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PERSPECTIVES ON INNOVATION, SCIENCE AND ENVIRONMENT



School of Public Policy and Administration

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About ISEMA

ISEMA is a graduate journal founded by students in the Innovation, Science and Environment (ISE) stream that preceded the Sustainable Energy Policy (SEP) program of the School of Public Policy and Administration at Carleton University. The purpose of ISEMA is to showcase the best student work on ISE and Sustainable Energy (SE) policy issues, while providing students with a unique opportunity to experience the peer-review process. Articles are nominated by professors teaching courses in the School of Public Policy and Administration. Nominated papers are subjected to a double-blind peer review process by ISE alumni and other specialists in the field. The highest ranked papers then undergo an editorial process before publication. ISEMA also serves as a valuable resource for students and others wishing to learn more about the latest policy trends and issues emerging from this exciting area.



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ABOUT THIS EDITION

For the last five months, the ISEMA executive and editorial board have been hard at work bringing together ISEMA Volume 12. Our editorial process began when we received 12 outstanding papers written by graduate students in the School of Public Policy and Administration at Carleton University. Following ISEMA's rigorous double-blind peer-review process, we selected four papers for publication in the 2018–2019 edition. Volume 12 comprises papers written during the 2017–2018 academic year. Each paper offers a unique perspective to ongoing debates within the energy and environmental sector:

- Travis Dagg explores and analyzes a Canadian energy and climate paradox: How can the federal government support meaningful GHG emissions reductions while encouraging the development of the Canadian oil sands for export? Dagg contextualizes this paradox by exploring political, legal and technical dimensions, as well as implications for Canada's transition to a low-carbon economy.
- Josh Russell re-examines the development of Ontario's electricity system through the multi-level perspective, challenging the conventional narrative by including an evaluation of Indigenous participation. Using the MLP, Russell shows how shifting regime and niche dynamics within a changing landscape transformed Indigenous participation. He also highlights the barriers Indigenous communities still face today.
- Gabrielle Morrison analyzes the elements that led to the relative success of the Montreal Protocol, arguing for a reconceptualization of the framework within which international climate change policy is crafted.
- Grace Martin, in her second consecutive year as a published ISEMA author, critically examines *Bill C-68 An Act to Amend the Fisheries Act and other Acts in Consequence* by evaluating the opportunities and challenges associated with meaningful integration of Indigenous knowledge and participation in the *Fisheries Act*.

The Editorial Board would like to thank all participants in the external and internal review process for dedicating their time and focus to the publishing of this collaborative endeavour. The board would also like to thank Carleton University's School of Public Policy and Administration for their continued support of ISEMA.

***A National Paradox: Canada's Conflicting Reality
Surrounding Increased Oil Sands Production and Greenhouse
Gas Emissions Reductions***

Author: Travis Dagg

***Written for: The Science, Politics and Economics of Global
Climate Change***

INTRODUCTION

Since the election of the Trudeau Liberals in 2015, Canadians and international audiences alike have heard the repeated refrain that growing the economy and protecting the environment go hand in hand. This is made evident by the title of Canada's historic plan to achieve its climate commitments, the Pan-Canadian Framework on Clean Growth and Climate Change (PCF). The plan was created in conjunction with the provinces and territories (with the exception of Saskatchewan) and outlines policies to reduce domestic greenhouse gas emissions while promoting innovation and clean growth. The PCF outlines how Canada will achieve its 30% emissions reduction target below 2005 levels by 2030, in line with international commitments made under the Paris Agreement. At the same time, the federal government has encouraged production of the carbon-intensive Alberta oil sands to boost exports and economic growth, insisting it is in the national interest. Can increased oil sands production go hand in hand with Canada's climate change commitments?

This paper explores and analyzes this seemingly paradoxical situation, in which the federal government is supporting meaningful greenhouse gas emission reductions while encouraging the development of carbon-intensive oil sands for export. This research also works to contextualize the current paradox, highlight current industry trends and innovation, assess the changing legal and financial landscape, and work to address future uncertainty with the use of scenario analysis. Finally, recommendations are provided to

help Canada adapt to a low-carbon future. The aim of this paper is to explore the federal government's two positions and, where possible, help reconcile them so that Canada can be a credible and effective leader in the transition to a low-carbon economy.

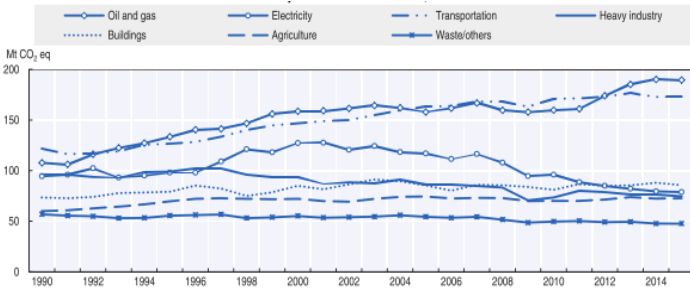
Contextualizing the Paradox

In 2015, during the 21st Conference of the Parties (COP) meetings in Paris, Canada's newly elected Prime Minister, Justin Trudeau, declared to the international community that "Canada [was] back" and ready to take on a new leadership role internationally (Fitz-Morris, 2015). This role involved supporting ambitious international climate change and greenhouse gas emissions reduction initiatives to limit the increase in the global average temperature to well below 2-degrees Celsius. Notable actions include Canada's leadership in Mission Innovation and the Powering Past Coal Alliance. Most importantly, the Trudeau Liberals created a viable national path to achieving Canada's greenhouse gas emissions reduction target of a 30% reduction by 2030 from 2005 levels through the release of the Pan-Canadian Framework on Clean Growth and Climate Change.

In 2017, Prime Minister Trudeau declared that "no country would find 173 billion barrels of oil in the ground and leave them there" (Berke, 2017). This statement, in reference to the Alberta oil sands, illustrates the vast resource potential that Canada has to develop its oil reserves and highlights the threat posed to Canada's greenhouse gas emissions reduction targets. For context, the unconventional oil sands constitute 97% of Canada's oil reserves and currently, 11 billion barrels are in production with 78% of oil production being exported (ECCC, 2017). The Organisation for Economic Co-operation and Development (OECD) has found that, "unconventional oil production from [the] oil sands are roughly four times as [carbon] intensive per barrel as conventional crude produced in North America" (2017, p. 62). The rapid expansion and high carbon-intensity of the oil sands has negatively impacted

Canada’s national emissions profile. In 2015, Canada’s oil and gas sector produced the largest share of greenhouse gas emissions at 26% of the national total with the oil sands responsible for approximately 10% of Canada’s greenhouse gas emissions (Figure 1).

Figure 1: GHG emissions by Canadian economic sector, 1990-2015. Source: Natural Resources Canada, 2016.

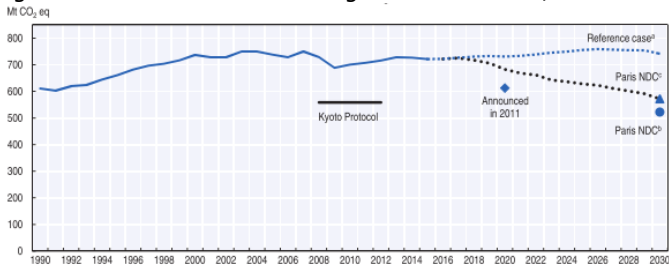


The oil sands are predicted to be Canada’s fastest growing source of greenhouse gas emissions, increasing from 35 Mt CO₂e in 2005 to 71 Mt CO₂e in 2015 and 115 Mt CO₂e by 2030 (ECCC, 2017). Nationally, this has prevented Canada’s emissions profile from shrinking, effectively wiping out emission reductions in other sectors. For example, increased oil sands output since 2005 has increased Canada’s emissions profile by 37 Mt CO₂e, offsetting the 38 Mt CO₂e reduction stemming from the closure of coal-fired generating stations in Ontario (ECCC, 2017). The OECD has warned that, “Without a drastic decrease in the emissions of the oil sands industry, the projected increase in oil production may seriously risk the achievement of Canada’s climate mitigation targets” (Zimonjic and Lunn, 2017).

As demonstrated in Figure 2, Canada faces challenges in achieving its 2030 greenhouse gas emission target of 517 Mt CO₂e. As seen in figure 2 below, analysis by Environment and Climate Change Canada has revealed that federal and provincial actions to reduce emissions, including measures in

the PCF, will drive the majority of reductions required; however, a significant gap of 66 Mt CO₂e will still remain by 2030. This is concerning because in order for Canada to meet its long-term obligations under the Paris Agreement and attempt to limit the increase in the global average temperature to well below 2-degrees Celsius, the government of Canada (in conjunction with the provinces) has outlined an emissions pathway involving an 80% reduction in greenhouse gas emissions compared to 2005 levels by 2050. This implies a rapid emissions reduction rate that is almost twice the level planned for 2014-2030 (OECD, 2017). For Canada to successfully meet its 2030 and 2050 emissions targets, reductions are going to be needed across the Canadian economy, including the largest sectoral emitters: oil and gas.

Figure 2: GHG emissions and Targets. Source: ECCC, 2017.



a) Government of Canada emissions projections with policies and measures in place as of 1 November 2016.
 b) Canada's Nationally Determined Contribution (NDC) under the Paris Agreement, including purchases of international credits.
 c) Canada's Nationally Determined Contribution (NDC) under the Paris Agreement, domestic reduction only.

Canada's domestic greenhouse gas emission reduction goals are important. However, since greenhouse gas emissions are a global problem and do not respect national boundaries, it is critical to examine the Earth's carbon capacity in the context of a 2-degree world. This is known as a carbon budget and is defined as, "the cumulative amount of carbon dioxide emissions permitted over a period of time to keep within a certain temperature threshold" (Carbon Tracker Initiative, 2018). According to the International Energy Agency (IEA), to have a 66% chance of keeping average global temperature

rise below 2-degrees Celsius, our planet has a total carbon budget of 1040 Gt CO₂e from 2011 until 2100 (Carbon Tracker Initiative, 2018). In 2017, global emissions were 36 Gt CO₂e meaning, if current trends continue, the planet will reach its budgeted carbon limit by approximately 2040. This is another reason why it is imperative that Canada meet its climate commitments and avoid locking in production of a high cost, carbon intensive fossil fuel for export.

Finally, it is critical that the economic impacts surrounding the oil sands be examined. A popular narrative exists that exaggerates the link between continued oil sands development and Canada's future economic prosperity. According to data compiled by Statistics Canada, this narrative is misleading and incomplete. In 2017, the oil sands supported and created 223,000 direct and indirect jobs across Canada, roughly 1.2% of total employment in Canada (Canadian Association of Petroleum Producers, 2018; Statistics Canada, 2018a). In the same year, the oil sands and relevant support activities contributed approximately \$51 billion to the \$1.8 trillion Canadian economy, approximately 2.7% of GDP (Statistics Canada, 2018b). In comparison, in 2016, Canada's clean technology sector was responsible for 274,000 jobs and represented 3.1% of Canadian GDP (Statistics Canada, 2017). While it must be acknowledged that investments and government revenues from the oil sands have historically been significant, Canada's future economic prosperity is not necessarily tied to oil sands development. The oil sands are vulnerable to the volatile boom and bust commodity cycle and will be one of the first to be priced out of the market in a global low-carbon economy.

INDUSTRY TRENDS

Recently, a number of concerning trends have become apparent within the oil sands industry, including the "Canadianization" of the oil sands, the proliferation of low cost clean energy alternatives, and the exposure of Canadian oil sand producers to the oncoming low-carbon transition.

Historically, the oil sands have been one of the most expensive oil plays to develop globally, requiring significant foreign capital investment to fuel production and expansion. Large multinational firms contributed to an industry high of \$34 billion in capital investments in oil sands projects in 2014 (Canadian Association of Petroleum Producers, 2016). Comparatively, capital investments in the oil sands in 2018, are expected to be \$12.6 billion, a 63% decrease from 2014 levels (Alberta Energy Regulator, 2018). Since 2014, this decline in investment has been coupled with an exodus of multinational firms from the oil sands, including Shell, Statoil, ConocoPhillips and Marathon Oil. These companies sold their assets and leases by striking deals with Canadian firms, like Suncor, Imperial Oil, Canadian Natural Resources and Cenovus Energy who were willing to expand their already significant oil sands holdings. As a result, Canadian ownership of the oil sands increased from 51% in 2016 to 80% in 2017 (Varcoe, 2017). This shift is noteworthy because it demonstrates Canadian companies are doubling down on unconventional fossil fuel while international firms are diversifying into lower cost, less carbon intensive energy. It is concerning that Canadian firms have not made significant attempts to diversify their portfolios with firms such as Enbridge, TransCanada and Suncor all selling off renewable energy assets in the last two years (Morgan, 2016; Morgan, 2017; Bickis, 2017). In sharp contrast, Shell and Statoil have announced investments of \$1 billion and \$500 million in alternative energies respectively in an attempt to reinvent themselves as energy companies (Ball, 2018; Reuters, 2018). There is no doubt that the dramatic drop in the price of oil from over \$100 per barrel in 2014 to approximately \$40 per barrel in 2016 contributed to the exit of large multinationals from the oil sands, but there has also been an increasing recognition by oil and gas companies that they need to adapt and prepare for a low-carbon future.

Compounding this shift from big oil to big energy is the rapid decline in the cost of alternative energy sources, specifically solar, wind and battery prices. Over a six year period, from 2010-2016 the average cost of electricity from solar and wind in the United States fell 60% and the price of lithium-ion batteries fell 73% (Ball, 2018). According to Bloomberg New Energy Finance, the global average levelized cost of electricity from solar will drop another 66% and wind will drop another 47% by 2040, ensuring that at a minimum renewable energy will be globally cost competitive with fossil fuel sources (2017). These trends, coupled with increasingly stringent climate policies around the world, are driving massive economic shifts that are creating an opportunity for oil companies to diversify and adapt to a shifting energy landscape. A common thread found across baseline scenarios in forecasts made by the IEA, the U.S. Energy Information Agency, Shell, and Statoil, recognizes that global energy systems will become decarbonized in the 21st century. Ultimately, this translates to a declining global market share for oil and gas products as peak demand for fossil fuels will occur sometime before 2050 (McNeill and Israel, 2017). This shifting energy landscape will have consequences for Canadian oil sands producers. Canada and the oil sands, as a marginal supplier of world oil due to its high costs and carbon footprint, will face the brunt of continued reductions in future oil demand (Bakx, 2016). In a cost and carbon constrained world, the products that are highest on the cost curve will become uneconomical and likely to become stranded. As a result, companies should start to shift their portfolios towards economically resilient products that will remain profitable in the long-term. However, Canadian oil sands producers have doubled down and risked locking themselves in to inflexible infrastructure with long term horizons. An analysis by the National Roundtable on the Environment and Economy estimated that oil and gas infrastructure will be responsible for 47% of locked in carbon emissions by 2030 and 71% by 2050 (2012). Given the potential risk of carbon lock-in and the long term horizons

involved, it is important to assess the vulnerability of Canada's oil sands producers in a low-carbon economy.

The Carbon Tracker Initiative conducted a scenario analysis of oil companies in a 2-degree world based on the IEA's 2016 World Energy Outlook. It focused on the percentage of a company's capital expenditures that fall outside of a 2-degree scenario, essentially highlighting what proportion of a company's investments may fail to deliver an acceptable return in a world limited to 2-degree warming. The results are troubling. Their work revealed that the five large Canadian oil producers, including Imperial Oil, Husky Energy and Suncor, have 40% to 60% of their capital investments exposed in a 2-degree scenario (Leaton and Grant, 2017). This is substantially higher than other international players, such as Statoil and BP that are only 20-30% exposed. Compared to lower cost producers, the oil sands face negative pressures from stricter greenhouse gas policies, including higher energy use, lower demand for product, and higher operating and carbon compliance costs. Once operational, the oil sands are also more difficult to wind down and producers are exposed to longer periods of risk due to the long time horizons involved. As international firms divest their risky, high-cost holdings in the oil sands and realign their portfolios to reflect a changing energy landscape full of new opportunity and low cost alternatives, Canadian firms have increased their ownership, taking on more risk and threatening their firms' future prosperity as the world shifts to a low-carbon future.

INNOVATE OR DIE

To remain competitive in a global low-carbon economy, technological innovation to achieve greenhouse gas reductions and cost savings is critical for the oil sands. Without it, the oil sands are likely to enter a future period of economic uncertainty and decline as global energy markets shift to low cost and low carbon alternatives. Key challenges that impact the exploitation of the oil sands are high capital and operating costs. High environmental impacts, including

air pollution, energy and water use, and tailings ponds reclamation are also notable challenges. Research is being conducted into all these important areas but for the purposes of this paper only efforts related to reducing the high costs and carbon intensive nature of in situ oil sands extraction (expected to be the primary extraction method in the future) will be considered. One promising technological innovation is direct contact steam generation, which enhances typical steam assisted gravity drainage (SAGD) methods. This method injects steam directly into the combustion chamber, removing the need for boiler tubes, while increasing efficiency and ensuring the majority of carbon dioxide remains underground. Demonstrating the long lead times associated with research innovation, direct contact steam generation has been under development by Natural Resources Canada for over a decade and is estimated to be at least 3-5 years away from commercialization as it remains to be seen if the technology can be successfully scaled up (Natural Resources Canada, 2017).

Another notable innovation is solvent-based extraction that replaces or reduces the use of steam with an injection of solvents, usually natural gas liquids like propane or butane. Steam generation constitutes the majority of greenhouse gas emissions associated with SAGD and the solvents used can typically be recovered and recycled, helping to lower operating costs. However, there is a lack of information and data on the impacts associated with this process and there are concerns about potential surface and subsurface contamination stemming from the use of solvents (McNeill and Israel, 2017). An additional modification of this process called electromagnetically assisted solvent extraction uses radiofrequency electromagnetic energy to heat the bitumen in combination with solvents, eliminating the use of steam (Suncor, 2017). A demonstration project is under review but there are concerns this approach is not viable on a large scale. The technological innovations discussed, if successful, are estimated to decrease greenhouse gas emissions

between 44% to 80% and reduce costs between 12% and 46% (Canadian Energy Research Institute, 2017a). The ranges listed are dependent on a number of factors, including commercialization, scalability and deployment. These figures are significant and would help keep the oil sands competitive economically while reducing environmental impacts. However, there are reasons to be concerned.

Over the last fifty years of oil sands production, continuous incremental change has helped increase efficiency and reduce the emissions intensity of the oil sands. Unfortunately, this has not reduced the absolute emissions associated with the oil sands. Indeed, the overall amount of emissions has continued to increase. According to a study by the Council of Canadian Academies, there is no suite of technologies that are deployable in the near to medium term that would achieve an absolute reduction in the environmental footprint of the oil sands (2015). There is valid evidence supporting this assessment, including the long lead time of 10-20 years to develop, demonstrate and implement new technology, the economic viability of new technology and the heterogeneous composition of oil sand deposits that can limit the effectiveness of new technology. Oil sands companies also tend to be risk averse, preferring continuous improvement over transformative change due to the large scale and capital intensive nature of oil sands projects (Council of Canadian Academies, 2015).

An encouraging development has been the passage of *the Oil Sands Emissions Limit Act* by the Alberta provincial government in 2016. The Act legislates a greenhouse gas emissions cap of 100 Mt CO₂e annually, covering all oil sands sites in the province. The legislation, if it remains in force over the long term, will provide clarity to companies and investors and hopefully spur innovation and increased research and development. The Canadian Energy Research Institute has forecasted that the cap will be reached by 2028, giving industry ten years to address its absolute emissions (2017b). As mentioned, ten years is a short time horizon and based on

data compiled by Research Infosource in 2016, Canada's oil and gas sector invests low amounts into research and development when compared to other Canadian industries. The data indicates that the oil and gas sector was behind the aerospace, information communication technology and pharmaceutical sectors with companies like Suncor, Imperial Oil and Cenovus Energy only spending 0.7%, 0.8% and 0.6% of revenue on research and development efforts respectively (Smith, 2017). The only notable exception was Canadian Natural Resources Limited, which spent almost 5% of revenue on research and development.

If oil sands producers are going to remain competitive they will have to boost investments in research and development and accelerate the demonstration and deployment of proven new technologies. The innovation challenges remain significant but these efforts may help drive down costs and absolute emissions. Otherwise, the production of the oil sands for export faces a bleak future in a carbon constrained and cost competitive world.

TIPPING THE SCALE: OPERATING IN A CLIMATE OF INCREASED RISK AND LIABILITY

As the transition to a low-carbon economy starts to take hold, businesses and industries in the energy sector will be operating in an environment of increased risk and liability. Recently, a number of developments have occurred in the scientific, legal and financial communities that demonstrate the important role these sectors have in helping to achieve a low-carbon world.

Over the years, the sophistication and accuracy of climate models has increased rapidly. The American Meteorological Society publishes an annual compendium of studies that assesses the role of climate change in extreme weather events and in 2016, it was found for the first time that some recent extreme weather events were not possible in a preindustrial climate. The finding indicates that

anthropogenic climate change has become significant enough to push events beyond the bounds of natural variability (American Meteorological Society, 2018). These probabilistic event attributions can help inform future forecasts and highlight the urgent need to act now to reduce greenhouse gas emissions. Attribution research has illustrated that the effects of climate change are already being felt and Canada is hardly immune to these trends. As a result of climate change, Environment and Climate Change Canada expects warmer temperatures and increased precipitation across the country, including extreme heat and severe rainfall events that raise the risk of wildfires and flooding (2017).

