A Comparative PESTEL Analysis of Canada and China's Management of Energy Markets

Kevin Zentner
University of Alberta

Alycia Fritze
University of Alberta

Andrea Kloster
University of Alberta

Larysa Romaniuk
University of Alberta

As globalization forces increase, the importance of intentional international trade partnerships is evident. Due to tense China-U.S. relations, this presents Canada with a unique opportunity to attain a stake in the global energy economy. This paper analyzes the risks associated with the development of these potentially lucrative partnerships from the lens of political, economic, socio-cultural, technological, environmental, and legal (PESTEL) implications. While the differences between the Canadian and Chinese approaches to these perspectives present a significant barrier, Canada stands to gain significant financial and economic benefits from such a partnership.

INTRODUCTION

In a globalized world, international partnerships are increasingly important and frequent. Economic superpowers like China and the U.S. typically yield the highest leverage in international trade, but thanks to the current China-U.S. trade war, Canada could take the open seat at this most exclusive of tables. Despite the dominant service industry in Canada, perhaps its best offering for the global market are its energy products. In Canada's quest to develop an energy partnership with China, in which Canada would supply energy products, Canada faces many challenges and risks—not the least of which are physical infrastructure barriers. These challenges and risks can be analyzed through an in-depth PESTEL analysis that explores the political, economic, socio-cultural, technological, environmental, and legal implications of such an effort. The Going Global (2018) report provides a brief PESTEL analysis on China as a whole, as opposed to just the energy market, which proved to be a valuable starting point for this report. Through examination of the energy environment by way of a PESTEL analysis, this document will argue that Canada's ability to secure partnerships, trade agreements, and supplier leverage in China's energy market is significantly

affected by risk. And yet, Canada's strict regulations afford a position to influence China through expertise in environmental initiatives surrounding petroleum production and spill cleanup.

POLITICAL

Although the environmental, economic, and regulatory goals in Canada and China are similar, discrepancies in political processes have a significant impact on the control and capabilities over energy projects. This section begins with an analysis of Canada's political instruments, followed by China's, and a subsequent comparison for conducting global business.

Canada

Natural Resources Canada submits initiatives and regulatory changes to what is called the forward regulatory plan. The forward regulatory plan is a public list of anticipated regulatory changes or actions that a department intends to bring forward or undertake in a specified time frame. The purpose of this document is to give stakeholders and trading partners a greater opportunity to help shape and develop regulations and impact future directives. The forward regulatory plan is adjusted and updated as Natural Resources Canada's operating environment changes (Natural Resources Canada, n.d.-b). One initiative of Natural Resources Canada is a shift towards cleaner technologies in the oil and gas sector to reduce carbon pollution, such as groundwater contamination. Federal goals include meeting the rising demand of oil and gas and funding the next generation of renewable energy (Natural Resources Canada, n.d.-a).

China

Every five years since 1953, the Chinese government has implemented a state-sponsored Five-Year Plan to communicate economic and social development initiatives to the public (Xinhua, 2015). The Five-Year Plan provides a glimpse at the priorities of the government and operates as a guideline rather than a rigid agenda (Xinhua, 2015; S.R., 2015). This approach is consistent with China's minimal regulatory infrastructure for dealing with contamination from energy projects, where targets are set with little enforcement (Qiu, 2011). The Five-Year Plan is drafted by the National Development and Reform Commission (NDRC) and its targets are established through consultation with experts from academia, industry, and other government ministries, while excluding public participation (Haacke, 2015). China is currently on its 13th Five-Year Plan for the period 2016-2020, which highlights a transition from coal to oil and gas, and the gradual replacement of land-based resources with renewable energy (Xinhua, 2015; Solomon, Cai, & Haacke, 2017). China's reliance on its Five-Year Plan influences policy-making where policies are assessed against national priorities (Kreab, n.d.). As such, most national strategies can be traced to Five-Year Plans (Kennedy, 2016).

Although Canada's forward regulatory plan and China's Five-Year Plan share similar progressive stances, they are not prepared, organized, or regulated in the same fashion, leading to substantial differences in dictating direction and regulation. Canada's forward regulatory plan is flexible, open to public opinion, and continuously evolving, whereas China's Five-Year Plans guide Chinese regulators throughout the implementation period. Varying government structures dictate significant differences in planning, implementation, and political processes for Canada and China. Canada's democracy includes its citizens in decision-making and China's central government consolidates power over natural resources, energy projects, and consultation (Liu, 2013). As such, China's central government has greater control over the direction of the country's energy industry but lacks the resources to regulate it to the levels of Canada and the U.S. Moreover, the Government of Canada has less control over the economic direction but stronger regulatory enforcement infrastructure (Qiu, 2011).

Implications

China's form of government is a political and social ideology which dictates how government and social organizations are established, whereas Canada's democracy is purely political (Glen, 2013). Conducting energy business in China might be considered more stable from a political perspective due to

the centralization of power over oil and gas projects. Five-Year Plans operate as guidelines, so integrating Canadian engineering and technology could prove easier due to lax regulatory processes and minimal public participation. McKinsey (2018) describes which flows are expected to increase through China's Belt and Road Initiative, but flows are also expected to increase from Australia, requiring further infrastructure development in China. Increases in liquified natural gas (LNG) are largely policy driven as the country attempts to reduce its environmental footprint.

ECONOMIC

China is an economic giant compared to Canada. In 2018, China and Canada's nominal gross domestic product (GDP) metrics in USD were $13,338B and $1,595B, respectively, with growth from the prior year of 6.0% and 2.1% (Economy Watch, 2019). In the recent year, both economies are expected to slow down due to the China-U.S. bilateral trade war, imposed tariffs, and various other political uncertainties (Lynch, 2018). The primary driver of China's market economy has historically been manufacturing and export industries, but the slowing demand of consumer products has shifted this focus to improving IT service and product offerings (The Economist, 2019a). Comparatively, Canada is characterized as a mixed economy and is heavily dominated by the service industry which employs three-quarters of the population (Canadian Visa, n.d.). Canada and China are leaders in the natural resources sector, especially for oil and gas. Natural resources are a substantial portion of each country's exports and imports, so factors of demand, supply, and tax systems are greatly affected by global events and circumstances. This section begins by detailing Canada's demand, supply, and the role of taxes sequentially followed by an examination of these aspects in China. The economic analysis section concludes with a comparison of economic functions for conducting global business.

