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Perspective

Canada's Green New Deal: Forging the socio-political foundations of climate resilient infrastructure?

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ABSTRACT

A global movement is underway to harness the power of coordinated state policy to address the significant and interrelated challenges of environmental degradation, climate change, poverty, and energy insecurity. In May 2019 a grassroots coalition comprising a range of civil society groups—scientists, labour unions, Indigenous peoples, and youth—launched the Pact for a Green New Deal (PGND) in Canada, with more than 150 town hall meetings across the country. Participants called for 100% renewable energy, phase out of the oil sands, a 50% reduction in emissions by 2030, and the creation of 1 million new green jobs and reconciliation with Indigenous Peoples [1]. A significant reorientation to the scale and direction of government expenditure, as happened in the American New Deal of the 1930s, can spur technical innovation but can also exacerbate inequalities. A Canadian green transition is significant globally given its high energy production, exports, and internal use. In this perspective piece we examine the transformative potential of a Canadian PGND by focusing on the social and political characteristics of energy infrastructure: the potential for 100% renewable energy, transitions for oil sands, energy democracy, Indigenous energy leadership, gender equity, and energy poverty. The actor coalitions emerging from these then forge specific energy transition pathways, whether just and inclusive, or not. The Canadian case highlights the complexities and opportunities that accompany countries with large geographies, fraught geo-political histories, strong federalism, inequalities of access to clean affordable energy, and an abundance of renewable energy.

1. Introduction

A decade ago, a Global Green New Deal (GND) was proposed following the Global Financial Crisis [2]. Early proponents argued that a state-led fiscal stimulus through coordinated policy interventions can simultaneously provide jobs in clean(er) industries, reduce emissions, spur technological innovation and ensure habitable living spaces for citizens [2,3]. Another reading of the GND, however, focuses attention on the socio-political infrastructure that needs to accompany this green shift to fulfil its full transformative potential. Like the 'old' post-war American New Deal before it, the significant changes proposed to scale and shape government expenditure have far-reaching political and social implications, not just financial and technological ones.

Green New Deals have the potential to harness the power of coordinated state policy to address significant and interrelated challenges of environmental degradation, climate change, poverty and energy insecurity. Renewable energy systems can be seen as the solution to greater security with respect to energy supply and access [4], but even "low-carbon" transitions can distribute costs and benefits unequally. Considerations of equity and justice are often afterthoughts in transitions "despite the fact that the concept of sustainable development, the target of many transition plans, is inherently rooted in these core notions" [5]. Those currently denied a place at the policymaking table or in well-paid energy sector jobs are not necessarily more likely to benefit from green technology than they did with fossil fuels. This leads to the question: can new green infrastructure transcend the social, economic and political structures that have created and sustained the current climate crisis?

The time is right for critical perspectives on a Canadian GND. In May 2019 a grassroots coalition from a range of civil society

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groups—scientists, labor unions, Indigenous peoples, and youth—launched the Pact for a Green New Deal (PGND) in Canada, following on the heels of the American GND debates, and within the context of the global school strikes for climate action in September 2019 [6]. The Canadian public is also supportive of more robust climate action, particularly compared to Americans—even those in relatively climate-active California [7]. In the 2019 federal election voters returned the incumbent Liberal party to office over their main Conservative rivals [8]. The social, financial and physical impacts of the climate crisis are predicted to intensify [9] and Canada's policy implementation gap to reach its National Determined Contribution (NDC) as a part of the Paris Agreement targets— let alone any broader environmental or social justice goals—is substantial [10]. A strong social foundation for the energy transition also contributes to meeting global 2030 Sustainable Development Goals, including SDG 5 on women's empowerment, SDG 7 on energy access and emissions, SDG 8 for decent work and economic growth, SDG 9 on sustainable and resilient infrastructure and SDG 10, which strives to address the needs of marginalized communities [11]. However significant opposition to extensive restructuring exists from incumbent industries and, in some cases, the workers within them. Just as the effects of climate change itself are differentially distributed, so too are the effects of mitigation and adaptation efforts, making multi-interest, cross-class and broad coalitions essential [12–14]. The issues explored in Canada may, in turn, offer insights to other resource-based and/or high carbon economies.

The Canadian resource and political economy context highlights issues with global environmental and political significance. These include: heavy economic reliance on fossil fuel extraction and export, the third highest global per capita greenhouse gas emissions [15], diverse Indigenous nations with powerful yet long-denied claims to sovereignty and self-governance [16,17], and access to clean and affordable energy [18] underlined by very strong constitutionally-backed energy federalism [19,20]. Ultimately the GND presents a critical opportunity for Canada to re-examine its societal priorities during the shift to a low-carbon society and ensure that climate transitions are both just and resilient [21]. Here we offer a national case of how the challenges to operationalizing the energy related goals of a GND are significant, but not insurmountable.

2. Context

2.1. The Pact for a Green New Deal

In Canada, the PGND is a grassroots coalition from a range of civil society groups to develop a roadmap for a transition to an inclusive, low carbon and biodiverse Canada. Inspired by the 2018 Le Pacte[1] in Quebec with over 280,000 signatures [22], the PGND aims to address multiple intersecting crises, from climate change and environmental destruction, to eroding social fabric, employment, and living standards [23]. The mechanism to build the roadmap so far has been a series of more than 150 town hall discussions across Canada, where more than 7000 participants identified 'green lines' which should be included in a Canadian GND, and 'red lines', which should not (summarized in Fig. 1).

The organizers did not aim for complete consensus, but rather for a bottom-up brainstorming exercise involving a wide range of participants. The visioning exercise resulted in 8900 red and green lines, which organizers sorted into broad categories[2] and from these identified four broad themes. As the movement grows, these lines are likely to shift, forming part of a living document [1]. The key goals that have emerged to date include a call to cut emissions in half by 2030, create more than a million jobs, phase out the fossil fuel industry by 2040 and shift to 100% renewable energy, build inclusive communities, and continue the reconciliation journey with Indigenous peoples. These goals are ambitious, but necessary in order to create a broad support base for transition. Given recent research on the Canadian context for a GND, what challenges and opportunities are organizers likely to encounter in moving from plan to practice?

2.2. Canada's unique energy context

Canada's geography—the second largest landmass and the longest coastline in the world—has a relatively low population density, with urban population centers clustered in the south [24]. The Canadian economy is heavily dependent on resource extraction and exports [25], with energy transport infrastructure organized continentally (North-South) rather than nationally (East-West) [20]. Despite increasing federal and provincial/territorial climate policy attention since 1990, GHGs have increased in the past decade, from 682MT in 2009, to 716 MT in 2017 [26]. Eighty-one per cent of Canada's GHGs are energy related [26] and it has the second highest per capita energy use in the OECD [27]. Approximately 292 off-grid northern rural and remote communities rely on diesel fuel, of which 170 are Indigenous (First Nations, Inuit or Métis) [28]. Energy related emissions are in large part due to road transportation, export-orientated fossil fuels, and non-renewable electricity generation (Fig. 2, Fig. 3). This emissions profile exists despite the fact that Canada's electricity sector is characterized by a relatively high proportion of hydropower generation at 60%, nuclear at 15%, coal at 9%, gas/oil/others at 10%, and non-hydro renewables at 7% [29,30].

Recent federal government strategies make bold (and unfulfilled) promises for Canada's energy transition, including the phasing out of coal by 2020 and pricing greenhouse gasses by 2018 [31,32]. Structurally, however, significant challenges remain. A transition to national, or even interprovincial/territorial energy governance to implement a GND would represent a significant physical and ideational change from the status quo. Canada's central government has jurisdiction over international agreements and interprovincial trade, but strong energy federalism limits the feasibility of unilaterally mandated policy change [33].

Provincial and territorial governments hold constitutional authority over the energy sector, including resource development, energy efficiency, generation sources, and transportation. Local actors, such as municipalities, have no constitutional authority for governing energy and are dependent on provincial/territorial legislation for their powers. Nonetheless these have become more active in recent years, for example, through the development of local energy plans [34–36]. The level of public or private ownership of key energy assets differs from jurisdiction to jurisdiction, as does the electricity mix and the interest group coalitions that facilitate or oppose any GND. There is also growing acknowledgement through Supreme Court decisions and international declarations of the land and resource governance claims of Indigenous nations in Canada [37,38].

The effectiveness of a GND thus hinges on its ability to take into account this complex institutional and resource setting.

[1] Le Pacte is a public commitment started by '500 artists, scientists and leaders from various sectors' where signatories commit to personal climate action, call for governments climate action and commit to sharing Le Pacte with friends and colleagues.

[2] The twelve categories for green lines were Economy and Government, Green Infrastructure, Nature, Agriculture, Social Justice, Democracy, Plastics, Climate Science, Decent Work, Indigenous Reconciliation, Climate Debt, and Rights. The categories for red lines were not reported in the results document.