As attribution links strengthen over time, there could be notable legal implications surrounding liability and appropriating responsibility for damage and loss as a result of climate change. Climate science has evolved and demonstrated that anthropogenic causes are responsible for climate change, and now attribution models are demonstrating the probable impacts of climate change from weather events (Risser and Wehner, 2017; American Meteorological Society, 2018). This evolution may leave states and companies vulnerable to legal action if they fail to take adaptive measures to confront the scientific reality of climate change. There is legal precedent for courts to accept probabilistic evidence as proving causation in situations where deterministic causation is impossible. A prominent example is government litigation against tobacco companies. Governments could not definitively prove a particular cancer was caused by smoking, but they could demonstrate that it increased the probability of cancer among their citizens, resulting in higher health care costs that tobacco companies were liable for (Dzieza, 2018). Since local governments are often the ones left dealing with infrastructure and repair costs in their communities, especially in the aftermath of extreme weather events, many governments, including New York City, are looking at litigation against fossil fuel companies. According to the United Nations, over 880 climate change litigation cases have been filed around the

world as of March 2017 (2017). There are shortcomings to this approach, but as the science of climate change and its impacts are better understood, governments and companies will face greater accountability in demonstrating their efforts to address climate change risks.

Finally, there has been a growing acknowledgment of climate change risks and impacts within the financial community. One of the critical functions of financial markets is to price risk to support efficient and informed capital allocation. However, without proper information, investors may incorrectly price assets leading to the misallocation of capital (Task Force on Climate-Related Financial Disclosures, 2017). Until recently, many companies did not publicly view climate change as a serious risk and did not consider it a significant issue for investors. According to the Task Force on Climate-Related Financial Disclosures, “organizations that invest in activities that may not be viable in the longer term may be less resilient to the transition to a lower-carbon economy; and their investors will likely experience lower returns” (2017). This is particularly true for oil and gas companies. To address this, companies are being encouraged, and in some situations, forced by shareholders to disclose the risks they face in a low-carbon world. These risks are wide ranging and can include policy, legal, technology, market, reputation and physical risks. As part of these disclosures, companies are required to assess short, medium and long term risks, their impacts and how they plan on managing their exposure to identified risks. These disclosures provide important information to investors and have helped push companies to adopt new policies in line with international climate commitments. This increased transparency is helping to shed light on which companies are preparing for the future and embracing new opportunities and which companies are facing substantial risk and uncertain business prospects.

In 2016, Suncor was the first Canadian oil and gas company to adopt a shareholder proposal requiring the company disclose

how its future operations will be impacted in a low-carbon world. The company also identified carbon risk as one of its principal risks, meaning it has potential to impact the company's strategic objectives and must undergo an annual review by its Board of Directors (Suncor, 2017). This is a step in the right direction and helps bring Suncor in line with international players like Shell and Statoil, who regularly conduct climate-related disclosures.

The inclusion of climate change and carbon risk in companies financial disclosures are important to increase transparency and to ensure oil and gas companies, especially those involved in the oil sands, are capable of maintaining and remediating their operations. By some estimates, the costs to remediate oil sands sites will be in the hundreds of billions of dollars (McNeill and Israel, 2017). This is a significant liability and one that should not be placed on taxpayers in the future. An unfortunate example involves the \$70 billion in liability for the costs of cleaning up coal sites in the United States (McNeill and Israel, 2017). These liabilities currently outweigh the profit-making ability of the industry, meaning citizens and governments will be responsible for funding the clean-up.

ERA OF RADICAL UNCERTAINTY AND THE USE OF SCENARIO ANALYSIS

The impacts of a shifting energy landscape and the increasing momentum towards a low-carbon economy has created a new era of radical uncertainty. As Ed Rawle, head of oil research for Wood Mackenzie stated, "the signs of peak oil demand really are there into the future. It's a question of when, not if" (Energy Diversification Advisory Committee, 2018). To help companies prepare and adjust to this era of uncertainty the Task Force on Climate-Related Financial Disclosures was created and issued a series of recommendations. Their key recommendation involved having companies conduct scenario analyses to better inform their decision-making. Scenario analysis is a way to identify and assess risk given a range of possible options and

outcomes. In the context of climate change, it allows companies to analyze a number of different pathways involving energy demand, energy mix and greenhouse gas emissions (Task Force on Climate-Related Financial Disclosures, 2017). Scenario analysis can also help frame strategic issues and give investors insight into a company's strategic and business resiliency.

To date, many large international oil and gas companies have issued reports demonstrating they have integrated climate-related scenario analysis into their planning. Models tend to include a 2-degree or lower scenario and commitments made under the Paris Agreement. A notable example is the Shell Scenarios team that is dedicated to modelling different versions of the future. Based on the scenarios produced, Shell has indicated that they will only continue investing and operating oil projects that can produce returns at \$40 a barrel (Ball, 2018). In contrast, internal assumptions about the future price of oil were not explicitly listed in scenarios conducted by Statoil and Suncor (Statoil, 2017; Suncor, 2017). There is mention of high and low oil prices along with high and low oil demand but no specific number to illustrate their assumptions. Stating the assumed price of oil used in the models would help bolster transparency and provide further clarity. There have also been concerns raised about the quality of the information disclosed, including inconsistencies and the lack of comparable reporting across and within industry (Chartered Professional Accountants Canada, 2017). Nonetheless, the use of scenario analysis by oil and gas companies is a welcome development that will continue to enhance dialogue and hopefully help vulnerable companies adapt to a low-carbon world.

Future uncertainty surrounding the price of oil and oil demand are also significant unknowns that will have a large impact on Canada's emissions profile. In Canada, climate change policy does not determine the level of oil production - the price of oil does. A higher oil price encourages oil sands

development boosting emissions from that sector, while supporting broader conservation efforts in other sectors of the economy. A low oil price triggers an opposite reaction discouraging oil sands development. Environment and Climate Change Canada conducted a sensitivity analysis of Canada’s greenhouse gas emissions to changes in GDP and oil price and it demonstrated the country’s vulnerability to these future unknowns (Figure 4).

Figure 4: Sensitivity of GHG emissions to changes in GDP and oil prices. Source: ECCC, 2017.

SCENARIOS	2020	2030	2030 PROJECTIONS–2005 EMISSIONS
Slow GDP, Low World Oil and Gas Prices	709	651	-87
Fast GDP, High World Oil and Gas Prices	742	793	55
"With Measures" Scenario	728	722	-16
Sensitivity Range	709 to 742	651 to 793	-87 to 55

In a future with a high annual GDP growth rate of 2.5% from 2015-2030 and a \$90/barrel price of Western Canadian Select in 2030, Canada would see its emissions increase by 55 Mt CO₂e. In a future with a low annual GDP growth rate of 1% from 2015-2030 and a \$21/barrel price of Western Canadian Select in 2030, Canada would see its emissions decrease by 87 Mt CO₂e (ECCC, 2017). The numbers used in the analysis are not as important as the trend of vulnerability that it highlights. It clearly illustrates that Canada’s emissions profile will be significantly impacted by the price of oil and the pace of economic growth. To counter this uncertainty, Canada should double down on its investments in clean technology and continue to diversify the Canadian economy to ensure the country’s emissions profile is not beholden to the volatile price of oil.

LOOKING AHEAD: RECOMMENDATIONS FOR THE FUTURE

After reviewing the paradoxical situation that Canada currently finds itself in, a number of recommendations can be made to help reconcile the conflicting reality of exploiting the oil sands for export while committing to ambitious

greenhouse gas emission reductions by 2030 and 2050. First, it is important to note that Canada's commitments under the Paris Agreement are not legally binding. To keep momentum and ensure Canada remains on track after a legacy of failed attempts, the government should legislate its emissions target into law and include annual updates to Parliament on its progress. This will help enhance the legitimacy and stickiness of climate policy in Canada. The United Kingdom has passed such a bill providing not just a legal imperative to reduce emissions but an opportunity to hold the government to account on its progress (or lack thereof). Second, climate-related financial disclosures should become mandatory by law as part of a company's securities filings. Canadian law already stipulates that material environmental issues must be disclosed to investors, further clarification explicitly identifying climate risk as an environmental issue would be welcomed. An accepted standard of climate-related disclosure should be adopted to ensure disclosures are consistent and comparable. The metrics and assumptions used to develop scenario analyses should also be transparent and clear.

Third, the federal government and provinces, particularly Alberta, should continue to leverage their strengths to diversify their economies, including the diversification of downstream products. Currently, 90% of bitumen is used to create combustible fuels and is subject to the volatile boom and bust commodity cycle (Cummings, 2018). Using bitumen to make non-combustible products like asphalt, lubricants, waxes, fertilizers and petrochemicals will create value-added products that can be sold at a more consistent price. A further example of leveraging past strengths to adapt to new opportunities includes Canadian oil sands companies that already possess advanced drilling technology and expertise that can be used to pursue geothermal energy opportunities in Canada and around the world. New and emerging opportunities in clean technology will help the Canadian and Albertan economies grow amid a time of transition.

Opportunities will continue to increase as the transition to a low-carbon economy takes hold.

This paper is not recommending the immediate phase out of the oil sands as the revenues and economic activity from current production can help fund a managed transition to a low-carbon economy in line with Canada's climate commitments. However, this paper highlights the dangers of building infrastructure that will be locked-in for decades and may be vulnerable to future market transitions that threaten its economic viability. As a result of this vulnerability and the significant downward trend in capital investment in the oil sands, it is not recommended that additional infrastructure be built to support an expansion of bitumen for export purposes.

CONCLUSION

This paper has worked to outline the paradox that the Trudeau Liberal government is currently experiencing in implementing effective climate change policies while promoting the carbon-intensive oil sands for export. If Canada is truly "back" and wants to be a leader on climate change, it will have to walk the talk by turning its words and commitments into real action. The PCF is a historic plan that outlines a pathway to a low-carbon economy but to have a realistic chance of limiting global average temperature rise to 2-degrees Celsius in line with the Paris Agreement, Canada will have to significantly reduce its greenhouse gas emissions to roughly 80% of 2005 levels by 2050. This will require a transition that will affect all sectors of the economy and as the global economy begins to transition to a low-carbon future, it is important that Canada is prepared. Canada possesses the skills and expertise to leverage its resources to build a better future, but there will be challenges. Now is the time to act strategically by avoiding locking in long-term infrastructure that may be vulnerable to a shifting energy landscape.

In the future, to help untangle and better understand the paradox that Canada is confronted with, it may be helpful to conduct a comparative assessment with a country that faces similar challenges, like Norway. This assessment could help provide further solutions to reconciling the tensions that exist between adopting stringent climate change policies and encouraging the development of fossil fuels for export. Absent step changing technological innovation and successful commercial scaling, the shifting energy, legal and financial landscapes all pose significant risks to the future economic viability of the oil sands. It is important for Canada to be ready. Increased climate-related financial disclosures and the use of scenario analysis are good first steps but more must be done to ensure that the economy and the environment truly can go hand in hand. The greatest challenge for Canada will be maintaining the momentum of the PCF so that in the long-term the country will transition from the current carbon and energy intensive economy of today to a low-carbon economy of the future.

REFERENCES

- Alberta Energy Regulator. (2018). "Capital Expenditures". Retrieved from <https://aer.ca/data-and-publications/statistical-reports/capital-expenditures>.
- American Meteorological Society. (2018). *Explaining Extreme Events of 2016 From A Climate Perspective*. Retrieved from http://www.ametsoc.net/eee/2016/2016_bams_eee_low_res.pdf.
- Ball, J. (2018). "Inside Oil Giant Shell's Race to Remake Itself For A Low-Price World". *Fortune*. Retrieved from: <http://fortune.com/2018/01/24/royal-dutch-shell-lower-oil-prices/>.
- Bakx, K. (2016). "Oil sands growth in doubt and could affect national GDP, federal finance report warns". *CBC News*. Retrieved from: <http://www.cbc.ca/news/canada/calgary/oilsands-investment-economy-gdp-alberta-fed-report-1.3500768>.
- Berke, J. (2017). "No country would find 173 billion barrels of oil in the ground and just leave them: Justin Trudeau gets a standing ovation at an energy conference in Texas". *Business Insider*. Retrieved from: <http://www.businessinsider.my/trudeau-gets-a-standing-ovation-at-energy-industry-conference-oil-gas-2017-3/>.
- Bickis, I. (2017). "Enbridge defends plan to sell onshore renewables as climate action increases". *Business News Network*. Retrieved from: <https://www.bnn.ca/enbridge-defends-plan-to-sell-onshore-renewables-as-climate-action-increases-1.941823>.
- Canadian Association of Petroleum Producers. (2016). *Capital Investment and Drilling Forecast Update*. Retrieved from: www.capp.ca/~media/capp/customerportal/documents/279588.pdf?v=2.
- Canadian Association of Petroleum Producers. (2018). "Economic Contribution". Retrieved from: <https://www.canadaoilsands.ca/en/explore-topics/economic-contribution>.
- Canadian Energy Research Institute. (2017a). *Cost and GHG Impacts of New Oil Sands Technologies*. Retrieved from:

http://ceri.ca/assets/files/Presentation%20Oil%20Sand%20Efficiencies%20and%20Tech%20Study_IAI_17%20Conference.pdf

Canadian Energy Research Institute. (2017b). *Economic Potentials and Efficiencies of Oil Sands Operations: Processes and Technologies*. Retrieved from: https://www.ceri.ca/assets/files/Study_164_Full_Report.pdf

Carbon Tracker Initiative. (2018). *Carbon Budgets Explainer*. Retrieved from: <https://www.carbontracker.org/carbon-budgets-explained/>

Chartered Professional Accountants Canada. (2017). *State of Play: Study of Climate-Related Disclosures by Canadian Public Companies*. Retrieved from: <https://www.cpacanada.ca/en/business-and-accounting-resources/financial-and-non-financial-reporting/sustainability-environmental-and-social-reporting/publications/climate-related-disclosure-study>

Council of Canadian Academies. (2015). *Technological Prospects for Reducing the Environmental Footprint of Canadian Oil Sands*. Retrieved from: <http://www.scienceadvice.ca/en/assessments/completed/oil-sands.aspx>

Cummings, M. (2018). "Alberta's energy industry has a bright future – but its going to take some work". *CBC News*. Retrieved from: <https://www.cbc.ca/news/canada/edmonton/edmonton-new-capital-oil-industry-uncertain-future-1.4523780>

Dzieza, J. (2018). "If Climate Change Wrecks Your City, Can It Sue Exxon". *The Verge*. Retrieved from: <https://www.theverge.com/2018/2/20/17031676/climate-change-lawsuits-fossil-fuel-new-york-santa-cruz>

Energy Diversification Advisory Committee. (2018). *Diversification, Not Decline: Adapting to the new energy reality*. Retrieved from: <https://open.alberta.ca/publications/9781460136867>

Environment and Climate Change Canada (ECCC). (2017). *Canada's 7th National Communication and 3rd Biennial Report*. Retrieved from:

https://unfccc.int/files/national_reports/national_communications_and_biennial_reports/application/pdf/82051493_canadanc7-br3-1-5108_eccc_can7thncomm3rdbi-report_en_04_web.pdf

Fitz-Morris, J. (2015). "Justin Trudeau tells Paris climate summit Canada ready to do more". *CBC News*. Retrieved from: <http://www.cbc.ca/news/politics/trudeau-address-climate-change-paris-1.3343394>.

Leaton, J., and Grant, A. (2017). *2 Degrees of Separation: Transition Risk for Oil and Gas in a Low Carbon World*. Carbon Tracker Initiative. Retrieved from: <http://2degreeseperation.com/#summary>.

McNeill, J. and Israel, B. (2017). *Prospects for Alberta oil and gas in a decarbonizing world*. Pembina Institute. Retrieved from: <http://www.pembina.org/reports/prospects-for-alberta-oil-and-gas-in-a-decarbonizing-world.pdf>.

Morgan, G. (2016). "Ontario wind power assets are next for sale after Suncor sells off its lubricant business". *Financial Post*. Retrieved from: <http://business.financialpost.com/commodities/energy/ontario-wind-power-assets-are-next-for-sale-after-suncor-sells-off-its-lubricants-business>.

Morgan, G. (2017). "TransCanada doubles down on oil and gas infrastructure after selling solar assets for \$540M". *Financial Post*. Retrieved from: <http://business.financialpost.com/commodities/transcanada-doubles-down-on-oil-and-gas-infrastructure-after-selling-solar-assets-for-540m>.

National Roundtable on the Environment and Economy. (2012). *Framing the Future: Embracing the Low-Carbon Economy*. Retrieved from: <http://neaia.org/wp-content/uploads/2013/04/framing-the-future-report-eng.pdf>.

Natural Resources Canada. (2016). *Energy Fact Book 2016-2017*. Retrieved from: https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/EnergyFactBook_2016_17_En.pdf

Natural Resources Canada. (2017). “Frequently Asked Questions about Direct Contact Steam Generation”. Retrieved from:
<https://www.nrcan.gc.ca/energy/oil-sands/19647>.

Organisation for Economic Co-operation and Development (OECD). (2017). *OECD Environmental Performance Reviews: Canada 2017*. Retrieved from: https://www.keepeek.com/Digital-Asset-Management/oced/environment/oced-environmental-performance-reviews-canada-2017_9789264279612-en#page1.

Reuters. (2018). “Statoil’s spending on renewables last year in line with plans”. Retrieved from:
<https://af.reuters.com/article/commoditiesNews/idAFL8N1R52D8>.

Risser, M., and Wehner, M. (2017). “Attributable human-induced changes in the likelihood and magnitude of the observed extreme precipitation during Hurricane Harvey”. *Geophysical Research Letters*, Vol. 44, pp. 12,457–12,464.

Smith, M. (2017). “Canadian Natural leads oil sector R&D spend, places fourth overall in Canada”. *JWN Energy*. Retrieved from:
<http://www.jwnenergy.com/article/2017/11/cnrl-leads-oil-sector-rd-spend-places-fourth-overall-canada/>.

Statistics Canada. (2017). “Environmental and Clean Technology Products Economic Account, 2007-2016”. Retrieved from:
<https://www.statcan.gc.ca/daily-quotidien/171213/dq171213g-eng.htm>.

Statistics Canada. (2018a). “Employment and Unemployment”. Retrieved from: <http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/labor07b-eng.htm>.

Statistics Canada. (2018b). “Gross domestic product at basic prices, by industry”. Retrieved from:
<http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&iid=3790031&&pattern=&stByVal=1&p1=1&p2=31&tabMode=dataTable&csid=>.

Statoil. (2017). *Energy Perspectives 2017: Long-Term Macro and Market Outlook*. Retrieved from:

<https://www.equinor.com/content/dam/statoil/documents/energy-perspectives/energy-perspectives-2017-v2.pdf>.

Suncor. (2017). *Suncor's Climate Report: Resilience Through Strategy*.

Retrieved from:

<https://sustainability.suncor.com/2017/pdf/Climate-Report-EN.pdf>.

Task Force on Climate Related Financial Disclosures. (2017). *Recommendations of the Task Force on Climate Related Financial Disclosures: Final Report*.

Retrieved from: <https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf>.

United Nations Environment. (2017). *The Status of Climate Change Litigation: A Global Review*.

Retrieved from <https://s3.amazonaws.com/tld-documents.llnassets.com/0005000/5485/status%20of%20climate%20change%20litigation.pdf>.

Varcoe, C. (2017). "Foreign exodus from oil sands has followed investment frenzy". *Calgary Herald*. Retrieved from:

<http://calgaryherald.com/business/energy/foreign-exodus-has-followed-investment-frenzy>.

Zimonjic, P., and Lunn, S. (2017). "Canada must reduce emissions from oil sands to meet climate goals: OECD report". *CBC News*. Retrieved from: <https://www.cbc.ca/news/politics/oecd-canada-climate-report-card-1.4455379>

Power and Politics: A Multi-Level Perspective on Indigenous Participation in the Evolution of Ontario's Electricity System

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INTRODUCTION

In 2015, the Truth and Reconciliation Commission of Canada released its calls to action, laying out ninety-four specific recommendations that call upon all levels of Canadian governments to begin the healing process after hundreds of years of colonialism and the trauma of the residential school system. Enabling Indigenous communities to determine what is best for their community development is one of the ways Canadian governments can pursue the meaningful course of reconciliation. This paper explores how Indigenous communities in Ontario have used energy to achieve greater self-determination through the ownership of energy projects. By focusing on the specific sector of energy, this paper examines and reveals the evolution of Indigenous Peoples participation in Ontario's electricity system.

The relationship between Indigenous Peoples and the Canadian state is an important topic within Canadian studies, however there has been little scholarship focusing on understanding this relationship prior to the 1960's (Cairns, 2000; Grant et al., 2014). Although the literature has grown significantly in the past few decades and has indisputably demonstrated the ways in which Indigenous Peoples are significant actors not only in Canada but in the international landscape as well, there are significant aspects of the relationship that remain to be examined (Bowie, 2013; Grant et al., 2014). One of the areas identified for further exploration are the barriers to Indigenous participation in renewable energy projects¹ (Krupa, 2012b).

¹ For the purpose of this paper, hydroelectric, solar photovoltaic, wind and biomass/biofuel will be considered renewable energy.

This paper analyzes the historical development of Ontario's electricity system with specific attention to the role of Indigenous actors. It demonstrates the transformation of Indigenous participation from marginalized actors to active participants and partners in renewable energy projects. To do so, this paper utilizes the Multi-Level Perspective (MLP) of Sociotechnical Transition Theory. The MLP has been a useful tool for understanding the sociotechnical transition of Ontario's electricity system (Rosenbloom & Meadowcroft, 2014), however the perspective has not been applied to specific actors within the system. A key distinction of this paper is its focus on the actors within the politico-economic aspect of the MLP as opposed to focusing solely on the sociotechnical actors. This paper therefore provides insight into the relationship between the politico-economic actors that contribute to sociotechnical transitions. By taking this approach, the discussion seeks to address the criticism that the MLP is lacking in the integration of power and politics into the framework (Geels, 2014; Meadowcroft, 2011; Osunmuyiwa, Biermann, & Kalfagianni, 2017; Smith, Voß, & Grin, 2010).

