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Economics and Environmental Policy Research Network (EEPRN), & Smart Prosperity Research Network

2018-2019 Funded Projects Summaries

The projects funded through Environment and Climate Change Canada's Economics and Environmental Policy Research Network (EEPRN) for 2018-2019 have been announced, and are listed below. The projects are driving new research in four areas: Conservation and Species at Risk; Innovation and Competitiveness; Policies for a Low-Carbon Economy; and Data Set Development and Linkages. These projects have also been supported with complimentary funding through the Smart Prosperity Research Network's Greening Growth Partnership, supported by a Social Sciences and Humanities Research Council of Canada Partnership Grant.

OVERVIEW OF FUNDED PROJECTS
[Detailed Project Descriptions are Provided in the Following Section]

Conservation & Species at Risk
1. Feasibility and Design of Crowd-Funded Conservation Impact Investments in Canada (PI: Kai Chan, UBC)
2. Wetland Conservation Economics: What We Know, What We Need to Know, and Evaluating a Novel Market-Based Instrument (PI: Patrick Lloyd-Smith, U. Saskatchewan)
3. Can Habitat Quotas Protect Sensitive Marine Habitats by Changing Fishers' Behaviour? An Analysis of the Ecological and Behavioural Effects of Coral and Sponge Quotas in the British Columbia Trawl Fishery (PI: Kai Chan, UBC)

Innovation & Competitiveness
1. Intellectual Property's Impact on Clean Innovation: A Knowledge Synthesis (PI: Jeremy de Beer, U. Ottawa)
2. Border Carbon Adjustments in Support of Domestic Climate Policies: Explaining the Gap Between Theory and Practice (PI: Kathryn Harrison, UBC)
3. What mobilizes green investment? Evidence from the Renewable Energy Sector and Beyond (Co-PIs: Mariana Mazzucato & Gregor Semieniuk, U. College London)
4. Decomposing the Carbon Clean-Up of Canadian Manufacturing (PI: Nouri Najjar, Western U)
5. Carbon Taxes and Competitiveness: Firm Level Evidence from British Columbia (PI: Hendrik Wolff, SFU)
6. A Sustainability Transition and Innovation Review (STIR) for Canada (Collaborative Project: PI 1: Paul Ekins, U. College London; PI 2: James Meadowcroft, Carleton U.)

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7. Circular Economy: An Interdisciplinary Literature Review (PI: Emmanuel Raufflet, HEC Montréal)

Policies for a Low Carbon Economy
1. Behavioural and Health Impacts of Low-Income Energy and Carbon Rebate Programs (PI: Blake Shaffer, U. Calgary)
2. Evaluating 'Just Transition' Policies for Coal Workers and their Communities in Alberta, Canada (Co-PIs: Hisham Zerriffi & Kathryn Harrison, UBC)
3. The Interaction of Public Green Economy Policies and Non-State Green Economy Initiatives: A Case Study Green Economy in Canada (Co-PIs: Matthew Hoffman & Steven Bernstein, U. Toronto)
4. Can Green Government Spending Facilitate Employment Transitions in a Low-Carbon Economy? (PI: David Popp, Syracuse U.)
5. The Politics of Carbon Pricing in the Canadian Federation (PI: Leigh Raymond, Purdue U.)
6. A Canadian Climate Politics Panel Survey (PI: Erick Lachapelle, U. de Montréal)
7. Carbon Pricing Costs for Households and Revenue Recycling Options in Canada (Collaborative Project: PI 1: Jennifer Winter, U. Calgary; PI 2: Brett Dolter, U. Regina)

Data Set Development & Linkages
1. Building a Dataset of Wind Energy Projects in Canada and the United States to Examine Factors that Predict Social Acceptance of Wind Energy (PI: Leah Stokes, UCSB)
2. Hydraulic Fracturing Chemicals Open Data (PI: Joel Gehman, U. Alberta)