GREEN LINES			
Indigenous Sovereignty	**Economy & Government**	**Green Infrastructure**	**Social Justice**
- Recognition of Indigenous title and rights - Implementation of UN Declaration on the Rights of Indigenous Peoples (UNDRIP)	- Legally binding climate target in line with 1.5˚C - Green jobs plan - Unionisation, workers rights, $15 minimum wage - Green technology subsidies	- Public infrastructure investment for 100% renewable economy - Sustainable, accessible public transportation - Incentives for local renewable energy creation	- Centering marginalized communities - Full access to quality public service - Landed status for migrants & refugees - Payment of climate debt to Global South
RED LINES			
Fossil Fuels	**Protecting Biodiversity & Nature**	**Plastics**	**Democracy**
- Phase out the fossil fuel industry, shift to 100% renewable energy by 2040 - Freeze all fossil fuel construction, extraction and transportation projects - Redirect fossil fuel subsidies to clean economy transition	- Personhood protection to forests and bodies of water, environmental bill of rights - Stop waste dumping into bodies of water - Ensure rights to clean air, water, healthy food, etc. - Protection of at least 30% of land and water by 2030	- Develop alternatives to single-use plastic & address plastic waste - End boil water advisories in Indigenous communities - Legislate to curtail excessive packaging	- Honour the promise to make Canada a proportional representation democracy

Fig. 1. Pact for Green New Deal Red and Green Lines Summary 2019 [Source:1].

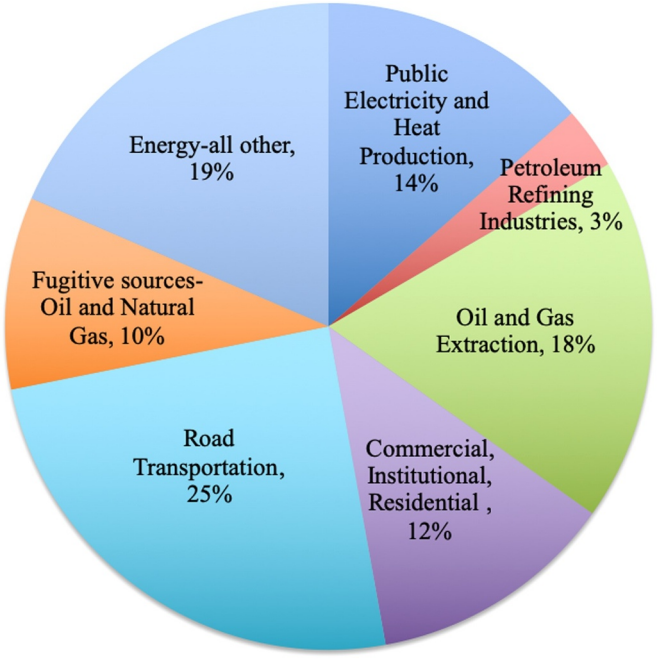

Fig. 2. Key sources of Canada's energy-related GHG emissions (583 MtCO2eq, 2017) data from: [26].

3. Potential for a Green New Deal in Canada

3.1. 100% renewable energy transition

The GND Green Lines call for a 100% renewable energy system. Renewable energy (RE) is important because it can mitigate climate change [4,39] and contribute to transformative societal change [40,41]. Incumbent nuclear power or fossil fuels are more compatible with monopolistic ownership. RE is compatible with distributed generation [42], is more geographically decentralized [43], complements decentralized ownership, and is viewed as a natural fit for local energy democracy [41,44]. However, challenges abound. RE is geographically and landscape specific [45] with a spatial density of production that is orders of magnitude lower than that of traditional centralized generation (W/m^2) [46]. Thus a shift towards renewable energy supply will likely increase pressures associated with spatial and land-use planning. Low spatial energy density combined with intermittency and low dispatchability means that a shift to RE requires a different architecture and logic than centralised systems [47,48] that have had an advantage for supplying energy dense cities. Without flexible technologies and innovations—conservation, demand response, aggregators, storage, virtual power plants, peer to peer trading, microgrids— traditional grids are currently limited to 20 to 40% intermittent renewable energy [49]. Additional demand from electric vehicles (EVs) further increase pressures for flexibility. Depending on how these options roll-out, there is potential to improve or exacerbate both energy poverty and energy democracy [48].

One recent model estimated that, based on current technology, it is possible to supply current demand with 100% renewable power in Canada [24]. While wind and solar power account for over 60% of Canada's total renewable potential (amounting to 92% of its 2010 demand), hypothetically, solar potential is unlimited. The study considered these temporally intermittent sources of power difficult to match spatially and temporally to demand profiles with limited storage and flexibility options. Only distributed solar photovoltaic in rural areas were considered and not urban areas that could most benefit from peak generation. This led to the estimation of a doubling of current hydropower production, a technology associated with negative societal and environmental consequences [50–52]. It also does not take into account shifting demand profiles, such as conservation and flexibility technology, and storage and demand growth from electric vehicles [53].

Investment in research, development, demonstration and deployment (RD3) of RE and flexible technologies by government and industry remain at a fraction of the investment in fossil fuels. The latter's share and total amount of RD3 funding has actually risen over time [54].

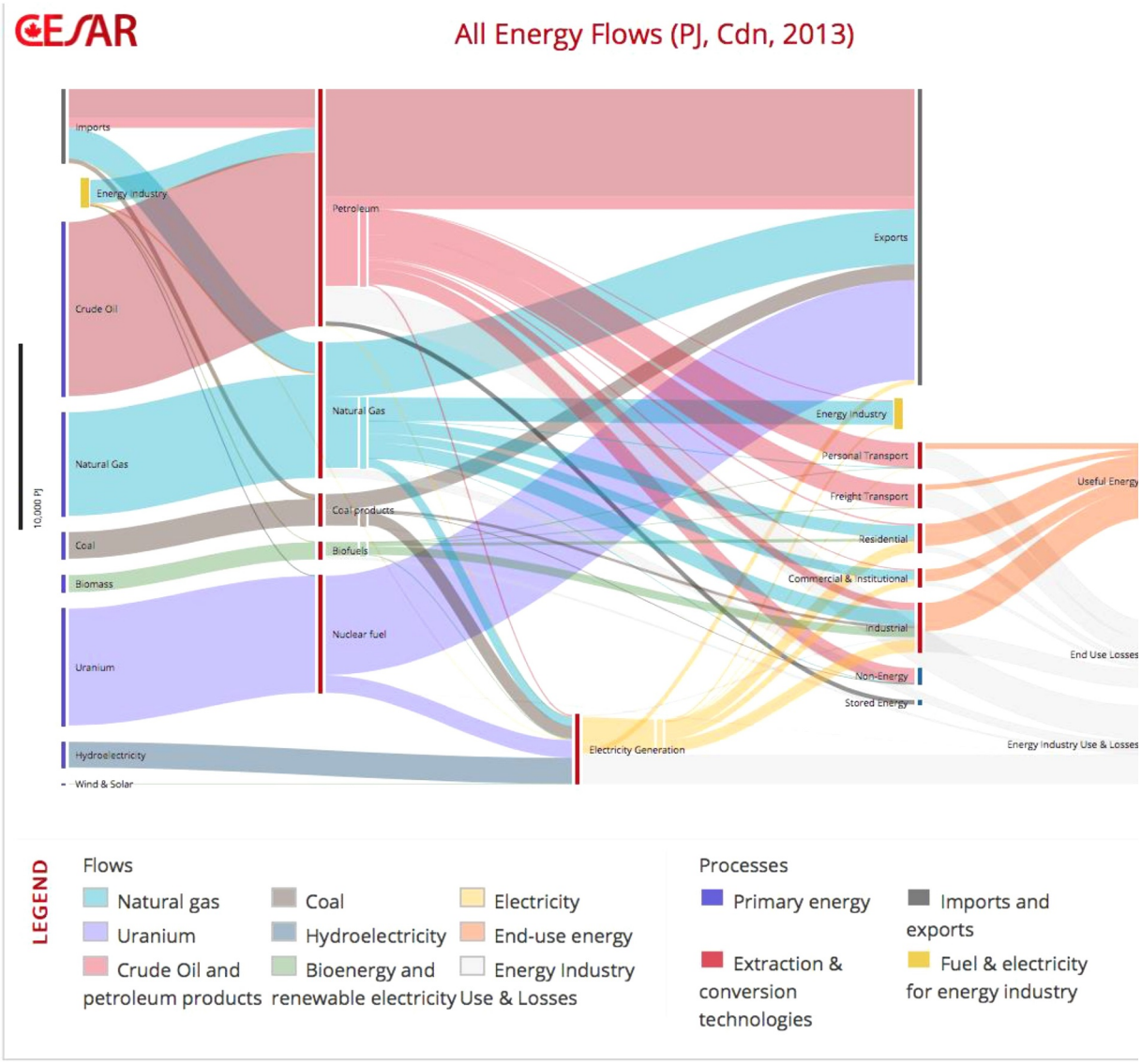

Fig. 3. Energy Imports, Use and Exports in Canada Source: [30].

