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Climate and Energy Politics in Canada and Germany: Dealing with Fossil Fuel Legacies [1]

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Abstract

Canada and Germany are both pursuing major energy transitions and far-reaching climate programs and targets, but they differ in terms of policies towards some energy sources and their preferred policy instruments. Both countries have committed to large scale emission reductions despite the challenge of regional divestment from fossil fuels: hard coal in North Rhine Westphalia and the Saarland; lignite in the Rhineland, in the Lusatsia (Lausitz) region, and in central Germany; coal in Alberta, Saskatchewan, and Nova Scotia; and oil and natural gas in Western Canada. This article compares the current Pan-Canadian Framework (PCF) on Clean Growth and Climate Change with the German Climate Law and the European Green Deal. Relying on these measures, Canada and Germany set out policies and targets to become climate neutral by 2050. The article identifies critical challenges in the transition away from fossil fuels in both countries and provides insights on the possibility and likelihood of linking policies and regulatory measures across the Atlantic.

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Introduction

Canada and Germany are two of the largest economies among the top ten greenhouse gas (GHG) emitters globally. In 2020, Canada accounted for 1.6 percent and Germany for 1.8 percent of global GHG emissions. The two countries, however, have quite different historical experiences with fossil-based energy. While Canada started with a relatively clean energy system based to a large extent on hydropower, it became a fossil fuel giant as a result of oil and natural gas discoveries in the West. Canada, as a colonial nation, was built on the exploitation of natural resources and Indigenous lands through a staples approach (Watkins 1963) that has been characterized by sequential periods when specific export commodities were dominant (fish, fur, timber, grain, oil), and associated with wider economic, social, and political consequences. The latest natural resource staples to be developed are oil and gas, with Canadian reserves of oil and gas, the vast majority of which are located in Alberta, accounting for 10 percent of known global reserves (Natural Resources Canada 2019). In comparison, Germany fueled its industrial development with domestic coal and lignite. German coal reserves are significant. Of known global reserves of coal, Germany accounts for 3.5 percent, Poland 2.5 percent, and the European Union (EU) as a whole about seven percent (Worldometers 2020). During its period of rapid economic growth from the 1960s into the 1980s, Germany also invested heavily in nuclear energy (Brauers, Herpich, and Oei 2018; von Hirschhausen et al. 2018), and so did Canada.

While both countries' economies have been heavily dependent on fossil fuels and had a similar number of nuclear reactors into the 1990s, in the last decades Germany has embarked on an energy transition away from nuclear energy and towards renewable energy sources (onshore and offshore wind, solar photovoltaics, geothermal, and green hydrogen). Germany plans to shut down the last of its nuclear reactors by 2022. More recently, it has laid out plans to phase out coal no later than 2038. These plans have been complemented by the controversial plan to bridge the transition from coal to renewables, with imports of Russian natural gas. Canada has also invested in expanding renewable energy and plans to phase out coal by 2030. But Canada remains heavily invested in western oil and gas and maintains its nuclear power facilities in Ontario and New Brunswick.

The impacts of Canada's and Germany's shifting energy paths are visible in their greenhouse gas emissions trajectories, which have moved in opposite directions. Canada's carbon dioxide (CO_2) emissions rose from 453.40 metric tonnes (hereafter m tonnes) in 1990 to 584.85 m tonnes in 2019. In contrast, German emissions declined in this same period from 1018.22 m tonnes to 702.60 m tonnes (Crippa et al. 2020). Indeed, although Canada started out relying on cleaner energy than Germany and in 1990 its per capita CO_2 emissions were only somewhat higher than in Germany (respectively, 16.37 versus 12.87 tonnes CO_2/cap), in 2019 they were substantially higher: 15.69 versus 8.52 tonnes CO_2/cap (Crippa et al. 2020).

This difference suggests that Canada's status as an increasingly major oil and gas producer in the past decades has worsened its climate balance despite the phase out of coal in Ontario and expansion of renewables in some provinces. In comparison, in Germany there have been major industrial shifts which include the shutting down of highly polluting plants and the modernization of infrastructure (particularly in eastern parts of the country after reunification in 1990), a strong expansion of renewable energies, and a move away from highly polluting coal to growing reliance on natural gas which has a lower CO_2 content. Germany has more consistently pursued climate policies than has Canada, where changes in party control of the federal government have resulted in swings in the degree of intensity with which Canada has addressed climate change.

This article examines factors that help explain Canada's and Germany's efforts to transition away from their historic energy paths towards cleaner, more climate-responsible energy systems, with attention to their differing experiences in dealing with powerful fossil fuel interests and carbon-intensive industrial actors. As German climate and energy policy cannot be understood without reference to the EU, the article also brings in relevant dimensions of EU climate laws and programs.

Canada, Germany, and the EU have all signed on to the Paris Climate Agreement. Canada has committed to reducing its GHG emissions by 30 percent of 2005 levels by 2030 and to working towards achieving net emissions neutrality by 2050. Germany is pursuing a 55 percent reduction of 1990 emission levels by 2030, has indicated its intentions to be climate neutral by 2050, and has supported the European Green Deal, which calls for climate neutrality for the entire EU by 2050 as well. To follow along with European and U.S. pledges to pursue more aggressive emission reduction plans, Canada announced on Earth Day 2021 (April 22nd) a more ambitious target of 40-45 % carbon emission reductions by 2030.

The article begins with a brief comparison of the energy structures in Canada and Germany. It then examines the German energy transition, the German Climate Protection Act, and the European Green Deal, before turning to the Pan-Canadian Framework on Clean Growth and Climate Change. Next, the article examines the significant challenges that both countries face in pursuing their ambitious climate policies, particularly the need to address the resistance of powerful fossil fuels lobbies, carbon-intensive industrial/financial interests, and impacted regions. Also considered is the extent to which and why these alliances may be shifting in Germany and Canada. The article concludes with discussion of areas where the two countries can cooperate to make progress toward their respective goals in transitioning energy sources and combatting climate change.

German Climate Policy and the German *Energiewende*

Germany plays a particularly important role within international and EU climate and energy policy-making, at times acting as a driver, and at other times acting as a brake. Germany was among the first states to introduce a voluntary climate target in 1990, and in 1995 it hosted the Bonn Conference which lay the groundwork for the 1997 Kyoto Protocol negotiations. Then Environment Minister and later German Chancellor, Angela Merkel, helped negotiate the Kyoto Protocol, and later pushed to assure its international ratification. It was under the German presidency of the European Council in 2007 that the groundwork was realized for an integrated European Climate and Energy program and at the onset of Ursula von der Leyen's (a German) term as European Commission President that the European Green Deal was launched in 2019.