Canada

Demand for energy is increasing as worldwide populations and consumption rates grow. A changing energy mix is emerging as sustainable technologies develop, consumer preferences shift, and policy measures evolve. These trends threaten the Canadian economy, which is heavily reliant on the non-renewable resource industry, but also presents an opportunity for Canada to become a leader in sustainable energy production. The International Energy Agency's (IEA) World Energy Outlook for 2018 projects a 27% increase in demand for energy from all sources by 2040, with the demand for natural gas and oil projected to rise by 27% and 10% respectively (Canadian Association, 2019). With overall energy demand increasing, there is also pressure to invest in clean sustainable hydrocarbon production. Development of a more diversified portfolio of energy sources will ensure Canada maintains its rank as a top energy producer—a goal of the federal government (Ljunggren, 2017). The Energy Innovation Program (EIP), which is just one of many Canadian led programs to support renewable energy research and development, received $49M over three years from April 2016 to March 2019 in support of clean energy innovation (Ashmore, 2019). This is a key component of the Government of Canada's promotion of sustainable economic growth towards a low-carbon economy (Natural Resources Canada, 2018b). Advancement of wind, hydro, and solar technologies and infrastructure have greatly increased in recent years, indicating Canada's commitment to a sustainable future and reducing regional dependence on provinces like Alberta.

Canada's mineral fuels, oils, and distillation products made up 14.5% of total goods exported in 2017 (Trading Economics, n.d.). The country has access to a large supply of oil and gas reserves, but there is an unequal geographical distribution in Canada with Alberta (77.4%), Saskatchewan (13.7%), and Newfoundland and Labrador (5.7%) being the largest producers (Natural Resources Canada, 2019). Alberta's Western Canadian Select heavy crude is a blend of bitumen and diluent and is difficult to transport and refine due to its viscosity. Older Canadian refineries do not have the capacity to process this heavy grade oil and must ship the majority of this oil south to the Gulf coast. This creates steep price differentials and the erosion of profit to the point of economic unviability (Leach, 2018). The U.S. continues to be Alberta's best market for oil and gas because of proximity and higher refining capacity, but the trade war

between the U.S. and China is concerning for its volatile effects on Canada's economy. Consequently, exports are expected to fall in future years with no projected increase in domestic demand (Morgan, 2018).

The energy industry operates in a free market, where investments by both Canadian and foreign companies ensure an efficient, competitive, and innovative system. Oil is traded globally and moves between markets by barge, pipeline, or railcar, so global prices are determined through the supply-demand balance. Canada faces an unusual situation with regard to its supply of oil and gas—there is potential for significant growth, but a lack of infrastructure and processing efficiency has curtailed production. Investment in pipelines has been one of the most divisive issues in Canadian politics, with continued debate and protest surrounding their expansion due to complications over social and environmental consultation. The federal government's decision to purchase the Trans Mountain Expansion project (TMX) for $4.5B, may increase the amount of oil transported between Edmonton and Burnaby three-fold if completed (White-Crummey, 2019; Trans Mountain, n.d.). Economic benefits from this project include short- and long-term employment opportunities, oil production revenue, and government revenues from taxes and royalties, but risk surrounds the project's completion (The Canadian Press, 2018; Trans Mountain, 2019). The TMX would help resolve infrastructure restraints and bottlenecks, allowing access to new global markets, reducing transport costs, and increasing the value captured for petroleum products.

Federal and provincial governments receive significant tax revenue from the oil and gas industry. Payments come from corporate income taxes, indirect sales and payroll taxes, crown royalties, and crown land sales, where royalty payments alone make up half of this revenue (Alberta Energy, 2018). Natural resources that exist within a province are owned by that province so energy producers must pay government royalties to access and develop extraction infrastructure. Canada has established a variety of tax credits for entities which engage in environmentally sustainable projects and investment, but tax cuts on machinery have not stimulated business investment as expected (Sanger, 2018). One major tax break is the Federal Qualifying Environmental Trust (QET) tax credit given to Canadian sites that operate a mine or extraction process, deposit waste, or operate a pipeline (Canada Revenue Agency, 2019).

China

China is the world's largest energy consumer, the largest producer and consumer of coal, and has the largest carbon emission footprint (EIA, 2018). As a net importer of oil and gas, China's economic growth has far exceeded their domestic capacity and production potential for their three primary fossil fuels: coal, petroleum, and natural gas (Going Global, 2018). China primarily trades with the Middle East and Russia but also imports oil and gas from Canada and the United States. Unlike Canada, there is little geographical separation between natural resource reserves and industrial hubs that serve final users. Coal mines are found in the Song-Nen Plain, Zhongyuan, ("China Resource," 2019) and Liaodong regions ("China Traditional Divisions," 2019) in close proximity to the heavily populated coast. Conversely, there are sizable untapped oil reserves to the south and west in the Hetao Ordos, Ba-Shu, and South Xinjiang regions. China's Five-Year Plans have focused on developing and investing in these western inland regions through developing transportation networks and energy plant infrastructure (Xinhua, 2015). Although coal and natural gas are the primary energy sources for China, strategies have been developed to adjust the energy mix and reduce reliance on coal. The most recent Five-Year Plan focuses on internal development and cultivation of technology that will sustain current energy production and investment in new technology that will reduce China's carbon footprint (Xinhua, 2015).

Demand for China's resources is directly linked to unprecedented economic growth, income gain, and advancing technology. Economic growth, as measured by GDP and energy consumption rates are closely related, as "with every 10% increase in gross domestic product, the average national material footprint (global allocation of used raw material extraction to the final demand of an economy) increased by 6%" (Weidmann et al., 2015, 6271). China's LNG import market is growing due to demand increases, resulting in a 52% compound annual growth rate (McKinsey, 2018), but also contributing to market volatility with daily price swings as high as 17% (Brewer, 2019). From all exporters, the most significant year-over-year growth was from Australia and the U.S., and this growth far outpaces the growth of domestic or pipeline LNG from central Asia (McKinsey, 2018). Asia's LNG demand is expected to continue growing to levels

nearly 50% higher in 2022 than in 2017, and China is expected to represent one third of all demand growth for LNG by 2035 (McKinsey, 2018).