The paper develops in three broad stages. First, it introduces the theoretical approach of the Multi-Level Perspective to outline the theoretical underpinnings of the analysis. Second, it provides a detailed history of the development of Ontario's electricity system from the focus of its effects on Indigenous communities. Finally, it concludes with a reflection on the observations raised in this paper and a brief discussion on future implications.

A NOTE ON TERMINOLOGY

Indigenous Peoples in Canada employ a diversity of terms within First Nations, Métis and Inuit groups that are influenced by social, cultural and linguistic contexts as well as legal terms (Hedican, 2017). Although legal and legislative documents utilize the term "Indian" and "Aboriginal" as outlined in the

Indian Act and Section 35 of the Canadian *Constitution Act*, 1982, this paper employs the broad term “Indigenous” to stay consistent with international documents such as the United Nations Declaration on the Rights of Indigenous Peoples. That being said, this paper concerns First Nations communities in Ontario. Exceptions in the terminology will be made when using legal terminology when referring to the *Indian Act* or the *Constitution Act*.

THEORETICAL APPROACH

This essay will employ the Multi-Level Perspective (MLP) of Sociotechnical Transition Theory (STT) to gain insight into the role Indigenous communities play in Ontario’s electricity system. The MLP analytical tool has been widely used in studies on sociotechnical transitions and will be an important tool in identifying and understanding the actors and forces within the sector.

The MLP provides a framework for understanding actors within the STT by recognizing that transitions occur in a non-linear fashion and within the scope of three analytical levels: the *niche*, the *regime* and the *landscape* (Geels, 2011). *Niches* are viewed as occupying space where radical and emerging innovation can occur that hope to challenge the dominant technologies, institutions and interests (Geels, 2011; Haley, 2014; Rosenbloom & Meadowcroft, 2014). Crucially, niches “had to overcome the constraining influence of regimes, branch out, link up with wider change processes, and drive transformations in those same regimes in the long term” (Smith et al., 2010). *Regimes* are defined by “deep structures” that uphold the existing sociotechnical systems; because they can be described as the dominant or incumbent actors, their embedded social and material structures, resources and power constrain development that challenges their power (Geels, 2011). These deep structures can take the form of sunk investments that lock-in actors into certain behaviors making it difficult to transition away from current systems (Unruh, 2000). The *landscape* represents broad developments that can put pressure on the regime through shifting cultural, political

and economic conditions allowing opportunities for niche actors to emerge (Geels, 2011; Haley, 2014).

The MLP has been useful for analyzing the current transition towards low-carbon energy systems. This has included a thorough analysis of Ontario's electricity system (Rosenbloom & Meadowcroft, 2014). The MLP combines concepts from evolutionary economics, science and technology studies, structuration theory and neo-institutional theory which makes it ideal for its application to a technical sector, such as electricity systems (Geels, 2004; Geels & Schot, 2007; Rosenbloom & Meadowcroft, 2014). Furthermore, its implied understanding of institutions, structures and power makes it particularly useful in considering the historical relationship between Indigenous community actors and the Government of Canada as well as the Government of Ontario.

Although a useful tool for understanding sociotechnical transitions, the MLP has been criticized for not giving adequate weight to the power dynamics and political dimensions that lead to the development and implementation of specific policies (Avelino & Wittmayer, 2016; Geels, 2014; Meadowcroft, 2011; Smith et al., 2010). Further, due to its origins in the theory of structuralism, the MLP gives less attention to the role and scale of collective actors (Avelino & Wittmayer, 2016; Geels, 2014). This has led to a greater focus on trying to understand the role of agency, power and politics within the regime and the regime's interaction with other actors during transition periods (Avelino & Wittmayer, 2016; Geels, 2011, 2014; Osunmuyiwa et al., 2017). One of the ways to address this is by seeking greater understanding of the regime actors and drawing attention to the power relation between regime and niche actors through exploring the politico-economic aspect of the MLP (Geels, 2014; Osunmuyiwa et al., 2017). Geels (2014) building off of Levy and Newell (2002) suggests that policy makers and incumbent actors form a core alliance at the regime level that can be described as a "historical bloc" (Geels, 2014; Levy & Newell,

2002). The observation of regime actors as a “historical bloc” is useful as it provides a frame for understanding how regime actors maintain their power (Geels, 2014). Two tools that draw from this theory will be of particular importance to this discussion: *Instrumental* forms of power that acknowledge the discrepancies of power between regime and niches by recognizing that regimes are often in positions of authority and have access to greater resources, media, personnel and capabilities putting niches at a disadvantage; and *discursive strategies* that describe how regimes can contribute to establishing dominant discourses that can set *what* issues are discussed and *how* those issues are being discussed (Avelino & Rotmans, 2009).

Thus, with a specific focus on the power relationship between regime and niche actors, this paper focuses on the politico-economic sphere of the MLP. By discussing the role of Indigenous niche actors and the hydro regime actor in Ontario’s electricity system, this paper will seek to better understand the relationships between actors and their influence on sociotechnical transitions.

BACKGROUND

Division of Powers

Obligations to and jurisdiction over certain issues affecting Indigenous Peoples in Canada are divided between the federal and provincial governments. A brief description of relevant responsibilities are described below.

Federal Authority

The Federal government’s exclusive legislative authority is exercised primarily in relation to the on-reserve and registered “status Indian”.² The scope of this authority is outlined in the

² The term “Indian” has largely fallen out of use and has been replaced by First Nation, however it is an important legal term under the *Indian Act* as it defines and guarantees rights to those that qualify as “status Indians”.

controversial *Indian Act* which governs almost all aspects of the lives and lands of “status Indians” by defining who has status, regulates band membership and government, taxation, lands and resources, wills and estates, and education (Parliament of Canada, 2001).

Provincial Authority

Provincial laws must not infringe upon an area of exclusive federal jurisdiction and can be “declared of no force and effect if it unjustifiably infringes an existing Aboriginal or treaty right protected under section 35 of the *Constitution Act, 1982*” (Parliament of Canada, 2001). Provincial governments do however offer services to Indigenous residents.

Indigenous Communities in Ontario

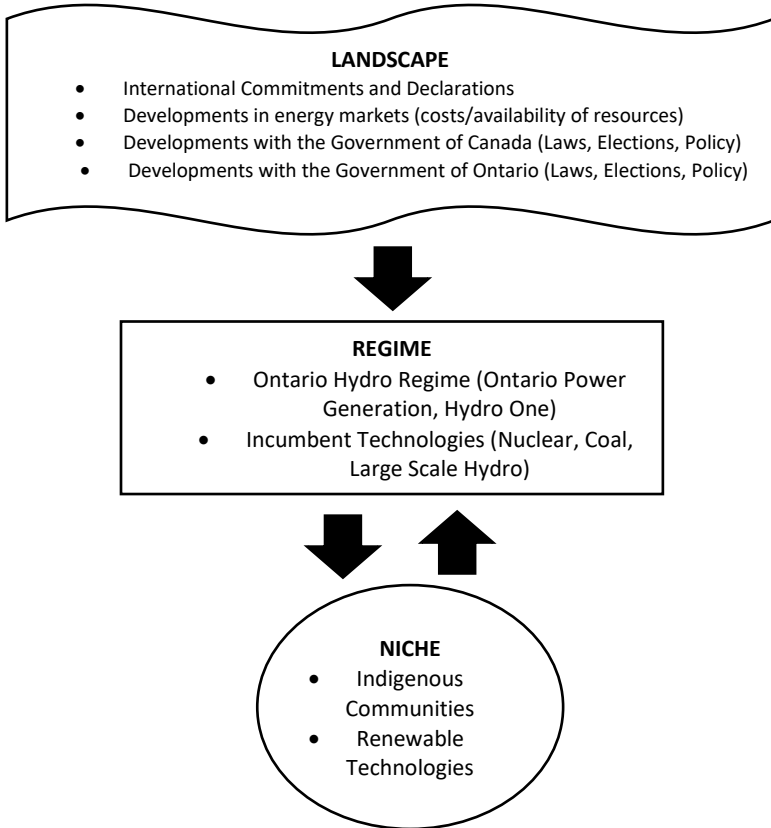
The province of Ontario has the highest population of Indigenous Peoples (301,425) of all the provinces accounting for 21.5% of Canada’s total Indigenous population (Statistics Canada, 2016). There are 46 treaties in Ontario that govern approximately 207 First Nation communities throughout the provinces. Although the federal government has significant authority over Indigenous policy, many policies at the provincial level can have significant effects on Indigenous communities. This is especially true for energy and electricity, where policy is largely under provincial jurisdiction. The heavy involvement of both levels of government in policy affecting Indigenous communities make them important components of the *landscape* in this discussion.

THE EVOLUTION OF INDIGENOUS PARTICIPATION IN ONTARIO’S ELECTRICITY SYSTEM

Ontario’s electricity system is a hybrid system in which aspects of ownership, operation and investment of generation can be both public and private (Rosenbloom & Meadowcroft, 2014). Ontario’s system was not always this way. Rosenbloom and Meadowcroft (2014) utilize the MLP to track the evolution of Ontario’s electricity system and categorize it in three distinct timelines: the Dawn of Power (1906–1922), the Endless

Expansion (1922–1997) and the Hybrid (2004–onwards) (Rosenbloom & Meadowcroft, 2014). The paper draws from these insights, and modifies them to better align with the evolution of various stages of Indigenous community involvement in Ontario’s energy system. The time periods have thus been modified to better frame the context of this paper: Expansion at All Costs (1900–1982), Changing Relationships and Forging Partnerships (1982–2003), and the Rise of Niche Actors and Niche Technologies (2003–onwards). Expansion at All Costs (1900–1982) is characterized by rapid expansion of generating capacity and a period where Indigenous communities’ rights were not respected. The period of Changing Relationships and Forging Partnerships (1982–2003) is characterized by key court challenges and the signing of favourable agreements with Indigenous communities; these developments show a significant evolution in the Canadian understanding of Indigenous rights. Finally, the Rise of Niche Actors and Niche Technologies (2003 – Onwards) period culminates in rapid and widespread deployment of niche generation technologies by Indigenous actors. By modifying these timelines, one aligns the participation of Indigenous actors with the wider political developments of Indigenous rights in Canada. These connections will show how political shifts in the landscape are crucial in shaping regime systems and their relationship with other actors. As actors can foster or deter transitions they are briefly identified and their roles defined below.

Figure 1: A snapshot of the Ontario Landscape, Regime Actors and Niche Actors. Landscape pressures act on regimes and niches. Regime actors exert considerable influence on niche actors, while niche actors seeking to influence the regime exert little influence. Source: Author's compilation.



EXPANSION AT ALL COSTS: ESTABLISHING THE REGIME (1900 – 1982)

The period of *Expansion at all Costs* is characterized by the needs of a growing province to meet its energy needs and a period when Indigenous communities were not viewed as

equal participants in Canadian society. However, the end of this period also saw progressive developments in Indigenous policy. From the beginning of the period to its end, significant landscape developments represented by changes in Indigenous policy had ramifications for how Ontario built its electricity system in the periods that followed. The major regime actors in this period were private electricity operators and Ontario Hydro. Both actors showed little respect for Indigenous Canadians and treaty rights, made evident by their lack of consideration for consultation and/or compensation when communities were affected by development. Typical of instrumental forms of power, niche Indigenous actors rarely had the resources to take part in institutionalized recourse against the regime for their grievances, but they were also subject to discursive strategies that affected *how* their grievances would be received in these institutionalized environments. The result was an inability to contest developments even when those developments would drastically affect their lives.

Shocks in the energy and political landscapes simultaneously spurred a transition away from coal and private electricity generation. During the first few decades of the twentieth century, Ontario's electricity system was mostly run by private enterprises and heavily reliant on coal (Rosenbloom & Meadowcroft, 2014). The Pennsylvania Coal Workers Strike caused severe electricity shortages in Ontario, which spurred actors to seek hydroelectric developments as a reliable replacement (Rosenbloom & Meadowcroft, 2014). After a significant political push, the incumbent actors and advocates for a privatized electricity system were defeated, and in 1922 the public utility, Ontario Hydro, was established and had acquired the last remaining privately owned electricity company signalling a significant shift in the operating regime (Rosenbloom & Meadowcroft, 2014). The move from coal to hydroelectricity and transformation from a private to a public system signified by the creation of a public regime displays how landscape developments and regime actors can drive

transitions. This new regime had severe implications for Indigenous communities in the province.

During the *Expansion at All Costs* period the Canadian and Ontario governments were busy finalizing the last of the numbered treaties to secure territory. With the signing of Treaty No. 9 in 1906, its adhesion treaty in 1929 and the Williams Treaty in 1923, the last of the Ontario treaties had been signed, solidifying provincial government geographic control of what is now the province of Ontario. However Ontario Hydro did little to respect Indigenous Peoples despite these new-found treaty rights.

Hydroelectric expansion and lack of legal recourse for First Nation communities defined this period with the flooding of First Nation communities. Industry, and the Ontario Government (through Hydro Ontario) were the regime actors that pursued these developments. The Ontario government has currently accepted four land claim agreements for review representing twenty First Nations communities in various parts of the province that claim their treaty land or unceded territory was affected by flooding during hydro-electric development (Government of Ontario, 2017a)³. These claims do not include other documented sources such as the flooding of Mattagami First Nation reserve lands in 1921, the effects of the Moose Cree First Nation down river from the Lower Mattagami hydroelectric facilities from 1928-1966, or the damming of sacred sites such as the Chaudière Falls in Ottawa in 1907 (Cragg & Schwartz, 1996; Free the Falls, n.d.; Henton, 1991; Hydro Ottawa, 2018; Morrison, 1986). The scale of damage has therefore not fully been determined. As current land claim agreements are in process with the provincial government, the lack of legal recourse during the time of the flooding and other undocumented cases make it a challenge to

³ Unceded territory refers to land where Aboriginal rights and title were never extinguished (Government of Ontario, 2018a).

understand how many or to what extent damage has been done, however with the information available, it is safe to say that the hydroelectric expansion of this period had significant impacts on First Nations communities for which those affected are still awaiting compensation. Other examples are more concrete.

The R.H. Saunders generating station opened in 1958 and is a run-of-the-river system on the St. Lawrence River with 1,045 megawatts (MW) of installed capacity (OPG, n.d.-b). Its construction required flooding habitable land that displaced over 6,500 people and a significant portion of the Mohawk Community of Akwesasne traditional territory (Ibid.). During the flooding, the First Nation community lost significant amounts of their territory including ten islands, burial grounds, sacred sites and fishing grounds (Ibid.). While other communities were compensated for their land, the Mohawk Community of Akwesasne did not receive compensation until 2008, fifty years after the generating station came online (Gorrie, 2008; Mohawk Council of Akwesasne, 2008; OPG, n.d.-b).

Table 1: List of First Nation communities and land claim agreements pursuing compensation for flooding Source: Government of Ontario, 2017a

Claim Type	First Nation Communities
Flooding	<ul style="list-style-type: none"> • Lac des Mille Lacs
Flooding (Lake of the woods/Shoal Lake/Winnipeg River First Nations)	<ul style="list-style-type: none"> • Anishinabe Wauzhushk Onigum (Rat Portage) • Anishnaabeg of Naongashing (Big Island) • Big Grassy (Mishkosiminiziibiing) • Buffalo Point • Iskatewizaagegan No. 39 (Shoal Lake 39)

	<ul style="list-style-type: none"> • Naotkamegwaning (Whitefish Bay) • Northwest Angle 33 • Northwest Angle 37 • Obashkaandagaang (Washagamis Bay) • Ochiichagwe'babigo'ining (Dalles) • Ojibways of Onigaming • Rainy River • Shoal Lake 40
Flooding due to damming	<ul style="list-style-type: none"> • Mississauga #8
Flooding due to hydroelectric dams (Rainy Lake First Nations)	<ul style="list-style-type: none"> • Couchiching • Mitaanjigamiing (Stanjikoming) • Naicatchewenin • Nigigoonsiminikaaning (NICKOUSEMENECANING) • Seine River

From the beginning of the twentieth century to the 1980's, Ontario Hydro established itself as the incumbent regime actor in Ontario's electricity system. At this point the relationship between Ontario Hydro and Indigenous communities was defined by drastic discrepancies in power dynamics characteristic of regime – niche relations. Ontario Hydro was able to exert significant influence over Indigenous communities and expand hydroelectric facilities to their detriment. If there was a means of viable recourse, there is little evidence that it was available to Indigenous niche actors to express their grievances as demonstrated in the number of land claim agreements still in process with the Ontario government and the amount of time it has taken to reach settlement agreements like the one between Ontario Power

Generation (OPG) and the Mohawk Community of Akwesasne. This is evidence of the clear power dynamics between Ontario Hydro and Indigenous communities characteristic of this age of expansion. It is evident that the regime actor, Ontario Hydro, could easily use instrumental power through its position of authority as a state-backed utility to amass significant resources to rebuff any claims from Indigenous communities. Furthermore, through its position of authority it could easily employ discursive strategies to shape the discourse, justifying that the benefits of infrastructure expansion outweighed government obligations to Indigenous communities. Before this period is over, this discourse was challenged due to pressures beyond the regime's control.

Changing Landscape

Significant changes in the landscape had drastic implications for regime actors in Ontario. In 1960, First Nations could vote without relinquishing their status rights; thirteen years later in 1973, the Calder Decision examined and broadened the scope of "Aboriginal title" which was instrumental in paving the way for the 1975 James Bay and Northern Quebec Agreement (JBNQA) which was signed in response to massive hydroelectric developments in northern Quebec that flooded Cree and Inuit traditional territory (Aboriginal Affairs and Northern Development Canada, 2014; Berger, et al., 2010; CBC News, 2010). Finally in 1982, Aboriginal rights were enshrined in the Canadian Constitution (Constitution Act, 1982). These three key events drastically changed the landscape in regard to Indigenous rights and put significant pressure on existing regimes to respect them. In the case of the JBNQA, this was a massive victory. For the first time, Indigenous actors successfully challenged a powerful, state-backed hydro regime and won. These decisions signified important landscape shifts in Indigenous policy, which would have far reaching implications for regime actors in Ontario.

The signing of the JBNQA signified increasing pressures on regime actors from both niche actors and the wider changing landscape embodied in the growing recognition of Indigenous

rights. Indigenous communities had long been affected by hydroelectric developments, but had little influence in their development or a meaningful way to seek justice in a legal system that had long been dominated by regime actors. The victory of niche actors in Quebec and the changing landscape was not unnoticed in Ontario's electricity system as niche actors began to link up with wider change processes.

CHANGING RELATIONSHIPS AND FORGING PARTNERSHIPS (1982 – 2003)

The period of *Changing Relationships and Forging Partnerships* is characterized by the same desire for expansion, however with greater fluctuations in actors and policy in Ontario's electricity system (Rosenbloom & Meadowcroft, 2014). This period saw fluctuations in actors as the system moves between a publicly owned and operated system to a push for greater privatization fuelled by political events; on the sociotechnical side, nuclear and coal became regime technologies (Rosenbloom & Meadowcroft, 2014). On the wider political level the period is further shaped by developments in Indigenous policy that continued to build off of the formative landscape transformations of the *Expansion at All Costs* period as greater understanding and clarification of Indigenous rights were determined.

The shifting landscape opened up doors for new Indigenous participants in Ontario's electrical system. With the seventeen words "the existing aboriginal and treaty rights of the aboriginal peoples of Canada are hereby recognized and affirmed", the Canadian government officially enshrined Aboriginal rights in the Canadian Constitution (Constitution Act, 1982)." These words gave Indigenous communities a more accessible means of legal recourse to challenge violations of their rights which were often ignored before.⁴

⁴ As described by Bowie (2013) it is important to note that social justice and sustainability frame two broad views that come to different conclusions on the state of Indigenous resource

With major landscape shifts in Indigenous policy, communities began exploring their options for electricity generation.

The fluctuation in incumbent regime actors from landscape pressures opened the door for Indigenous niche actors to begin to explore the space of electrical generation. The period of 1973–1991 is categorized by a period of flux that posed challenges to the current regime from landscape pressures according to Rosenbloom and Meadowcroft (2014). These pressures and new developments in the Indigenous policy landscape created opportunities for Indigenous niche actors to enter the electricity sector. The first of these breakthroughs was the Biigtigong Nishnaabeg (Ojibway of the Pic River First Nation) who partnered with Inergex and Regional Power Inc for a minority position in the 13.5 MW Wawatay hydroelectric project (Lumos Clean Energy Advisors, 2017a). The generating station became operational in 1991 and the community has since used the experience to become a major energy developer with over \$124 million in total investments and involvement in five hydroelectric generating stations with the combined capacity of 55 MW (Krupa, 2012a; Lumos Clean Energy Advisors, 2017a). The arrival of Biigtigong Nishnaabeg (Ojibway of the Pic River First Nation) as a player in electrical generation in Ontario is significant as it shows a political niche actor moving into territory that was previously held by the regime. Around the same time, developments on the Moose River were garnering the attention of both the Ontario Government and the Moose Cree First Nation.

management. One focuses on Indigenous Peoples, power relations and resistance that conclude current management practices (negotiated with the state) are a continuation of colonial relations and the indoctrination of Indigenous Peoples into state managed institutions. The second focuses on collaboration and social learning that view the relation as Indigenous Peoples contribution to the transformation of state management regimes from one of “command and control” to adaptive and collaborative approaches (Bowie, 2013). This paper takes the view of the latter conclusion.