Opportunities abound to replace fossil heating fuels as two thirds of energy used in Canada is lost [30], mainly as heat. A GND for Canada could be operationalized in part with a shift in RD3 investments towards supplying cities with RE, waste heat capture, EVs, and flexible technologies, but requires addressing the power of incumbent industries and bringing a wide range of actors on board [55]. Significant opposition to climate and energy transition policies in Canada has stalled progress for decades, first in mobilized denial about the science, but also manifesting in fears about the decline of high wage industrial employment and the impact on fossil fuel and related industry profits [56,57]. There is increasing interest in ensuring that green jobs are good jobs, but research suggests that this is not necessarily the case either in terms of unionization, or gender diversity [21,58,59]. Moreover, there is no one green transition, there are a wide range of more and less radical options; the skills, strengths and resource mobilization of particular agents will decide the course of future transitions [60]. A strong nuclear union, as exists already in Canada, is therefore likely to push heavily for the nuclear low carbon option over other alternatives. In jurisdictions lacking this constituency, alternative transition routes relying on other technologies are more likely [14].

3.2. *Transitioning the oil sands*

Canada's resource wealth has led to an economy significantly dependent on resource extraction and exports [25]. It is the fourth largest oil producer in the world, with the third largest oil reserves of 171 billion barrels (bbl) largely in the form of crude bitumen (i.e. oil sands) [61]. Canada's energy exports accounted for 48% of U.S. crude oil imports in 2018 [62]. Current oils sands production (2.8 million bl per day) represents only a small fraction of the potential reserves but generated $1.48 billion through royalties in 2016–17 alone [63,64]. The oil sands sector also attracts investments from the U.S., Europe, and Asia, drawing $313 billion in 2018 [65]. Since 2005, there has been a 158% increase in bitumen extraction and synthetic crude oil from the oil sands, contributing significantly to Canada's increased emissions [26], and placing the country amongst the top ten GHG emitters globally [66].

While the potential for greening Canada's energy sector is promising [24], the federal government persists in supporting the development of the oil sands sector [67]. Continued development of the oil sands creates immense challenges for a GND as well as global climate disruption. Transitioning *away* from the oil sands is not currently officially discussed by the federal government or by the Province of Alberta where over 97% of the proven reserves can be found, due to continued

entrenched political support and strong economic investments. Instead, discussions focus on allowing for growth in the sector or allowing for 'paced development' [68]. Indeed, the federal government has vested interests in expanding the sector, as seen through its purchase of the Trans Mountain Pipeline for $4.5 billion in 2018. Despite controversies, pipeline expansion was approved in 2019 (although the Federal Court of Appeal ruled in September 2019 that six new legal challenges can go forward). The proposed Pipeline is expected to increase its capacity from 300,000 to 890,000 barrels per day [69] and its approval will increase production in a sector that is already emitting 10% of Canada's total emissions (Fig. 2).

The challenge in transitioning Canada–and the world–away from the oil sands is complex, impacting global energy markets and actors and involving hundreds of billions of dollars in investments. A proposal for compulsory labelling to indicate that oil sands crude oil is 23% more carbon intensive than conventional oil was voted down in the European Parliament in 2014 [70]; the market for oil sands further expanded in 2017 when the European Union and Canada signed the Comprehensive Economic and Trade Agreement, further facilitating the export of oil sands crude oil [71]. Can Canada continue to develop the oil sands and also forge ahead with its climate change commitment? Some point to technological innovation as an enabler of continued development. For example Canada's National Determined Contributions place strong emphasis on new technologies to solve climate change challenges. Investments in carbon capture and storage in Alberta are expected to sequester 2.76 million tons of CO_2 per year [72]. The federal government is also providing $200 million a year[3] to support research and innovation to 'improve oil sands technology'[67], while clean technology producers were allocated only half that amount ($100 million). The continued growth of the sector has not been fully accounted for in global emissions scenarios. Canada is projected to increase its oil sands production by 2.5 million bl per day over the next 25 years under the conditions of "the most stringent emissions scenario" [73]. Some studies also show that oil sands carbon emissions measurements are not accurate. New methods indicate there should be an approximate 30% increase in emission estimates [74]; this would put oil sands emissions at 101 $MtCO_2eq.$, exceeding the Alberta government's 100 MT emissions cap.

If a clean energy transition is to occur, governments at all levels need to reconcile their contradictory policies to promote climate mitigation goals and rethink the development of the oil sands. The last attempt at a National Energy Program that included fossil fuels in Canada lasted just five years (1980–1985), and led to deep regional political divides that still shape the energy landscape today [20]. Governments also need to take into account the commitment to adopt the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) in terms of their Free, Prior, and Informed Consent (FPIC) in such decisions that affect Indigenous peoples lives and lands. If the federal government fails to act, then bottom up initiatives are needed to push a transition forward. For instance, the grassroots fossil fuel divestment movement has expanded globally, withdrawing over 6.24 trillion US dollars from the fossil fuel sector [75]. Grassroots movements at the national level, such as Canada's GND, may be key to jump start a low-carbon transition since governments seem to be reluctant to choose long-term sustainability initiatives—SDG13 on Climate Action, SDG7 for clean energy and SDG9 to promote sustainable industrialization—over short-term economic gain.

New actor networks are required to spur and push for particular transition pathways [12,14]. One often neglected but vital group required to bring about 100% RE and the Oil Sands transition is organized labour, which represents roughly 30% of the workforce, or 4.8 million Canadians. [76]. The Canadian Labour Congress along with the International Council of Trade Unions (ICTU) was instrumental in advocating for and articulating the concept of a just transition, which is a core element of the proposed GND. It has also been included in the preamble to the Paris Agreement and adopted by the United Nations Environment Program, International Labour Organisation and World Health Organisation [59]. Canadian workers will be designing, building and educating for the new energy economy just as others may be fighting with their respective industries for the status quo. Extractive industries have historically provided well-paying unionized employment, particularly in the provinces of Saskatchewan and Alberta. This has created strong coalitions aligning some unions with these polluting industries in order to protect jobs and local livelihoods, while other unions are staunch advocates of labour-led GNDs [12,77].

There are signs, however, of increased labour support for GND and transition policies in Canada. Iron & Earth, a non-profit led by oilsands workers conducted a poll in 2016 finding that workers support a transition to 100% renewable energy, with 80–95% supportive of just transition policies [78]. Within the general public, these numbers are even higher. In 2019 Blue-Green Canada (an alliance formed in 2008 by the United Steelworkers, Environmental Defense, Unifor, Pembina Institute, Clean Energy Canada, Columbia Institute and the Broadbent Institute) recommended the development of a 'Just Transition Act' for Canada, arguing that "climate change must also address economic inequality or else climate change will risk becoming a more deeply divisive issue amongst Canadians." [79]. At the 2019 convention of UNIFOR, Canada's largest private sector and oil and gas union, resolution 5 supported a GND and resolution 21 a just transition. The union also held an inaugural just transition conference in September of 2019. In order to more centrally place the importance of decent and just work in the climate transition [80] some have advocated rebranding the GND in Canada to a 'Good Work Guarantee' [81]. Failing to prioritize employment risks galvanizing opposition to deep transitions from potential allies and citizens currently occupied with meeting their basic daily needs.

3.3. Energy democracy

Energy systems have historically operated via top-down planning with centralized, increasingly private, ownership; this has been accompanied by a range of negative impacts for the planet and proximate communities [33,56,82,83]. A just renewable energy transition is a central pillar of the PGND, and this requires the inclusion of actors outside the industry-policy nexus [84]. The grassroots concept of energy democracy challenges this orientation by highlighting the normative value and the strategic importance of including citizens and civil society organizations in the design, ownership and operation of energy infrastructure [41,85]. It is defined as increasing the participation in and control of energy systems by non-traditional actors, often including citizens, civil society organizations and historically marginalized populations [86]. It can entail a range of benefits for energy transitions: increasing the social acceptability of new infrastructure [87]; distributing financial benefits to proximate affected populations [88]; helping to encourage energy literacy [89]; including previously marginalized actors with new and innovative ideas; and aiding in effective policy implementation [44].