This trend is especially visible for countries which are transitioning from developing to developed, like China. Natural resources are the building blocks for the operational effectiveness of the entire economic system, especially for countries which rely heavily on the manufacturing sector as is the case in China (Zhang, Guan, Wu, & Zhao, 2018). China and other developing countries have seen linear growth in final energy consumption, paralleling economic growth as compared to developed countries who have experienced negative trends (International Energy Agency, 2016). Although this historical linear movement is apparent, China has recently shifted its focus to developing more sustainable technology and expects energy consumption rates to slow.

Recent affairs with the U.S. have directly affected China's economy, with both exports and imports falling in recent months due to trade war (Trading Economics, 2019). Still, China is making some effort to increase foreign investment, with co-vice chairman of the China Securities Regulatory Commission Fang Xinhai stating there would be more approvals from Wall Street banks for majority ownership in securities (Lu, 2019). This is consistent with Canadian firm Brookfield's recent move for property investments in Shanghai, despite recent political topics such as the arrest of Huawei's CFO (Zheng, 2019). China's main economic driver is manufacturing exports, and this sector has experienced slower growth for the first time since March 2018 (The Economist, 2019b). Since energy is a requirement for production, the decline in exports will reduce the amount of energy consumed. China aims to counteract these trends through monetary policy, increasing trade with developing countries and promoting strong growth through expenditure on public services. Through this period, import shipments of oil and gas have risen year-over-year because of shifted trade relationships, but also due in part to seasonality (The Economist, 2019b).

Through the last 50 years, China has invested heavily in the development of its natural resource industries by increasing transportation networks within the country, and much of the population has shifted from rural areas to coastal regions where major urban cities are located (Farchy & Kynge, 2016). This dramatic reform moved rural natural resource producers towards price liberalization and decentralization, and opened domestic players to foreign trade and investment. Urban populations in China now consist primarily of middle-class citizens who have driven growth in consumer expenditure. According to Euromonitor International, "in 2030, more than three-quarters of Chinese households are expected to earn disposable incomes of more than US$10,000, compared to less than 40% in 2010," (Gordon, 2016). In turn, this population is purchasing more consumer goods which use natural resources as material and energy inputs.

Conversely, environmental change and advancing technologies shift demand for natural resources by driving demand for some materials in substitution for others. In 2008, the Chinese government adopted the Circular Economy Promotion Law with the intent to effectively promote and improve resource utilization efficiency, protect the natural environment, and realize sustainable development (Geng, Fu, Sarkis, & Xue, 2012). China has taken a clear lead in renewable energy, becoming the world's largest producer, exporter, and installer of solar panels, wind turbines, batteries, and electric vehicles (Dudley, 2019). Chinese businesses, as compared to many of the other competitors in the marketplace, have taken a proactive stance on changing the resource landscape, viewing it as an opportunity to introduce resource efficiency and new product lines (Dudley, 2019). While population and energy demands continue to increase, the pace of innovation and technology could counteract growth trends and divert energy consumption towards energy produced by sustainable sources. The transition to electric vehicles reduces the demand for petroleum products and the rare earth metals used in car batteries such as lithium, graphite, and cobalt. Despite potential for significant growth in these sectors, the demand for electrical energy from the masses far outweighs current capabilities of renewable resources to produce such amounts of energy.

China's supply of oil is endowed by its four state-owned oil companies: China National Offshore Oil Corporation, China National Petroleum Corporation, China National Refinery Corp. and Sinopec (Going Global, 2018). With its circular economy philosophy and efforts to reduce reliance on other countries, the Chinese government implemented strict policies to maintain oil reserves, while also incentivizing the big four oil producers to increase their recovery rates (Xinhua, 2015). Shanxi, China's second-biggest coal

producer, aims to upgrade its energy structure from coal to clean energy and build a 10,000 km cross-province pipeline that will give better access to high-quality energy sources such as LNG (Going Global, 2018). Furthermore, McKinsey (2018) describes how the global supply of LNG is expected to grow solely through unconventional supply methods, such as shale extraction.

Still, maturing oil fields, over-reliance on inefficient power generation, and capacity build-up require imports to sustain the growing energy demand. China has large oil reserves in the west, but production is slow due to high extraction costs and a lack of sufficient infrastructure in much the same way Canada struggles with heavy oil ("China Resource," 2019). To combat this, the Chinese government has implemented policies to streamline project approval processes to attract more private investment in the energy transmission infrastructure sector. Rioux (2019) suggests further action to optimize "the utilization of existing capacities in the domestic natural gas upstream and midstream sectors" (p.394) through market-oriented pricing. This action, combined with a reduction of barriers to market access, could stimulate competition and efficiency. China's most recent Five-Year Plan does identify these as areas to optimize the domestic LNG supply, and the government is taking real action to fulfill these intentions (Xinhua, 2015).

With increased competition and the aforementioned measures to increase profit margins, the tax system is the only means by which China has realized revenue from production and distribution operations. One type of tax that China has implemented is the value-added tax (VAT) which is a tax paid by exporters on goods shipped abroad (PWC China, 2017). Additionally, exporters can file for rebates on the taxes they pay depending on the products they export. Recently, tax reform has been introduced "to blunt the impact of the deepening trade wars with the US" (Koty, 2018), mainly for electromechanical and cultural products. Many natural resources are inputs along the supply chain of the 397 new items that are now eligible for rebates, including lithium batteries, steel products, and books (Koty, 2018). Other responses to the China-U.S. trade conflict include tax cuts to support small businesses, regional policies to minimize business costs, and import tax cuts for other Asian countries (PWC China, 2017).

In addition to VAT taxes, producers and exporters of natural resources are subject to a resource tax. Taxable natural resources include crude oil, natural gas, coal, and various minerals, with forests and grassland being the only sectors not yet covered under the legislation (Dezan Shira & Associates, 2016). Introduced in 1984, the tax has undergone several reforms to make taxation levels more sensitive to current market conditions and increase the scope of affected resources (KPMG, 2016). Following the Chinese government's encouragement of environmentally-friendly process development, resource tax reform has brought tax reductions for companies with enhanced oil recovery (EOR) expertise (Xinhua, 2017). By June 2017, Chinese firms had their taxes cut by $604M USD, enhancing each company's resource utilization and promoting industrial upgrades (Xinhua, 2017). One drawback of these incentives is they are only given to government-operated companies, making market entry difficult for entrepreneurs and international firms.