Over the years, Germany has set out numerous ambitious climate and energy plans as well as voluntary domestic GHG emission reduction targets. These include the Climate Protection Program of 2000, the Integrated Energy and Climate Program of 2007, the Climate Protection Concept of 2010, and the Climate Protection Plan 2050 set in 2016. Hundreds of policy measures have been introduced to shift industry, society, and energy producers in cleaner directions, to tighten building efficiency standards, to address excessive consumption and waste, to expand recycling, to further public transport opportunities, and to digitalize the economy to enhance efficiencies.

With these goals and actions, Germany seeks to spur new industries and become a global climate leader. Between 1990 and 2020, Germany reduced GHG emissions by 42.3 percent and expanded renewable energy in the electricity sector from three to 45 percent (Agora Energiewende 2021).[4] An initial drop in emissions was tied to unification as many industries in the former East Germany could not compete in the new system or meet its higher pollution standards. The German Federal Environmental Agency reports that between 1989 and 1994, CO_2 emissions in the former East Germany dropped by about 43 percent while in the former West Germany they remained largely stable. The "wall fall profit" in terms of CO_2 emission reductions has been estimated to be about 105 million tonnes or about 10 percent of the emission reductions from 1990 levels (Eichhammer et al. 2001, 7-11). Often overlooked in discussions about the wall fall profit are the tremendous financial and social costs associated with the industrial restructuring of the East; while these were perhaps easy emission reductions, they were certainly very costly. After about the mid-1990s, further emission drops are associated with climate policy measures.

More recently, the COVID-19 crisis has played a role in the sharp greenhouse gas emissions reductions and in the strong performance of renewable energies. Agora Energiewende (2021) estimates that without the economic slowdown induced by the pandemic, emissions would have only been about 38 percent below 1990 levels. Prior to the pandemic, Germany's climate actions were increasingly criticized, especially by environmentalists, as being too lopsided. While much was being done to build up renewables, too little was being done to address emissions in the hard-to-abate sectors due to resistance from some of the country's most powerful industries, including the coal and automobile sectors.

Germany's energy transition (*Energiewende*) and its climate policies have been pushed forward by environmental movements and the Green Party, public opinion, and the search for new areas of industrial development. Public pressure began with calls for a nuclear phase out, transitioned to focus on renewable energy, and more recently to demands for still more far-reaching climate action. For many years, deeper changes to the status quo were challenged by conventional fossil fuel dependent industries and regions (Hey 2010; Stefes 2016). The Christian Democratic Union (CDU) and its Bavarian sister party, the Christian Social Union (CSU), with its strong ties to big business interests, and the Social Democratic Party (SPD) with its support from the labour unions, initially resisted the demands for a more rapid transition in the country's energy structure and transport system. This resistance has more recently weakened as public demand for climate action has strengthened. Over time, fossil fuel industries have felt compelled to begin investing more actively in the renewable energy sector.

Phasing Out Nuclear Energy and Phasing in Renewables

The *Energiewende* envisions a shift away from nuclear and fossil fuel dependency, enhanced resource and energy efficiency, and the expansion of renewable energy capacity. The *Energiewende* has its roots in decades of contention over nuclear energy policies. Anti-nuclear protests galvanized Germany in the 1970s and 1980s. These protests led to the birth of the Green Party, which over the course of the next decades pressed other political parties to develop more assertive programs for sustainable development (Hager 2016). Today, German political parties

[4] See also the Frauenhofer Institute's energy charts: https://www.energy-charts.de/index.htm

(with the exception of the Alternative for Germany (*Alternative für Deutschland*)) vie with each other to convince voters that they are the true representatives of green interests. The Chernobyl nuclear crisis in 1986 weakened public and political support for nuclear energy; the nuclear crisis in Japan in 2011 basically ended support altogether. Germany, which once had more than a quarter of its electricity supplied from nuclear energy, will soon be nuclear free.

Related to the phase out of nuclear energy have been the efforts to promote renewable energy. The growth of renewables began with the 1990 Electricity Feed-in Law requiring grid operators to take renewable energy into the grid, including from small producers, and the expansion of feed-in-tariffs as a result of the Renewable Energy Law of 2000 (von Hirschhausen 2018; Clausen 2019). This law was negotiated under a Social Democratic Party – Green Party coalition (Morris and Jungjohann 2016).

Phasing Out Coal and Transport-related Emissions

Despite progress on renewables, Germany's GHG emissions were dropping more slowly than planned before the COVID-19 pandemic struck; in fact, it appeared that the country would fail to meet its 2020 greenhouse gas reduction target. Progress was stifled by the country's continued heavy reliance on coal, both hard coal and lignite, in the heating and electricity sectors. Hard coal and lignite combined accounted for over 39 percent of electricity generation in 2017. While working to develop the image of a clean manufacturing economy, Germany was spewing pollution from its 42.6 gigawatts (GW) worth of coal-fired power generation capacity. Transport-related emissions tied to oil and gas use were another problem area. A plan to have one million electric vehicles on the road by 2020 had to be pushed back by two years as neither the industry nor the government prioritized the transition (Reuters 2018) and because the industry focused on the internal combustion engine and energy-intensive luxury vehicles (Miller and Campbell 2019). The slow pace of change in the automobile sector is certainly linked to the power of this industry, which employs over 800,000 people directly and many more indirectly. The pace of improvements in the energy efficiency of the housing stock has also been slow. Without a climate law making the realisation of targets mandatory, progress was uneven.

Germany Moves to Phase Out Coal

Starting in the mid- to late 2010s, pressure grew internally and externally for Germany to do more to address emissions from coal-fired power plants, its single largest source of emissions (Stefes 2016; Oei 2018). An external source of pressure was the launch by the United Kingdom and Canada of the Powering Past Coal Alliance at the 23rd Conference of the Parties to the UN Framework Convention on Climate Change in Bonn, Germany in 2017 (Power Past Coal Alliance 2017). The formation of an international alliance to phase out of coal in Bonn was an embarrassment for Germany as it was seeking to portray itself as a climate leader but had yet to really tackle its own coal-based emissions. It certainly added to the pressure being created by large public protests.

Domestic protests have taken many forms, and some are still on-going. In 2018, in North Rhine Westphalia, protesters built camps in the Hambach Forest to protect this old growth forest scheduled to be cut down by the energy giant, RWE, in order to get at the lignite below. In 2019, activists broke through police lines to prevent mining equipment from being used in the Garzweiler lignite mine, and the following year they broke in and occupied the mine. In parallel actions, in

Brandenburg, protesters blocked the train tracks leading to one of the country's dirtiest coal-fired power plants, Jänschwalde. The confrontations between police and activists are reminiscent of the conflicts which had taken place decades earlier against nuclear power plants.