Four mighty rivers characterize Northern Ontario: the Moose River, the Albany River, the Attawapiskat River and the Severn River. In the Moose River basin, hydroelectric activities have long affected First Nations communities with four dams: Smoky Falls (1928), Little Long (1963), Harmon (1965) and Kipling (1966) (Cragg & Schwartz, 1996). Collectively, the dams form the Lower Mattagami system. Characteristically of the *Expansion at All Costs* period, these dams had significant effects on neighboring and downriver First Nations communities in the absence of consultation, mitigation or compensation by the Ontario Government, once again demonstrating the discursive strategies used by the regime (Cragg & Schwartz, 1996; Henton, 1991). This legacy manifested in local resistance when Ontario Hydro planned to expand the Lower Mattagami system. Due to resistance from local communities and landscape pressures, OPG and the Moose Cree First Nation came to an agreement in 1994 that secured the community a twenty-five per cent equity share in the six new generating units (450 MW capacity) as well as \$300 million worth of contracting opportunities that have been viewed as a compromise by both parties — evidence of the weakening of the regimes ability to apply discursive strategies (Canadian Hydropower Association, n.d.; Garrick, 2015; OPG, n.d.-a).

These two successful endeavours display the effects of a changing landscape as well as the beginning of Indigenous niche actors in Ontario's electricity system. Further landscape changes were underway that would continue to have lasting impacts in both fields. In 1990, Member of the Legislative Assembly of Manitoba Elijah Harper's opposition to the Meech Lake Accord brought Indigenous issues back into the public eye and in the years to follow, Ontario implemented two lasting policy commitments: the Moose River Basin Commitment and the Northern Rivers Commitment. Both commitments outline the conditions for future hydroelectric development on these northern rivers that required firm commitment from First

Nations communities before any hydroelectric project over 25 MW could be built (Ontario Power Authority, 2005; Ontario Waterpower Association & Government of Ontario, 2005). It is important to note that these commitments have largely been maintained, signifying an important development in the relationship between the Government of Ontario and First Nations communities.

In the electricity sphere, politics were influencing a changing regime. In 1998 the *Energy Competition Act* was passed, dismantling Ontario Hydro. This divided the company into one transmission and one distribution company in the hopes of moving the sector towards greater privatization (Rosenbloom & Meadowcroft, 2014). The sector moved towards greater competitiveness in electricity markets, but not privatization, this coupled with a greater emphasis on the environment by political actors ushered in a new era that was optimal for Indigenous participation. The *Changing Relationships and Forging Partnerships* phase of Ontario's electricity system begins to show the changes in regime power as communities that historically had little say in energy projects started to forge partnerships and agreements that could apply pressure on the regime. It clearly builds off of important developments in the Indigenous policy landscape that came about in the latter portion of the previous developmental stage which gives greater voice to niche actors to influence the sociotechnical transition.

THE RISE OF NICHE ACTORS AND NICHE TECHNOLOGIES (2003 – PRESENT)

The *Niche Actors and Niche Technologies* period is defined by the influence of politics on regime configuration; key political developments provided optimal opportunities for Indigenous actors to participate more fully in the electricity system. After going through a period of flux, Ontario's electricity system changed again to incorporate both aspects of privatization and public ownership and operation in what Rosenbloom and

Meadowcroft term as the “Hybrid System” (Rosenbloom & Meadowcroft, 2014). This system was the result of significant landscape developments in the North American electricity landscape and efforts from the McGuinty Liberal government to make positive linkages between environmental and economic policy (Rosenbloom & Meadowcroft, 2014; Winfield, 2012). Three major commitments define this period: the commitment to phase out coal from Ontario’s electricity system; an obligation to enhance energy conservation measures; and, crucially, the implementation of supports for renewable energy technologies with the Renewable Energy Source Request for Proposals, the Renewable Energy Standard Offer Program (RESOP), the Feed In Tariff (FiT) program and in 2009, the *Green Energy and Green Economy Act* (Rosenbloom & Meadowcroft, 2014). These political developments would have profound influence not only on the make-up of Ontario’s electricity system, but also make the most significant crossover between politico-economic and sociotechnical developments displayed in Ontario’s electricity policy and the involvement of Indigenous actors.

In 2009, dramatic landscape changes put significant pressure on regime actors enabling niche actors and niche technologies to break through to become part of Ontario’s electricity system. After a period of domination by politico-economic regime state-owned actors, and sociotechnical regime technologies, the year 2009 marked a crucial turning point in supports for niche actors to enter the market. With the *Green Energy and Green Economy Act* and all its support for renewable energy technology, the Ontario Liberal Party government carved out room for niche participation (Rosenbloom & Meadowcroft, 2014). Indigenous actors had long been affected by energy projects carried out by the regime with little or no significant recourse and were confronted with barriers when trying to develop their own electrical generation projects (Krupa, 2012b). The new developments in 2009 with significant incentives for private

actors to participate in renewable energy production changed this.

Indigenous communities as niche actors began utilizing niche technologies to participate in the electricity system. Renewable energy programs became a true incentive for Indigenous communities. By implementing these projects, Indigenous communities complimented the political landscape pressures on the regime by providing a nurturing environment for these niche technologies and by doing so, challenged the old regime configuration. From 1992 to 2016, forty-one projects with Indigenous participation and a capacity of 1 MW or greater came online or are nearing completion in approximately twenty communities boasting a combined generating capacity of 2082.3 MW.⁵ Most of these projects came online in the last seven years, proof of the effectiveness of support for renewable energy technologies. Other sources put this number even higher at 239 projects with 2,200 MW of capacity (Government of Ontario, 2017b).⁶ For communities that were largely at the whims of the energy regime for so long, this signaled a significant development in regime and niche relations.

⁵ See Annex A for details.

⁶ Discrepancies in project numbers are a product of defining Indigenous participation and the timelines used by the Government of Ontario. This paper has largely drawn from Powering Reconciliation by Lumos Clean Energy Advisors for its figures. The report defines “participation” as ownership, partnership, Impact Benefit Agreements, royalty agreements, and lease agreements. Projects with limited benefits are excluded. (Lumos Clean Energy Advisors, 2017b). Limited benefits are not defined in the report.

Table 2: Indigenous renewable energy projects as a share of Ontario’s generating capacity. Source: IESO, 2017; Lumos Clean Energy Advisors, 2017a.

Energy Source	Indigenous Installed Capacity (MW)	Ontario Installed Capacity (MW)	Share of Total Installed Capacity
Wind	1248.9	4,313	29%
Solar	211.5	380	56%
Hydro	614.4	8,472	7%
Biofuel	7.5	495	1%
TOTAL	2082	13, 660	15%

The period of *Niche Actors and Niche Technologies* saw drastic social and technological transformations in Ontario’s electricity system. Spurred by landscape pressures caused by political developments, the electricity regime was challenged as the governing Ontario Liberal Party⁷ carved out space for niche actors to take root in the electricity system. This period saw a significant increase in participation from Indigenous communities who utilized both regime and niche technologies to become actively involved in the new electricity system. This however could not have taken place without the developments of Indigenous policy in the previous stages that signified important changes in the wider politico-economic landscape. The crossover and influence from these previous stages are significant, as the gradual and deserved recognition of Indigenous legal rights began to determine that Indigenous communities were not passive actors unfairly subjected to the whims of regime projects, but active players able to influence and foster the growth of niche technologies. In this final and current stage, it is clear that the uptake of niche technologies

⁷ At the time this paper was published, the Ontario Liberal Party was replaced by the Ontario Conservative Party in the Ontario Legislature. It is uncertain if the new government will continue along the same trajectory.

by Indigenous communities was influenced by the link with broader change processes in the politico-economic landscape.

MOVING FORWARD

The Ontario Government has played an important role in the adoption of niche technologies and incorporating them into the electricity system. Developments in the Indigenous policy landscape and Ontario environmental policy further provided tools for communities to become more actively involved in implementing their own energy projects. Ontario is undergoing another period of flux where future political decisions may influence the direction on whether Ontario continues to challenge regime structures and foster the adoption of niche technologies or recommit to former processes.

Ontario's Long-Term Energy Plan

Delivering Fairness and Choice: Ontario's Long Term Energy Plan 2017 (OLTEP) restates its commitment to Indigenous participation in Ontario's electrical system; however, decisions in the last mandate of the Ontario Liberal Party have also removed some of the supports that may have been crucial to technology uptake by communities. The OLTEP highlights the important role Indigenous communities have in Ontario's electricity system citing the 2,200 MW of generating capacity (Government of Ontario, 2017b)⁸. It commits to continue support for community energy plans and providing support to address high electricity costs in remote communities as well as grid connection projects (Government of Ontario, 2017b). These are all positive initiatives, however it falls short on support for larger renewable energy projects critical for a renewable energy transition. In 2016, the Ontario Government announced the suspension of the Large Renewable Energy

⁸ Discrepancies in generating capacity from Ontario's Long Term Energy Plan and the figures in this paper are due to the availability of sources and the choice by the author to only count projects over 1 MW. For greater details see Annex. A.

Procurement Program as well as the FiT programs. Although the Ontario Government has committed support for energy programs that focus on conservation and energy efficiency, the cancellation of these incentive programs may affect the uptake of renewable sources in the future.

Off-Grid and Remote Communities

There are thirty-five off-grid communities with a total population of 21, 342 in Ontario; over half of that population is Indigenous (Aboriginal Affairs and Northern Development Canada and Natural Resources Canada, 2011). Twenty-five of these are First Nations communities that rely solely on diesel fuel to power their communities (Government of Ontario, 2017b). These communities have been constrained by the capacity and reliability of their aging diesel generating systems leading to a plague of issues, including diesel spills, black outs, and social and mental health issues related to the inability to expand essential infrastructure (Bombicino, 2016; Freyman, 2017; McCarthy, 2017). The lack of attention to these crucial energy related issues for so long by both levels of government indicate that although progress has been made in the relationship between the centralized regime and First Nations communities, a clear power dynamic remains. Indigenous and Northern Affairs Canada and the Government of Ontario have recently announced support for the Wataynikaneyap project that would connect twenty-one of these remote communities (Government of Ontario, 2017b; McCarthy, 2017). If the project progresses as it should, it is expected that they will be connected by 2023 (“Wataynikaneyap Project,” n.d.).

CONCLUSION

This paper shows the significance of incorporating politico-economic analysis into the MLP. By focusing on Indigenous communities in Ontario, this paper has been able to explore the political and power relationship between regime and niche actors and the influence of political landscape developments in sociotechnical transitions. It has shown the clear political power relationships that were key to stalling development and

how political intricacies were important factors in contributing greater power to Indigenous niche actors. By using this approach, this paper seeks to integrate politico-economic perspectives for their role in shaping sociotechnical transitions to build off of and contribute to a more integrated MLP framework.

ANNEX A: List of Indigenous renewable energy projects over 1 MW. All data taken from Powering Reconciliation by Lumos Clean Energy Advisors, when information was missing other sources were used to supplement the data. Source: Lumos Clean Energy Advisors, 2017b, 2017a; Oxford Community Cooperative, 2017.

Project Name	Community	Partner	Source	Capacity	Date
Rainy River (3 projects one site - Morley, Dave Rampel, Vanzwolf)	Rainy River First Nation	Connor Clark & Lunn Infrastructure partner	Solar	25 MW	2014
Lac Seul Hydro Obishikokaanig Waasiganikewigamig	Lac Seul Hydro Obishikokaanig Waasiganikewigamig	Ontario Power Generation Inc.	Hydro	12 MW	2009
Thunder Bay Airport	Fort William (Ojibways of Onigaming First Nation)	Sky Power	Solar	9 MW	2013
Fort William First Nation Solar Park	Fort William (Ojibways of Onigaming First Nation)	Sky Power	Solar	10 MW	2014

Greenwich Wind farm	Fort William (Ojibways of Onigaming First Nation)	Enbridge Inc.	Wind	98.9 MW	2011
Namewamini kan Waterpower Project (Twin Falls (4.4 MW) and Long Rapids (5.6 MW))	Bingwi Neyaashi Anishinaabek, Animbiigoo Zaagi'igan Anishinaabek Biinjitiwaabik Zaaging Anishinaabek	Namewamini Hydro Inc.	Hydro	10 MW	2016
Pic River Hydro Project (High Falls and Manitou Falls)	Biigtigong Nishnaabeg (Ojibway of the Pic River First Nation)	First Nation	Hydro	6 MW	2014
Twin Falls Hydroelectric Project (Kagiano)	Biigtigong Nishnaabeg (Ojibway of the Pic River First Nation)	Kagiano Power Corporation	Hydro	5 MW	2001
Wawatay Station Hydroelectric Project (Black River)	Biigtigong Nishnaabeg (Ojibway of the Pic River First Nation)	Innergex Developed with Regional Power, the Band holds a minority position	Hydro	13.5 MW	1992
Umbata Falls Hydroelectric Project	Biigtigong Nishnaabeg (Ojibway of the Pic River First Nation)	Umbata Falls LP Innergex (49)	Hydro	23 MW	2008

Gitchi Animki Hydroelectric Project (Gitchi Animki Bezhig & Gitchi Animki Niizh) Upper and Lower White River	Pic Mobert First Nation	Pic Mobert Hydro Inc.	Hydro	18.9 MW	2015
White River Forest Products	Biigtigong Nishnaabeg (Ojibway of the Pic River First Nation)	Drayton Valley Power Ltd.	Biomass	7.5 MW	2013
Lower Mattagami River Project (Little Long, Smoky Falls, Harmon, and Kipling)	Moose Cree First Nation	Ontario Power Generation Inc.	Hydro	450 MW	2015
Big Beaver Falls	Wabun Tribal Council Brunswick House First Nation, Chapleau Ojibwe First Nation and Chapleau Cree First Nation	Amik-Bbf Hydrokap L.P.	Hydro	5.5 MW	2013
Camp Three Rapids	Wabun Tribal Council Brunswick House First Nation, Chapleau Ojibwe First Nation and	Amik-Bbf Hydrokap L.P.	Hydro	5.5 MW	2013

	Chapleau Cree First Nation				
White Otter Falls	Wabun Tribal Council Brunswick House First Nation, Chapleau Ojibwe First Nation and Chapleau Cree First Nation	Nipiy-Wof Hydrokap L.P.	Hydro	5.5 MW	2013
Old Woman Falls	Wabun Tribal Council Brunswick House First Nation, Chapleau Ojibwe First Nation and Chapleau Cree First Nation	Nipiy-Owf Hydrokap L.P.	Hydro	5.5 MW	2013
Four Phase III Solar Power Projects "Cochrane Solar"	Taykwa Tagamou Nation and Wahgoshig First Nation	Northland Power Inc.	Solar	40 MW	2015
Bow Lake Wind	Batchewana First Nation (Chinodin Chigumi Nodin Kitagan)	Nodin Kitagan Limited Partnership	Wind	58.3 MW	2015

Mother Earth Renewable Energy Wind Project	M'Chigeeng First Nation	3G Energy	Wind	4 MW	2012
Okikendawt Hydroelectric Project	Dokis First Nation	Okikendawt Hydro L.P.	Hydro	10 MW	2015
Rooftop Solar (13)	Shawanaga First Nation	Strathcona Energy Group (SEG)	Solar	1.8 MW	2015
Alderville First Nation Solar PV Groundmount Project	Alderville First Nation	Alderville Solar Limited Partnership	Solar	5.7 MW	2013
Dufferin Wind Power	Six Nation of the Grand River	Dufferin Wind Power Inc.	Wind	91.4 MW	2014
Welland Ridge Road	Six Nation of the Grand River	Sune Welland Ridge LP	Solar	10 MW	2014
Niagara Regional Wind Farm	Six Nation of the Grand River	Boralex, Enercon	Wind	230 MW	2016
Grand Renewable Energy Park	Six Nation of the Grand River	Pattern Energy, Samsung	Wind	148.6 MW	2014
Grand Renewable Energy Park	Six Nation of the Grand River	Samsung C&T, Conner Clark & Lunn Infrastructure, and Six Nations.	Solar	100 MW	2015

Port Dover / Nanticoke	Six Nation of the Grand River	Capital Power (PDN) L.P.	Wind	104.4 MW	2014
Norfolk Bloomsburg	Six Nation of the Grand River	Suncor Norfolk Bloomsburg LP	Solar	10 MW	2013
Gunn's Hill Wind Farm	Six Nation of the Grand River	Prowind	Wind	18 MW	2016
South Kent	Walpole Island First Nation		Wind	270 MW	2014
Adelaide (Suncor)	Aamjiwnaang First Nation	Suncor Adelaide Wind Limited Partnership	Wind	40 MW	2015
Grand Bend Wind Farm	Giiwedini Noodin FN Energy Corporation (The Aamjiwnaang and Bkejwanong First Nations)	Giiwedini Noodin ("North Wind"), Northlands Power (50%), ecoENERGY	Wind	100 MW	2016

REFERENCES

- Aboriginal Affairs and Northern Development Canada. (2014). The James Bay and Northern Quebec Agreement and the Northeastern Quebec Agreement - Annual Reports 2008-2009 / 2009-2010. Retrieved from <https://www.aadnc-aandc.gc.ca/eng/1407867973532/1407868059939>
- Aboriginal Affairs and Northern Development Canada and Natural Resources Canada. (2011). *Status of Remote/Off-Grid Communities in Canada*.
- Avelino, F., & Rotmans, J. (2009). "Power in transition: An interdisciplinary framework to study power in relation to structural change." *European Journal of Social Theory*, vol 12, no 4, 543–569.
- Avelino, F., & Wittmayer, J. M. (2016). Shifting Power Relations in Sustainability Transitions : A Multi-Actor Perspective. *Journal of Environmental Policy*, vol 18, 628–249.
- Berger, T., Kennett, S. A., & King, H. (2010). *Canada's North: What's the Plan?* Retrieved from <http://assembly.nu.ca/library/Edocs/2010/000940-e.pdf>
- Bombicino, E. (2016). How Energy Poverty Devastates Pikangikum. *TVO*. Retrieved from <https://tvo.org/article/current-affairs/shared-values/how-energy-poverty-devastates-pikangikum-first-nation>
- Bowie, R. (2013). Indigenous Self-Governance and the Deployment of Knowledge in Collaborative Environmental Management in Canada. *Journal of Canadian Studies*, vol 47 no 1.

- Cairns, A. C. (2000). *Citizens Plus: Aboriginal Peoples and the Canadian State*. Vancouver: University of British Columbia Press.
- Canadian Hydropower Association. (n.d.). *Paths Forward: Hydropower and Aboriginal Relationships Across Canada*. Retrieved from https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/energy-resources/Paths_Forward_-_Hydropower.pdf
- CBC News. (2010). First Nations right to vote granted 50 years ago. Retrieved from <http://www.cbc.ca/news/canada/north/first-nations-right-to-vote-granted-50-years-ago-1.899354>
- Constitution Act (1982). Retrieved from <http://laws-lois.justice.gc.ca/eng/Const/page-16.html>
- Cragg, W., & Schwartz, M. (1996). Sustainability and historical injustice : Lessons from the Moose River Basin. *Journal of Canadian Studies*, vol 31, 60–81.
- Free the Falls. (n.d.). Vision: the Falls. Retrieved from <https://freethefalls.ca/vision/the-falls/>
- Freyman, S. (2017, January 6). Industry and Indigenous Communities Let the Sun Shine In on the Shared Problem of Diesel. *Financial Post*. Retrieved from <http://business.financialpost.com/commodities/energy/industry-and-indigenous-communities-let-the-sun-in-on-the-shared-problem-of-diesel>
- Garrick, R. (2015). Moose Cree Foresees Benefits from Lower Mattagami Project. Retrieved from <http://www.wawataynews.ca/wwt/business/moose-cree-foresees-benefits-lower-mattagami-project>

- Geels, F. W. (2004). "From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory." *Research Policy*, vol 33(6–7), 897–920.
- Geels, F. W. (2011). "Environmental Innovation and Societal Transitions The multi-level perspective on sustainability transitions : Responses to seven criticisms." *Environmental Innovation and Societal Transitions*, vol 1, no 1, 24–40.
- Geels, F. W. (2014). "Regime Resistance against Low-Carbon Transitions : Introducing Politics and Power into the Multi-Level Perspective," *Theory, Culture, and Society*, vol 31, no 5.
- Geels, F. W., & Schot, J. (2007). "Typology of sociotechnical transition pathways," *Research Policy*, vol 36, no 3, 399–417.
- Corrie, P. (2008, June 29). Our Own Three Gorges. *The Toronto Star*. Retrieved from https://www.thestar.com/news/insight/2008/06/29/our_own_three_gorges.html
- Government of Ontario. (2017a). Current Land Claims. Retrieved from <https://www.ontario.ca/page/current-land-claims>
- Government of Ontario. (2017b). *Delivering Fairness and Choice: Ontario's Energy Plan 2017*. Retrieved from <https://www.ontario.ca/document/2017-long-term-energy-plan>
- Government of Ontario. (2018a). The Algonquin Land Claim. Retrieved from <https://www.ontario.ca/page/algonquin-land-claim>

- Government of Ontario. (2018b). Treaties. Retrieved from <https://www.ontario.ca/page/treaties>
- Grant, J. A., Panagos, D., Hughes, M., & Mitchell, M. I. (2014). A Historical Institutional Understanding of Participatory Governance and Aboriginal Peoples: The Case of Policy Change in Ontario's Mining Sector. *Social Science Quarterly*, vol 9, no 4, 978–1000. <https://doi.org/10.1111/ssqu.12115>
- Haley, B. (2014). Low-Carbon Innovation From a Hydroelectric Base: The Case of Electric Vehicles in Quebec. *Environmental Innovation and Societal Transitions*, vol 14, no 5–25.
- Hedican, E. J. (2017). *The First Nations of Ontario: Social and Historical Transitions*. Toronto: Canadian Scholars.
- Henton, D. (1991, September). Ontario Cree Fight their Own "James Bay." *Toronto Star*.
- Hydro Ottawa. (2018). About Us. Retrieved from <https://hydroottawa.com/about/our-company/our-history>
- IESO. (2017). Ontario's Energy Supply Mix. Retrieved from <http://www.ieso.ca/learn/ontario-supply-mix/ontario-energy-capacity>
- Indigenous and Northern Affairs Canada. (2018). Ontario Region. Retrieved from <https://www.aadnc-aandc.gc.ca/eng/1100100020284/1100100020288>
- Krupa, J. (2012a). Blazing a new path forward : A case study on the renewable energy initiatives of the Pic River First Nation. *Environmental Development*, vol 3, 109–122.
- Krupa, J. (2012b). Identifying barriers to aboriginal renewable

energy deployment in Canada. *Energy Policy*, vol 42, 710–714.