Implications

Energy is a significant component in every economy, whether it be an export, import, input for production, or barrier to entrepreneurship. Managing increased demand is a matter of discussion for both China and Canada, but differences in social responsibility and the welfare of national economies impact legislation, technological development, and global trade participation. Total debt now sits at roughly 360% of GDP in Canada and 265% of GDP in China, creating significant economic difficulty and risk for both countries in the coming years (Finlayson, 2018). China has utilized its aptitude in manufacturing technology to diversify its energy resources beyond reliance on coal but will remain a net importer of oil and gas for the foreseeable future (Bloomberg News, 2016). While Canada has also taken measures towards environmentally conscious energy diversification technology, it remains committed to developing oil and gas projects to increase exports and diversify its market.

Currently, the Canadian and Chinese business environment is structured in a way that makes interaction difficult. Canada holds an abundance of individual entities along the supply chain, whereas China's centralized natural resource approach contains four entities which serve national interests. Although market penetration is difficult due to the structure and culture of the Chinese energy sector, there is an opportunity for Canadian service and supply companies to lend their expertise in enhanced oil recovery with

technologies such as water injection, polymer flooding, and steam flooding. The China-U.S. trade war could have consequences for Canada—if China's national oil companies become stagnant and the U.S. stops providing LNG, the markets for product, technology, and investment could become attractive. Still, U.S. tariffs continue to add economic uncertainty to Canadian business in China (Tapp, 2018). Both countries want to manage supply and leverage foreign innovation and technology to improve efficiency.

SOCIO-CULTURAL

An analysis of Canada and China through the socio-cultural lens provides the perspective of the shared beliefs, values, and practices held in these countries. Canada and China present an interesting analysis for this lens as both countries have several communities, groups, and regional considerations to understand and address, as opposed to a singular perspective that reflects the entire country's opinion. The socio-cultural context is also increasingly important for energy producers and consumers as larger trends and globalization push countries and companies to consider the impact of their actions on community members. An examination of Canada's culture is followed by Chinese considerations, and the implications of similarities and discrepancies conclude this section.

Canada

The shared beliefs, values, and practices of Canadian inhabitants are fractured amongst different communities. As oft-featured in the news, the Indigenous perspective is crucial for the development and implementation of any energy project. The media enjoys portraying Indigenous groups as victims of energy development who are fully opposed to oil sands for reasons of environmental protection of their lands (Deranger, 2015). While environmental issues are certainly a concern for many Indigenous groups, and some Indigenous groups are against energy development, the postulation that Indigenous groups are all environmental victims can be harmful to both sides involved. A more holistic picture is one where Indigenous communities are looking to be partners in energy development and be properly consulted (Bellrichard, 2018). As seen with the rejection of the Trans Mountain pipeline expansion, proper consultation with affected Indigenous groups is crucial for the ultimate implementation of pipelines (Bellrichard, 2018). What is key about consultation, however, is understanding the regional considerations within the Indigenous perspective.

In Alberta, a number of Indigenous groups endorse the energy sector. For example, the Kainai band advocates for bands to take an active role in the economic benefit generated from energy, citing their own benefits such as subsidized living expenses for reserve members (Rieger, 2018). In the Fort McKay First Nation, a community with access to energy jobs, the unemployment rate sits at 16.7% (Statistics Canada, 2018b). Compare this with the Ermineskin First Nation, a community without ready access to energy jobs, whose unemployment rate is almost double at 29.0% (Statistics Canada, 2018a). However, this is not to say that Albertan Indigenous communities are all fully supportive of energy projects. Rather, there is evidence of greater support from these communities, likely because of the increased consultation, economic benefits, and job creation Albertan communities have seen due to their proximity to oil sands.

In British Columbia, however, Indigenous communities are proponents of clean energy (Shaw, Cook, Fitzgerald, & Sayers, 2017), turning towards sources such as solar and wind energy (Shaw et al., 2017). This trend mimics a larger, Canada-wide shift in Indigenous groups towards green energy (McDiarmid, 2017). As further evidence, many of the B.C.-based Indigenous groups affected by the Trans Mountain expansion were elated with the Supreme Court ruling that the Trans Mountain Corporation had not sufficiently consulted the affected communities. These communities sought greater partnerships regarding the economic benefits and environmental impact the pipeline would create and felt that Trans Mountain Corporation had thus far done a poor job (Laanela, 2018).

The differences in opinion amongst Albertan and B.C. Indigenous groups are reflected at a provincial government level as well. A contentious argument between the Alberta and BC governments over the Trans Mountain pipeline was sparked in 2018, reflecting a larger energy conflict. Over the course of the still-unresolved argument, both governments have threatened to harm the economy of their neighbour (Gerson,

2018). Alberta Premier Rachel Notley continued to push for the national economic benefits of pipeline development, while the B.C. government has been focused on protecting the interests of its province's environment and coast (MacVicar, 2019). At the federal level, Prime Minister Justin Trudeau's government is at odds with Alberta, as they are unable to agree on what takes priority: slowing climate change or the economic benefit of pipeline production. Notley has claimed Trudeau is not doing enough to protect jobs or Alberta's energy sector ("Global National", 2018). In response, Trudeau pointed to his government's $4.5B purchase of the pipeline as proof of his pipeline commitment (White-Crummey, 2019). However, to protect the interests of all Canadians, Trudeau also continues to advocate for climate protection and Indigenous consultation, issues that tend to upset pipeline supporters (White-Crummey, 2019).

The perspectives of Indigenous groups and provincial and federal governments illustrate a portion of the complex mosaic of opinions held by Canadian citizens with regards to the country's energy sector. With regards to energy development, Canadians tend to value respect for the law, Indigenous rights, and the environment, but inhabitants of individual provinces might disagree on the boundaries of what constitutes environmental values (Sinha, 2013; English Online, Inc., 2016). Energy companies, particularly inter-provincial companies, must navigate these and other values in their operations. They must balance profitable operations with job creation, minimal environmental damage, and Indigenous consultation.

China

Although China is economically one country, a singular business approach to all regions of China will not be fruitful, given the provisions required by its multitude of unique ethnic minority groups (Hathaway, 2016). Here, the term "ethnic minority" refers to groups in China native to the lands in which they inhabit.