In this increasingly tense environment, in 2018 the coalition government formed the Commission for Growth, Structural Change, and Employment (more commonly known as the Coal Commission). Germany often makes use of such commissions to develop consensus among divergent interests on deeply divisive issues. Commission members discuss and debate for weeks, months, or in this case over a year until a compromise solution can be found. The commission's final report was released in February 2019. With just one negative vote, the report called for a total phase out of coal by 2038, with a possible earlier phase out by 2035 (Schulz 2020). One year later, the German parliament agreed on a "coal phase out" law. The capacity of power plants using hard coal (anthracite) (22.7 GW in 2017) and those using lignite (19.9 GW in 2017) are to be reduced to around 15 GW each by 2022, with a further reduction to 8 GW capacity for hard coal and 9 GW capacity for lignite-fired power plants by 2030. Support of up to 40 billion Euro for structural transitions and compensation to power plants in the impacted regions is expected (Bundesrat 2020).

Under pressure from youth activists (especially Fridays for Future) and fearing loss of voter support in the face of its failure to meet set targets, the ruling CDU/CSU - SPD coalition began work on a climate protection law. The Federal Climate Change Act, a major framework law, entered into force on December 18, 2019. In discussing the need for the law, the coalition partners noted the heavy financial burden the country would face if it failed to fulfill its GHG emission reduction targets under the EU's Effort Sharing Decision (Fraktionen der CDU/CSU und SPD 2019). The act mandates a minimum 55 percent reduction in GHG emissions by 2030 (relative to 1990 levels); sets annual emission budgets for the energy, industry, transport, buildings, agriculture, and waste sectors; and legislates climate neutrality as a goal for 2050. The government is itself to become climate neutral in all of its activities and investments by 2030. The act requires annual performance evaluations and transparency in emissions data provided by an independent evaluation committee. The ministries responsible for under-performing sectors will be required within a three-month period to present an immediate action program (*Sofortprogramm*) with measures for how to address shortcomings. Parliament will determine if further regulatory measures are needed (Deutscher Bundestag 2019).

The Climate Action Programme 2030 specifies measures to reach targets. Starting in 2020, air flight taxes were increased, a CO_2 price was established which raised the price of fossil fuels for transport and heating, a new tax incentive for building renovations was introduced, and the value added tax on train tickets was reduced. To address concerns about consumer backlash, electricity prices for residential consumers are to be reduced by cutting the feed-in tariff for renewables, a controversial idea intended to offset the higher prices on oil, gas, and kerosene.

Amid growing concern about foreign competition in electric vehicle development, the automobile sector has also been targeted. The Climate Action Programme establishes several targets: 40 to 42 percent emissions reductions for the transport sector compared to 1990 levels, seven to 10 million electric vehicles on the road, and a target of one million charging stations for electric vehicles by 2030. As in Canada, various purchase incentives for e-vehicles have been introduced.

There will, of course, be obstacles to acceptance of some of these measures (Schreurs and Ohlhorst 2015; Bues 2020). The expansion of wind parks, large solar installations, biomass facilities, and electricity storage systems are facing opposition from affected communities and some nature conservation interests. There is also opposition to the phase-out in affected communities. To integrate the public into the implementation process, participatory decision-making initiatives are becoming increasingly common at both the *Länder* (state) and federal levels.

An additional problem relates to the possible lock-in effect caused by infrastructure being developed for natural gas, which is being turned to to replace coal. The controversial Nord Stream 2 pipeline, which is to bring natural gas directly from Russia to Germany via the Baltic Sea, is a case in point.

EU Climate Policy and the European Green Deal

EU climate and energy policies set general directions, targets, and expectations for Member States, which then have the responsibility for implementation (Lederer,2020). German climate and energy policy must be viewed in this context. The EU has managed to maintain a surprising degree of consensus on the importance of climate action despite the diversity of its Member States and their rather different energy structures (Schreurs and Tiberghien 2007; Schreurs and Tiberghien 2010; Jordan et al. 2012; Wurzel, Connelly, and Liefferink 2017). It uses a variety of means ranging from advice to directives and regulations to encourage, cajole, or require Member States to do more to protect the environment. This has been the case, for example, in relation to Germany's automobile sector, which historically has lobbied the federal government to oppose more stringent emission regulations. Once tighter emission regulations are nevertheless decided upon at the EU level, as has occurred on numerous occasions, the German industry must comply (Oki 2020).

Member States also take their own priorities and interests and elevate them onto the EU's agenda in an effort to create a level playing field within the EU or to enhance progress on an issue of normative concern, like climate change. Germany played a critical part in early efforts to elevate renewable energy to the EU agenda. In the meantime, the EU has issued a series of directives aimed at expanding renewable energy capacity and improving energy efficiency. As a consequence, the growth of renewable energy across the EU has been striking. In 2005, renewable energy in gross final energy consumption for the EU28 stood at nine percent; at the end of 2019 it was 18.9 percent (and 19.7 percent for the EU27) (European Environment Agency 2019; Eurostat 2021).

The EU has also managed to keep climate action a Union priority despite some ups and downs in Member State enthusiasm for stricter action. In 2014, in the lead up to the Paris Climate Agreement, the Clean Energy for All Package was adopted setting GHG emission reduction targets for 2030. These targets were amended upwards in December 2018 to 40 percent GHG emissions reduction (compared to 1990 levels), 32 percent for renewable energy and 32.5 percent for energy efficiency (compared to 2005 levels) (European Commission 2019). The European Commission (n.d.) reported in 2020 that, between 1990 and 2018, the EU reduced GHG emissions by 23 percent while the economy grew by 61 percent over the same time period, meaning the EU had exceeded its 2020 target to reduce emissions by 20 percent of 1990 levels ahead of schedule. A decoupling from energy use and GHG emissions is occurring (European Commission 2020a).

With increasing concern in the EU about global warming, pollution, inefficient material use, natural resource depletion, and import dependency for energy and natural resources, in 2019, the European Commission proposed a European Green Deal. It addresses the areas of clean energy, sustainable industry, building renovation, sustainable mobility, food production and consumption, and biodiversity protection. The European Green Deal aims at climate neutrality and zero pollution by 2050. The EU has set a plan to cut emissions by 55 percent of 1990 levels by 2030 (on the debate behind these targets see Abnett 2020; European Commission 2020d).

Part of the EU's COVID-19 recovery package that was spearheaded by Germany and France calls for a tax on non-recycled plastics and the introduction of carbon border taxes starting in 2023 on products being produced in countries with lower carbon emission standards than the EU. Thirty percent of the total €1.8 trillion package, combining the multiannual financial framework (MFF) and Next Generation EU, is to target climate-related projects (European Council 2020). The European Green Deal bases its climate change targets and goals on ecological modernization discourses, reflecting debates in Germany about the economic opportunities for climate change action (Machin 2019).