Levy, D. L., & Newell, P. (2002). Business Strategy and International Environmental Governance: Toward a Neo-Gramscian Synthesis. *Global Environmental Politics*, vol 2, no 4, 84–101.

Lumos Clean Energy Advisors. (2017a). Indigenous Clean Energy Projects. Retrieved from <http://indigenoucleanenergy.com/ice-projects/>

Lumos Clean Energy Advisors. (2017b). *Powering Reconciliation*. Retrieved from https://mma.prnewswire.com/media/571359/Lumos_Energy_Powering_Reconciliation___Survey_of_Indigenous_part.pdf

McCarthy, S. (2017, August 17). Ottawa Approves \$60 Million in Funding for Electricity in Remote Ontario First Nation. *The Globe and Mail*.

Meadowcroft, J. (2011). Environmental Innovation and Societal Transitions Engaging with the politics of sustainability transitions. *Environmental Innovation and Societal Transitions*, vol 1, no 1) 70–75.

Mohawk Council of Akwesasne. (2008). Mohawk Council of Akwesasne Finalizes Settlement Agreement with Ontario Power Generation.

Morrison, J. (1986). TREATY RESEARCH REPORT TREATY No . 9.

Ontario Power Authority. (2005). *OPA - Power Systems Planning: Supply Mix Advice and Recommendations*.

Ontario Waterpower Association, & Government of Ontario.

- (2005). Ontario's Waterpower, (October).
- OPG. (n.d.-a). Lower Mattagami. Retrieved from <https://www.opg.com/generating-power/hydro/projects/lower-mattagami/Pages/lower-mattagami.aspx>
- OPG. (n.d.-b). RH Saunders Generating Station. Retrieved from <https://www.opg.com/generating-power/hydro/ottawa-st-lawrence/Pages/rh-saunders-station.aspx>
- Osunmuyiwa, O., Biermann, F., & Kalfagianni, A. (2017). "Applying the multi-level perspective on socio-technical transitions to rentier states : the case of renewable energy transitions in Nigeria," *Journal of Environmental Policy and Planning*. Vol 20, no 2, 143-156.
- Oxford Community Cooperative. (2017). Current Projects. Retrieved from <http://www.oxford-cec.ca/page-1741090>
- Parliament of Canada. (2001). Federal-Provincial Jurisdiction and Aboriginal Peoples. Retrieved November 23, 2017. Retrieved from <https://lop.parl.ca/content/lop/ResearchPublications/tips/tip88-e.htm>
- Rosenbloom, D., & Meadowcroft, J. (2014). "The journey towards decarbonization : Exploring socio-technical transitions in the electricity sector in the province of Ontario (1885 – 2013) and potential low-carbon pathways." *Energy Policy*, vol 65, 670–679.
- Smith, A., Voß, J., & Grin, J. (2010). "Innovation studies and sustainability transitions : The allure of the multi-level perspective and its challenges" *Research Policy*, vol 39,

no 4 435–448.

Statistics Canada. (2016). Aboriginal Peoples in Canada: First Nations People, Métis and Inuit.

Unruh, G. C. (2000). Understanding Carbon Lock-In. *Energy Policy*, vol 28, 817–830.

Wataynikaneyap Project. (n.d.). Retrieved from <http://www.wataypower.ca/node/7>

Winfield, M. S. (2012). *Blue-Green Province*. Vancouver: UBC Press.

Reimagining International Climate Change Policy: Lessons Learned from the Montreal Protocol

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INTRODUCTION

The ratification of the Montreal Protocol marked the first time the international community recognized our species' collective ability to affect Earth's environment on a planetary scale (American Chemical Society, 2017). The Montreal Protocol's success can be attributed to three key factors (1) successful problem identification and structuring, (2) the use of policy windows created by valence, and (3) international cooperation. As the most successful Multi-Lateral Environmental Agreement (MEA) in history, the Montreal Protocol provides an opportunity for policymakers to draw lessons and inform future international environmental policies.

The threat that climate change poses necessitates an examination of what makes MEAs successful. While the Paris Agreement was a significant step towards international consensus and cooperation on the climate change issue, the Paris Agreement and United Nations Framework Convention on Climate Change (UNFCCC) have been insufficient to address climate change. It is the contention of this essay that it is necessary to reconceptualise the framework within which international climate change policy is crafted, allowing for successful problem definition, the creation of valence driven policy windows, and effective international cooperation. This essay is divided into three parts. First the Montreal Protocol is examined to describe and analyze the elements that led to its success. Second, the Paris Agreement is discussed, identifying short-comings in both the agreement itself and the international climate change framework within which it was created. Finally, a possible future international climate

change framework centered on a hydrocarbon phase-out model is discussed.

THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEplete THE OZONE LAYER

In 1973, two American researchers studying the impacts of chlorofluorocarbons (CFCs) in the Earth's atmosphere discovered that CFC compounds, when acted upon by solar radiation, decompose in the stratosphere and release molecules of chlorine and chlorine-monoxide. These chlorine and chlorine-monoxide molecules were found to destroy ozone, contributing to the depletion of the ozone layer. These findings were confirmed by the National Academy of Sciences in 1976, prompting a ban on CFC-based aerosols in the United States, Norway, Sweden and Canada by 1978. While these initial bans were a significant step forward, ozone depletion was a global problem that required a global solution. The recognition by many members of the international community of the effects of CFCs on stratospheric ozone and the subsequent discovery of the Antarctic ozone hole set in motion a series of events that led to the Montreal Protocol. Fifty-six countries agreed to the Montreal Protocol, beginning the process of a global phase-out of CFCs and other ozone depleting substances. Since the initial 1989 agreement, the Montreal Protocol has undergone eight revisions, the most recent in 2016.

Scientists have causally linked international cooperation in phasing out CFCs and the slow recovery of the ozone hole. In January 2018, a National Aeronautics and Space Administration (NASA) study definitively proved that levels of ozone-destroying chlorine molecules continue to decline, resulting in less ozone depletion (Reiny, 2018). Scientists have predicted that the ozone hole will heal itself entirely by the end of this century (Reiny, 2018) due to the effectiveness of the Montreal Protocol's phase-out. In an era of decreasing confidence in multi-national institutions, the success of the

Montreal Protocol is a beacon of hope for future international agreements.

As the spectre of climate change looms large over the international community, carefully examining the Montreal Protocol to discern what elements made this agreement successful is paramount. The Montreal Protocol is widely considered the most successful MEA, if not the most successful international agreement in history. Though there are more than 1,100 MEAs covering nearly every imaginable environmental issue (Gonzalez, 2015), the Montreal Protocol distinguishes itself among these agreements as a testament to the global community's ability to address international environmental challenges. Reflecting on the context, structure, and implementation of the Montreal Protocol is necessary to guide future international climate change and environmental policy. Certainly, the magnitude of the threat that climate change poses necessitates an urgent evaluation and reconceptualization of what elements make international environmental policies and frameworks effective. While addressing climate change will be much more difficult than addressing ozone depletion by virtue of the fact that climate change is more complicated, there are still lessons to be learned from the Montreal Protocol.

MONTREAL PROTOCOL PROBLEM IDENTIFICATION AND STRUCTURING

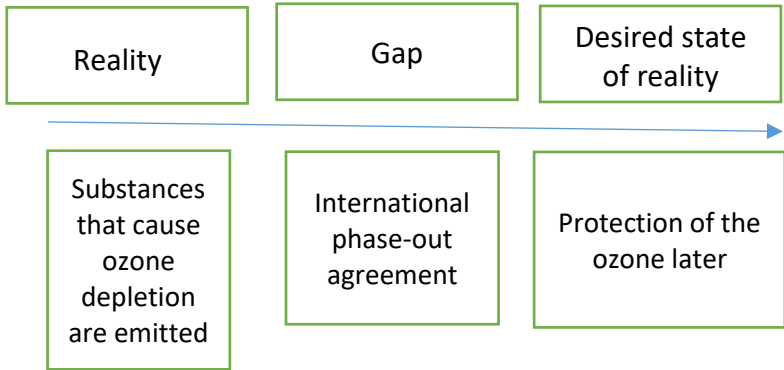
Problem definition is the foundation on which further policy action is built. As Dunn notes: "problem structuring is a central guidance system... that affects the success of all subsequent phases of policy analysis," (Pal, 2014). The conceptualization of the problem at hand necessarily informs the subsequent response(s); there can be no effective response or solution without first recognizing, defining, structuring, and articulating the problem (Pal, 2014). What constitutes a policy problem is not easily defined, but all definitions share three basic components: (1) the current reality: the current state of affair in which unrealized needs

or values exist, (2) a desired state of affairs: in which there is an improvement on reality, and (3) a gap between these two states (Pal, 2014). This simplified view of problem identification provides insight into how public problems are understood and approached by policymakers. These three components inform the subsequent discussion of the Montreal Protocol's problem definition process.

The Montreal Protocol's successful implementation began with clear problem identification and structuring, which provided a foundation for cogent and effective policy action. Taking the simplified view of problem identification, the Montreal Protocol successfully defined all three unknowns (Figure 1). By 1987, the countries convening in Montreal knew that CFCs and similar substances⁹ were causing stratospheric ozone depletion. Furthermore, the international community recognized that ozone depletion was leading to an increase in UVB rays reaching Earth surface, exposing certain areas of the world to an increase in UVB index and therefore higher incidence of skin cancer. The current state of affairs was well understood and perceived to be problematic. Consensus was reached despite significant industry opposition and trade group push-backs, reminiscent of contemporary climate change skepticism campaigns (Gonzalez, 2015). The desired state of affairs defined by the Montreal Protocol was the protection of the ozone layer at the earliest possible time, given the urgency of the issue from a public health standpoint. The gap between the reality and desired state of reality was the selected policy action: the phase out of ozone depleting substances. The *clarity* and *specificity* that was reached on this issue was indispensable to the success of the Montreal Protocol.

⁹ CFCs, hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs) were the primary agents causing ozone depletion.

Figure 1. Montreal Protocol Problem Identification and Structuring. Source: Author's contribution



VALENCE AND THE MONTREAL PROTOCOL

Valence is still a relatively new concept within policy studies, though it is gaining wide usage in related social science fields. Cox and Béland suggest that within policy studies, valence can be used to describe how pre-rational processes create policy preferences based on emotional triggers (Cox and Béland, 2013). Valence describes how an individual's perception and reception of a policy is determined by emotional responses as much as logic or reason. If a policy idea has high valence, it has a strong connection to an individual's emotional state. Going beyond the individual, to the extent that a group (e.g. epistemic community or electorate) can be said to have a collective emotional state, valence can help explain why some policy ideas are broadly embraced and others are rejected (Cox and Béland, 2013). The notion that support for a policy initiative can be garnered through an appeal to emotional responses rather than solely relying on rational processes adds a new dimension to

polymaking. Furthermore, high valence can be used to create “policy windows,” or a point in time when circumstances become conducive to adopting a course of action (Cox and Béland, 2013). If an issue or event generates a large-scale emotional response, the increase in valence allows policymakers to take action that otherwise wouldn’t be politically feasible.

Valence contributed heavily to the success of the Montreal Protocol. Without high levels of valence, it is unlikely that policymakers would have been able to take the relatively extreme international action necessary to address ozone depletion. As the depletion of stratospheric ozone (which absorbs most of the UVB radiation reaching the Earth’s surface) by CFCs was linked to skin cancer, ozone depletion became increasingly salient in public and scientific discourse. The relationship between ozone depletion and cancer created a policy window for international action simply because cancer is an extremely high valence issue. Cancer undoubtedly provokes a deeply emotional, quasi-irrational response from the public. From funding for scientific research, to headlines, to charity events and beyond, cancer is an enduring public crisis and concern. The high incidence of cancer¹⁰ across the world means that it is virtually impossible for an individual not to be impacted by cancer, either personally or through their relationships.

When ozone depletion was linked to skin cancer, it created a high valence, emotionally-charged policy window for international action. Valence is therefore effective in explaining and describing the conditions that made the Montreal Protocol successful. It seems unlikely that ozone depletion on its own could have generated high valence; only those with the specialized knowledge required to appreciate the harm ozone depletion was doing to Earth’s natural

¹⁰ 1 in 2 Canadians are expected to get cancer in their lifetime (Canadian Cancer Society, 2017)

systems would have viewed ozone depletion as a high-priority issue. Even among those who understood the impact of ozone depletion, there is no guarantee that the issue would take on an *emotional* quality. To this point, the crux was the established connection between ozone depletion and skin cancer. While ozone depletion did not carry high valence in and of itself, it drew support from an external but related high valence issue. The Montreal Protocol did not attempt to *generate* higher valence for ozone depletion, but rather made use of pre-existing high level of valence, capitalizing on the resulting policy window.

MONTREAL PROTOCOL AND INTERNATIONAL COOPERATION

The Montreal Protocol can be understood as the successful globalization of an environmental policy issue. In fact, the Montreal Protocol is the only MEA that enjoys universal membership, this factor contributing heavily to the protocol's success (Gonzalez, 2015). Simply put, had the protocol not been ratified so widely, it would not have been so successful. The key to garnering such wide support was the configuration of the national phase-out plan, allowing for differential phase-out timelines.

The Montreal Protocol made use of the principle of “common but differentiated responsibility,” which aims to recognize the different needs and circumstances of countries at different stages of development without sacrificing global action (Gonzalez, 2015). The principle of common but differentiated responsibility, first formally articulated at the 1992 Rio Earth Summit, can be seen clearly in the implementation of the Montreal Protocol. Additional time, financial resources, and assistance was afforded to developing economies, with phase-out deadlines averaging 10-18 years later than developed economies. These differential phase-out timelines relieved some of the burden that was placed on developing economies, allowing for widespread ratification of the protocol and the successful implementation of the phase-out policy. Furthermore, the Montreal Protocol provided financial

assistance to help developing countries transition to technologies that allowed them to comply with mandates. The establishment of the Multilateral Fund for the Implementation of the Montreal Protocol (MLF), which has spent \$3.6 billion to assist countries meet their Montreal commitments (Multilateral Fund, 2018), has been an indispensable resource throughout the phase-out process. The phase-out timelines also effectively acknowledged not only the challenges faced by developing economies but the responsibility of developed economies to lead by example.

The success during the policy process was predicated on the Montreal Protocol choosing one specific and relatively uncomplicated issue and implementing a phase-out. This framework, which might be considered somewhat heavy-handed in its regulatory approach, ensured uniformity of action and consensus on the nature and severity of the issue. Uniformity, consensus, and stringency were factors that worked to ensure the effectiveness of the policy and should be considered key lessons for future international environmental policy.

CLIMATE CHANGE MITIGATION AND THE COP21 PARIS AGREEMENT

The Paris Agreement under the UNFCCC was an analogous attempt to globalize an environmental issue. The UNFCCC has served as the framework for international cooperation to combat climate change by limiting average global temperature increase since 1992 (UNFCCC 2018). This framework has created an international climate change policy regime which (1) focuses on addressing climate change as one issue and (2) uses global average temperature increase to frame climate change mitigation policies. The Paris Agreement, adopted in December 2015, was a step forward in the evolution of this regime, building on the work undertaken by the convention (UNFCCC, 2018). The Paris Agreement outlined the need for greater action on, and investment in, the necessary technology to transition to a

sustainable and low carbon future while also stressing the importance of adaptation measures. Most relevant to this discussion, the Paris Agreement's central aim was to strengthen the global response to the threat of climate change through mitigation efforts. Using the UNFCCC framework, the Paris Agreement stipulated that climate change (as one cohesive issue) should be addressed by keeping global temperature rise well below 2 degrees Celsius above pre-industrial levels. Nationally determined contributions (NDCs) were selected as the means through which countries would share and distribute responsibility for controlling global average temperature rise. However, the UN's 2017 Emissions Gap Report states that the NDCs that form the foundation of the Paris Agreement only cover approximately one third of the emissions reductions necessary to meet the goal of staying well below 2 degrees Celsius (United Nations Environmental Programme, 2017). Furthermore, the gap between the NDCs and the total reductions actually undertaken by countries remains substantial.

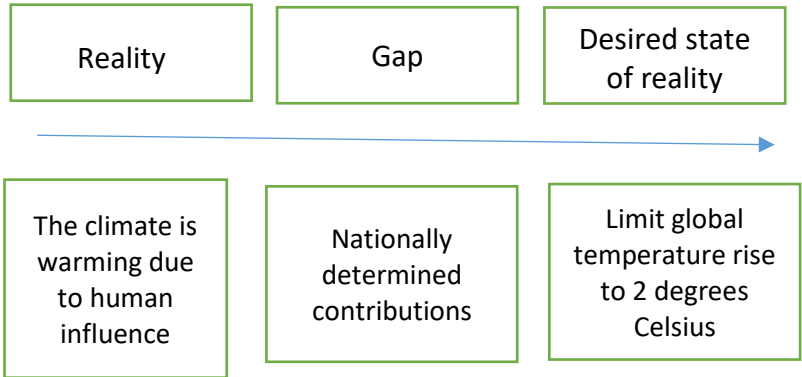
THE PROBLEM WITH PARIS: PROBLEM DEFINITION DURING COP21

In comparison to the issue of ozone depletion, defining and structuring the problem of climate change is significantly more difficult. Climate change is a multifaceted, multidimensional problem that requires solutions on a variety of fronts. There is also significant disagreement within public and political discourse regarding whether climate change is real (dependent on national/jurisdictional context), the severity of the issue, and the proposed timeline of action. The plethora of stakeholders with views on these issues that require mediation includes, but is not limited to, developed and undeveloped countries, governments (all levels, across countries), industries (regime and niche), financial institutions, scientific and epistemic communities, academic institutions, and marginalized communities. Divergent perspectives from a seemingly endless list of sources and

stakeholders have marred efforts to discern, shape, and articulate the problem; essential components of problem structuring that required the inclusion of both facts and values (Pal, 2014). Indeed, climate change has all the hallmarks of a wicked problem (World Bank, 2014), these many factors combining to impede effective problem identification and structuring.

The Paris Agreement focused on addressing climate change as one issue, hindering policy progress from the outset. The problem the Paris Agreement sought to address was pre-structured around the UNFCCC framework, leaving no room for radical re-interpretation of the problem, the goals, or the available instruments. Once again taking the simplified view of problem identification, figure 2 shows how the reality, the desired reality, and the selected policy action to bridge this gap were nebulous at best. Framing the reality and desired state of reality around temperature increase was a macro-level approach that did not lend itself to any simple, logical solution. The gap between these two states became NDCs, allowing each country to self-determine what their responsibility and therefore contribution should be. During the Montreal Protocol, the gap between the reality and desired state of reality was the selected policy action (figure 1). In the case of the Paris Agreement, there was no clarity on what specific policy action should be undertaken by each country. The path between the current state of affairs and the desired reality, which should have been a clear policy initiative, was unclear and open to interpretation by each jurisdiction. While allowing countries to determine their contributions was no doubt an attempt to reach consensus on common but differentiated responsibility, the reality became that the NDCs were insufficient to reach the agreement's stated goals.

Figure 2: COP21 Paris Agreement Problem Identification and Structuring. Source: Author's contribution



As Pal notes, an ill-structured problem is marked by high levels of uncertainty and competing objectives and alternatives leading to high levels of disagreement if not outright paralysis (2014). In this case, both the lack of *clarity* and *specificity* doomed the Paris Agreement from the start. Given the constraints set out by the UNFCCC regime, the way that the problem was defined and structured by the Paris Agreement is unsurprising. The Paris Agreement illustrates how the predefined and rigid UNFCCC framework has become a hindrance to the creation of effective international policy on climate change.

VALENCE AND THE PARIS AGREEMENT

While the importance of climate change in public discourse is growing, it still lacks an emotional quality. In Canada, the change in the public reception of federal carbon pricing policies between 2008 and 2016 is indicative of changing public sentiment. Carbon taxation, which was previously rejected as wasteful and unnecessary, has been embraced (or at least tolerated) by all but one federal party due in large part to the increase in knowledge and concern regarding climate change. However, the emotional response that

created a policy window for action in the case of the Montreal Protocol is still lacking. The plethora of negative externalities associated with climate change present a host of opportunities for policymakers to relate climate change to high valence issues. In Canada, as the severity and frequency of climate change related disasters grow, policy makers will have the opportunity to capture the emotional response of both those directly impacted (e.g. disaster struck communities, insurance companies) and indirectly impacted (e.g. taxpayers, trade and resource reliant industries). Up to this point, while negative externalities have been described and analyzed, policy makers have not engaged with many of these externalities in a meaningful way during the policy process. Just as the Montreal Protocol framed the need for action around public health concerns, so should climate change agreements seek to capitalize on external but related high valence issues. Section 3.2 of this paper provides a further discussion of how valence could be used in the future to create policy windows for action on climate change.