As pressure increases to develop new renewable energy infrastructure, tensions are likely to intensify over the location and ownership of energy assets [55]. New renewable generation assets like wind and solar tend to be decentralized, meaning that many more local areas are going to be confronted by the physical, social and financial impacts of an energy transition [43]. Canada's disjointed energy governance with competing and often conflicting local, federal, provincial/territorial, and Indigenous government mandates adds complexity to the widespread development of energy democracy [87,90]. Furthermore, mainstream energy transition paths led by incumbent corporate actors and established policy networks envision local actors primarily as

[3] But sources do not indicate for how many years the support will continue on for.

energy consumers rather than energy citizens [91].

A shift to increased energy democracy—with diverse gendered, racial and class interests at the table —is likely to bring with it significant conflict over the goals and means of an energy transition, but radical change is unlikely without it. There are two primary mechanisms through which citizens can play a greater role in shaping energy system outputs and outcomes in Canada. The first is participation in energy sector planning and decision making (citizens fora, policy co-design initiatives, public consultation). Efforts to hold deliberative consultations on energy policy have taken place in some specific provincial settings, such as Nova Scotia, but even so, the historical legacy of public inclusion is largely one of tokenistic consultation rather than policy empowerment or co-production [92].

The second mechanism is increased asset ownership by citizens at the local level (through community energy ownership, re-municipalization of utilities) [93,94]. In recent years, researchers have attempted to capture the nature and extent of energy democracy in Canada. Despite persistent data gaps, one of the most comprehensive efforts to capture the nature and scope of local energy ownership in Canada illustrates that more than 785 distinct energy projects owned by municipalities, co-operatives, non-profits, Indigenous communities, and charitable organizations operate in Canada [95]. These projects are engaged in a wide range of activities vital for effective and resilient energy transitions, from renewable power generation, to micro-grid distribution and energy demand management [48]. Questions of who owns and who controls Canada's energy future are only set to become more important. Mechanisms of energy democracy through participation and project ownership provide one path forward.

3.4. Indigenous energy sovereignty

Indigenous resurgence in Canada is underway, but energy security, let alone sovereignty, is far from being realized. Nearly 1.6 million people identify as Indigenous, 61% First Nations heritage, 37% Metis and 2% Inuit [96]. The original peoples comprise many distinct nations and communities with 634 First Nations, such as the Mi'kmaq, Nuu-chah-nulth, Dene, who speak more than 50 distinct languages [97]. Indigenous population growth since 2006 is four times that of other groups at 42% [96]. The effects of settler colonialism and racism on Indigenous peoples continue to permeate Canadian society, leading to socio-political and infrastructural hardship today. For example, status First Nations children are more than four times as likely to live in poverty than non-Indigenous children, though statistics vary significantly between provinces[4] [98]. Remote and off-grid Indigenous communities in the Canadian North are some of the most energy insecure in Canada, with unreliable and expensive diesel-powered generators further compounding other structural challenges they face.

Settler (non-Indigenous) peoples are beginning to recognize the damaging effects of ignoring their shared history. Participants of the PGND highlighted the need to fully implement several aspects. First, the recommendations of Canada's Truth and Reconciliation Commission (TRC) that, in 2015, brought broader awareness to Canadians of the attempted genocide of Indigenous peoples through residential schools. Second, the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), particularly concerning the rights of Indigenous Peoples to Free Prior and Informed Consent (FPIC) [1]. Canada became a full supporter of UNDRIP in 2016, and the Province of British Columbia became the first Canadian legislation to enshrine it into law in 2019 (Bill 41) [99]. There are over 152 large-scale (over 1 MW) clean energy projects that claim to 'significantly involve' Indigenous peoples in Canada, including 'impact agreement beneficiaries to direct ownership' [100]. But these numbers include hydroelectric developments such as the highly contested Muskrat Falls and Site C projects, which contradict many Indigenous legal orders and ways of being in the world due to the environmental devastation and displacement they cause [101,102]. Thus the quality and meaningful consultation rather than simply the fact of participation needs deeper evaluation [103].

Renewable energy is viewed in Canada as a possible mechanism for reconciling the damage of colonization, settler colonialism, and capitalism's impact on human relationships [101]. Global sustainability leader Chief Gordon Planes of T'Sou-ke Nation argues "[Indigenous peoples] have lived for thousands of years on this continent without fossil fuels. It is appropriate that [Indigenous peoples] lead the way out of dependency and addiction to fossil fuels and to rely on the power of the elements, the sun, the wind, and the sea once again" [104]. That is, Western technology or worldviews alone cannot solve the climate crisis and associated impacts. Indigenous-led renewable energy projects can be threatened by state-centric energy policies and legislation that does not embrace (FPIC) as laid out in the UNDRIP (see UNDRIP Articles 25–26, 28–29, and 32) let alone promote meaningful Indigenous participation [105,106]. Therefore, to implement the green lines of the GND, Indigenous peoples would need to be recognized as rights-holders with FPIC and co-governance. There is potential in a GND to incorporate Indigenous ways of knowing and address the intersecting challenges facing Indigenous peoples, which include energy poverty, access and resource sovereignty as well as gendered issues.

3.5. Gender equity

There can be no climate justice or just transition without gender equity; the impacts of climate change as well as adaptation policies and programs will have differing effects across the gender spectrum as gender roles, responsibilities, and relationships shape our vulnerability and capacity to adapt [107]. Addressing this challenge as part of a GND opens up tremendous opportunities by securing a wider, deeper talent pool to address our climate crisis [108] and help to meet Canada's 2030 Sustainable Development Goal (#5) of gender equality [11]. Gender diversity enhances innovation and creativity [109][89], and women's leadership is considered critical in a democratic renewable energy transformation [110]. Recent research suggests women tend to view issues of climate change mitigation, RE, and the environmental benefits of EVs more positively than their male counterparts, but far more work in the area is required [111–114].

The gender employment gap in energy industries is significant [115]. We know this, despite the fact that studies exploring women's experiences in the clean energy sector are sparse [115], and even less prevalent for gender-diverse or LGBTQ2S[5] persons. Nineteen percent of jobs in the energy industry overall go to women globally, but they work disproportionately in office support or administrative jobs; the economic implications of gendered income gaps during working years spill from current earnings into broader challenges such as retirement pension savings and elder-poverty [116,117].

The renewable energy sector is projected to increase significantly in the next 30 years, with the total number of jobs growing from 7 million in 2012 to 10.3 million in 2017 and an anticipated 29 million in 2050 [108]. Women make up only 32% of the global RE workforce [108], and only 25% in Canada [118]. A 2017 survey attributed this gap to: a lack of understanding about the range of occupations and opportunities, a limited number of visible female role models, a male-dominated industry culture, (un)conscious biases of women's roles, and a lack of family-friendly policies and culture [119].

IRENA [108] has recently identified ways to equitably engage

[4] 65% of Status First Nations children in Saskatchewan and Manitoba, live in poverty, while 29% of Status First Nations children in Quebec live in poverty. [98] argue this is driven by particularly low rates of child poverty for James Bay Cree (Eeyou Itschee) in Northern Quebec.

[5] LGBTTQ2S: lesbian, gay, bisexual, transgender, transsexual, queer, questioning, and two-spirit.

women. First, 'mainstreaming' gender across all clean energy frameworks is critical, which includes policies, programs, practices and a gendered analysis of data collection. Second, tailored training and skills development is needed rather than a one-size-fits-all approach. Third, attracting and retaining talented women can be achieved through responsive policies such as parental leaves and flexible working hours and conditions. Finally, and perhaps most importantly, is to structurally create a culture, and demonstrate through role modelling, a set of social norms that illustrates how gender diversity is valued in the workplace.

There are a number of mechanisms that can be leveraged to promote an equitable one. Canada has publicly committed to prioritizing both SDGs 5 and 7 through existing frameworks, policies, and programs (e.g., the Equal by 30 Campaign: Equal Pay, Equal Leadership, Equal Opportunities, a joint Clean Energy Ministerial and IEA initiative led by Natural Resources Canada) [118,120]. Indigenous-focused training programs like the Indigenous Clean Energy Network's 20/20 Catalyst program have more than 35% of applications come from Indigenous women [121]. The role of grassroots women's networks may also play an important role in helping to close the gender gap (Allison et al., 2019). In Canada, we are aware of two such networks: Women in Renewable Energy (WiRE) and Women and Inclusivity in Sustainable Energy Research (WISER) Network. Because it is well-established that there are gendered impacts of climate change in and on Indigenous communities [122–125], a new research initiative "Indigenous Women in Renewable Energy (I-WIRE)" is exploring how Indigenous women experience the sector and how an Indigenous-led women's network might help reduce the racialized and gendered barriers they face [126].