DETAILED PROJECT DESCRIPTIONS

Conservation and Species at Risk

Feasibility and Design of Crowd-Funded Conservation Impact Investments in Canada, 2-year project
Principal Investigator: Kai Chan (University of British Columbia)
Researcher: Paige Olmsted (Postdoctoral Researcher, University of British Columbia)

Financing conservation and ecosystem service restoration is particularly challenging due to sizable upfront costs for benefits that accrue over time, diffusely or indirectly, and often in the form of avoided future costs. Proposals to privately fund any type of social good (including the environment) bring about similar concerns. This project seeks to explore the opportunities for, and impediments facing, novel vehicles for crowd-funded conservation impact investing Canada. By focusing on impact investing, the intent is to generate funding to support

conservation efforts, while also building an ethic of engagement and stewardship in financial supporters.

Wetland Conservation Economics: What We Know, What We Need To Know, and Evaluating a Novel Market-Based Instrument, 3-year project
Principal Investigator: Patrick Lloyd-Smith (University of Saskatchewan);
Co-Investigators: Kenneth Belcher (University of Saskatchewan), Peter Boxall (University of Alberta)

This project will advance our understanding of how economics can contribute to wetland conservation on the North American prairies. Wetlands provide substantial ecological and economic benefits through the provision of ecosystem functions and services. While society reaps the majority of benefits from wetland conservation, private landowners are often left to bear the costs of supplying wetland services. With this mismatch in benefits and costs, it is perhaps not surprising that wetlands have continued to be drained and degraded in the North American prairies. To better align producer and social goals, several payment schemes have been piloted on the prairie landscape targeting the supply of wetlands. One market-based instrument that has not been studied is a certification program where agricultural commodities are identified as having been produced by farmers who practice sustainable wetland management. This certification enables consumers who value the ecosystem services provided by wetland conservation to express these preferences in the market. We will evaluate the consumer demand for these certified products and their role in incentivizing the provision of wetland ecosystem services in agricultural landscapes.

Can Habitat Quotas Protect Sensitive Marine Habitats by Changing Fishers' Behaviour? An Analysis of the Ecological and Behavioural Effects of Coral and Sponge Quotas in the British Columbia Trawl Fishery, 2-year project
Principal Investigator: Kai Chan (University of British Columbia)
Researcher: John Driscoll (PhD Candidate, University of British Columbia)

Habitat damage and destruction presents one of the most fundamental challenges to truly sustainable fisheries. This concern is greatest for fisheries in which mobile gears, such as bottom trawls, regularly contact the seafloor. The typical management approach to this issue is to close specific areas of the seafloor to the fishing gear(s) in question. While this approach can be effective, it can also be costly and time- and effort-intensive to carry out the process of identifying at-risk areas and negotiating closures. Furthermore, this approach by itself does not help to protect sensitive habitats outside of the closed areas.

In 2012, a novel approach to habitat conservation emerged, as the British Columbia ground fish bottom trawl fishery and a group of conservation organizations worked together to develop and implement a suite of mandatory management measures to reduce and manage this fishery's habitat impacts. As a part of these measures, the fleet added strict vessel-specific maximum allowable coral and sponge catch limits to their existing quota and at-sea monitoring system. Thus, since 2012, each participant in this

fishery has operated with a strong economic disincentive to catch corals or sponges. This research project will investigate whether these vessel limits have resulted in *de facto* closed areas emerging in otherwise fishable areas, through individual and/or collective action among the fleet's participants

Innovation and Competitiveness

Intellectual Property's Impact on Clean Innovation: A Knowledge Synthesis, 2-year project
Principal Investigator: Jeremy de Beer (University of Ottawa)
Researchers: Eashan Karnik (Juris Doctor Candidate, University of Ottawa) and Nickolas Robelek (Juris Doctor Candidate, University of Ottawa)

The need to adopt clean energy technologies is a pressing issue not just in Canada. This research tackles one crucial aspect of this global challenge, namely exploring how a better understanding of intellectual property rights impacts clean innovation. Current literature shows that intellectual property operates for clean innovation on three levels: (a) as an *indicator* of clean innovation, (b) as an *incentive* for clean innovation, and (c) as an *impediment* to clean innovation. This research will examine in more detail how intellectual property can be used as a tool for policy makers to drive clean innovation, aiming to answer questions of how intellectual property law and policy frameworks impact clean innovation. It will look at how intellectual property management and licensing strategies impact clean innovation.