With regards to energy development, many ethnic minority groups in China, such as the Uighurs in the Xinjiang province, are struggling to maintain their cultural identity against the Chinese government's prioritization of economic development (Corben, 2012). Although economic development has always been a priority, the exploitation of natural resources has intensified since the early 2000s in regions populated by ethnic minority groups (Corben, 2012). In the Yunnan province, the Jinuo people have historically managed their forests in traditional and effective ways (Long & Zhou, 1999). However, rapidly changing forestry policy from the government has destroyed their ecosystem (Long & Zhou, 1999). At a national level, the interests and practices of regional ethnic minority groups are not accounted for when developing natural resource and economic policy. Overseas, Chinese energy companies do understand Indigenous perspectives, as evinced by the partnership between China Petroleum & Chemical Corp, China Construction Industrial & Energy Co. Ltd., and several Indigenous communities in Alberta to build a bitumen refinery (Asia Pacific Foundation of Canada, 2018). Nonetheless, ethnic minority groups are disregarded at home (Corden, 2012). By disrespecting and marginalizing current ethnic minority communities, Chinese energy companies are also disregarding the crucial role that ethnic minority knowledge and care have had on preserving the fertility of rural lands for later economic development in the 21st century (Tiejun, Kinchi, Cunwang, Huili, & Jiansheng, 2010).

In February 2019, the Central Committee of the ruling Chinese Communist Party stated that their top rural policy goal is to reduce rural poverty (The Economist, 2019c). The provinces of Tibet, Xinjiang, Sichuan, Gansu, and Yunnan are scheduled to receive the most fiscal support with programs that use rural lands in conjunction with urban construction projects (The Economist, 2019c). Among other layers of poverty, rural communities face energy poverty (He, Hou, & Liao, 2018). This implies that energy consumption is low, the quality of energy structure is poor, and there is a lack of accessibility to all forms of energy (He et al., 2018). Provided they are treated as partners in the government's plans for rural land development, said program is an opportunity to reduce energy poverty in rural areas.

In contrast, urban areas are energy-rich and are moving towards renewable energy (Mah, 2019). Since the 2005 enactment of the Renewable Energy Law, urban Chinese communities have seen an increase in green energy sources, such as solar, reflecting an increased social interest in green practices (Mah, 2019). China's growing middle class, who are more likely to frequent urban areas, are increasingly demanding less pollution from the government as they move towards renewable energy (Going Global, 2018). Another regional variation includes coastal regions. These areas, due to their opportunity for economic stimulation

through ports, enjoy increased affluence and job opportunities compared to inland regions (Fan, Kanbur, & Zhang, 2009). Across all regions, increased access to resources and energy has correlated with poverty reduction (Fan, Kanbur, & Zhang, 2009).

As mentioned, urban populations of China are becoming greener. This is due to multiple factors: superior technology, higher incomes, accessibility of green energy sources, and, unfortunately, externalizing of production and pollution towards poorer (likely rural and inland) areas of China (Feng, Siu, Guan, & Hubacek, 2012). Energy companies must be cognizant that current actions are not improving sustainability if the pollution is simply produced elsewhere.

However, the country is ultimately moving towards greener practices. As explored in the Economic section, the social interest in green practices across China is reflected in governmental policies, such as those that move towards adopting a circular economy model, which emphasizes the importance of sustainability and improved efficiency of resource utilization (Geng et al., 2012). This policy reflects a widely held Chinese value of harmony between humans and nature (Mao, 2017). This harmonious value drives citizens and corporations to balance economic development with sustainable practices, as seen in recent years. Another Chinese value of pertinence is that morality surpasses law in importance (Mao, 2017). Energy companies must therefore frame their ethically ambiguous actions as morally necessary to avoid the negative connotation of illegality. The Chinese oil giant, China National Offshore Oil Corporation (CNOOC Group), has received negative publicity since the early 2000s regarding ethical issues, such as human rights abuses, drug trafficking, and the inefficient handling of oil spills (Boot, 2008; Kwok, 2008; Yong, 2011). In this environment, CNOOC has likely survived and continued to succeed by framing their actions as morally ambiguous. Ultimately, China represents a diverse community that is divided along lines of poverty, energy access, and green practices.

Implications

The implication of this socio-cultural analysis is that for both Canada and China, there is no singular approach that reflects the interests and values of the entire country. Both countries have important and vastly different regional communities whose voices are crucial yet difficult to all satisfy. Canada and China both have Indigenous peoples whose perspective is incredibly important as landowners and potential economic partners, yet their perspective is not fully valued. There is also the governmental element, in which these federal governments are struggling to balance economic development and sustainable policy in order to meet social trends in their countries. Lastly, both countries have distinct ethical values which dictate which actions of energy companies will be permitted. Ultimately, any company looking to develop an energy partnership with either Canada or China must understand these crucial implications and provide products and services which improve the lives of citizens.

TECHNOLOGY

China has traditionally been known for its rich agricultural, mining, and manufacturing sectors, and these industries, combined with population growth, have pushed China to be the world's largest net importer of petroleum products (EIA, 2018). Production of oil and gas in China has remained relatively steady in recent years, resulting in the requirement of increased infrastructure in order to serve China's growing need. China occupies a high-risk/high-return position in the Canadian export market, where transport and drilling technology may be a lucrative opportunity to pair with China's abundance of labour and supplies (Going Global, 2018). This section explores the technologies which have impacted Canada's oil and gas sector, followed by an examination of China's technology and infrastructure approach. The section concludes with a discussion of technology-centred energy trade with China and determines that China is a high-risk market for Canada's energy tech exports.

Canada

Although the U.S. is the global leader in oil and gas technology, contemporary extraction methods have been adopted in Canada and in some cases expanded upon (Going Global, 2018). Canada's stringent

environmental restrictions have had an impact on petroleum projects, driving technological advances for reduced surface disturbance and better recovery rates. In situ extraction, hydraulic fracturing, and horizontal drilling technology have reduced the number of wells required to extract more resource, but the combination of these factors with walking drilling rigs has had a marked impact on the speed of extraction (Topf, 2015). This technology has enabled small, nimble producers to see significant growth in the U.S. and Canada, and one company combining these advances to great effect is Seven Generations Energy. This organization has developed a 36-well "super pad" with horizontal wells covering over 2500 acres across the reservoir which sees less than 1% surface disturbance (Jaremko, 2017). Moreover, super pads allow for full land reclamation, and this technology has not yet reached its ceiling for economic value: horizontal wells in North America can be as deep as 7900 meters (Jaremko, 2017). China's technology is lagging significantly, as the first walking, deep drilling rig was not delivered in China until 2014 (Herrenknecht Vertical, 2019), and this technology has been gaining traction in Canada since the early 90s (Canadian Horizontal, 2019). Canada's advantage is also linked to its geographic position with respect to the U.S., as technology more easily flows between English-native countries who share a land border.