A key policy instrument for achieving Germany's climate goals has been the EU emissions trading system (ETS), which was launched in 2005 and covers thousands of industries. Sectors covered by the ETS have to cut emissions by 43 percent compared to 2005 and non-ETS sectors by 30 percent (Bayer and Aklin 2020). Early design flaws, and especially the allocation of too many pollution allowances to major industries – a problem that ensued in significant part due to the demands of German industries – limited the effectiveness of the system. Subsequent corrections to the ETS' design have improved its functioning to some degree. Despite the low prices on carbon resulting from initial design flaws, according to one assessment (Bayer and Aklin 2020), the ETS saved the EU about 1.2 billion tonnes of CO_2 between 2008 and 2016, equating to reductions of 3.8 percent of total EU-wide emissions compared to a scenario without an ETS. With the reforms, the price of carbon has risen from a low of just under three Euros per tonne of carbon in April 2013 to over 43 Euros per tonne in April 2021.[5] Under the EU post-COVID-19 stimulus package, the ETS is to be expanded to the aviation and maritime sectors as well as to the transportation and heating sectors. This pricing of carbon is critical for Germany in its efforts to meet its domestic targets as it incentivizes the shift away from fossil fuels. The European Commission (2020b) reported an 8.7 percent drop in GHG emissions in 2019 compared to 2018 levels, largely a result of a decline in emissions from stationary sources (with coal being replaced by renewables and gas-fired power production), and a significant jump in the carbon price after the fourth EU ETS reform.

Canadian energy and climate change politics

Canada is among the most decentralized of all federal countries. In 1982, *The Constitution Act* (section 92a) strengthened provincial powers over natural resources. Each province has exclusive jurisdiction over the development, conservation, and management of its non-renewable resources, which includes energy resources, forests, and hydroelectric power facilities. The federal

[5] See the EMBER EU ETS carbon pricing tracking system: https://ember-climate.org/data/carbon-price-viewer/.

government has authority over transboundary emissions and interprovincial matters, and has considerable authority to regulate GHG emissions. While the federal government takes the lead in signing international agreements such as the Kyoto Accord and the Paris Accord (2015), the effective implementation of such agreements depends heavily on the cooperation of the provinces and territories. Due to wavering levels of commitment at both the federal and provincial levels, Canada generally has a weak record of following through on international climate change commitments. Furthermore, Canada is the only G7 nation without a national energy strategy (Schott and Campbell 2013). The lack of such a strategy makes it difficult to coordinate energy and climate policy and to set specific timelines and targets (Benz and Broschek, 2020).

Adding to the complexity is the legacy of the colonial state system. The current Liberal government is committed to truth and reconciliation with 94 calls to action (Truth and Reconciliation Committee 2015) and reversing the colonial path in line with the UN Declaration on the Rights of Indigenous Peoples (UNDRIP, UN 2007). There are large areas of Canada that are either unceded territories or have treaties or modern land claims that provide considerable power and autonomy for Indigenous Peoples. Recently, Indigenous leaders and activists have openly demonstrated against large energy projects, such as natural gas and oil pipelines going through British Columbia (BC) as well as oil exploration in the Arctic (e.g., Clyde River vs. Petroleum Geo-Services). A shift to a more meaningful nation-to nation dialogue will require more Indigenous representation in decision-making and an enhanced role of the federal government as a power broker and mediator between Indigenous Peoples and provincial and territorial governments when it comes to overlapping energy and environmental policies (Gramiak and Schott 2018).

Energy and climate change policies differ quite significantly within Canada. There are important regional differences in terms of provincial efforts to reduce energy-related carbon emissions (decarbonization) and decouple economic activities and energy demand. Canada has a relatively clean electricity grid, with 67 percent of electricity coming from renewable sources and 82 percent from non-GHG emitting sources. Some provinces are very advanced in terms of their clean electricity grids (e.g., Manitoba, Québec, BC, Newfoundland and Labrador, and Ontario). Five provinces (Nova Scotia, New Brunswick, Prince Edward Island, Ontario, and Québec) and all three territories (Yukon, Northwest Territories, and Nunavut) have achieved some degree of decoupling and decarbonization. However, provinces with resource-dependent economies (Saskatchewan, Alberta, Manitoba, Newfoundland and Labrador, and BC) are failing to decouple and only BC has managed to make some gains in decarbonization (Hughes 2020). In aggregate, Canada's economic growth is still fuelled by increases in energy demand and weak decarbonization efforts due to a split between the post-industrial East and the industrialized fossil fuel dependent West (Hughes 2020). Since Pierre Elliot Trudeau's National Energy Program, there have been five attempts in Canada to coordinate energy and climate change policy that have so far failed to offset increasing emissions from oil and gas development in the western provinces (Macdonald 2020; Winfield and Macdonald 2020). A continuation of this attempt is the recent acquisition of the Trans Mountain Pipeline expansion by the federal government to bring Albertan oil to a port near Vancouver. This project will enable a tripling in the pipeline's capacity to 890,000 barrels of oil per day but increases Alberta's challenge in meeting its GHG emission reduction targets and sends a mixed message on future industry and energy transition directions.

The oil and gas sector has maintained a strong influence on Canadian politics for several decades and managed until 2016 to limit any serious climate regulations for the sector. A strong alliance

of vested interests linking oil companies, natural gas companies, utilities in the US and Canada, and the Canadian financial oligopoly (Toronto Dominion Bank, Bank of Montreal, Scotiabank, CIBC, and Royal Bank) successfully counteracted calls for stricter environmental legislation in most provinces and by the federal government. There was also surprising public support and media coverage of climate skeptics, who were falsely perceived as providing a balanced view on climate science.

The Struggle to Develop and Implement a Pan-Canadian Framework on Clean Growth and Climate Change

The election of a Liberal government under the leadership of Justin Trudeau in 2015 indicated a shift in the approach to energy policy, and a more climate-friendly direction compared to the previous approach of the Conservative government led by Stephan Harper. An important step was the development of a more coordinated plan to tackle GHG emissions while enabling clean growth, which was introduced by the Liberal government in 2016 in the form of the Pan-Canadian Framework on Clean Growth and Climate Change (PCF).

As noted above, implementation of effective climate and energy policy requires coordination between the federal and provincial governments. For this reason, the PCF was developed after the Declaration of the Premiers adopted at the Québec Summit on Climate Change in 2015 where it was agreed to take ambitious action in support of meeting or exceeding Canada's 2030 target of a 30 percent reduction below 2005 levels of GHG emissions. This involves a commitment to pursue a collaborative approach between provincial, territorial, and federal governments to reduce GHG emissions, and to enable sustainable economic growth. The PCF explicitly acknowledges the rights of Indigenous Peoples and their leadership in the adoption of the Paris Agreement (Canada 2016). At that point, Saskatchewan was the only province not to sign on to the PCF.