Border Carbon Adjustments in Support of Domestic Climate Policies: Explaining the Gap Between Theory and Practice, 1-year project
Principal Investigator: Kathryn Harrison (The University of British Columbia)
Researcher**:** Stefan Pauer (PhD Candidate, The University of British Columbia)

A growing number of scholars, business leaders, and environmentalists have recommended border carbon adjustments (BCAs, also known as carbon tariffs) to support domestic climate policies, in particular market-based instruments for carbon pricing. BCAs offer the promise of environmental, economic, and political benefits; yet despite growing political support for them and their potentially substantial benefits, they remain conspicuously absent in practice. The objective of this research is to understand the conditions under which policy-makers adopt or do not adopt BCAs, examining this observed discrepancy between theory and practice**.**

What mobilizes green investment? Evidence from the Renewable Energy Sector and Beyond, 2-year project
Principal Investigators: Mariana Mazzucato (University College London), Gregor Semieniuk (University College London)
Researcher: Martha McPherson (University College London)

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Mobilizing investment into low-carbon and energy efficient technologies is one of the great challenges of mitigating climate change. The efforts to achieve the goals of the Paris Agreement will need to be massive, with several factors making this challenge particularly difficult. Individual investment project often come with their own set of hard implications - often large, long, and with immature technology, financing green investment is comparable to financing innovation, an endeavor often too risky for private investors. It is for this reason that effective government policies are therefore crucial, and while there are calls for more government policy including by investors themselves, e.g. at this year's Canada-hosted G7 summit (UNEP Finance Initiative 2018), just what works well to "accelerate" investment is still unclear. There exists a need to address the impact of direct government investment and co-investment, as well as specialized agencies such as green banks, and how this plays a key role in mobilizing private finance. This project attempts to answer the question of whether or not public investment is effective at mobilizing private investment, and how this interacts with other low-carbon policies whilst looking at such results in a Canadian context.

Decomposing the Carbon Clean-Up of Canadian Manufacturing, 3-year project
Principal Investigator: Nouri Najjar (Western University);
Co-Investigator: Jevan Cherniwchan (University of Alberta)
Researcher: Meghdad Rahimian (PhD Candidate, Western University)

The greenhouse gas (GHG) intensity of Canada's manufacturing sector has fallen by over 20% since the early 2000s. While this recent trend is promising, as it suggests the Canadian economy is becoming cleaner, little is known about the causes of this clean-up. This research systematically explores the sources underlying this clean-up, by asking if it has been driven by changes in the relative size of clean and dirty industries, changes in facility entry and exit, changes in the relative output of clean and dirty firms within industries, or changes in the emission intensity of individual firms. Determining these sources is important, as they have implications for how the Canadian economy might be affected by future climate policy, such as the Pan-Canadian Framework on Clean Growth and Climate Change.

Carbon Taxes and Competitiveness: Firm Level Evidence from British Columbia, 2-year project
Principal Investigator: Hendrik Wolff (Simon Fraser University)
Researchers: Akio Yamazaki (PhD Candidate, University of Calgary)

Developing effective and equitable policies for combating climate change is one of the urgent tasks of this century. Whilst there is a broad consensus in the economics literature that carbon taxes are efficient, the distributional impacts of such policies have remained hotly debated. Claims range from one extreme that these taxes "kill jobs" and "harm competitiveness" to the opposite, that they generate economic growth and "spur innovation."

The goal of this paper is to deepen our understanding of the costs and benefits of carbon taxes. Using the most comprehensive confidential dataset available, this paper examines the effect of the British Columbia carbon tax on the firm performance by focusing on their profits, production, employment, capital, wages, and productivity. This will help policymakers make more informed decisions on the future of carbon policy, particularly with regard to what policies could be bundled with carbon taxes in order to minimize the distributional impacts. Ultimately, the insights of this study will help Canadian policymakers to better implement the first pillar of the Pan-Canadian Framework on Clean Growth and Climate Change.