3.6. Energy poverty

At first glance, low-carbon energy systems are seen as the solution to greater energy security in terms of supply and access, but they can still disproportionally impact marginalized groups [127]. The impact of transition strategies on the inability to attain necessary levels of domestic services for social and material needs (i.e., energy poverty) [128] requires monitoring and consideration. It also connects to the previously outlined energy challenges facing communities along race, class, and gender lines. The costs of ignoring energy poverty in a GND include lack of access to energy, under-consuming energy, and associated health burdens [129]. Furthermore, refusing to act at scale on a GND transfers climate costs onto the shoulders of citizens across Canada [81].

According to Canada's independent federal regulator, the Canada Energy Regulator (CER) (formerly known as the National Energy Board), "a household may be described as experiencing [energy] poverty when it spends more than 10% of its income on utilities" [130] .[6] Consequently, the CER estimates 8% of Canadian households experience energy poverty; however, methods for arriving at this estimate as well as reasons for using the 10% indicator are not explained. The problem lacks critical inquiry in Canada, but we know that energy poverty is a "highly-complex social problem" not just a technical or economic issue [131]. The underlying dynamic contexts associated with the phenomenon include energy pricing policies or poor energy infrastructure as well as energy needs varying by social, family, or housing arrangements and culture, customs, and shared conventions [132–136].

The Federal Sustainable Development Strategy [137] and SDGs make clear Canada's sustainability priorities. These include clean energy and access to affordable, reliable, and sustainable energy in the transition to a low-carbon economy as well as the goal of clean and sustainable communities that contribute to human health and well-being. Yet, there is a lack of insight on the potential adverse consequences of economic and environmental transition strategies on individuals and communities that may exacerbate vulnerabilities. Intervention research in this area would provide a much-needed opportunity to study the social dimensions of energy transitions [138]. Another such opening is that vulnerability thinking can be seen as probabilistic, so changing circumstances can influence the probability of people entering (or exiting) energy poverty [128]. Given that socio-technical transitions involve imbalances of power, politicians and industry are likely to have their interests favored [139]. It thus becomes imperative to "cast wider society as the assessors of just energy practices" [5] and it is precisely this momentum that is fueling the PGND.

4. Conclusion

Energy transitions are inherently political, and we have outlined how the challenges in Canada are not simply technological. However, when political will and careful design meet social and technological change, radical change can happen in relatively short spaces of time [140]. The GND provides an opportunity to define and demand an equitable and just transition, one in which the centrality of modern energy needs and services in peoples' everyday lives are fully acknowledged. Energy infrastructure in Canada is currently deeply contested, both in business-as-usual and transition scenarios. This is illustrated by the opposition to new infrastructure from particular provinces/territories, environmental actors, and many Indigenous peoples to projects like the Keystone XL and Trans Mountain Pipeline. It is also evident in the tensions between incumbent industries, organized labour in various sectors and environmental actors across the country. Scaling up this infrastructure across the country demands the creation of a more just and equitable economy providing inclusive and decent employment. The rollout of new renewable energy infrastructure will also require significant social licence; thus a realizable potential of renewable energy that respects UNDRIP, FPIC and addresses social inequities requires more diversity in both governance tools and leadership [109,110].

Democratic and participatory governance is crucial for building social acceptance and legitimacy, which is reflected in the outcomes from PGND town halls [21,41,90]. Visioning exercises and deliberative forums involving diverse citizens co-designing a shared energy future therefore makes significant strategic sense. However, decades of racialized, centralized and elite- dominated energy institutions are deeply rooted in industry networks, employment, politics, policy processes and in the ideas about the role energy plays in Canada. The articulation and construction of new social infrastructure will require widespread education, together with concrete behavioural changes at individual and collective levels. The power of the state can facilitate a just transition but will be challenging in the complex Canadian institutional setting. It will also need to overcome resistance from powerful incumbent energy actors and facilitate marginalized ones [55], including its responsibilities to uphold Nation-to-Nation relationships with Indigenous peoples. Radical change in Canada is domestically necessary and globally significant, given its greenhouse gas emissions and global reliance on the oil sands. The gap between business as usual and a climate just energy future is daunting, but this overview illuminates potential paths forward if the socio-political foundations of a green energy future are prioritized.

Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

[6] Both energy poverty and fuel poverty are used in reference to the phenomenon occurring in the developing and developed world, respectively, however evidence of deprivation of energy services in the developed world challenges the "energy poverty – fuel poverty binary" [128].