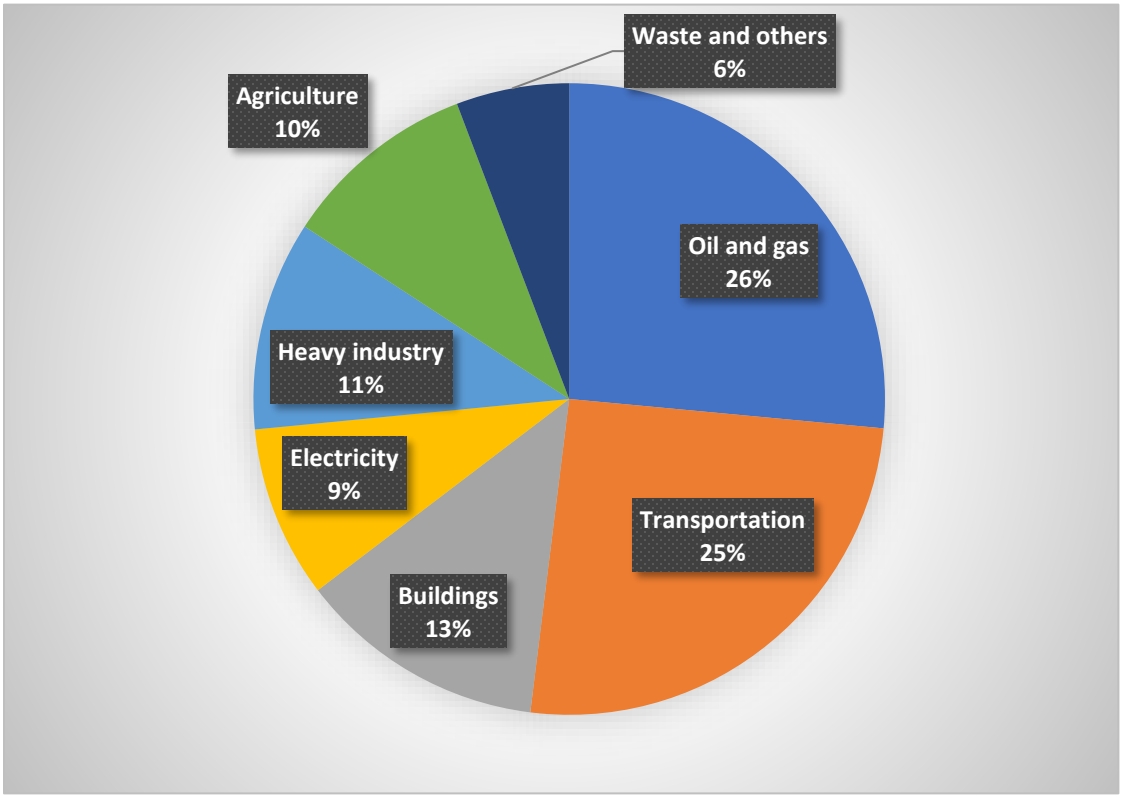
The PCF tries to ensure that the provinces and territories have the flexibility to design their own policies and programs to meet emission-reductions targets, with federal support for infrastructure, specific emission-reduction opportunities, and clean technologies. The PCF focusses on carbon pricing with complementary measures by sector, adaptation and resilience, and industrial policy and economic development. To achieve these objectives, the Liberal government proposed a clean growth direction with aggressive carbon price targets. A federal levy of 20 dollars per tonne of carbon came into effect April 1, 2019 and applies to provinces that did not adopt their own carbon taxes, cap-and-trade systems or other plans for carbon pricing. The levy will rise by 10 dollars per year until it reaches 50 dollars in 2022. An announcement by the Liberal government in December 2020 committed to a further increase of the carbon price beyond 2022. Starting in 2023, the price will go up by 15 dollars per tonne a year from the current 30 dollars until it hits 170 dollars in 2030.

A major commitment in the Liberal's climate plan is the phase out of traditional coal units across Canada by 2030. This will only affect Nova Scotia, New Brunswick, Alberta, and Saskatchewan but is a major step towards a cleaning of the country's electricity grids. Important highlighted measures are new and enhanced transmission lines between and within provinces and territories, deployment of smart-grid technologies, and the reduction of diesel-powered generation for Indigenous Peoples and northern and remote communities. In the building sector, new energy efficient measures focus on the goal of adopting a 'net-zero energy ready' model building code by 2030 and retrofitting existing buildings through energy efficiency improvements and fuel

switching, including in Indigenous communities and in social housing initiatives. For the transportation sector, the federal government merely commits to continue implementing increasingly stringent standards for emissions from light duty vehicles and to taking action to improve efficiency and to support fuel switching in the rail, aviation, marine, and off-road sectors. Although the PCF committed to develop a Canada-wide strategy for zero-emission vehicles (ZEV) by 2018, and to boost zero emission infrastructure, no specific strategy has been developed. The government has set rather non-ambitious targets for sales of ZEVs compared to other OECD countries (10 percent of new light-duty vehicle by 2025, 30 percent by 2030, and 100 percent by 2040 (Transport Canada 2020)), and a 5,000-dollar incentive for the purchase or lease of an eligible battery electric, hydrogen fuel cell, or longer-range plug-in hybrid vehicle, and a 2,500-dollar incentive for a shorter-range plug-in hybrid vehicle. These incentives are topped up with additional subsidies only in Québec and BC. Canada aims to reduce methane emissions from the oil and gas sector, including offshore activities by 40 to 45 percent by 2025, and to phase down use of hydrofluorocarbons (HFCs) to support Canada's commitment to the Montreal Protocol's Kigali amendment. The enhancement of carbon sinks is stressed, as are the increased use of wood products in construction, the production of renewable fuels and bioproducts, and enhanced innovation to advance GHG efficient management practices in forestry and agriculture. Canada will provide infrastructure investment to deal with and prepare for climate risks like floods, wildfires, droughts, and changes in temperature, including thawing permafrost, and extreme weather events (Bush and Lemmen 2019). The government will support new approaches and 'mission-oriented' research approaches to accelerate innovation, to support clean technology, to enhance export potential, to strengthen financing, and to create jobs and a new clean energy sector. A recent announcement committed to net zero emission by 2050 (ECCC 2020) with legally-binding, five-year emissions-reduction milestones, support for clean electricity generation, greener buildings and communities, and the electrification of transportation and nature-based climate solutions, such as a commitment to plant two billion trees in a decade.

The PCF provides the first guiding framework of its kind which directly affects the provinces' energy investments and electricity generation. It is overly optimistic, however. The complementary measures do not go far enough, as they mostly focus on *carrots* and lack timelines and concrete suggestions on how to push emission reductions further in key sectors. Oil and gas, and heavy industry are responsible for 37 percent of GHG emissions. Without serious advancements in those sectors, Canada will not be able to achieve its targeted 511 metric tonnes of CO_2 equivalent cut by 2030 (see figure 1).