A Sustainability Transition and Innovation Review (STIR) for Canada: Comparative Appraisal of Canada's STI Policy Mix for Sustainability Transitions, 2-year project
Collaborative Project – Jointly Awarded:
Award 1: Principal Investigator: Paul Ekins (University College London)
Award 2: Principal Investigator: James Meadowcroft (Carleton University)

The challenge of sustainability transitions, including the transition to a low carbon economy, is pertinent for Science, Technology and Innovation (STI) policy and governance. But how can policy mixes for sustainability transitions be appraised and compared between countries? The unprecedented complexity, indeterminacy, scale and urgency of sustainability transitions calls for a systemic and critical reflection on the adequacy of policy mixes and governance for STI. This research project will implement an innovative approach and methodology to guide a critical evaluative reflection on how prepared STI policy mix and governance frameworks in Canada are to respond to the challenges of sustainability transitions, and how Canada compares to selected economies around the world. The proposed research will be based on an existing Sustainability Transition and Innovation Review (STIR) framework, designed and tested by a University College of London research team as part of a larger project with the global Innovation for Sustainable Development (Inno4SD) Network. The particular approach adopted in the STIR framework is based on a review of quantitative indicators and qualitative expert appraisals of a country's performance – and will allow for evaluation of how Canada's STI policy mix/performance compares to selected economies around the world, previously reviewed through the broader Inno4SD Network project.

Circular Economy: An Interdisciplinary Literature Review, 2-year project
Principal Investigator: Emmanuel Raufflet (HEC Montréal)
Researchers: Renato Chavez (PhD Candidate, HEC Montréal), Philippe Genois-Lefrançois (PhD Candidate, Université de Montréal) and Geoffrey Lonca (PhD Candidate, Polytechnique Montréal)

This project will conduct an interdisciplinary academic literature review, mapping how different academic disciplines define circular economy. The objective of this systematic comparative effort is to consolidate the burgeoning literature on circular economy which encompasses various

disciplines, including engineering, management and economics, and urban studies among others. This review is expected to improve conversations between researchers from different fields, and in doing so, facilitate thinking and action with policy-makers and practitioners.

Policies for a Low-Carbon Economy

Behavioural and Health Impacts of Low-Income Energy and Carbon Rebate Programs, 2-year project
Principal Investigator: Blake Shaffer (University of Calgary);
Co-Investigator: Nicolas Rivers (University of Ottawa)

This research seeks to better understand the impact of energy- and carbon-based support programs for low-income households. It specifically seeks to answer two related questions. First, how do consumers spend income from low-income energy and carbon-based support programs? Second, what is the impact of low-income energy- and carbon-based support programs on health or other outcomes? Understanding how consumers receiving energy or carbon labelled transfers spend their money will allow policy makers to better understand the efficacy of their policies in both achieving GHG reductions and protecting at-risk households from energy poverty.

Evaluating 'Just Transition' Policies for Coal Workers and their Communities in Alberta, Canada, 1-year project
Principal Investigators: Kathryn Harrison (The University of British Columbia), Hisham Zerriffi (The University of British Columbia)
Researcher**:** Sandeep (PhD Candidate, The University of British Columbia)

The province of Alberta's Climate Leadership Plan has committed to a complete transition away from coal-based electricity to low-carbon energy sources by 2030. Alberta's plan is matched by a comparable goal in the Pan-Canadian Framework on Clean Growth and Climate Change. This switch in energy system will have a transformative social impact on workers and communities that are dependent on coal jobs. Many coal workers in Alberta will lose their jobs, along with many community members working in supporting industries. Several towns and villages in Alberta are expected to be negatively affected by this loss of employment and related revenues – so far 17 towns and villages have already applied for and received funding under Alberta government's Coal Community Transition Fund. Overall, the provincial government has committed to various policies to help coal workers and community members access retraining and transition to jobs in other sectors. The federal government has also announced $35-million in its 2018 budget and launched a Task Force on the Just Transition, to provide recommendations on how best to support coal workers and their communities.