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References

[1] Coalition for a Green New Deal, Green New Deal, https://act.greennewdealcanada.ca/what-we-heard/, (2019) (accessed August 22, 2019).
[2] UNEP, Geneva, https://wedocs.unep.org/bitstream/handle/20.500.11822/7903/A_Global_Green_New_Deal_Policy_Brief.pdf?sequence=3&amp%3BisAllowed=, (2009) (accessed August 22, 2019).
[3] M. Mazzucato, M. McPherson, The Green New Deal: a bold mission-oriented approach, London, 2018.
[4] M. Diesendorf, B. Elliston, The feasibility of 100% renewable electricity systems: a response to critics, Renew. Sustain. Energy Rev 93 (2018) 318–330, https://doi.org/10.1016/J.RSER.2018.05.042.
[5] K. Jenkins, B.K. Sovacool, D. McCauley, Humanizing sociotechnical transitions through energy justice: an ethical framework for global transformative change, Energy Policy 117 (2018) 66–74, https://doi.org/10.1016/j.enpol.2018.02.036.
[6] J. McMahon, Forbes, https://www.forbes.com/sites/jeffmcmahon/2019/09/22/no-one-seemed-to-notice-greta-thunbergs-critique-of-the-green-new-deal/#6864688938, (2019).
[7] E. Lachapelle, M. Mildenberger, Conversat, https://theconversation.com/canadians-in-every-riding-support-climate-action-new-research-shows-122918, (2019).
[8] Carl Meyer, Mother Jones, https://www.motherjones.com/environment/2019/10/how-climate-policy-dominated-canadas-election/, (2019) (accessed January 4, 2020).
[9] E. Bush, D. S., Lemmen, Canada's Changing Climate Report, Government of Canada, Ottawa, Canada, 2019www.ChangingClimate.ca/CCCR2019.
[10] Climate Action Tracker, (accessed August 22, 2019), Current Policy Projections Canada, (2019) https://climateactiontracker.org/countries/canada/current-policy-projections/.
[11] United Nations, United Nations Sustainable Development Goals, (2019) https://www.un.org/sustainabledevelopment/sustainable-development-goals/ accessed September 29, 2019.
[12] M. Hurlbert, M. Osazuwa-Peters, K. Mcnutt, J. Rayner, Transitioning from coal: toward a renewables-based socio-technical regime in Saskatchewan, Environ. Innov. Soc. Transitions (2019), https://doi.org/10.1016/j.eist.2019.11.005.
[13] G. Evans, L. Phelan, Energy Policy, Energy Policy 99 (2016), pp. 329–339 https://www-sciencedirect-com.ezproxy.auckland.ac.nz/science/article/pii/S0301421516302300.
[14] M. Betsill, D. Stevis, The politics and dynamics of energy transitions: lessons from Colorado's (USA) "New energy economy&quot, Environ. Plan. C Gov. Policy 34 (2016) 381–396, https://doi.org/10.1177/0263774X15614668.
[15] OECD, Greenhouse gas emissions (2019).
[16] S. Lightfoot, Global Indigenous Politics: A Subtle Revolution, Routledge, London, 2016.
[17] J.L. MacArthur, S. Matthewman, Populist resistance and alternative transitions: Indigenous ownership of energy infrastructure in Aotearoa New Zealand, Energy Res. Soc. Sci (2018) 0–1, https://doi.org/10.1016/j.erss.2018.05.009.
[18] A. Halff, B.K. Sovacool, J. Rozhon, Energy poverty: Global Challenges and Local Solutions, Oxford University Press, Oxford, 2014.
[19] K. Harrison, Passing the Buck: Federalism and Canadian Environmental Policy, UBC Press, Vancouver, 1996.
[20] M. Mildenberger, L.C. Stokes, The energy politics of North America, in: K.J. Hancock, J. Allison (Eds.), Oxford Handb. Energy Polit, Oxford University Press, 2019, , https://doi.org/10.1093/oxfordhb/9780190861360.013.36.
[21] G. Piggott, M. Boyland, A. Down, A. Raluca Torre, Realizing a Just and Equitable Transition Away from Fossil Fuels, Stockholm, 2019, http://www.indiaenvironmentportal.org.in/files/file/realizing-a-just-and-equitable-transition-away-from-fossil-fuels.pdf accessed January 2, 2020.
[22] Le Pacte, Le Pacte Pour La transition, (2019). https://www.lepacte.ca/en/the-pact/ (accessed September 19, 2019).
[23] Coalition for Green New Deal, Green New Deal: In 10 Questions - Greenpeace, Greenpeace, Canada, 2019https://www.greenpeace.org/canada/en/press-release/23453/green-new-deal-in-10-questions/ accessed August 22, 2019.
[24] C. Barrington-Leigh, M. Ouliaris, The renewable energy landscape in Canada: a spatial analysis, Renew. Sustain. Energy Rev 75 (2017) 809–819, https://doi.org/10.1016/j.rser.2016.11.061.
[25] M. Howlett, K. Brownsey, Canada's resource economy in transition: the past, the present and future of Canadian staples industries, (2008).
[26] Environment and Climate Change Canada, National inventory report 1990–2017: greenhouse gas sources and sinks in Canada: executive summary, 2019.
[27] World Bank, Energy use (kg of oil equivalent per capita) - OECD members 2015, OECD/IEA Stat (2019), https://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE?end=2018&locations=OE-CA&most_recent_value_desc=true&start=2005 accessed October 1, 2019.
[28] Government of Canada, Status of remote/off-grid communities in Canada, 2011. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2013-118_en.pdf.
[29] Natural Resources Canada, Generation by source 2017, Nat. Resour. Canada (2019), https://www.nrcan.gc.ca/electricity-facts/20068#L3.
[30] CanESS, Sankey diagrams associated with fuel and electricity production and use in Canada, CANESS (2017), http://www.cesarnet.ca/visualization/sankey-diagrams-canadas-energy-systems.
[31] Canada's Premiers, Canadian Energy Strategy, Canadian Energy Strategy Working Group, 2015 http://www.canadaspremiers.ca/phocadownload/publications/canadian_energy_strategy_eng_fnl.pdf.
[32] Canada's First Ministers, Pan-Canadian framework on clean growth and climate change: Canada's plan to address climate change and grow the economy, 2016. https://www.canada.ca/content/dam/themes/environment/documents/weather1/20170125-en.pdf.
[33] C. Potvin, S. Burch, D. Layzell, J. Meadowcroft, N. Mousseau, A. Dale, I. Henriquest, L. Margolis, H. Matthews, D. Paquin, H. Roamos, D. Sharma, S. Sheppard, N. Slawinski, *Re*-Energizing Canada: pathways to a low-carbon future - Sustainable Canada dialogues – Sustainability, viability, Montreal (2019), http://sustainablecanadadialogues.ca/en/scd/energy accessed September 12, 2019.
[34] S.M. Wyse, C.E. Hoicka, By and for local people': assessing the connection between local energy plans and community energy, Local Environ 24 (9) (2019) 883–900, https://doi.org/10.1080/13549839.2019.1652802.
[35] L. Tozer, Community energy plans in Canadian cities: success and barriers in implementation, Local Environ. 18 (2013) 20–35, https://doi.org/10.1080/13549839.2012.716406.
[36] L. Tozer, Urban climate change and sustainability planning: an analysis of sustainability and climate change discourses in local government plans in Canada, J. Environ. Plan. Manag. 61 (2018) 176–194, https://doi.org/10.1080/09640568.2017.1297699.
[37] G. Lowan-Trudeau, Indigenous renewable energy. Mapping renewable energy projects by Indigenous communities across Canada, (2016). https://indigenousenergy.ca/database/.
[38] K. Coates, First Nations engagement in the energy sector in Western Canada, Tsuu T'ina Nation, Alberta (2016), http://www.irccanada.ca/sites/default/files/First Nations Engagement in the Energy Sector in Western Canada.pdf (accessed December 21, 2016.
[39] J.B. Greenblatt, N.R. Brown, R. Slaybaugh, T. Wilks, S.T. Mccoy, The future of low-carbon electricity, Annu. Rev. Environ. Resour. 42 (2017) 289–316, https://doi.org/10.1146/annurev-environ.
[40] M. Wolsink, The research agenda on social acceptance of distributed generation in smart grids: renewable as common pool resources, Renew. Sustain. Energy Rev. 16 (2012) 822–835.
[41] M.J. Burke, J.C. Stephens, Energy democracy: goals and policy instruments for sociotechnical transitions, Energy Res. Soc. Sci. 33 (2017) 35–48, https://doi.org/10.1016/J.ERSS.2017.09.024.
[42] C. Kuzemko, C. Mitchell, M. Lockwood, R. Hoggett, Policies, politics and demand side innovations: the untold story of Germany's energy transition, Energy Res. Soc. Sci. 28 (2017) 58–67, https://doi.org/10.1016/J.ERSS.2017.03.013.
[43] G. Bridge, S. Bouzarovski, M. Bradshaw, N. Eyre, Geographies of energy transition: space, place and the low-carbon economy, Energy Policy 53 (2013) 331–340, https://doi.org/10.1016/j.enpol.2012.10.066.
[44] A.L. Berka, E. Creamer, Taking stock of the local impacts of community owned renewable energy: a review and research agenda, Renew. Sustain. Energy Rev. 82 (2018) 3400–3419, https://doi.org/10.1016/J.RSER.2017.10.050.
[45] M.J. Pasqualetti, Reading the changing energy landscape, in: S. Stremke, A. van den Dobbelsteen (Eds.), Sustain. Energy Landscapes. Des. Plan. Dev, CRC Press, Taylor & Francis Group, New York, 2012, pp. 11–44 http://ebookcentral.proquest.com/lib/york/reader.action?docID=1019592&ppg=31.
[46] V. Smil, Chapter 7 Making Sense of Power Densities, in: Power Density A Key to Underst, Energy Sources Uses, MIT Press, 2015, pp. 190–220.
[47] L. Ramirez Camargo, G. Stoeglehner, Spatiotemporal modelling for integrated spatial and energy planning, Energy. Sustain. Soc 8 (2018) 1–29, https://doi.org/10.1186/s13705-018-0174-z.
[48] C.E. Hoicka, J.L. MacArthur, The infrastructure for electricity: a technical overview, in: K. Hancock, J. Allison (Eds.), Oxford Handb. Energy Polit, Oxford University Press, 2019.
[49] E. Martinot, Grid integration of renewable energy: flexibility, innovation, and experience, Annu. Rev. Environ. Resour. 41 (2016) 223–251, https://doi.org/10.1146/annurev-environ-110615-085725.
[50] T. Martin, S.M. Hoffman (Eds.), Power struggles: Hydro Development and First Nations in Manitoba and Quebec, University of Manitoba Press, 2011.
[51] D.E. Martin, S. Thompson, M. Ballard, J. Linton, Two-eyed seeing in research and its absence in policy: little Saskatchewan First Nation elders' experiences of the 2011 flood and forced displacement, Int. Indig. Policy J. (2017) 8.
[52] S.M. Hoffman, Powering injustice: hydroelectric development in northern Manitoba, in: P. Thompson (Ed.), Environ. Justice Int. Discourses Polit. Econ, Routledge, 2017, pp. 147–170.
[53] IEA, Global EV Outlook 2019, Paris (2019).
[54] S.M. Jordaan, E. Romo-Rabago, R. McLeary, L. Reidy, J. Nazari, I.M. Herremans, The role of energy technology innovation in reducing greenhouse gas emissions: a case study of Canada, renew, Sustain. Energy Rev. 78 (2017) 1397–1409, https://doi.org/10.1016/j.rser.2017.05.162.
[55] M.C. Brisbois, Powershifts: a framework for assessing the growing impact of decentralized ownership of energy transitions on political decision-making, Energy Res. Soc. Sci 50 (2019) 151–161, https://doi.org/10.1016/J.ERSS.2018.12.003.
[56] B. Carroll, Canada's Carbon-Capital Elite, A tangled web of corporate power, Can. J. Sociol (2017) 42, https://doi.org/10.29173/cjs28258.
[57] H. Veltmeyer, P. Bowles, Extractivist resistance: the case of the Enbridge oil