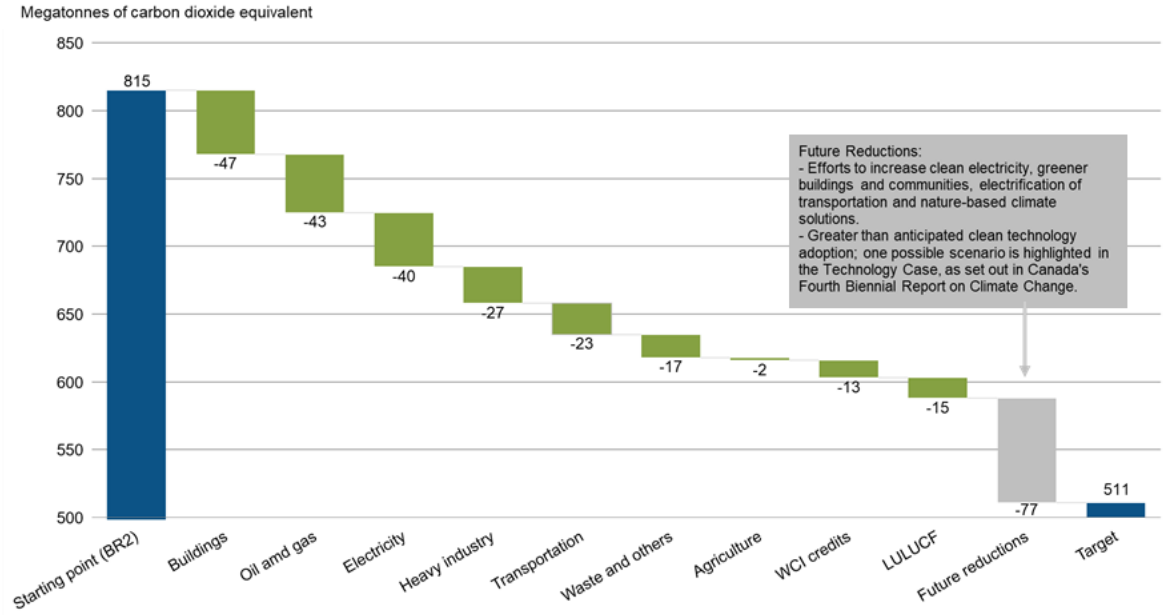
Figure 1: Canadian GHG Emissions by Economic Sector in 2018.



Source: (Environment and Climate Change Canada 2020) with percentage calculations and illustration by authors.

The most recent progress report by Environment and Climate Change Canada (ECCC) indicates that contributions to emission reductions by sector are not sufficient. Canada is projected to overshoot its target by about 105 metric tonnes of CO_2. To close that gap, Canada counts on credits from the Western Climate Initiative (WCI 2020) (trade of carbon credits between California and Québec), contributions from the land use change and forestry sector, and uncertain advances in clean electricity, greener buildings, electrification of transportation, nature-based climate solutions (mostly planting trees), and greater than anticipated clean technology adoption (see figure 2).

Figure 2: Contributions to emissions reductions in 2030.



Source: (Government of Canada 2019), figure 2: Contribution to Emissions reductions.

The experience to date with the PCF has been mixed. The 2021 Climate Change Performance Index (CCPI) ranked the effectiveness of Canadian climate change policy 58th (in comparison, Germany's ranks 19th) (Burck et al. 2020) with the spread between the countries increasing relative to the previous year when Canada was ranked 55th and Germany 23rd (Burck et al. 2019). The CCPI report gives Canada:

> *very low* ratings in the categories GHG Emissions, Renewable Energy and Energy Use. In all three categories, the country is not on track for a well below 2°C compatible pathway. While the country is rated *high* for its proactive role at international level, experts continue to observe a discrepancy between international climate leadership and national implementation (2019, 23).

There are a number of reasons for Canada's mediocre to poor performance. The transportation sector is not advancing at the speed necessary to realize these reductions. There are hardly any regional electric trains or buses. A high-speed train in the most densely populated corridor from Windsor, Ontario to Ville de Québec, Québec has been discussed for decades but there is no progress in site (Railway Technology 2020). The electric vehicle and hybrid vehicles targets are not aggressive enough, critical infrastructure is missing, and incentives vary widely across the country. Large scale dairy and beef farmers that contribute significantly to GHG emissions, and that command some of the largest dairy prices in the world, are not anticipated to contribute to meeting the 2030 emission reduction goals in the proposed plan. Provinces have their own building codes and are slow to adopt new national guidelines.

Due to the fact that provinces have more control and power over energy policy, building codes, environmental policy and transport infrastructure than in most other countries, it is difficult for Canada to coordinate its policies and implement a federal strategy like the PCF. The PCF is, however, the closest Canada has come to coordinated action on climate change and future energy

developments. The reason for failures in coordination goes back to the first serious attempt in the 1980s under Pierre Elliot Trudeau (the father of Canada's current Prime Minister), which fueled Western alienation and entrenched opposing regional political agendas in federal politics.

Western Resistance, Indigenous Rights and a New Direction for Canadian Industry

The resistance in Canada to coordinating energy policies and climate change policies goes back to the failure of the National Energy Programme (NEP) in the 1980s, which contributed to the alienation of the West (perhaps with the exception of BC) from trusting a centralized government acting mostly in what it perceived to be the interests of eastern Canada's service and manufacturing sectors. Prime Minister Justin Trudeau is in a precarious situation as his Liberal Party is committed to implementing and reaching ambitious climate targets while making up with alienated western provinces. In the 2019 federal election, the Liberal Party did not acquire a single seat in Alberta, Saskatchewan, or Manitoba, and Trudeau returned to office with a minority government. For the first time in Canadian history, climate change action and policies were a serious election issue. The clear majority of voters cared about climate change action even if it was not necessarily centre stage (Clarke and Pammett, 2020). Andrew Scheer's Conservative Party did not have a serious stand on climate change policies, which some political analysts claim cost them the election in key Conservative ridings in the Greater Toronto metropolitan area (Ibbitson 2019). The last Canadian election, therefore, created a new era in climate change policy that could favour climate change policy implementation in the future (*The Economist* 2019). For the time being, however, Trudeau's Liberal government needs opposition party support to put through polices, and it faces fierce criticism and resistance from western provinces and Conservative provincial governments (e.g., the Ford government in Ontario; the Kenney Government in Alberta). The federal government had to use the Greenhouse Gas Pollution Pricing Act to impose a carbon tax on five provinces (Saskatchewan, Manitoba, Ontario, New Brunswick, and Alberta) that did not have an equivalent system in place. They objected to this imposition (Harrison 2020) and launched constitutional court challenges. These five provinces make up half of all provinces and 59.3 percent of the Canadian population (Canada, n.d.). This does not, however, coincide with public opinion on carbon pricing and climate change action. Almost the same percentage of Canadians (58 percent) indicated in a poll by Nanos for the *Globe and Mail* that it would be unacceptable for a province to opt out of the national climate change plan (Keller 2019). In addition, imposed carbon taxes are redistributed as tax credits to households in affected provinces, so that there is an incentive to switch to less carbon intensive products and behaviour without affecting household incomes.