In this first, exploratory phase, our project will synthesize just transition principles from the relevant literature. Ultimately, our project will use these principles to evaluate federal and provincial policies aimed at supporting coal workers' employment transition.

The Interaction of Public Green Economy Policies and Non-State Green Economy Initiatives: A Case Study Green Economy in Canada, 2-year project
Principal Investigators: Matthew Hoffman (University of Toronto) and Steven Bernstein (University of Toronto)
Researchers: Retaj Ramadan (Undergraduate student, University of Toronto) and Michaela Pedersen-Macnab (PhD Candidate, University of Toronto)

Efforts to catalyze the emergence and growth of the "green economy" in Canada consist of a mix of federal and provincial policies as well as a series of non-state initiatives. This project seeks to assess how these two types of initiatives and sources of potential catalytic change interact and under what conditions they will work together to enhance the growth of the green economy, increase the durability of green economy policy, and/or build support for subsequent green economy initiatives. This research will examine non-state initiatives that are steering businesses, specifically Green Economy Canada (https://greeneconomy.ca/), Climate Smart (https://climatesmartbusiness.com/), and The Natural Step (http://naturalstep.ca/). It will look particularly at whether/how public policies provide incentives and support that enhance the *capacity* of existing non-state governance initiatives in ways that may lead to their scaling up, and conversely how/whether the actions of the non-state governance initiatives themselves generate particular political effects (through *norm change* and *coalition building*) that might enhance the durability and expansion of public policies.

Can Green Government Spending Facilitate Employment Transitions in a Low-Carbon Economy? 1-year project
Principal Investigator: David Popp (Syracuse University)
Researcher: Ziqiao Chen (PhD Candidate, Syracuse University)

The impact that a low-carbon economy will have on employment is still largely unknown. Environmental advocates argue that stronger environmental policies create high-paying "green jobs", while critics point to the job losses that they are sure will follow. Existing research offers us mixed answers on the effect that environmental regulation will actually have on jobs, with the effects varying by industry. Because transitioning to a low-carbon economy will largely change the "brown job" landscape, it is important to not only focus on the net effect of regulation on employment, but to also understand how easy it will be for individuals losing jobs to find new employment in potentially very different sectors. Using data from the U.S Department of Labor's O*NET database, this research has been able to identify the workplace skills required for a green economy. As these skills do not always overlap with the skills used in

"brown" jobs, this project asks whether government spending designed to create new green jobs will be effective in regions where workers currently lack the skills needed for these jobs.

The Politics of Carbon Pricing in the Canadian Federation, 2-year project
Primary Investigator: Leigh Raymond (Purdue University);
Co-Investigator: Kathryn Harrison (University of British Columbia)

The Pan-Canadian Framework on Clean Growth and Climate Change acknowledges the diversity of the Canadian federation and of existing provincial approaches to carbon pricing, though with the notable addition of a federal backstop where provinces do not establish their own carbon pricing regime. Not surprisingly, the very different political economies of Canadian provinces have given rise to a diversity of approaches, with distinctive provincial carbon pricing schemes in BC, Alberta, Quebec, Nova Scotia, Newfoundland, PEI and the territories, and planned imposition of the federal carbon tax and dividend in 2019 in Saskatchewan, Manitoba, Ontario, and New Brunswick.

Understanding why provinces have crafted distinct approaches to carbon pricing or rejected carbon pricing altogether requires a nuanced understanding of provincial economies, political culture, and partisan politics. In addition, the federal response warrants closer examination as it entails a top-down approach to a degree not previously seen in Canadian environmental policy. The project proposes a workshop on Carbon Pricing in the Canadian Federation coincident with the Congress of Social Sciences and Humanities, at which experts on the politics and environmental policy in different provinces would each be asked to address a common set of questions.