pipeline project in Northern British Columbia, Extr. Ind. Soc 1 (2014) 59–68, https://doi.org/10.1016/j.exis.2014.02.002.
[58] C.J. Hatch, D.-.G. Tremblay, L. Cazabon-Sansfaçon, The role of social actors in advancing a green transition: the case of Québec's cleantech cluster, J. Innov. Econ. 24 (2017) 63, https://doi.org/10.3917/jie.024.0063.
[59] D. Stevis, R. Felli, Global labour unions and just transition to a green economy, Int, Environ. Agreements Polit. Law Econ. 15 (2015) 29–43, https://doi.org/10.1007/s10784-014-9266-1.
[60] J. Köhler, F.W. Geels, F. Kern, J. Markard, E. Onsongo, A. Wieczorek, F. Alkemade, F. Avelino, A. Bergek, F. Boons, L. Fünfschilling, D. Hess, G. Holtz, S. Hyysalo, K. Jenkins, P. Kivimaa, M. Martiskainen, A. McMeekin, M.S. Mühlemeier, B. Nykvist, B. Pel, R. Raven, H. Rohracher, B. Sandén, J. Schot, B. Sovacool, B. Turnheim, D. Welch, P. Wells, An agenda for sustainability transitions research: state of the art and future directions, Environ. Innov. Soc. Trans.. 31 (2019) 1–32, https://doi.org/10.1016/J.EIST.2019.01.004.
[61] Natural Resources Canada, Oil Resources (2017), https://www.nrcan.gc.ca/energy/energy-sources-distribution/crude-oil/oil-resources/18085 (accessed September 7, 2019).
[62] US EIA, Canada is a key energy trade partner to the United States - Today in energy - U.s, Energy Information Administration (EIA) (2019), https://www.eia.gov/todayinenergy/detail.php?id=39632 (accessed September 28, 2019).
[63] Royalty Review Advisory Panel, Alberta at the crossroads, 2017. https://postmediacalgaryherald2.files.wordpress.com/2016/01/alberta-royalty-review-report.pdf.
[64] J. Wilt, Canada's Commitment of $220 Million to Transition Remote Communities Off Diesel a Mere “Drop in the Bucket,”The Narwhal. (n.d.). https://thenarwhal.ca/canada-s-commitment-220-million-transition-remote-communities-diesel-mere-drop-bucket (accessed April 27, 2018).
[65] Natural Resources Canada, Crude oil facts, (2019). https://www.nrcan.gc.ca/crude-oil-facts/20064 (accessed September 6, 2019).
[66] Government of Canada, Global greenhouse gas emissions, (2019).
[67] Natural Resources Canada, What are the oil sands?, (2019). https://www.nrcan.gc.ca/energy/energy-sources-distribution/crude-oil/what-are-oil-sands/18089 (accessed September 6, 2019).
[68] L. Virla, J. Lieu, G. Fitzpatrick, Canada: Finding common ground – the need for plural voices in lower-carbon futures of the Alberta oil sands, in: S. Hanger-Kopp, J. Lieu, A. Nikas (Eds.), Narratives of Low-Carbon Transitions Understanding Risks and Uncertainties, Routledge, London, 2018, pp. 46–66, , https://doi.org/10.4324/9780429458781.
[69] Goverment of Canada, Trans mountain expansion project (2019). https://www.canada.ca/en/campaign/trans-mountain/what-is-tmx.html (accessed September 6, 2019).
[70] J. Crisp, Canada tar sands will not be labelled ‘dirty” after all,’ euractiv.com. (2014). https://www.euractiv.com/section/trade-society/news/canada-tar-sands-will-not-be-labelled-dirty-after-all/ (accessed September 7, 2019).
[71] M. Hope, European lawmakers vote to pursue tar sands oil friendly trade deal with Canada, (2017). https://www.desmog.co.uk/2017/01/12/meps-vote-pursue-tar-sands-friendly-trade-deal-canada (accessed September 7, 2019).
[72] Alberta Ministry of Energy, Carbon capture and storage (CCS) fact sheet, (2017). https://www.energy.alberta.ca/AU/CCS/Pages/default.aspx (accessed September 7, 2019).
[73] Natural Resource Canada, What are the oil sands?, (2019). https://www.nrcan.gc.ca/energy/energy-sources-distribution/crude-oil/what-are-oil-sands/18089 (accessed September 6, 2019).
[74] J. Liggio, S. Li, R.M. Staebler, K. Hayden, A. Darlington, R.L. Mittermeier, J.O. Brien, R. Mclaren, M. Wolde, D. Worthy, F Vogel, internationally recommended methods, Nat. Commun. (2019) 10, https://doi.org/10.1038/s41467-019-09714-9.
[75] 350.org, Fossil Free, 350.Org. (2019). https://gofossilfree.org/global-fossil-fuel-divestment-movement-reaches-6-24-trillion-in-assets-under-management/ (accessed September 9, 2019).
[76] Government of Canada, Labour Organizations in Canada 2015 - Canada.ca, Labour Organ. Canada 2015. (2015). https://www.canada.ca/en/employment-social-development/services/collective-bargaining-data/reports/union-coverage.html (accessed January 4, 2020).
[77] D. Bratt, Canada and the Global Nuclear Revival, McGill-Queens University Press, Montreal, 2012.
[78] E. MacArthur, N. Poole, L. Easton, M. Fraser, L. Hidebrand, P. Leung, Workers’ climate plan report: a blueprint for sustainable jobs and energy, Edmonton, 2016. http://d3n8a8pro7vhmx.cloudfront.net/themes/5640eaf72213934458000001/attachments/original/1480293178/Iron_and_Earth-WCP_Nov_2016_vers_2.pdf?1480293178 (accessed January 4, 2020).
[79] Blue-Green Canada, Letter to new government on just transition and climate action | blue green canada, (2019). http://www.bluegreencanada.ca/blog/letter-new-government-just-transition-and-climate-action (accessed January 4, 2020).
[80] UNIFOR, UNIFOR Resolutions and Constitutional Amendments, Toronto, 2019. https://www.unifor.org/sites/default/files/attachments/resolutions_booklet_eng_june_2019.pdf (accessed January 4, 2020).
[81] C. Thomas-Muller, Canada needs its own Green New Deal. Here's what it could look like, Natl. Obs (2018), https://www.nationalobserver.com/2018/11/29/opinion/canada-needs-its-own-green-new-deal-heres-what-it-could-look (accessed January 4, 2020).
[82] J.L. MacArthur, Empowering Electricity: Co-operatives, Sustainability, and Power Sector Reform in Canada, UBC Press, 2016.
[83] C. Morris, A. Jungjohann, Energy Democracy: Germany's Energiewende to Renewables, Palgrave Macmillan, 2016.
[84] E. Creamer, W. Eadson, B. van Veelen, A. Pinker, M. Tingey, T. Braunholtz-Speight, M. Markantoni, M. Foden, M. Lacey-Barnacle, Community energy: entanglements of community, state, and private sector, Geogr. Compass. (2018), https://doi.org/10.1111/gec3.12378.
[85] M.J. Burke, J.C Stephens, Political power and renewable energy futures: a critical review, Energy Res. Soc. Sci. 35 (2018) 78–93, https://doi.org/10.1016/J.ERSS.2017.10.018.
[86] A.M. Feldpausch-Parker, D. Endres, T.R. Peterson, Editorial: a research agenda for energy democracy, Front. Commun. 4 (2019) 53, https://doi.org/10.3389/fcomm.2019.00053.
[87] K. Shaw, S.D. Hill, A.D. Boyd, L. Monk, J. Reid, E.F. Einsiedel, Conflicted or constructive? Exploring community responses to new energy developments in Canada, Energy Res. Soc. Sci. 8 (2015) 41–51, https://doi.org/10.1016/j.erss.2015.04.003.
[88] Ö. Yildiz, J. Rommel, S. Debor, L. Holstenkamp, F. Mey, J.R. Müller, J. Radtke, J. Rognli, Renewable energy cooperatives as gatekeepers or facilitators? Recent developments in Germany and a multidisciplinary research agenda, Energy Res. Soc. Sci. 6 (2015) 59–73, https://doi.org/10.1016/j.erss.2014.12.001.
[89] F. Duguid, Part of the solution: developing sustainable energy through co-operatives and learning, phd dissertation, University of Toronto (2007).
[90] L.C. Stokes, The politics of renewable energy policies: the case of feed-in tariffs in Ontario, Canada, Energy Policy 56 (2013) 490–500, https://doi.org/10.1016/j.enpol.2013.01.009.
[91] B. Lennon, N.P. Dunphy, E. Sanvicente, Community acceptability and the energy transition: a citizens’ perspective, Energy. Sustain. Soc. 9 (2019) 35, https://doi.org/10.1186/s13705-019-0218-z.
[92] G.F. Johnson, The limits of deliberative democracy and empowerment: elite motivation in three Canadian cases, Can. J. Polit. Sci 44 (2011) 137–159.
[93] K. Szulecki, Conceptualizing energy democracy, Env. Polit. 27 (2018) 21–41, https://doi.org/10.1080/09644016.2017.1387294.
[94] P. Devine-Wright, Community versus local energy in a context of climate emergency, Nat. Energy (2019), https://doi.org/10.1038/s41560-019-0459-2.
[95] C.E. Hoicka, J.L. MacArthur, From tip to toes: mapping community energy models in Canada and New Zealand, Energy Policy 121 (2018) 162–174, https://doi.org/10.1016/j.enpol.2018.06.002.
[96] Statistics Canada, Aboriginal Peoples Highlight Tables, 2016 Census, (2016). https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/abo-aut/Table.cfm?Lang=Eng&T=101&SR=1&S=99&O=A&RPP=25&PR=0&D1=8&D2=1&D3=1&TABID=2.
[97] Assembly of First Nations, About AFN, (2019).
[98] N. Beedie, D. Macdonald, D. Wilson, Towards Justice: Tackling Indigenous child poverty in Canada, 2019.
[99] Indigenous and Northern Affairs Canada, United Nations declaration on the rights of Indigenous peoples, (2017). https://www.aadnc-aandc.gc.ca/eng/1309374407406/1309374458958 (accessed September 29, 2019).
[100] Indigenous Clean Energy Network, Indigenous clean energy projects, (2019). https://indigenouscleanenergy.com/ice-projects/ (accessed September 29, 2019).
[101] H. Stefanelli, R. D., C. Walker, D. Kornelsen, D.H. Martin, J. Masuda, H. Castleden, Renewable energy and energy autonomy: how Indigenous peoples in Canada are shaping an energy future, Environ. Rev. 27 (2018) 95–105.
[102] J. Clogg, H. Askew, E. Kung, G. Smith, Indigenous legal traditions and the future of environmental governance in Canada, 2Journal environ, Law Pract. 227 (2016) 24.
[103] E. Tchekwie Deranger, The Green New Deal in Canada: challenges for Indigenous participation, Yellowhead Inst. (2019).
[104] Chief Gordon Planes, T-Souke First Nation, (2018). https://www.tsoukenation.com (accessed September 29, 2019).
[105] H. Castleden, D. Martin, A. Cunsolo, K. Lauridsen, Implementing Indigenous and western knowledge systems: “You have to take a backseat” and abandon the arrogance of expertise, Int. Indig. Policy J. (2017) 8.
[106] N. Watts, M. Amann, S. Ayeb-Karlsson, K. Belesova, T. Bouley, M. Boykoff, P.M. Cox, The Lancet countdown on health and climate change: from 25 years of inaction to a global transformation for public health, Lancet 391 (2018) 581–630.
[107] G. Terry, No climate justice without gender justice: an overview of the issues, Gend. Dev. 17 (2009) 5–18.
[108] IRENA, Renewable energy: a gender perspective, 2019. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Gender_perspective_2019.pdf.
[109] R. Pearl-Martinez, J.C. Stephens, Toward a gender diverse workforce in the renewable energy transition, Sustain. Sci. Pract. Policy (2016) 12 https://www.tandfonline.com/doi/pdf/10.1080/15487733.2016.11908149 (accessed September 23, 2019).
[110] E. Allen, H. Lyons, J.C. Stephens, Women's leadership in renewable transformation, energy justice and energy democracy: redistributing power, Energy Res. Soc. Sci. 57 (2019) 101233, , https://doi.org/10.1016/j.erss.2019.101233.
[111] J. Clancy, U. Roehr, Gender and energy: is there a Northern perspective? Energy Sustain. Dev. 7 (2003) 44–49, https://doi.org/10.1016/S0973-0826(08)60364-6.
[112] F. Denton, Climate change vulnerability, impacts, and adaptation: Why does gender matter? Gend. Dev. 10 (2002) 10–20, https://doi.org/10.1080/13552070215903.
[113] L. Kalof, T. Dietz, G. Guagnano, P Stern, Race, gender and environmentalism: the atypical values and beliefs of white men, race, Gend. Cl. 9 (2002) 112–130, https://doi.org/10.2307/41675022.
[114] A. Kronsell, L. Smidfelt Rosqvist, L. Winslott Hiselius, Achieving climate objectives in transport policy by including women and challenging gender norms: the Swedish case, Int. J. Sustain. Transp 10 (2016) 703–711, https://doi.org/10.1080/