INTERNATIONAL COOPERATION AND THE PARIS AGREEMENT

While the Paris Agreement was a significant step forward and a decent attempt at international cooperation and consensus on the climate change issue, several key features impeded the agreements ability to achieve its goals. The efforts of the Paris agreement were largely undermined by the attempt to address climate change as a singular issue through an NDC approach to reducing global emissions. While the NDCs made use of the principle of common but differentiated responsibility by allowing each country to decide how great their emissions reductions should be, the Paris Agreement's NDC model took this principle too far. While the Montreal Protocol acknowledge (without specifically articulating) the principle of common but differentiated responsibility, the goal of a *phase-out* of ozone depleting substances was established. While the timelines along which countries reached the elimination of these substances were

differentiated, there was a common goal across countries. Unfortunately, the Paris Agreement did not articulate the need to eliminate carbon or other GHG emissions, only that these emissions needed to be reduced and that “Parties (should) aim to reach the goal of peak greenhouse gas emissions as soon as possible,” (UNFCCC, 2015a). Some countries, like Canada, made commitments to reduce GHG emissions from a base year within a given timeframe (30% reductions on 2005 emissions by 2030), while other countries, such as Argentina, committed to reductions based on business-as-usual projections (15% emissions cut by 2030 compared to business-as-usual projections) (Carbon Brief, 2018). Additionally, many countries have pledged to increase their emissions reductions contingent on international aid or support. The NDC framework put forward by the Paris Agreement undermined international efforts to reduce emissions by not providing one clear, common end goal for all countries.¹¹ Each country determined at what level they were entitled to emit rather than mutually agreeing to eliminate emissions.

In determining their contribution, each country had to weigh the costs and benefits of emissions reductions, considering political and market factors such as competitiveness. Indeed, countries were naturally concerned by the fact that their NDCs might hinder their economy in the short-term while other countries continued to emit at higher levels. This NDC framework created a veritable prisoner’s dilemma in which each country weighed cooperation against self-interest.

¹¹ Furthermore, one study showed that the “pre-Industrial baseline” used to calculate warming goals and the carbon budget was not defined by the conference, allowing each country to decide their precise pre-industrial baseline. Ambiguity in the baseline definition has led to an increased likelihood that we will exceed the 1.5 degrees Celsius by the end of this century (Schurer 563).

Countries such as Senegal¹² (5% emissions reductions by 2030 compared to business-as-usual projections) (Carbon Brief, 2018) selected self-interest in the form of modest emissions reductions to the detriment of the collective. Had the Paris Agreement instead proposed a phase-out, the expectation of total emissions elimination would have been asserted, leaving uncertainty only as to the timeline of action for each individual country. This would have eliminated the need for Game Theory strategies, leaving only cooperation in finding a path to an equitable low-carbon transition. Ultimately, the NDC approach did not create a clear or specific vision of a low-carbon future and was therefore not able to facilitate the creation of national pathways to reach that goal.

LEARNING FROM THE MONTREAL PROTOCOL: THE HYDROCARBON PHASE-OUT MODEL

Given the enormous threat that climate change poses, it is insufficient for those who study international climate agreements to simply analyze the limitations of past efforts. Rather, it is incumbent upon scholars and critics to learn from past mistakes and propose possible solutions. Taking lessons from the successes of the Montreal Protocol and the limitations of the Paris Agreement, the remainder of this paper attempts to reimagine the framework within which international climate policies are designed. This section explores the possibility of a separate but complimentary international strategy to tackle climate change using specific hydrocarbon phase-out agreements to help decrease global CO₂ emissions.

The Paris Agreement revealed the inability of the UNFCCC framework to make the short-term and radical changes necessary to mitigate climate change. However, it would be

¹² While Senegal's share of global emissions is negligible (0.07% of the world's total), the country's NDC illustrates how countries were given the opportunity to commit to modest emissions reductions rather than cooperate and truly commit to a low-carbon transition.

unwise to completely negate the progress the Paris Agreement has made. The Paris Agreement can still be understood as an effective starting point for action on climate change, so long as it is not perceived as an all-out solution. The Paris Agreement laid the groundwork for further, more specific policy action on climate change by establishing international consensus on the validity of the climate change issue. The fact that the Paris Agreement and the UNFCCC framework operates at such a high level is still beneficial in that their generality captures the broader issue, implicating every country in the world and demanding international action. The Paris Agreement may very well come to serve as a pre-condition for the success of more specific agreements to come. A key element of the Montreal Protocol's success was its *specificity*. Choosing one cohesive and relatively uncomplicated issue allowed for effective problem identification and structuring, gave policy makers the opportunity to capitalize on valence, and allowed for international consensus on one common goal. Taking lessons from the Montreal Protocol, the subsequent discussion postulates that specific hydrocarbon phase-out agreements, beginning with an international phase-out of coal as a combustible fuel source, are a hitherto unexplored but potentially effective means of mitigating climate change.

Bloomberg's New Energy Outlook 2018 shows that a global coal phase-out by 2035 would lower total global emissions by a further 54% (Henbest et al, 2018). Given this analysis, a coal phase-out alone would be insufficient to maintain global warming below 2 degrees Celsius by 2100 (Henbest et al, 2018). However, an international coal phase-out would still constitute a significant step towards the goal of mitigating human influence on the climate system. Furthermore, a coal phase-out agreement could lay the groundwork for further phase-out agreements, the cumulative impact of these separate agreements being real, meaningful action to mitigate climate change.

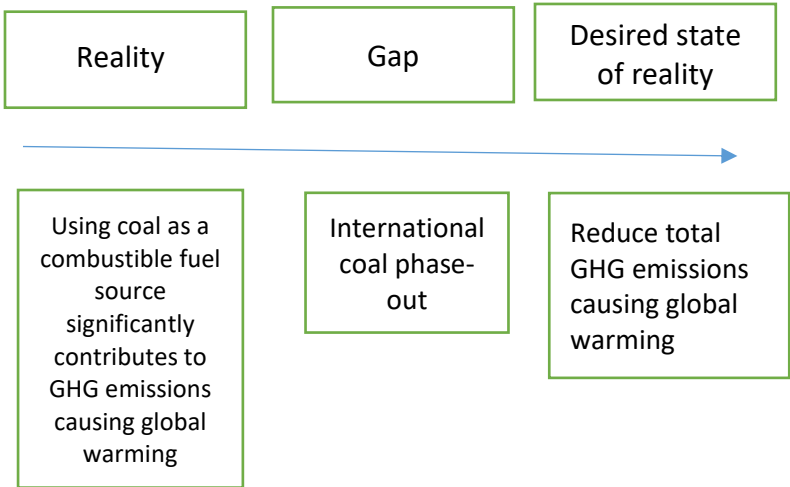
Phasing-out coal is by no means a simple exercise. As of 2018, coal remains the world's greatest source of carbon emissions (Canada, 2018). Coal makes up 28.1% of the world's energy supply, 65% of global coal usage goes towards electricity production (Canada, 2018). However, several factors make coal an attractive candidate for a hydrocarbon source phase-out agreement. Compared with the demand growth for coal in the early 2000s, worldwide coal use remains relatively flat in the International Energy Outlook 2017 Report (US Energy Information Administration, 2017). Coal is increasingly replaced by natural gas, renewables (wind, solar, and hydroelectric in particular), and nuclear for electric power generation, leading to weakening global demand. Ontario's 2014 coal-phase out is indicative of how market factors as much as a determination to combat climate change and air quality issues are contributing to the decline of coal globally. Following suit, the province of Alberta has plans to phase out coal by 2030 (though it is anticipated that the low cost of natural gas and renewables will move this deadline forward). In addition, in 2015 Canada, Britain, and 24 other countries (as well as the US states of California, Oregon, and Washington and a host of corporations and organizations) committed to the *Powering Past Coal Alliance*, which plans to phase out coal by 2030. This alliance recognizes that climate change mitigation requires OEDC and EU countries to commit to phasing out coal by 2030, the rest of the world following no later than 2050 (Canada, 2017). Much like the commitments by several countries to phase-out CFCs that preceded the Montreal Protocol, the *Powering Past Coal Alliance* is proof that international action on this issue is possible and past due.

INTERNATIONAL PROTOCOL ON COAL: PROBLEM IDENTIFICATION AND STRUCTURING

By narrowing the issue at hand, problem identification and structuring becomes relatively straight forward. Climate change in its entirety can be seen as a wicked problem in which the complexity, informational disputes, and high levels

of disagreement among stakeholders have impeded proper problem identification and structuring. However, many authors argue that even if it is not possible to solve wicked problems, it may still be possible to address them (Newman and Head 2017). Newman and Head suggest that wicked problems can be addressed by considering values, judgments, mediation of divergent perspectives, and context (2017). While diversifying considerations is paramount, it seems another possible option when policy makers encounter wickedness is to deconstruct the problem at hand, addressing the problem's component parts. This is essentially what the coal phase-out aims to do. Coal, the largest source of energy-related CO₂ emissions globally (World Bank, 2014), is a major component of the broader climate change problem. Addressing the use of coal is easier than addressing climate change because coal usage is a less complicated issue with fewer considerations coming into play. While eliminating the use of coal is undoubtedly challenging, it is not intractable or wicked. Once again taking the simplified model of problem identification, figure 3 shows that the current reality, desired reality, and means of bridging this gap are relatively straight forward and comprehensible.

Figure 3. International Protocol on Coal Problem Identification & Structuring. Source: Author's contribution.



CLIMATE CHANGE, COAL, AND VALENCE

Drawing on the Montreal Protocol, future climate agreements should attempt to capitalize on external but related high valence issues rather than attempting to generate valence for the issue at hand. While climate refugees and other negative externalities resulting from climate change do generate high valence, a policy maker's ability to capitalizing on valence is dependent on the broad acceptance of the reality and anthropogenic nature of climate change. This causal link is problematic, as climate change science is still contested in some parts of the world. Returning to the idea of an international coal phase-out, coal carries its own external but related high valence issues that can be used to circumvent the problem of causally linking immigration and extreme weather to climate change. Coal is associated with a variety of negative health impacts related to air quality that are widely known and accepted. Coal combustion

releases mercury, nitrogen oxides, sulfur dioxide and other hazardous substances, contributing to asthma, lung cancer, congestive heart failure, and strokes (Earth Talk, 2015). As previously discussed, cancer carries incredibly high valence, as do the other health consequences of burning coal.

China's issues with air quality and smog exemplify how anxiety over coal's negative externalities can be turned into concrete policy action. Though coal has long been identified as a major source of poor air quality leading to public health problems, one study found that in 2013 coal was responsible for 40% of the deadly fine particulate matter in China's atmosphere, causing 366,000 premature deaths (Wong, 2016). Similar to the case of the Montreal Protocol and ozone depletion causing cancer, the negative externalities of burning coal have come to be seen as a public health crisis in China. In 2013, when public anxiety over air pollution peaked, the Chinese government announced plans to diminish coal use in major population centers (Wong, 2016). Since 2013, the Chinese government has made significant strides to transition China away from coal. Coal demand fell for three consecutive years (2014-2016) due to stricter regulation and coal's decreasing competitiveness, especially compared to natural gas and renewables (Dale, 2018). In this instance, public health concerns associated with coal created a policy window, allowing China to take action that might otherwise be impossible given the prominence of coal in China's energy system. Much like the Montreal Protocol and the example of China, the proposed coal phase-out agreement should not attempt to generate higher valence for climate change or coal use in and of itself, but rather capitalized on the pre-existing high level of valence associated with human health, creating a policy window for international action.

INTERNATIONAL COOPERATION AND THE COAL PHASE-OUT

Instead of being constrained by the UNFCCC, a specific coal phase-out agreement would be able to create its own

framework for international cooperation. The phase-out model would create the expectation of eliminating coal, leaving uncertainty only as to the timeline of action for each individual country. Drawing on the Montreal Protocol, an international coal phase-out agreement could make use of the principle of common but differentiated responsibility by creating different phase-out timelines for different countries. Nations that continue to rely heavily on coal for economic development, such as India, would be allowed a longer timeline. However, the availability and increasing affordability of alternative options such as natural gas and renewables must be considered. While it is no doubt more difficult for developing economies to relinquish coal as an energy source, the long-term benefits associated with transition away from the dirtiest, most polluting hydrocarbon should not be overlooked. The transition away from coal should be seen as an investment as much as a sustainable development strategy with a variety of positive externalities including better air quality and reduced risk to public health. The coal phase-out agreement could also learn from the Montreal Protocol by establishing a Multilateral Fund for the Implementation of the Coal Phase-Out to help countries meet their phase-out deadlines, therein relieving some of the short-term burden placed on struggling or developing economies.¹³

¹³ Working with a hydrocarbon phase-out model, after coal is phased out next would come bitumen, then crude oil, etc. until fossil fuels are no longer a dominant source of energy. However, the idea of hydrocarbon phase-out agreements is complicated by many factors. The hegemony of fossil fuel regimes is particularly problematic. Unlike the chemical industry, the fossil fuel industry is widespread, complex, and made up of a variety of different and powerful actors. Additionally, unlike the chemical industry, for the most part fossil fuel regime actors have only one product, a phase-out indicating the death of their enterprise.

CONCLUSION

This paper has attempted to critically examine the Montreal Protocol and the Paris Agreement to better understand the successes and failures of these MEAs. This analysis has highlighted the limitations of the framework within which international climate change agreements are created. The key factors that led to the success of the Montreal Protocol are all hindered by the UNFCCC framework. Approaching climate change as one broad issue, not taking advantage of climate change's many negative externalities to capitalize on high valence, and undermining international cooperation through NDCs worked against the Paris Agreement's objectives. It is therefore essential to reconceptualise the framework used to create international agreements so that future climate change mitigation policies will be more successful.

The hydrocarbon phase-out model is presented as a possible new framework that can be used to craft international climate change policy. The purpose of the hydrocarbon phase-out model is to deconstruct climate change, focusing on one narrow issue that is both clear and specific. However, the hydrocarbon phase-out model is just one of many ways climate change could be deconstructed. For example, instead of (or overlaid on) a hydrocarbon phase-out agreement there could be an international agreement committing to zero emissions electricity generation by a certain date. Alternatively, the world could pursue a protocol on zero emissions vehicles, effectively phasing out internal combustion engines. The underlying goal is to create a framework within which effective problem definition, capitalizing on valence, and international cooperation is made possible by the clarity and specificity of the issue at hand. It is the contention of this essay that many smaller, more specific agreements all working towards mitigating climate change would be more effective than an attempt to address climate change in its entirety.

REFERENCES

- American Chemistry Association. (2017). "Chlorofluorocarbons and Ozone Depletion: A National Historic Chemical Landmark," *The Vitamin B Complex*. Retrieved from <https://www.acs.org/content/acs/en/education/whatischemistry/landmarks/cfcs-ozone.html>
- Becklumb, P. (2010). "Climate Change and Forced Migration: Canada's Role." *Library of Parliament*. Retrieved from <https://lop.parl.ca/Content/LOP/ResearchPublications/2010-04-e.pdf>
- Benedick, R. (1991). "The Diplomacy of Climate Change Lessons from the Montreal Ozone Protocol," in *Energy Policy*, Vol 19, pp. 94-97.
- Henbest, S; Giannakopoulou, E; Kimmel, M; Grace, A; Rooze, J, Lu, Sophie, Harries, T; Chase, J; Goldie-Scot, L; Chatterton, R; Turner, A. (2018) "New Energy Outlook 2018," *Bloomberg New Energy Finance*. Retrieved from <https://about.bnef.com/new-energy-outlook/?src=WIR-0717#toc-download>
- Canada. (2013). *Evaluation of Environment Canada's Activities in Support of the Montreal Protocol and Multilateral Fund*. Retrieved from https://www.ec.gc.ca/ae-ve/6AE7146E-0991-4C2F-BE2F-E89DF4F8ED1E/13-017_ID%20431%20Montreal%20Protocol_ENG.pdf
- Canada. (2016). *Pan-Canadian Framework on Clean Growth and Climate Change: Canada's Plan to Address Climate Change and Grow the Economy (PCF)*. Retrieved from <https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework.html>
- Canada. (2017). *Powering Past Coal Alliance Declaration*. Retrieved from <https://www.canada.ca/en/services/environment/weather/climatechange/canada-international-action/coal-phase-out/alliance-declaration.html>
- Canada. (2018). *Coal Facts*. Retrieved from <http://www.nrcan.gc.ca/energy/facts/coal/20071>

- Canadian Cancer Society. (2017). "Nearly 1 in 2 Canadians Expected to Get Cancer: Report," National News Release. Retrieved from <http://www.cancer.ca/en/about-us/for-media/media-releases/national/2017/canadian-cancer-statistics/?region=bc>
- Chenier, G. (1997). "International Environmental Regimes in Formation of Global Policy and Cooperation: The Case of the Montreal Protocol on Substances that Deplete the Ozone Layer," *University of Miami Dissertation from ProQuest*. 70.
- Carbon Brief. (2018). "Paris 2015: Tracking Country Climate Pledges," Retrieved from, <https://www.carbonbrief.org/paris-2015-tracking-country-climate-pledges>
- Cox, R.H. and Béland, D. (2013). "Valence, policy ideas, and the rise of sustainability," *Governance*, Vol. 26, No. 2, pp. 307-328.
- Dale, S. (2018). "Analysis – Spencer Dale, Group Chief Economist," *BP*. Retrieved from <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/chief-economist-analysis.html#analysis-coal>
- Daniel, J. (2012). "Limitations of Single-Basket Trading: Lessons from the Montreal Protocol for Climate Policy," in *Climate Change*, Vol 2, pp. 241-248.
- Earth Talk; producer Scheer, R. 2015. "How Coal Kills," *Scientific American*. Retrieved from <https://www.scientificamerican.com/article/how-coal-kills/>
- European Commission. (2007). *The Montreal Protocol*. Retrieved from https://ec.europa.eu/clima/sites/clima/files/docs/montreal_prot_en.pdf
- Foster, V. and Bedrosyan, D. (2014). "Understanding CO2 Emissions from the Global Energy Sector," *Live Wire Knowledge Note Series* No. 2014/2015. Retrieved from <http://documents.worldbank.org/curated/en/873091468155720710/Understanding-CO2emissions-from-the-global-energy-sector>

- Gonzalez, M; Taddonio, K; Sherman, N. (2015). "The Montreal Protocol: How Today's Successes Offer a Pathway to the Future," in *Journal of Environmental Studies*, Vol 5, pp. 122-129.
- Honkonen, T. (2009). *The Common but Differentiated Responsibility Principle in Multilateral Environmental Agreements: Regulatory and Policy Aspects*. The Netherlands: Kluwer Law International.
- Hollows, F. and Moran, D. (1981). "Cataract – The Ultraviolet Risk Factor" in *The Lancet*, Vol. 318, pp. 1249-1250.
- Jordan, A. (1998). "The Ozone Endgame: The Implementation of the Montreal Protocol in the United Kingdom," in *Environmental Politics*, Vol 7, pp. 23-52.
- McMichael, A.J.; Lucas, R.; Ponsonby, A.-L.; Edwards, S.J. (2003). "Chapter 8: Stratospheric Ozone Depletion, Ultraviolet Radiation and Health," in *Climate Change and Human Health*, WHO. Retrieved from <http://www.who.int/globalchange/publications/cchhbook/en/>
- Molina, M.; Zaelke, D; Sarma, K.; Anderson, S; Ramanathan, V.; Kaniaru, D. (2009). "Reducing Abrupt Climate Change Risk Using the Montreal Protocol and Other Regulatory Actions to Complement Cuts in CO2 Emissions," in *PNAS* Vol 106, pp. 20616-20621.
- Morrisette, P. (1991). "The Montreal Protocol: Lessons for Formulating Policies for Global Warming." *Policy Studies Journal*, Vol 19, pp. 152-161.
- Multilateral Fund. (2018). *Welcome to the Multilateral Fund for the Implementation of the Montreal Protocol*. Retrieved from <http://www.multilateralfund.org/default.aspx>
- Newman, J; Head, B. (2017). "The National Context of Wicked Problems: Comparing Policies on Gun Violence in the US, Canada, and Australia." *Journal of Comparative Policy Analysis* Vol. 8, pp. 40-53.
- Pal, L. (2014). *Beyond Policy Analysis: Public Issue Management in Turbulent Times*. (5th ed.) Toronto: Nelson Education Ltd.
- Parker, M. (2018). "Coal Power," *Bloomberg*. Retrieved from <https://www.bloomberg.com/quicktake/confronting-coal>

- Reiny, S. (2018). "NASA Study: First Direct Proof of Ozone Hole Recovery Due to Chemical Bans," *NASA: Earth*. Retrieved from <https://www.nasa.gov/feature/goddard/2018/nasa-study-first-direct-proof-of-ozone-hole-recovery-due-to-chemicals-ban>
- Reuters. (2018). "Britain Outlines Plans for 2025 Coal-Power Phase Out," *Reuters: Environment*. Retrieved from, <https://www.reuters.com/article/us-britain-coal-phase-out/britain-outlines-plans-for-2025-coal-power-phase-out-idUSKBN1EU11P>
- Shankleman, J. (2017). "A Tiny Island Prepares the World for a Climate Refugee Crisis," *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2017-11-15/a-tiny-island-prepares-the-world-for-a-climate-refugee-crisis>
- Schurer, Mann, Hawkins, Tett, and Hegerl. (2017). "Importance of the Pre-Industrial Baseline for the Likelihood of Exceeding Paris Goals," *Nature Climate Change* Vol. 7, pp. 563-567.
- Taylor, H.R.; West, S.K.; Rosenthal, F.S.; Munoz, B. (1988). "Effect of Ultraviolet Radiation on Cataract Formation," in *The New England Journal of Medicine*, Vol 319, pp.1429-1433.
- United Nations Environmental Programme (UNEP). (2017). "Emissions Gap Report: Executive Summary". Retrieved from https://wedocs.unep.org/bitstream/handle/20.500.11822/22101/EGR_2017_ES.pdf?sequence=1&isAllowed=y
- United Nations Framework Convention on Climate Change (UNFCCC). (2015a). *Adoption of the Paris Agreement: Proposal by the President*. Retrieved from <https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>
- UNFCCC. (2015b). *Conference of the Parties Twenty-First Session Paris Agreement*. Retrieved from http://unfccc.int/files/home/application/pdf/paris_agreement.pdf
- UNFCCC. (2016). *Fast Facts & Figures*. Retrieved from http://unfccc.int/essential_background/basic_facts_figures/items/6246.php#pa

- UNFCCC. (2018). *Background on the UNFCCC: The International Response to Climate Change*. Retrieved from http://unfccc.int/essential_background/items/6031.php
- U.S. Energy Information Administration (USEIA). (2017). "International Energy Outlook: Executive Summary," *U.S. Department of Energy*. Retrieved from https://www.eia.gov/outlooks/ieo/exec_summ.php
- Wong, E. (2016). "Coal Burning Causes the Most Air Pollution Deaths in China, Study Finds," *The New York Times*. Retrieved from <https://www.nytimes.com/2016/08/18/world/asia/china-coal-health-smog-pollution.html>
- World Bank. (2014). "A Wicked Problem: Controlling Global Climate Change". Retrieved from <http://www.worldbank.org/en/news/feature/2014/09/30/a-wicked-problem-controlling-global-climate-change>

Uncharted Waters: Strengthening the role of Indigenous knowledge in decision-making under Canada's Fisheries Act

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Indigenous peoples in Canada have been advocating for greater decision-making authority in natural resources co-management arrangements since the 1970s (Houde, 2007). Recently proposed amendments to the *Fisheries Act* under Bill C-68 promise to strengthen the role of Indigenous knowledge (and Indigenous peoples) in project reviews, monitoring, and policy development. While knowledge co-production and co-management practices are not new concepts in Canada, the explicit policy requirement for greater recognition of Indigenous knowledge and the need for Indigenous involvement in decision-making is still significant. Consideration of the potential difficulties and benefits associated with the proposed amendments under Bill C-68 is warranted to ensure their implementation actually empowers Indigenous peoples and results in tangible improvements to the way fish and fish habitat are managed and protected in Canada. Following a brief description of the proposed changes to the *Fisheries Act* as they relate to Indigenous peoples and knowledge, this paper provides an overview of the potential challenges and opportunities associated with integrating Indigenous knowledge in government natural resource management, and concludes with a series of recommendations to facilitate greater knowledge co-production and participatory decision-making under the *Fisheries Act* in Canada. At the time of this paper's publication, Bill C-68, *an Act to Amend the Fisheries Act and other Acts in consequence*, passed third reading in the House of Commons and received second reading in the Senate.