China

Production in China is decreasing for large, mature oilfields, and sustainable petroleum extraction technology would allow these mature sites to continue operating (Going Global, 2018). To combat this, China recently implemented a policy calling for the maximization of recovery rates of oil sites and offering a reduction in tax rates for qualifying projects (Going Global, 2018). This presents an opportunity for global companies with experience in EOR methods. Significant investment in technology such as water injection, polymer flooding, and steam flooding has been adopted by China's national oil companies, an area where Canadian oil and gas companies have considerable knowledge and experience. China has also explored carbon storage through the Yanchang Integrated Carbon Capture and Storage Project, which will capture 410K tonnes of carbon yearly from a coal to gas plant operating in the Shaanxi province (Going Global, 2018). Therefore, China is most likely to be open to new technologies when there is combined environmental, recovery rate, and cost savings.

Pipeline development is a contentious point in Canada with requirements for comprehensive environmental and Indigenous consultation for petroleum projects. Canadian pipelines use a top-down design approach, where each project requires evaluation and analysis according to initial conditions, where control is decided by the project manager as opposed to the lead engineer (Xu, 2017). This differs from China's approach with the development of Line D, which will see further natural gas imports through the expanding network of pipelines that span Turkmenistan, Uzbekistan, and Kazakhstan (Intellinews, 2018). A review of the design documentation for Line D revealed that engineers designed only according to their individual experience, resulting in a lack of evidence in the preliminary design (Xu, 2017). This design concept gap between Canadian pipeline documentation and that of Line D is telling of the lack of technological know-how and infrastructure, where SCADA and control system architecture, security, and equipment specifications are severely lacking in integrity (Xu, 2017). Line D is just one solution for the import of petroleum products through this region, as the Khorgos-Aktau railway, China-Kyrgyzstan-Uzbekistan railway, and dry port Khorgos Gateway provide additional trade routes with Central Asia (Farchy & Kynge, 2016). This infrastructure, known as China's Belt and Road Initiative, does provide diversity of transport methods but not of markets. Furthermore, LNG imports are expected to increase through the Power of Serbia pipeline, set to come online in 2024 (McKinsey, 2018). This new infrastructure and increasing demand make China's petroleum market relatively volatile with daily price swings as high as 17% as discussed previously (Brewer, 2019).

China's methods for pre-drilling prediction for offshore drilling are also outdated, only implementing traditional methods in the Ying-Qiong Basin due to conditions which differ from the geological environment. This indicates that inadequate technology exists beyond just land-based extraction (Zhang et al., 2018). Fine-scale reservoir prediction for ultra-deep gas and water identification have seen some technological advances, such as geosteering drilling of horizontal wells, which has improved the efficiency of exploration for the Yuanba gas field, but this has not been adopted for some projects due to cost

restriction (Guo, 2018). With growing demand and stagnant technology infrastructure, diversifying this market should be a priority for China

China's increasing demand has demanded new technology such as shale gas extraction. The development of this method brings new environmental complications such as oil-drilling fluid technology, where waste cuttings are a by-product of production consumption (Xing, Wang, & Feng, 2018). Safe containment of this requires special pit-sealing technology and landfill treatment such as a plastic cushion (Xing et al., 2018). This also contributes to oil waste, as any remaining oil resource in the drilling fluid is unable to be recovered. Treatment of this waste material in Canada is conducted through methods including thermal distillation, solvent extraction processing technology, bioremediation (see MNA above), and chemical demulsification treatment technology (see EA above). This means there is an opportunity to conduct business with China to see the use of these methods (Xing et al., 2018). Though the LNG market is heating up in China, some skeptics believe extraction is too costly, citing lower global gas prices (Sui et al. 2018). Sui (2018) also suggests that there is a shortage in drilling oil in China, but that the unique oil in Daqing fields could be superior for drilling lubrication purposes if desulfurized and de-aromatized.

Implications

Exporting Canadian oil and gas products to markets outside the U.S. has become increasingly difficult due to judicial precedent, but China could be an attractive market for extraction technology, and FDI for technology in China has increased by 40.9% year-over-year despite the China-U.S. trade war (Yeung, K.). With recovery rates becoming a tax consideration, China will look to exhaustive extraction projects which include super pads, horizontal drilling technology, and walking deep drilling rigs for expedited implementation. Oxford Economics describes how the U.S. has seen success, with 1.4% annual growth in value-added services for mining and oil extraction, and a 1.7% increase in value-added services in petroleum and coal manufacturing ("Understanding the US-China," 2017). In fact, service exports to China have increased across all industries, suggesting there is opportunity for Canada to increase engagement ("Understanding the US-China," 2017). China's lax regulatory processes make this market ripe for process technology, and lack of integrity in preliminary design is indicative of opportunities in management, engineering, and consultancy (Going Global, 2018). If Canada expects to compete with Kazak and Russian oil and gas suppliers, pipeline capacity to the west coast will need to increase significantly, and an analysis of refining capability in China must be taken into account. Technology's role in Canada-China trade is largely contingent on Canada's ability to scale offerings to the level required by China's national oil companies and reduce the price of exploration, drilling, and environmental technologies. Marketing technology to China is contingent on China's ability to implement and capture value from these initiatives, and fundamentally changing the design procedures for these projects will be met with cultural complications. Therefore, it can be ascertained that Canada's ability to export technology is much the same as the export of products—significant risk surrounds Canada's ability to conduct business with China for oil and gas projects (Going Global, 2018).

ENVIRONMENT

There are several environmental risks associated with hydrocarbon extraction and transport, but this section focuses on one of the most contentious issues: soil toxicity. Although management of emissions is another consideration for the energy industry, climate change is a global problem with issues spanning from agriculture to transportation sectors and as such will not be discussed. Four primary groundwater remediation technologies are in use with regularity: pump-treat (P&T), monitored natural attenuation (MNA), permeable reactive barriers (PRB), and air sparging (AS), each with their own flaws (An et al., 2016). Beginning with an examination of Canada's approach to environmental cleanup, a discussion of China's methods follows, and implications for conducting business in China concludes the section.