A larger hurdle will be achieving climate targets without a more direct-action plan for the future of the oil and gas sector. The federal acquisition of the Trans Mountain expansion pipeline in August 2018 for 4.5 billion dollars was a serious blow to the federal government's credibility in terms of climate change action and international commitments. The federal government proclaimed that the pipeline would not undermine the government's commitment to meet or exceed the 2030 Paris targets (MacLean 2018), but they did not provide estimates on how the project would affect emissions projections. Energy economist Marc Jaccard estimated that the expansion of the pipeline would add 8.8 metric tonnes of CO_2 equivalent upstream annually, which over a 50-year lifespan could consume 83 percent of Canada's share of the Paris Agreement (Maclean 2018; Donner 2016). The federal government seems to some to be pursuing policies with conflicting objections: on the one hand, it supports aggressive cuts to GHG emissions in order to satisfy the Paris commitments, while on the other hand it is spending precious public resources

that lock in the traditional fossil fuel sector. In order to meet the Paris Agreement's two-degree target, McGlade and Ekins (2015) estimated that it will be necessary to leave roughly 80 percent of all known fossil fuel deposits in the ground. Pearce estimated that Canada must resist extracting about 75 percent of its oil reserves and 25 percent of its natural gas reserves (Pidcock 2015). The government is committed to limit warming to 1.5 degrees, which would imply even more reserves be left in the ground.

At the same time, the oil and gas sector is having an uncertain future, since oil sands extraction cannot compete with other world supplies of lower-priced oil, and is more vulnerable to fluctuation in global oil prices and uncertainty over pipeline expansion (IEA 2021). Furthermore, since Alberta is landlocked, it relies on refineries in the United States and receives a discounted oil price. In early 2020, the Alberta Government bought a share in the Keystone XL pipeline's extension at a time of major budget deficits. One of the first actions of President Biden was to revoke the permit for the pipeline (The White House 2021), killing the project. Oil markets have become increasingly volatile with battles over market share in a progressively contested resource sector that is still adding reserves (e.g., off the coast of Guyana (Baddour 2020)); the sector is also challenged by sharply declining prices of renewable energy and is threatened by rapidly increasing carbon prices.

Another dilemma is the BC government's plan to expand its liquid natural gas (LNG) export sector to Asian markets. Despite an early and aggressive carbon tax, the province will not be able to meet its own provincial climate targets (Eco Justice 2020). The LNG expansion requires new pipelines that have divided communities between proponents and opponents. Decisions were recently challenged by Indigenous hereditary chiefs who questioned the legitimacy of the colonially imposed system of First Nation Band Councils that make decisions on behalf of Indigenous groups. This led to demonstrations about the Coastal Gas Link project in BC and nationwide solidarity demonstrations that were only halted by the pandemic lockdown (Rastello 2020).

The oil and gas industries are recognizing that the current downturn is no exception and that they can no longer rely on conventional markets to sell their products because market prices are too low and unpredictable, and products will be increasingly subject to regulation and carbon pricing. In the oil sands sector, Suncor has developed a partnership with Enerkem, which turns household garbage into biofuels at a renewable production scale (Corporate Knights 2020). The oil sector industry and Alberta Innovates are focusing on innovation and value added to the oil sands resources. Bitumen Beyond Combustion (BBC) is considering opportunities to produce carbon fiber at large scale to produce lighter, more energy efficient vehicles, including electric vehicles, which could potentially quadruple the revenue from Alberta's current bitumen output with an added economic potential of carbon fibre, activated carbon and asphalt binder in the range of 84 billion dollars annually (Corporate Knights 2020). Industry is looking at the development of green hydrogen (from renewable energy) and blue hydrogen (from natural gas with steam methane reforming) as zero carbon fuel solutions. These new directions overlap with German and EU policy directions and interests and suggest some possible areas for future collaboration. These movements, along with a shift in public opinion that acknowledges the climate emergency, suggest that a decline in vested interests is emerging and that alliances are shifting.

Comparing German and Canadian Experiences with Clean Energy Transitions

Recent developments in Canada, Germany, and the EU suggest that policy makers increasingly recognize that they can no longer avoid addressing climate change. Climate change, and the accompanying need for a low-carbon energy transition, has been given greater priority on the policy agenda. With the European Green Deal and the strength of the Green party in German and EU politics, climate change is high on Germany's political agenda. Political forces are also shifting in Canada where climate change for the first time became a serious federal election issue in 2019, and a national framework is now in place with the PCF. Despite political pushback by certain provinces, public opinion is on the side of more aggressive climate change policy, and even the fossil fuel industry is realizing that they need to be creative in pursuing newer and greener directions. Industry is starting to understand that Canada must advance passed its old staples approach based on the export of its abundant natural resources. Industry and provinces such as Alberta are realizing that diversification of the economy and a longer vision based on value-added and innovative cleaner technologies are more important than volatile and unpredictable fossil fuel markets and trade partners. Still, as much as Germany needs to find ways to transition coal regions into regions pursuing cleaner technologies, Canada needs to transition its oil and gas sector into cleaner technologies and more value-added processes.

Certainly, neither Canada, Germany, nor the EU have done enough to date to mitigate against climate change, yet there are signs of a growing willingness on the part of their governments, industry, and society to support innovative plans and programs that shift energy and economic structures in new directions (Balthasar, Schreurs, and Varone 2019). While all three have at times slid back into entrenched behaviors, more recent climate plans, programs, and targets give some hope that economically difficult choices are possible even in the face of strong industrial or local opposition to sectoral and regional transformations.

The comparison shows that overcoming opposition from legacy industries has been and remains challenging. In the case of Germany, this can be seen from the lack of progress in reducing emissions from the transport sector despite the efforts of the EU to introduce more stringent emission limits. The difficulty of phasing out legacy industries is also evident in the relatively late phase-out of coal. As a point of reference, the phase-out of nuclear energy began in the 1970s and was legislated first in 1990 and again in 2011; demands for a phase out of coal, on the other hand, took hold much later, only in the 2010s, with legislation only implemented in 2019. The lack of action addressing emissions from the coal and transport sectors has challenged Germany's claims to be a climate leader based on its successes with renewable energy development. Although renewable energy has been rapidly expanding for many years, emissions have shown little improvement because of the country's inability to wean itself of its dependence on coal and conventional automobiles. Reaching an agreement to phase out coal was only possible with promises of large compensation programs to the affected industry and regions and increasingly strong demands from the public. Certainly, it was also important that the long-term outlook for the coal industry is bleak given global shifts towards introducing prices on carbon emissions as well as the declining costs of renewables. In the case of the transport sector, it may take international competition and top-down EU directives to bring about a faster transition.