CONTEXT

The federal *Fisheries Act* (R.S.C., 1985, c. F-14) is one of Canada's strongest environmental laws. Established in 1868,

it is also one of Canada's oldest laws. Outside of Indigenous rights and title, the *Fisheries Act* grants the Minister of Fisheries and Oceans wide discretion to manage and regulate fisheries in Canada, and provides the Department of Fisheries and Oceans Canada (DFO) with the responsibility for the conservation and protection of fish and fish habitat. The department shares certain powers with other authorities and jurisdictions¹⁴, including some decision-making authority with Indigenous peoples through treaty and land claim agreements.

Indigenous peoples managed fisheries resources according to their own legal traditions long before the creation of federal and provincial fisheries laws. Section 35 of the *Constitution Act, 1982* entrenches existing Aboriginal and treaty rights, and the 'duty to consult' requires the federal government to take active steps to consult with Indigenous communities whose asserted rights or title may be infringed by its actions, whether or not these rights have been established in court. The level of consultation required varies both with the strength of the claim and the potential severity of the infringement. It is worth noting that many s. 35 cases involve fisheries, reflecting the centrality of fish to many Indigenous societies, and their opposition to government intrusion in their rights to manage their fisheries (Nowlan et al., 2016).

On February 6, 2018, the federal government tabled a number of proposed amendments to the *Fisheries Act* under Bill C-68. The bill passed third Reading in the House of Commons on June 20, 2018 and had received second reading in the Senate at the time of this paper's publication. The proposed amendments outlined in Bill C-68 aim to restore lost protections and introduce modern safeguards, provide

¹⁴ Environment and Climate Change Canada (ECCC) administers the pollution prevention provisions of the *Fisheries Act*. DFO delegates responsibilities for inland waters to the provinces and territories, and shares certain fisheries management responsibilities with countries outside of its exclusive economic zone

better certainty for Canadian industry, strengthen the role of Indigenous peoples in decision-making, ensure the long-term sustainability of marine resources, and provide strong, meaningful protection for all of Canada’s fish and fish habitat (DFO, 2018). In practice, the proposed changes include the addition of a “purpose clause”, the addition of broad Ministerial discretion, a new fetter on Ministerial discretion relating to declining fish stocks, requirements to consult with Indigenous peoples and take Indigenous knowledge into consideration, a requirement to take cumulative effects into consideration for new projects, and the extension of conservation protections to all fish and fish habitat (reversing 2012 amendments¹⁵).

Several of the proposed amendments align with the federal government’s Indigenous reconciliation agenda. These include: a new explicit requirement to consider potential adverse effects of a decision on Indigenous rights, acknowledgement of the importance of Indigenous fisheries, explicit reference to Indigenous communities and Indigenous knowledge, and a number of changes to project authorizations. Most notably, Bill C-68 extends the federal government’s power to make fisheries-related agreements to include Indigenous governing bodies, such as co-management bodies. It increases opportunities for Indigenous participation, specifies consultation requirements, specifies consideration of traditional knowledge, modernizes terminology, and acknowledges the importance of Indigenous fisheries. According to the Government of Canada, the amendments passed in June 2018 are based on feedback received from partners, stakeholders, Indigenous peoples, and Canadians across all demographics (DFO, 2018).

In broad terms, the proposed amendments under Bill C-68 mean that, in making decisions under the amended *Fisheries*

¹⁵ In 2012, the Government of Canada removed certain fish and fish habitat protection provisions from the *Fisheries Act* (DFO, 2018)

Act, the Minister would be required to consider any adverse effects that the decision may have on the rights of Indigenous peoples, as recognized and affirmed by s. 35 of the *Constitution Act*, 1982. Further, before recommending to the Governor in Council that a regulation be made under the amended *Fisheries Act*, the Minister would have to consider any traditional knowledge provided to him or her. Further, any traditional knowledge provided to the Minister under the amended *Fisheries Act* in confidence would remain confidential.

The Minister would also be granted the authority to enter into agreements with “Indigenous governing bodies” relating to fisheries and fisheries management. Such agreements were previously restricted to provinces and territories. Under Bill C-68, “Indigenous governing body” is defined so as to include a council, government, or other entity authorized to act on behalf of an Indigenous group, community, or people that holds rights recognized and affirmed by s. 35 of the *Constitution Act*, 1982. Depending on the nature of the regulations, such an agreement could result in the Indigenous governing body being the sole manager of a fishery. Such agreements may also provide for the application of Indigenous laws that are deemed equivalent in effect to a provision of a regulation, and the amendments appear to contemplate that such laws would be administered and enforced by the Indigenous body within its own territory.

This paper explores potential challenges and opportunities associated with incorporating Indigenous knowledge in decision-making under Canada’s *Fisheries Act*. The overarching research question is: “How can the role of Indigenous knowledge (and Indigenous peoples more generally) be strengthened in decision-making under Canada’s *Fisheries Act*?” The paper aims to answer this question in three analytical sections. The first section reviews a number of commonly cited challenges associated with past attempts to incorporate Indigenous knowledge in natural resource

management processes in Canada and elsewhere. The second section summarizes potential opportunities based on recent developments in natural resource management projects in Canada. Finally, the third section considers the implications of Bill C-68 with regard to Indigenous knowledge and decision-making under the *Fisheries Act*, and identifies a series of recommendations to help facilitate knowledge co-production and shared governance.

CHALLENGES

One of the most pressing challenges faced by federal officials since the tabling of Bill C-68 is the question of how the government can meaningfully incorporate Indigenous knowledge in decision-making processes. The challenges of incorporating Indigenous knowledge (and the involvement of Indigenous peoples more generally) in environmental governance are well documented in scholarly research in Canada (McGregor, 2014). Key challenges for Canada to consider as it aims to further reconciliation with Indigenous peoples in the areas of fisheries management and protection are discussed below.

Different knowledge systems

A number of challenges may arise when attempting to integrate Indigenous knowledge and science. The most basic of which is the lack of common understanding of what Indigenous knowledge is. Indigenous knowledge can refer to data points and observations, as well as the knowledge systems that place these observations within worldviews, sets of values, and beliefs. In 2000, Usher defined Indigenous knowledge as “all types of knowledge about the environment derived from the experience and traditions of a particular group of people” (p. 185) and, “the knowledge claim of those who have a lifetime of observation and experience of a particular environment and as a result function very effectively in that environment, but who are untutored in the conventional scientific paradigm” (p. 186).

Most researchers agree it is difficult or impossible to distill the abstract nature of Indigenous knowledge into a simple definition (Canadian Science Policy Center [CSPC], 2017). While Western science is generally reductive and linear in nature, Indigenous knowledge is multi-faceted, comprising more than factual observations. According to Houde (2007), Indigenous knowledge also includes past and current uses, management systems, ethics and values, culture and identity, and cosmology. Leroy (2009) states that Indigenous knowledge is part of the collective genius of humanity, representing the accumulated experience, wisdom and know-how unique to nations, societies, and communities of people living in specific ecosystems. While such sophisticated and existential concepts may better depict the relationality of Indigenous knowledge systems as compared with Western science, they do little to improve the effectiveness of knowledge transfer.

Further, differences in the modalities for communication used in Indigenous societies as compared to scientific or legal-bureaucratic processes can also lead to complications. Certain oral traditions, such as songs, chants, stories, and ceremonies, are often important repositories for Indigenous knowledge, but pose practical challenges for knowledge transfer (Armitage et al., 2011; Ray, 2014). Thus, attempts to integrate science and Indigenous knowledge often lead to inadequate interpretation of Indigenous language and terms (CSPC, 2017). Unfortunately, the complexities associated with defining and communicating Indigenous knowledge can be exacerbated by the negative biases held by many non-Indigenous researchers and resource managers.

Operational difficulties

While there are clear differences between Western science and Indigenous knowledge, perhaps even more challenging is the perceived relative validity of the two knowledge systems by those with the power to make decisions. Western science is often promoted as objective, quantifiable, and the

foundation for “real” knowledge creation or evaluation. In contrast, Indigenous knowledge may be seen by non-Indigenous scientists or fisheries managers as anecdotal, imprecise, and unfamiliar. In other words, Indigenous knowledge is often only valued when it supports or supplements archaeological, or other scientific evidence. Unfortunately, its utility is questioned or dismissed as myth when it challenges scientific “truths” (Kim, 2016; Nicholas, 2018). The reason for this may be that some researchers and natural resource managers are concerned that the expertise of Indigenous knowledge contributors cannot be critically examined in scientific contexts (Bohensky & Maru, 2012). Rather, the verification of Indigenous knowledge is based on a storyteller’s reputation, where elders and other designated knowledge holders are expected to be truthful, and to help each other in ensuring that a proper rendition of a story is given (Bohensky & Maru, 2012).

A related operational challenge is that in some communities, Indigenous knowledge is not shared universally. Indigenous peoples in Canada may be wary of sharing their knowledge because of a history of exploitation, a lack of recognition and respect for their values and rights, a lack of safeguards and protection of knowledge, and a lack of perceived long-term benefits for doing so (McGregor, 2014). Thus, Indigenous peoples may wish to maintain ownership over their knowledge, even when they choose to share it with others and call for collaborative approaches to do so (McGregor, 2014). Indigenous communities and organizations, and increasing numbers of scholars and activists, therefore struggle with the tension between advocating for openly sharing Indigenous knowledge and advocating for its protection.

Given these difficulties, it may come as no surprise that Canada lacks a consistent approach or policy regarding the use of Indigenous knowledge in environmental governance. In many areas where Indigenous communities exist, there are no formal co-management processes where the integration

of Indigenous knowledge can take place. Some smaller jurisdictions, such as Nunavut, have developed their own policy frameworks. However, these are areas of Canada where Indigenous peoples form a significant faction or majority of the population, and where there are established co-governance practices tied to land claims. Thus, while there is significant potential to develop more collaborative environmental management frameworks in conjunction with land-claims processes, First Nations in historic treaty areas are at a far greater disadvantage (Bowie, 2013). Further, Indigenous knowledge has only been recently formally recognized in national policies. As a result, Indigenous knowledge studies and initiatives have occurred on a project-by-project basis in Canada.

Unequal power arrangements

Historic inequalities between Indigenous and non-Indigenous people likely contribute to the lack of respect for Indigenous knowledge and the fragmented policy infrastructure for its application. Stefanelli et al. (2017) assert that using Western knowledge to “legitimize” Indigenous knowledge is paternalistic, and works to perpetuate the ongoing processes of colonialism. In the same vein, Bowie (2013) writes about how systemic colonial power inequalities are at the root of complications associated with meaningful knowledge co-production and resource co-management.

The worst examples of failed attempts to integrate Indigenous knowledge into natural resources research stem from a lack of due process and mutual respect. Unfortunately, Indigenous peoples and their knowledge are often viewed by non-Indigenous researchers as objects for study rather than as people to be working with (McGregor, 2009). This may be due to constraints associated with funding, publication, and tenure/promotion incentives that are incongruent with the relationality of Indigenous knowledge (Stefanelli et al., 2017). According to the Inuit Tapiriit Kanatami (ITK), even Indigenous-focused research has

a tendency to be governed, resourced, and conducted in a manner that limits Indigenous participation (ITK, 2018).

Beyond the research environment, the oppression of Indigenous peoples and their knowledge often extends to the circumstances under which decisions are made. While co-management arrangements recognize that there is much to be gained by sharing knowledge, the ability to do so and work towards decisions that find common ground is often undermined by the context in which research and board deliberations occur (Bowie, 2013). When Indigenous knowledge is treated as an adjunct to the knowledge and methods of state managers, Indigenous representatives do not achieve meaningful levels of participation that can noticeably affect the outcome of resource management decisions (Bowie 2013). Western knowledge and its holders have been privileged since at least the time of British expansion, while Indigenous knowledge and its holders have only recently been invited into institutional environments (e.g., government policy, and research and literature within academia) (Stefanelli et al 2017).

OPPORTUNITIES

While the challenges associated with incorporating Indigenous knowledge in natural resource management decisions are well known, potential openings where collaboration and dialogue can occur in a mutually beneficial manner require further attention (McGregor, 2014). Such opportunities are concerned with the benefits of an adaptive and process-focused co-production of knowledge and decision-making in project reviews, monitoring and policy development. Nation-to-nation relationships have the potential to both foster and limit discussions. The key to success in this area is to ensure neither Indigenous nor Western knowledge is privileged over the other.

The value of Indigenous knowledge

There is much that can be learned through engagement and discussion with Indigenous peoples that Western knowledge has not yet been able to “confirm” (Stefanelli et al 2017). As stewards of traditional territories, and being intricately connected to lands and waters, Indigenous peoples, particularly those in rural and remote areas, often experience changes to natural resources first and most severely. The proportion of Canada’s population that is Indigenous has been growing by 20.1 % between 2006 and 2011 compared with 5.2 % for the non-Indigenous population (Statistics Canada, 2013), and is expected to grow continuously. Given current questions around environmental challenges and the management of natural resources in Canada, the contribution of Indigenous cultures to scientific research and development, and national science culture, is recognized (McGregor, 2014; Kim, 2016).

Various Indigenous declarations, developed and articulated at international environmental and sustainable development fora over the past two decades, assert the importance of Indigenous knowledge (McGregor, 2014). For example, a catalyst for the recognition of Indigenous and local knowledge systems within the context of sustainable development emerged from the World Commission on Environment and Development (WCED) report, “Our Common Future” (also known as the Brundtland Report) in 1987. More recently, the United Nations Declaration on the Rights of Indigenous People (2007), which is now supported by Canada (although Canada was one of only four nations to object to the Declaration), represents a recognition of Indigenous sovereignty by each of the federal governments and an important aspect of meaningful partnerships in the research and management of natural resources. The Government of Canada is thus motivated to formally include Indigenous knowledge in environmental legislative and policy frameworks. Along with its inclusion in the proposed amendments to the *Fisheries Act* (Bill C-68), references to

Indigenous knowledge appear in legislation such as the *Canadian Environmental Protection Act*, the *Species At Risk Act*, the *Canadian Environmental Assessment Act 2012*, and the proposed new *Impact Assessment Act* and *Canadian Energy Regulator Act* (Bill C-69).

Canadian governments are increasingly recognizing the value of combining science with local and traditional knowledge in solving problems where neither science nor local knowledge is individually sufficient (Armitage et al., 2011). Integrating Indigenous knowledge into a scientific fisheries program has the potential to play a major role in its success, and is crucial to inform locally-relevant fisheries management and conservation. Examples of recent attempts to do this in Canada include a study of the migration paths of Arctic char in Cambridge Bay, Nunavut (CSPC, 2017), an investigation into crab population dynamics in British Columbia (Ban et al., 2017), and a study to extend historical baselines for yelloweye rockfish, also in British Columbia (Eckert et al., 2017). With contemporary understandings of the significant benefits that accompany the co-implementation of Indigenous and Western research and management techniques, continuing to relegate Indigenous peoples and Indigenous knowledge systems to secondary or supplementary roles in research processes is not justified (Stefanelli et al 2017).

Indigenous peoples may choose to engage in Indigenous knowledge sharing and environmental governance initiatives in Canada, despite possible reservations described earlier in this paper. First, Indigenous peoples often wish to maintain, re-establish and sustain their relationships and responsibilities to the earth (Takedo & Ropke, 2010). Further, Indigenous knowledge plays an important role in regaining control over their territories by influencing decision-making or facilitating their participation in decision-making through collaborative or cooperative arrangements (Takedo & Ropke, 2010; Bowie, 2013). Finally, Indigenous knowledge has an

emerging role in self-government agreements, in which Indigenous nations obtain law-making powers and can develop and administer their own environmental management regimes (McGregor 2014). Therefore, Indigenous knowledge is considered to be a necessary component for recognizing Indigenous and treaty rights and realizing self-determination (Bowie, 2013; McGregor, 2014).

Knowledge co-production and co-management

Co-management practices and the use of Indigenous knowledge in natural resource management is not a new practice in Canada. Indigenous peoples have been active over the past four decades in negotiating co-management arrangements that incorporate Indigenous knowledge and are closer to their values and world views (Houde, 2007). Co-management “broadly refers to the sharing of power and responsibility between government and local resource users, [this being achieved through] various levels of integration of local and state level management systems” (Notzke, 1995, p. 187). Collaborative co-management processes are increasingly recognized as leading to more effective ecological management decisions by increasing equity in the decision-making process. In contrast to centralized, bureaucratic resource management systems, which are often criticized for ignoring local needs (Houde, 2007; Ostrom, 2010), co-management practices remove power from a central state. In doing so, they gain access to systems of knowledge and practices that are better attuned to local specifics, and increase the efficiency of decision implementation by involving people that are directly affected by the decisions (Houde, 2007).

There is evidence of Indigenous knowledge already being institutionalized in natural resource management in Canada. Indigenous communities are engaged with both government and non-governmental organizations over resource-related issues in attempts to address the interrelated goals of development, conservation, social justice, and self-

determination (Bowie 2013). Indigenous collaboration in environmental management can be found in the co-management of fish, wildlife, parks, and forest resources. Indigenous peoples are increasingly able to access enhanced roles in environmental assessment processes and agreements or partnerships with industrial proponents, as well as through collaborative initiatives with governments, environmental groups, academic organizations, and among First Nations. Such efforts at collaboration signal the increased role and institutional presence of Indigenous peoples in Canadian environmental and resource management (Bowie, 2013).

There are cases where co-management regimes have made considerable steps towards reflecting shared decision-making. An example of this, as noted by Natcher and Davis (2007), is the revitalization of traditional forms of natural resource management by four Yukon First Nations, represented by the Northern Tutchone Council (NTC). During the early 2000s, the NTC worked with elders to record and ultimately institutionalize spiritually-driven traditional laws, referred to as Doo'Li, into contemporary land management policy in the NTC settlement region. Specific elements of Doo'Li that were institutionalized into First Nation fisheries policy include gestures long believed to be necessary for the annual return of salmon, such as: prohibiting the shooting of bears near salmon spawning grounds; avoiding touching the eyes of salmon; disposing of fishnets by burning if an otter is snared; never putting fish in a dry pot and pouring water over them; prohibiting children from stepping over fishnets; and always leaving some fish for the bears, eagles, and other animals. Reflective of an Indigenous focus on relationships, the Doo'Li provides a "means by which social relationships, both human and nonhuman, can be maintained and, in some cases, rebuilt" (Natcher and Davis 2007, p. 275). Resting in Indigenous knowledge, laws, and institutions that are specific to land management, the use of Doo'Li is considered by the NTC leadership as being essential to devolution and their

successful transition to self-government (Natcher and Davis, 2007).