Canada

MNA is the degradation of pollutive hydrocarbons which have drained into the soil, specifically for in situ extraction methods. This method of control and remediation of groundwater pollution has seen considerable traction in Alberta, but China has been slower to adopt, as globally, P&T methods are considered most sustainably viable (EnviroWiki, 2019). P&T methods have been met with criticism, suggesting that this method is uneconomical and unable to ever reduce groundwater contamination to drinking levels (Vodrias, 2001). As such, newer technologies must be considered when determining the economic viability of global business with China on topics of environmental cleanup with respect to petroleum projects.

Technological advancements have brought about Enhanced Attenuation (EA), which augments the MNA process through chemical or biological enhancement. Canada has had notable progress on the use of microorganism enzymes for this process (Epp, 2002). This process reduces the total pollutive petroleum hydrocarbons without the use of a P&T system, and B.C. developed a committee in 2002 to ensure responsible use of this technology (Epp, 2002). A considerable list of prerequisites must be met for the use of MNA technology in Canada, as explained in the BC. Ministry of Environment's Technical Guidance on Contaminated Sites document. MNA and EA may only be performed under the legal provisions set out in B.C.'s Environmental Management Act, and requires an "Approval in Principle, Certificate of Compliance and independent remediation," (BC Ministry, 2014) to implement. The privatization of the oil and gas industry in Canada complicates environmental cleanup processes through new technologies, where traditional technologies are still favoured for aquifers which affect drinking water.

China

Groundwater contamination is a significant issue, especially in rural China where wells are the only water source available. This topic has garnered government interest with a promise of $5.5B over 10 years to combat contamination (Qiu, 2011). China's Ministry of Land and Resources concedes that 90% of China's shallow groundwater is polluted, citing industrial waste sites such as tailings ponds as contributors (Qiu, 2011). China lacks a regulatory framework and legal provisions for dealing with contamination, and research in this field has been limited (Qiu, 2011). Considering the enormity of this problem in China, using environmental standards set in Canada and the U.S. as a benchmark is likely impossible, as remediation may not be considered successful given the resources and knowledge currently available in China. The State Council of China recently published the Action Plan on Prevention and Control of Soil Pollution, disseminating approaches to contamination control methods towards the development of practical legislation for groundwater (Sun, 2017). There is also a need for further research, especially regarding agricultural groundwater, as, "surveys of varying scale have been scattered, and there is no clear understanding of the status of organic contamination in agriculture throughout China, given that the types of [organic contaminants] vary across the vast farmland of the country" (Sun, 2017). Specifically, a comprehensive study of organic pollution in soils should be conducted on a national scale to better understand which methods are economical (Sun, 2017).

China is still testing the viability of MNA for soil compounds throughout the country's diverse landscape, but initial impressions indicate that it is "a scientifically robust strategy for controlling and remediating pollution of groundwater already contaminated with petroleum" (Qian et al., 2018) due to the physicochemical properties of groundwater in Northeast China. MNA is far less costly than P&T, so an opportunity exists for Canada to export technology stemming from MNA—specifically enhanced attenuation—and expect a positive adoption rate (Vodrias, 2001). This notion is consistent with the 2018 Going Global report, which states: "The global market for environmental services such as…carbon mitigation technologies is rapidly expanding, with China and the U.S. the key export markets" (2018). The Chinese environmental technologies market is approximately $65.8B annually, and though this investment isn't wholly petroleum-focused activity, many monitoring and water quality technologies can be utilized across multiple industries, including soil remediation and reclamation technologies (Going Global, 2018).

Implications

The global environmental monitoring market is growing and "expected to reach $19.6 billion annually by 2021, growing at an annual rate of 7.7 per cent" (Going Global, 2018, p.61). With rapid growth in "industrialization, implementation of increasingly stringent environmental regulation policies, and the growing need to comply with various environmental safety regulations," (Going Global, 2018, p.61) the Chinese government's focus on contamination cleanup positions them as an importer of monitoring technology to minimize spill cleanup costs (Qiu, 2011). For this reason, the Asia-Pacific region is expected to be the fastest growing, and Canada is forecasted to take a significant share of the monitoring market if trade barriers can be breached (Going Global, 2018). China's position on environmental factors is vastly different from Canada's, and the export of spill and monitoring technology will be dependent on the ability to scale solutions to that of China's massive groundwater issue.

LEGAL

Several legal factors impact Canada's ability to conduct business in China, but none more significant than complications which arise from the discrepancy between Canada's common law and China's civil law system. This section explores the implications of this disparity and describes how the consolidation of power in China creates barriers to entry for Canadian petroleum producers.

Canada

The 1867 Constitution Act separates law-making authority between the federal parliament and the provincial legislatures (Billingsley, 2013). Section 92A states that in each province, the legislature may make laws with respect to the exploration, development, conservation, and management of non-renewable natural resources in the province. As such, the regulation of the extraction of oil and gas varies depending on the jurisdiction (Department of Justice, 2013). However, matters that cross provincial boundaries, such as railways or pipelines, may be considered federal jurisdiction (Natural Resources Canada, n.d.-c). If there is a conflict between federal and provincial legislation, the doctrine of paramountcy states that federal law prevails (Interjurisdictional Immunity, n.d.). Federal authority for Canadian oil and gas regulation is delegated to the National Energy Board and Alberta's provincial matters are the responsibility of the Alberta Energy Regulator and the Alberta Utilities Commission (Manning & Tamura-O'Connor, 2017). Canada operates under a common law system, so legal precedent through case law has a significant impact over natural resource law. The impact of this system might best be examined through the *Redwater Decision*, which ruled that bankrupt energy companies cannot walk away from old wells and determined they must fulfill environmental obligations before creditors are paid (Johnson, 2019). This decision has influenced further non-renewable natural resource lawmaking and has impacted the economic risk associated with Canadian energy projects.