A Canadian Climate Politics Panel Survey, 2-year project
Principal Investigator: Erick Lachapelle (Université de Montréal);
Co-Investigators: Matto Mildenberger (University of California Santa Barbara), Kathryn Harrison (University of British Columbia), Leah Stokes (University of California Santa Barbara)

This project involves a four-wave panel study of Canadian attitudes toward carbon pricing. Using the opportunity afforded by the Canadian federal government's decision to rebate the proceeds from the federal carbon tax in the form of tax credits, it will examine how attitudes toward this policy change at different stages of policy (i.e. tax and rebate) implementation. With its focus on Canadians living in British Columbia, Alberta, Saskatchewan, Ontario, and Quebec, it will also capture the attitudes of Canadians living under different carbon pricing regimes. The objective is to measure the extent to which different policy designs shape and reshape public attitudes toward climate policy. Findings from this research will help inform policy decisions around politically acceptable carbon price design.

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Carbon Pricing Costs for Households and Revenue Recycling Options in Canada, 2-year project
Collaborative Project – Jointly Awarded:
<u>Award 1: Principal Investigator</u>: <u>Jennifer Winter</u> (University of Calgary);
                <u>Co-Investigator</u>: <u>Kent Fellows</u> (University of Calgary).
<u>Award 2: Principal Investigator</u>: <u>Brett Dolter</u> (University of Regina)

The Government of Canada's implementation of the Pan-Canadian Framework on Clean Growth and Climate Change – which mandates a floor price on greenhouse gas emissions – means that in 2019, all provinces and territories in Canada will have a carbon price. However, more research is needed on the expected or observed effects of carbon pricing in Canada, particularly when it come to the costs to households. This research will quantify the costs of carbon pricing for households in each province in Canada, and across income distributions. It will also analyse revenue-recycling options based on existing provincial policies (where appropriate) as well as alternative revenue recycling policies. Using this research, we want to develop a computable general equilibrium model to estimate consumer and producer response to carbon pricing. We then want to use this model to develop an interactive web tool whereby users can describe their circumstances and calculate their own cost of carbon pricing.

Data Set Development and Linkages

Building a Dataset of Wind Energy Projects in Canada and the United States to Examine Factors that Predict Social Acceptance of Wind Energy, 3-year project
<u>Principal Investigator</u>: <u>Leah Stokes</u> (University of California Santa Barbara)
<u>Researcher</u>: <u>Chris Miljanich</u> (PhD Candidate, University of California Santa Barbara)

Addressing climate change requires societies to transition towards low-carbon sources, including renewable energy. In Canada and the United States, the electricity system is undergoing a rapid shift away from conventional technologies towards renewable energy resources. By far the biggest growth area is wind energy, which, as of August 2018, supplied 6% of Canada's electricity demand, and 8% of United States' in 2016. Building wind turbines provides public goods, reducing both local air pollution and combating global climate change. This technology has proven politically controversial, with social movements arising to protest wind energy projects across North America. While some research has examined specific cases of public resistance toward specific wind energy projects, there is no systematic study of wind projects on a larger scale, especially those that attempt to identify predictors of local resistance toward wind energy projects. This project uses a novel dataset of wind energy projects in North America to examine drivers of support for renewable wind energy technologies in an attempt to better understand how we can increase support for wind energy.

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Hydraulic Fracturing Chemicals Open Data, 1-year project
Principal Investigator: Joel Gehman (University of Alberta)

The widespread adoption of hydraulic fracturing has ushered in a "shale revolution," but also has raised concerns about its potential environmental, health and safety effects. In light of these developments, the goal of this project is to compile and distribute a comprehensive database of hydraulic fracturing chemicals injected at more than 150,000 wells in Canada and the United States from 2011-2018. All wells will be identified using their well identifiers, allowing this database to be easily linked to numerous other datasets which also reference these same identifiers. Data will be gathered from public sources, such as the FracFocus.org website, and government agencies, such as the US Environmental Protection Agency, Alberta Energy Regulator, and the British Columbia Oil and Gas Commission. The dataset created from this research would then be made publically available to help inform future work on policy.

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