Towards self-determination

The more that Indigenous communities take the lead in establishing collaborative initiatives regarding fisheries management (and natural resources management more generally), the more likely their concerns will be adequately reflected in the process (McGregor 2009). However, as described earlier in this paper, collaborative environmental management efforts by Indigenous peoples face significant restraints as colonial power structures remain largely intact. For example, the advisory status of Indigenous peoples in many co-management processes in Canada means the final decision-making authority still rests with federal, provincial, or territorial governments (Bowie, 2013). Successful integration of Indigenous knowledge will therefore require a transition in governance models in which the participation of Indigenous communities is collaborative and nation-to-nation processes is essential (McGregor 2009). In other words, significant capacities for self-governance are necessary to ensure that Indigenous knowledge and participation of Indigenous communities in co-management processes are most effective.

Self-governance, if it can be achieved, would mean different things for different communities. Further, it would not need to be limited to the realm of environmental management and natural resources. One example is the concept of “shared governance” in Haida Gwaii (Penikett, 2014). In this context, shared governance involves a combination of co-management or co-jurisdiction arrangements in a variety of areas of vital interest to the Indigenous authority (Penikett, 2014). Self-determination has also been identified as a solution to many of the health challenges facing First Nations communities and certain success stories could be modelled for fisheries management. For example, the Tripartite Framework Agreement in British Columbia empowers First

Nations peoples to play a more significant leadership role in provincial health governance, although it does not translate to self-governance (Kent, 2014). Kent (2014) recommends a multilevel mosaic model of self-governance that offers increased control over local governance in such a way that is proportional to communities' capacities and needs, while respecting First Nations' collective right to self-determination. Implementing such a model of self-governance would require reconsidering and restructuring colonial power dynamics entrenched within Canada's structure of government.

RECOMMENDATIONS

Bill C-68 builds in several opportunities to increase and enhance the role of Indigenous peoples and Indigenous knowledge in decision-making under the *Fisheries Act*. Following is a series of recommendations for the federal government to help ensure the amended Act leads to greater empowerment of Indigenous peoples in the management and protection of fish and fish habitat in Canada.

Pathways for knowledge co-production

There are a number of potential pathways for Indigenous knowledge to influence decision-making in the amended *Fisheries Act*. The most obvious entry points are through the new provisions under Bill C-68 described earlier in this paper (recognizing that most are not mandatory). However, many details related to the content in the Act still need to be outlined in regulations. For the Act to be successful, regulations or other guidance documents must provide clear direction on the use of Indigenous knowledge in decision-making around fish and fish habitat management, and provide for greater empowerment and representation of Indigenous peoples in the decision-making process. One opportunity for Indigenous voices to be accommodated is the proposed multi-interest advisory committee. While the details around how this panel operate are still being developed, the proposed Act indicates that its membership will include significant Indigenous representation.

Other entry points for Indigenous knowledge in fisheries and fish habitat management decision-making processes include science advice and research and monitoring undertaken by DFO (e.g., CSAS, 2017), and through the established consultation processes associated with Integrated Fisheries Management Plans (DFO, 2013). Further, a necessary entry point will be through other federal departments in support of horizontal mandate priorities, such as Indigenous reconciliation, gender-based analysis plus (GBA+), and other legislation related to the new federal environmental assessment process (CERA 2012; Bill C-69).

Indigenous knowledge could also be better supported by the Government of Canada through its Tri-Council external academic research funding. A paradigm shift is needed such that Indigenous communities are empowered to identify their needs and partner with scientists to find answers (CSPC, 2017). The government could increase Indigenous research funding, including permanent funding and incentives for training to support scientists in efforts to involve Indigenous communities in research programs for knowledge co-production (CSPC, 2017). Further, it could provide incentives to increase the number of scholars with specialization in Indigenous science (Ninnes, 2000; Kim, 2017) such that forthcoming research incorporating Indigenous perspectives could pave the way to promote culturally inclusive scientific approaches (Popp, 2018). A recent example is the National Inuit Strategy on Research, which aims to advance Inuit governance in research, enhance the ethical conduct of research, align funding with Inuit research priorities, ensure Inuit access, ownership, and control over data and information, and build capacity in Inuit Nunangat research (ITK, 2018)

Changing structural and institutional frameworks

Effective knowledge mobilization and joint decision-making between Indigenous peoples and the Government of Canada

will require significant changes to the structural and institutional frameworks that guide resource management in this country. By expressly contemplating agreements between the Minister and Indigenous groups to further the purpose of the *Fisheries Act*, Bill C-68 has the potential to facilitate the empowerment of Indigenous people in decision-making. However, the scope and content of such agreements is potentially very broad, as the new purpose of the Act is to “provide a framework for (a) the proper management and control of fisheries, and (b) the conservation and protection of fish and fish habitat, including by preventing pollution.” The coming regulations will reveal whether this is intended to be co-management or a full delegation of decision-making authority to Indigenous peoples.

Further, while the changes in Bill C-68 are positive, it is important to note that not all of the amendments go as far as they could. Like its predecessor, Bill C-68 ensures that the Minister maintains broad discretion over decisions. With regard to the new provisions related to Indigenous peoples, Bill C-68 includes the use of “may” rather than “must” which effectively presents them as options for the Minister to consider (Axmann et al., 2018). With the exception of recommendations to the Governor in Council that a regulation be made, or in exercising permitting power under particular sections of the Act, the Bill does not otherwise require the Minister to consider traditional Indigenous knowledge. It also expressly states that the Minister shall not require any traditional knowledge to be provided to him or her in conducting research or collecting data or other information.

Similarly, with regard to consultation, the language of the Bill appears to align with the well-established common law principles of the Crown’s duty to consult. With the exception of the references to s. 35 rights of Indigenous peoples, all other references to consultation in the Act provide that the Minister “may” consult with Indigenous bodies, which could

be viewed by Indigenous groups as falling short of the federal government's stated support for UNDRIP "without qualification" (Axmann et al., 2018). This means that existing challenges associated with incorporating Indigenous knowledge in policy, decision-making, and knowledge co-production (as described earlier in this paper) could continue to prevail under an amended *Fisheries Act*.

Guiding principles for knowledge co-production and co-management

Regardless of the mechanism for knowledge co-production and co-management, three guiding principles could help strengthen the role of Indigenous knowledge in decision-making under the *Fisheries Act*. First, there must be recognition that Indigenous knowledge is not just an add-on to scientific research or assessment processes, but is recognized as an integral, valuable, and equal component to the entire process. Despite significant differences between the holistic, experiential, and qualitative dimensions of Indigenous knowledge that contrast with reductive, experimental, and quantitative Western scientific approaches, there are also significant points of connection, such as the need for more holistic or integrated approaches (Stevenson, 2006). A balanced approach would recognize Indigenous knowledge and Western science concepts as intrinsically linked, while integrating cultural and community specific contexts (Friendship & Furgal, 2012; Walsh et al., 2013).

Second, there must be a recognition of the relationship between communities and the resources they depend on; that those resources are the reason why communities were established in those places (CSPC, 2017). It is the separation of knowledge and control over lands that Indigenous communities are resisting by advocating for their inclusion in management processes (Bowie, 2013). Thus, knowledge integration is a social process that must recognize the identity of, and relationships amongst, the people whose knowledge might be integrated (McGregor, 2009; Walsh et al., 2013).

Indigenous communities (including youth and Elders) need to be involved in ongoing deliberations with other participants where their role does not cease once studies are completed. This requires significant commitment to cross-cultural dialogue, respectful communication, and some level of trust (CSPC, 2017).

Third, the limits of knowledge co-production (the limits of science, Indigenous knowledge, and their capacity to be linked) must be recognized by all parties. While knowledge co-production may provide a more holistic picture, gaps will still remain. For example, Indigenous knowledge is distributed knowledge, and a single individual will never know the entire knowledge system (Walsh et al., 2013). Equally, scientific monitoring and other research processes are limited to set timescales and geographical locations and to an expected degree of standard error. Knowledge verification and peer review processes will always be important for both types of knowledge systems.

Practical recommendations include the following (adapted from Stefanelli et al., 2017): 1) Research teams (and governance structures) should consist of both Indigenous and non-Indigenous members; 2) Research teams (and government officials) should spend time with members of the community; 3) Research teams (and government officials) need to understand that knowledge implementation is not an end-point, but an ongoing process that requires the maintenance of relationships and continual sharing of ideas; and, 4) Researchers and members of governance structures must be respectful of both Indigenous and Western knowledge systems. Recognition by all parties of the strengths and weaknesses of both Indigenous and Western sciences will allow for effective collaboration to occur.

SYNTHESIS AND CONCLUSIONS

The proposed amendments to the *Fisheries Act* under Bill C-68 are a positive step forward in the government's Indigenous reconciliation agenda. In particular, specific reference to agreements between the Minister and Indigenous bodies to further the purpose of the Act demonstrates strong support for co-management, Indigenous governance, and meaningful incorporation of Indigenous knowledge. The pace and degree to which Indigenous knowledge and Indigenous empowerment in fisheries decision-making will occur as a result of the proposed changes to the *Fisheries Act* will depend on how they are implemented as in the forthcoming regulations, operational details, agreements between the Minister and Indigenous bodies, and fisheries management decisions going forward.

Combining Indigenous knowledge systems with Western science and legal-bureaucratic forms of management and decision-making is an inherently complex process. Challenges often stem from unequal power arrangements and institutional practices that require Indigenous knowledge to fit within a scientific management system, even though the knowledge of Indigenous people can be fundamentally different from that held by scientists (i.e., oral vs. written, holistic vs. compartmentalized) (Armitage et al., 2011). The revitalization of Indigenous governance structures and protocols from which to direct engagement in collaborative resource management and joint decision-making that includes Indigenous knowledge is therefore necessary. Meaningful incorporation of Indigenous knowledge in decision-making under the *Fisheries Act* will require time, patience, openness, willingness, and a significant increase in dedicated human and social capital.

A multilevel mosaic model of self-governance could offer increased control over local governance and fisheries management in such a way that is proportional to communities' capacities and needs, while respecting First

Nations' collective right to self-determination and upholding Canada's fiduciary relationship to Indigenous people (Bowie, 2013; Kent, 2014). However, this would require restructuring colonial power with significant local or regional negotiation between Indigenous peoples, federal and provincial or territorial governments. In the meantime, Canada can advance knowledge co-production through deliberative, community-focused, participatory knowledge co-production and co-management processes based on mutual respect and a joint recognition of the strengths and limitations of both knowledge types.

REFERENCES

- Armitage, D., Berkes, F., Dale, A., Kocho-Schellenberg, E., and E. Patton. (2011). Co-management and the co-production of knowledge: Learning to adapt in Canada's arctic. Retrieved from:
<https://www.sciencedirect.com/science/article/pii/S0959378011000665>
- Axmann, S., Lee-Anderson, S., and P.R. Cassidy. (2018). Angling for reconciliation: An overview of Indigenous-related amendments to the Fisheries Act. Retrieved from:
<http://www.mondaq.com/canada/x/671804/Environmental+Law/Angling+For+Reconciliation+An+Overview+Of+Indigenou+sRelated+Amendments+To+The+Fisheries+Act>
- Ban, N., Eckert, L., McGreer, M. & A. Frid. (2017). Indigenous knowledge as data for modern fishery management: a case study of Dungeness crab in Pacific Canada, *Ecosystem Health and Sustainability*, 3:8, DOI: [10.1080/20964129.2017.1379887](https://doi.org/10.1080/20964129.2017.1379887)
- Bohensky, E.L. and Y. Maru. (2011). Indigenous knowledge, science, and resilience: What have we learned from a decade of international literature on "integration"? *Ecology and Sociology* 16 (6). Retrieved from:
<https://www.ecologyandsociety.org/vol16/iss4/art6/>.
- Bohensky, E. L., Butler, J. R. A., and J. Davies. (2013). Integrating Indigenous ecological knowledge and science in natural resource management: perspectives from Australia. *Ecology and Society* 18(3): 20. Retrieved online:
<http://dx.doi.org/10.5751/ES-05846-180320>.
- Bill C-68: An Act to amend the Fisheries Act and other Acts in consequence. (2018). As passed, Jun3 20, 2018, First Session, Forty-second Parliament. Retrieved from the Parliament of Canada website:

http://www.parl.ca/Content/Bills/421/Government/C-68/C-68_3/C-68_3.PDF

Bill C-69. An Act to enact the Impact Assessment Act and the Canadian Energy Regulator Act, to amend the Navigation Protection Act and to make consequential amendments to other Acts. (2018). As passed, June 20, 2018. First Session, Forty-second Parliament. Retrieved from the Parliament of Canada website: <http://www.parl.ca/DocumentViewer/en/42-1/bill/C-69/third-reading>

Bowie, R. (2013). Indigenous self-governance and the deployment of knowledge in collaborative environmental management in Canada. *Journal of Canadian Studies/Revue d'études canadiennes*, 47 (1). Retrieved from: <http://muse.jhu.edu.proxy.library.carleton.ca/article/535645/pdf>

Canadian Environmental Protection Act. (1999). (S.C. 1999, c. 33). Retrieved from: <http://laws-lois.justice.gc.ca/eng/acts/c-15.31/>

Canadian Environmental Assessment Act, (2012). (S.C. 2012, c. 19, s. 52). Retrieved from: <http://laws-lois.justice.gc.ca/eng/acts/c-15.21/index.html>

Constitution Act. (1982). Section 35. Retrieved from: <http://laws-lois.justice.gc.ca/eng/Const/page-16.html>

CSAS [Canadian Science Advisory Secretariat]. (2017). Science Guidance on Design Strategies for a Network of Marine Protected Areas in the Newfoundland and Labrador Shelves Bioregion. Science Advisory Report 2017/046. Retrieved from: http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2017/2017_046-eng.html

CSPC [Canadian Science Policy Centre]. (2017). Indigenous and Western Science: Gathering new knowledge through co-

designed research. [CSPC 2017 conference proceedings]. Retrieved from: <http://sciencepolicy.ca/indigenous-and-western-science-gathering-new-knowledge-through-co-designed-research>

DFO [Department of Fisheries and Oceans Canada]. (2013). Preparing an Integrated Fisheries Management Plan (IFMP). Retrieved from: <http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/guidance-guide/preparing-ifmp-pgip-elaboration-eng.htm>

DFO. (2018). A Fisheries Act for the future. Retrieved from <http://www.dfo-mpo.gc.ca/campaign-campagne/fisheries-act-loi-sur-les-peches/index-eng.html>

ECCC [Environment and Climate Change Canada]. (2017). Acts, Regulations and Agreements: *Fisheries Act*. Retrieved from: <https://www.ec.gc.ca/pollution/default.asp?lang=En&n=072416B9-1&pedisable=true>

Eckert, L.E., Ban, N.C., Frid, F., and M McGreer. (2017). Diving back in time: Extending historical baselines for yelloweye rockfish with Indigenous knowledge. Aquatic Conservation: Marine and Freshwater Ecosystems banner. Retrieved from: <https://doi-org.proxy.library.carleton.ca/10.1002/aqc.2834>

Ellis, S. C. (2004). Meaningful Consideration? A review of traditional knowledge in environmental decision making. *Arctic*, 58(1), 66–77. <https://doi.org/10.2307/40512668>

Fisheries Act (R.S.C., 1985, c. F-14). Retrieved from: <http://laws-lois.justice.gc.ca/eng/acts/f-14/>

Friendship, K.A. and C.M. Furgal. (2012). The role of Indigenous knowledge in environmental health risk management in Yukon, Canada. *International Journal of Circumpolar Health*, 71(0):1-13 DOI 10.3402/ijch.v71i0.19003. Retrieved from:

<https://www.tandfonline.com/doi/full/10.3402/ijch.v71i0.19003>.

Health Canada. (2011). British Columbia tripartite framework agreement on First Nation health governance. First Nations & Inuit Health. Retrieved from <http://www.hc-sc.gc.ca/fniah-spnia/pubs/services/tripartite/framework-accord-cadre-eng.php>

Houde, N. (2007). The six faces of traditional ecological knowledge: Challenges and Opportunities for Canadian co-management arrangements. *Ecology and Society* 12 (2) 34 [online]. Retrieved from: <https://www.ecologyandsociety.org/vol12/iss2/art34/>

ITK [Inuit Tapiriit Kanatami]. (2018). Inuit National Strategy on Research. Retrieved from: <https://itk.ca/national-strategy-on-research/>

Kent, A. (2014). Restructuring First Nations health governance: A multilevel solution to a multifaceted problem. *The Arbutus Review*, 5 (1).

Kim, M. (2017). Indigenous knowledge in Canadian science curricula: cases from Western Canada. *Cultural Studies of Science Education*, 12 (3): 605–613. Retrieved from: <https://link-springer-com.proxy.library.carleton.ca/content/pdf/10.1007%2Fs11422-016-9759-z.pdf>.

Leroy, L.B. (2009). Naturalizing Indigenous knowledge: synthesis paper. Canadian Council on Learning. Aboriginal Learning Knowledge Centre. Imprint Saskatoon, Sask. (pp. 7-15) [ebook]. Retrieved from: <http://books.scholarsportal.info/viewdoc.html?id=361996>

McGregor, D. (2009). Honouring our relations: An Anishinabe perspective on environmental justice. In Agyeman, J., Haluzadelay, R., Peter, C., & O'Riley, P., (Eds.), *Speaking for*

ourselves: Constructions of environmental justice in Canada (pp. 27–41). Vancouver, Canada: University of British Columbia Press.

McGregor, D. (2014). Lessons for collaboration involving traditional knowledge and environmental governance in Ontario, Canada. *Alternative*, 4 (10). Retrieved from: <http://journals.sagepub.com.proxy.library.carleton.ca/doi/pdf/10.1177/117718011401000403>

Nicholas, G. (2018). How Western science is finally catching up to Indigenous knowledge. *Maclean's*. [News article]. Retrieved from: <http://www.macleans.ca/society/how-western-science-is-finally-catching-up-to-indigenous-knowledge/>

Ninnes, P. (2000). Representations of Indigenous knowledges in secondary school science textbooks in Australia and Canada, *International Journal of Science Education*, 22:6, 603-617, DOI: 10.1080/095006900289697 Retrieved from: <https://doi.org/10.1080/095006900289697>

Notzke, C. (1995). A new perspective in aboriginal natural resource management: Co-management. *Geoforum* 26: (2): 187-209. Retrieved from: [https://doi.org/10.1016/0016-7185\(95\)00019-H](https://doi.org/10.1016/0016-7185(95)00019-H)

Nowlan, L., Lloyd-Smith, G., Kirby, A. (2018). Enforcing the Fisheries Act – Perspectives from the Pacific Coast. A Symposium of Environment in the Courtroom: Protection of the Marine Environment, Dalhousie University. Retrieved from: http://www.cirl.ca/files/cirl/l-nowlan_2016_hfx_en2.pdf

Ostrom, E. (2010). Beyond markets and states: Polycentric governance of complex economic systems. *American Economic Review* 100: 647-672. Retrieved from: <https://www.aeaweb.org/articles?id=10.1257/aer.100.3.641>.

- Penikett, T. (2012). Six definitions of aboriginal self-government and the unique Haida model. Paper prepared for the Action Canada. Northern Conference, Haida Gwaii. Retrieved from: <http://www.actioncanada.ca/wp-content/uploads/2014/04/Haida-Gwaii-Governance-EN-Oct-2012.pdf>
- Popp, J. (January 2, 2018). How Indigenous knowledge advances modern science and technology. The Conversation. [news article] Retrieved from: <https://theconversation.com/how-indigenous-knowledge-advances-modern-science-and-technology-89351>.
- Ray, A.J. (2015). Traditional Knowledge and Social Science on Trial: Battles over Evidence in Indigenous Rights Litigation in Canada and Australia International Indigenous Policy Journal, suppl. The Future of Traditional Knowledge Research: Building, 6 (2). Retrieved from: <https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=1221&context=iipj>.
- Species at Risk Act. (S.C. 2002, c. 29). Retrieved from: <http://laws-lois.justice.gc.ca/eng/acts/s-15.3/>
- Statistics Canada. (2013). Aboriginal Peoples in Canada: First Nations People, Métis and Inuit. Catalogue no. 99-011-X2011001. Ottawa, (ON): Government of Canada.
- Stefanelli, R.D., Castleden, H., Harper, S.L., Martin, D., Cunsolo, A., and Harta, C. (2017). Experiences with integrative Indigenous and Western knowledge in water research and management: a systematic realist review of literature from Canada, Australia, New Zealand, and the United States. Environmental Reviews, 25(3): 323-333. Retrieved from: <https://doi.org/10.1139/er-2016-0114>

- Takeda, L. and I. Ropke. (2010). Power and contestation in collaborative ecosystem-based Management: The case of Haida Gwaii. *Ecological Economics*.
- United Nations. (2007). Declaration on the Rights of Indigenous Peoples, Official Records of the General Assembly, Sixty-first Session, Supplement No. 53 (A/61/53), part one, chap. II, sect. A.
- Usher, P. (2000). Traditional ecological knowledge in environmental assessment and management. *Arctic* 52, 2: 183. Retrieved from:
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.474.5055&rep=rep1&type=pdf>
- Walsh, F. J., Dobson, P.V., and Douglas, J.C. (2013). Anpernirrentye: a framework for enhanced application of indigenous ecological knowledge in natural resource management. *Ecology and Society*, 18(3): 18. Retrieved from:
<https://www.ecologyandsociety.org/vol18/iss3/art18/>
- WECD [World Commission on Environment and Development]. (1987). *Our Common Future*. Retrieved from: <http://www.un-documents.net/our-common-future.pdf> .