In the case of Canada, a significant hydropower base, the expansion of renewable energy, the North American shale gas revolution, and continued dependence on nuclear energy have made coal redundant, both economically and environmentally. The same has not been true for oil and gas.

These industries remain politically extremely powerful in western provinces, but face growing opposition from environmentalists, Indigenous groups, the general public, and increasingly the financial sector. Still, while oil and gas interests in western provinces remain substantial, developments south of the border are changing the economics of oil and gas. The cancellation of the Keystone Pipeline sends a powerful message and changes calculations both for Alberta and the federal government. The federal government's plan to overcome western Canadian resistance to an energy transition by owning the Transmountain Pipeline is a political hurdle and puts in doubt the seriousness of their climate change targets and commitments.

Public opinion in both countries is also increasingly demanding stronger government action to combat climate change. Fridays for Future has been a powerful force calling for change in Germany and has also established a presence in Canada.

Transatlantic energy and climate linkages and low carbon transitions

Achieving climate neutrality will require action on all fronts. Germany and Canada have a number of opportunities to work more closely together in achieving their targets and goals while advancing innovative new economic sectors and more socially and environmentally responsible supply chains. The recently ratified free trade agreement (Comprehensive Economic and Trade Agreement) that removed most of the tariffs between Canada and the EU sets the stage for further cooperation for climate and energy. In both Germany and Canada, industry is recognizing that change is in the air. Canadian oil provinces are more desperate than before to diversify their economies and invest into innovative processes. Germany, like other EU states, is similarly eager to be a leader in clean energy technologies. This provides an opportunity to innovate and invest in the clean tech sector, not only in renewable technologies but also in clean fuels, alternative aviation fuels, and new supply chains to extract and process transition minerals and metals (World Bank 2017; 2020) and to advance the circular economy.

A closer partnership between Germany and Canada is also of strategic importance. Both Germany and Canada depend on trade and energy relations with partners that are increasingly acting in their own single national interests. For Germany (and the EU), energy relations with both Russia and the US are complicated. For Canada energy relations with the US have changed recently since the US has become an energy superpower in its own right and is now less dependent on Canada's oil and gas sector. The US has also restricted trade and foreign imports (e.g., at the expense of the Canadian automotive and aluminum sector) with their 'Buy American' program that is continued under the Biden Administration. Many materials and metals that are required to enable clean energy development and a green transition are sourced from countries with unstable governments and are extracted with unsustainable and unethical methods (for example cobalt extraction in Congo) or are controlled by powerful countries like China. Since Canada has all of the metals and minerals and some infrastructure and know-how in automotive and energy sectors, and Germany has expertise in advancing clean technologies and processes, there are a number of opportunities that could be further explored. Four areas for potential transatlantic collaboration are highlighted here.

Clean Energy Innovation

Mission Innovation is a global initiative between 24 countries (including Canada) and the European Commission to accelerate clean energy innovation. The initiative has set eight specific innovation challenges (ICs) (IC1: Smart grids, IC2: Off-grid access to electricity, IC3: Carbon capture, IC4: Sustainable biofuels, IC5: Converting sunlight, IC6: Clean energy material, IC7: Affordable heating and cooling of building, and IC8: Renewable and clean hydrogen). Canada and the EU are participating in all of the eight challenges. Canada is one of the co-leads on IC4 and IC6, while the EU is one of the co-leads on IC5, IC7, and IC8. Germany is a co-lead on IC5 and IC8 as well, but is not participating in IC4. There is, therefore, already a strong partnership between the EU, Germany, and Canada on clean technology innovation.

Linking of Carbon Markets

Through the PCF, Canada is committed to carbon pricing or equivalent emissions reductions with an incremental rise of the carbon price by 10 dollars per tonne of carbon equivalent until it hits 50 dollars in 2022. Québec has a cap-and-trade program with California that also involved Ontario for a short period of time. That system is similar to the EU ETS and could potentially be linked. A larger emissions trading system would reduce the emission reduction cost for some provinces and Member States through trade with jurisdictions that have lower abatement costs. A combined system would also ensure the same carbon price, eliminate carbon leakage and would advance trade links and further implementation of CETA. An expanded EU ETS would allow for growing emission trading opportunities and a reduced increase in the anticipated EU ETS price.

Development of a Just and Sustainable Energy Transition Supply Chain

There is a unique opportunity for Canadian-German cooperation on renewable energy and battery technology advancement as well as on establishing socially responsible electric vehicle manufacturing hubs. Canada has a crucial supply of nickel, cobalt, and some of the largest known reserves and resources for rare earth metals (NR Can 2020), as well as many other vital energy transition minerals. Both Germany and Canada have strong auto-supply chains. Canada has promising start-ups in EV buses and trucks (Torrie, Bak and Heaps 2020) and low speed EV passenger vehicles. A natural collaboration between German auto manufacturers, Canadian mining companies and auto-supply centres in Ontario and Québec is sensible especially as US auto manufacturers are withdrawing from Canadian production centres. Furthermore, corporate finance as well as consumers are demanding more sustainable, just and ethical supply chains, from mineral extraction to material recycling.

Partnering on Advancement of the Circular Economy

An important component of a just and sustainable clean energy supply chain is the development of a circular economy. Here, Germany and the EU have been leaders. Canada could learn from the EU's initiatives and experiences in developing new collaborative production processes with blue and green hydrogen, battery and EV production, biofuel development (particularly sustainable aviation fuels), and low carbon materials. Insights from these innovative production processes could then be used to reform other existing sectors of the economy in order to transition to a large scale (across sectors) circular economy approach.

Germany and Canada can more easily meet their own climate change and energy security objectives if they work together on linking emissions trading and carbon pricing mechanisms, furthering clean energy innovation, advancing circular economy concepts, and developing new supply chains from mining exploration to recycling of crucial metals and minerals. Pursuing such transatlantic partnerships will provide opportunities for a more just green transition that reduces inequalities through redistribution of carbon pricing proceeds, the retraining of employees in hard hit sectors, and a meaningful and respectful inclusion of Indigenous Peoples. The colonial expropriation of the lands of Indigenous Peoples has had serious environmental consequences and negative social impacts; it has also presented obstacles to the ability of Indigenous people to partake in the benefits deriving from energy sector production. As major greenhouse gas emitters, Europe and Canada have had significant impacts on Indigenous Peoples and developing countries., and, therefore, share a responsibility to change this situation and find a sustainable path together with the leadership and advice of Indigenous Peoples and impacted communities. The opportunity of alliances between new industrial branches, environmentalists and Indigenous interests to enable a just transition to a low or no carbon economy that is circular and inclusive is on the horizon. Governments need to support this direction and make sure it will be realized.

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