emissions.

Altogether, our results can be summarised as shown in Table E.1.

[1] Alberta SGER has been repealed and replaced by the Carbon Competitiveness Incentive Regulation (CCIR) in 2017, and then by the Technology Innovation and Emissions Reduction (TIER) Regulation in 2019 (CCIR) – see Chapter 2 for details. The other three carbon pricing systems studied in this report are currently in force.

Table E.1: Summary Results

Jurisdictions	Indicators		
	Emissions efficiency	GDP	GHG Emissions
EU-ETS	(+) 0.80 billion per Kt CO2e (+3.0%)	(-) 25,084 billion USD (-4.1%)	(-)9.9Mt CO2e (-4.9%)
Cap-and-trade	(+)0.16 million USD/kt CO2e (+3.6%)	(+)60.78 billion USD (+4.7%)	(-)9.07 Mt CO2e (-3.4%)
BC Carbon tax	---	(+)11.49 billion CAD (+5.55)	---
Alberta SGER	---	(+)40.97 billion CAD (+14.6%)	(+)37.95 Mt CO2e (16.3%)

Note: "-----" means no impact

It should be noted that some of the topics related to the carbon pricing options were beyond the scope of the current study and would be a subject for further CERI research:

- Social acceptability and political palatability of action in ensuring outcomes is not considered;
- The administrative process and cost of the instruments are not explicitly considered or evaluated;
- Carbon leakage associated with each instrument and options for its mitigation have not been evaluated.

This study emphasizes the necessity to design policies based on lessons learned from experience and empirical evidence from already established policies around the world. The CERI findings align well with conclusions and suggestions from other reviewed literature (Burtraw and Themann 2018; Carbon Pricing Leadership Coalition 2017; Christensen and Olhoff 2019; Harrison 2019; Schmalensee and Stavins 2017; Raymond 2019; World Bank 2019) on the lessons that can strengthen the functioning of carbon markets and can be applicable to Canada. Both are summarized below:

- Both carbon tax and emissions trade systems have a great capacity to reduce GHG emissions; however, a level at which they are utilized is not adequate for significant change towards low-carbon economies;
- Strengthening existing and adding new carbon policies and actions, especially those that can deal with carbon leakage, is needed;
- Current carbon prices in many jurisdictions remain insufficient to achieve the objectives of the Paris Agreement, even with extended carbon pricing policies in place to align with the specific GHG reduction targets[2];
- Stronger complementary policies and actions are needed to achieve the total reductions in GHG emissions in a case of the BC carbon tax;
- Lessons from ETS systems, especially California's cap-and-trade system, has revealed that the economy-wide approach can be more efficient than managing specific sectors differently.

[2] According to (Carbon Pricing Leadership Coalition 2017), a minimal direct price on GHG emissions needs to be in the range of US$40–80/t CO2e by 2020 and US$50–100/t CO2e by 2030 to meet the objectives of the Paris Agreement, under the condition that an ambitious climate policy is in place for the specific jurisdiction.

- Linkage of a cap-and-trade system with those in other jurisdictions (such as California's cap-and-trade system linked with Quebec) could potentially reduce abatement costs, price volatility, and market power.