15568318.2015.1129653.
[115] B. Baruah, Renewable inequity? Women's employment in clean energy in idustrialized, emerging and developing economies, Nat. Resour. Forum. 41 (2017) 18–29, https://doi.org/10.1111/1477-8947.12105.
[116] G. Pacheco, L. Chao, B. Cochrane, Empirical evidence of the gender pay gap in New Zealand, Wellington, New Zealand (2017).
[117] World Economic Forum, The industry gender gap women and work in the fourth industrial revolution, 2016.
[118] Natural Resources Canada, The equal by 30 campaign, Nat. Resour. Canada (2018).
[119] Electricity Human Resources Canada, Profile of women working in the clean energy sector in Canada, Final Report (2017), https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/energy-resources/Profile_of_Women_Working_in_the_Clean_Energy_Sector_in_Canada_compressed.pdf.
[120] M. Williams, L., Fletcher, A., Hanson, C., Neapole, J., Pollack, Women and climate change impacts and action in Canada: feminist, Indigenous, and intersectional perspectives, 2018. https://adaptingcanadianwork.ca/wp-content/uploads/2018/02/Women-and-Climate-Change_FINAL.pdf.
[121] ICE 20/20 Catalyst Director. Personal Communication, (2018).
[122] J. Bunce, A & Ford, How is adaptation, resilience, and vulnerability research engaging with gender? Environ. Res. Lett. (2015) 10.
[123] P.E. Perkins, Canadian Indigenous female leadership and political agency on climate change, Clim. Chang. Gend. Rich Ctries. Work. Publicy Policy Action (2017) 282.
[124] K.P. Whyte, Indigenous women, climate change impacts, and collective action, Hypatia 29 (2014) 599–616.
[125] L. Williams, Climate change, colonialism, and women's well-being in Canada: what is to be done? Can. J. Public Heal (2018) 1–4.
[126] A SHARED Future, A shared future, (2018). http://asharedfuture.ca/.
[127] C. Teelucksingh, B. Poland, C. Buse, R. Hasdell, Environmental justice in the environmental non-governmental organization landscape of Toronto (Canada), Can. Geogr. 60 (2016) 381–393, https://doi.org/10.1111/cag.12278.
[128] S. Bouzarovski, S. Petrova, A global perspective on domestic energy deprivation: overcoming the energy poverty-fuel poverty binary, Energy Res. Soc. Sci. 10 (2015) 31–40, https://doi.org/10.1016/j.erss.2015.06.007.
[129] B.K. Sovacool, R.J. Heffron, D. McCauley, A. Goldthau, Energy decisions reframed as justice and ethical concerns, Nat. Energy 1 (2016) 16024, https://doi.org/10.1038/nenergy.2016.24.
[130] National Energy Board, Market snapshot: fuel poverty across Canada – lower energy efficiency in lower income households, (2017). https://www.cer-rec.gc.ca/nrg/ntgrtd/mrkt/snpsht/2017/08-05flpvrt-eng.html?=undefined&wbdisable=true.
[131] K.J. Baker, R. Mould, S. Restrick, Rethink fuel poverty as a complex problem, Nat. Energy 3 (2018) 610–612, https://doi.org/10.1038/s41560-018-0204-2.
[132] S. Bouzarovski, S. Tirado Herrero, Geographies of injustice: the socio-spatial determinants of energy poverty in Poland, the Czech Republic and Hungary, Post-Communist Econ. 29 (2017) 27–50, https://doi.org/10.1080/14631377.2016.1242257.
[133] U. Dubois, H. Meier, Energy affordability and energy inequality in europe: implications for policymaking, Energy Res. Soc. Sci. 18 (2016) 21–35, https://doi.org/10.1016/j.erss.2016.04.015.
[134] C. Robinson, S. Bouzarovski, S. Lindley, Getting the measure of fuel poverty": the geography of fuel poverty indicators in England, Energy Res. Soc. Sci. (2017) 1–15, https://doi.org/10.1016/j.erss.2017.09.035.
[135] L. Lutzenhiser, Social and behavioral aspects of energy use, Annu. Rev. Energy Environ. 18 (1993) 247–289, https://doi.org/10.1146/annurev.eg.18.110193.001335.
[136] E. Shove, Converging conventions of comfort, cleanliness and convenience, J. Consum. Policy 26 (2003) 395–418 https://link.springer.com/content/pdf/10.1023/A:1026362829781.pdf.
[137] Environment and Climate Change Canada, Achieving a sustainable future. A federal sustainable development strategy for Canada 2019-2022., Ottawa, Canada, 2019. http://www.fsds-sfdd.ca/index.html#/en/goals/.
[138] R. Das, M. Martiskaïnen, Energy deprivation in everyday living: estimating, profiling, and escaping energy poverty in Canada, SPRU - Sci. Policy Res. Unit Curr. Proj. (2018), http://www.sussex.ac.uk/spru/research/projects/energy-poverty-canada.
[139] M. Lawhon, J.T. Murphy, Socio-technical regimes and sustainability transitions: insights from political ecology, Prog. Hum. Geogr. 36 (2012) 354–378, https://doi.org/10.1177/0309132511427960.
[140] B.K. Sovacool, How long will it take? Conceptualizing the temporal dynamics of energy transitions, Energy Res. Soc. Sci. 13 (2016) 202–215, https://doi.org/10.1016/J.ERSS.2015.12.020.