China

All oil and gas resources in China are state-owned, and China's oil and gas regulatory authorities include the National Development and Reform Commission, the Ministry of Commerce, and the Ministry of Land and Resources (Jin, Yan, & George, 2014). The Ministry of Natural Resources has recently replaced the State Ocean Administration, the Ministry of Land and Resources, and the National Surveying and Mapping Bureau for the purpose of streamlining policymaking to increase efficiency (Mason, 2018). The responsibilities of this new ministry include overseeing the development, utilization, and protection of natural resources; managing surveying, mapping, and geological exploration; establishing a system for paid use of natural resources; and unifying investigations and rights registration (Thomson Reuters, n.d.).

There is no one law that governs China's natural resources; rather, the legislative framework for the exploitation and conservation of natural resources is dispersed across various laws at the national and local level (Liu, 2013). Natural resource law in China is essentially made up of four broad components: (1) regulations about ownership and the right to the use of natural resources; (2) regulations about the protection and regeneration of natural resources; (3) regulations about the utilization and exploitation of natural

resources; and (4) regulations about legal liability (Xueting, 1990). As such, only China's highest court—the Supreme People's Court—may interpret the law and past cases hold no legal precedent (Troutman Sanders, 2015). China utilizes a civil law system, and case law in the form of past legal precedents and judicial rulings do not enforce the rulings on subsequent cases. China's consolidation of power is also evident in the Great Firewall, and this approach to social conformity has resulted in difficulty utilizing western technologies in China's energy sector (Kurlantzick, 2008).

Implications

Although Canada and China's legal systems vary, each country has regulatory authorities responsible for the exploration, development, and management of natural resources. The civil law system in China is more concrete than Canada's common law system but being that the majority of the energy industry in China is state-owned, conducting business which is not in the best interest of the country can be problematic. This consolidation of power can make it difficult for Canadian investors to interact with China through the export of technologies which contradict the legal stringencies set by China's leadership (Kurlantzick, 2008). The requirement to make adaptations to technology may erode the economic viability of conducting business in China.

CONCLUSION

This paper has explored, through an in-depth PESTEL analysis, the risks and challenges Canada faces in supplying energy products, technology, and knowledge to China. China has made a significant push upwards on the World Bank ranking from 78th to 46th of 190 economies for ease of doing business, but risk still surrounds the business environment (Trading Economics, 2017). As risk will not deter Canada from striving for this partnership, the question of how to market Canadian energy products is raised. From a political lens, China has higher regulation and centralization, resulting in a more predictable and complicated go-to-market strategy for Canada. Amalgamating the economic and socio-cultural contexts, Canada and China are both striving to stimulate their national economies while satisfying the sometimes-paradoxical needs and rights of various regional communities. Canada and China have traditionally held different values with respect to environmental and technological advances proving a challenge in compatibility, but recent Chinese focus on groundwater contamination reduction and remediation indicate Canada may be positioned to capitalize on this reorientation. Lastly, the legal systems are vastly different in Canada and in China, resulting in different playing fields for their native energy companies and considerable barriers for Canadian exporters.

For Canada to successfully market their energy products and services to China, they must mitigate the present political, technological, and legal differences and focus on shared environmental, economic and socio-cultural goals. The scalability of Canada's petroleum solutions must meet the massive demand of China's centralized oil and gas sector. Finally, if Canada is to develop its trade relationship with China, it must demonstrate that this relationship will improve environmental conditions, create long-term economic stability, and improve the lives of Chinese peoples.

ACKNOWLEDGEMENTS

We thank Dr. Edy Wong and Mic McCollum for their ongoing support of this research and for the organization of the authors' study tour to China.

REFERENCES

An, D., Xi, B., Wang, Y., Di, X., Tang, J., Dong, . . . & Pang, C. (2016, January). A sustainability assessment methodology for prioritizing the technologies of groundwater contamination remediation. *Journal of Cleaner Production*, *112*(5), 4647-4656. Retrieved from https://www-sciencedirect-com.login.ezproxy. library.ualberta.ca/ science/article/pii/S0959652615011099

Alberta Energy. (2018). *Resource revenue collected*. Retrieved from https://www.energy.alberta.ca/AU/Royalties/Pages/RRCollected.aspx
Ashmore, E. (2019, January 30). *Innovation funding opportunities*. Strategic Timelines. Retrieved from https://www.innovatecalgary.com/files/public-files/january-2019-funding-overview-01-30-2019.pdf
Asia Pacific Foundation of Canada. (2018, September 14). *Indigenous Communities Sign Agreement with Chinese Firms to Pursue New Refinery in Alberta*. Retrieved from https://www.asiapacific.ca/news/indigenous-communities-sign-agreement-chinese-firms-pursue
BC Ministry of Environment. (2014, November). *Technical guidance on contaminated sites*. Retrieved from https://www2.gov.bc.ca/assets/gov /environment/air-land-water/site-remediation/docs/technical-guidance/tg22.pdf
Bellrichard, C. (2018, August 31). *'More was required of Canada': Ruling shows where Ottawa fell short with first nations on trans mountain*. CBC News. Retrieved from https://www.cbc.ca/news/indigenous/trans-mountain-appeal-ruling-first-nations-duty-to-consult-1.4805694
Billingsley, B. (2013). Evolution, not revolution: Canada's constitutional history. *LawNow Magazine*. Retrieved from https://www.lawnow.org/canadas-constitutional-history/
Bloomberg News. (2016). *Meet the Chinese newcomers staking a claim to global oil trading*. Retrieved from https://www.bloomberg.com/news/articles/2016-01-12/meet-the-chinese-newcomers-staking-a-claim-to-global-oil-trading
Boot, W. (2008, October 24). *Chinese oil giant accused of human rights abuses in Burma*. The Irrawaddy. Retrieved from https://web.archive.org/web/20110726190223/ http://www.irrawaddy.org/article.php?art_id=14498#
Brewer, R. (2019, February 8). *China Petroleum & Chemical*. The Motley Fool. Retrieved from https://www.fool.com/quote/nyse/china-petroleum-chemical/snp/
Canada Revenue Agency. (2019, February 26). *T2 income tax guide – 2018*. Government of Canada. Retrieved from https://www.canada.ca/content/dam/cra-arc/formspubs/ pub/t4012/t4012-18e.pdf
Canadian Association of Petroleum Producers. (2019, March). *2018 economic report series - leveraging opportunities: Diversifying Canada's oil and natural gas markets*. Canada's Oil and Gas Producers, 9309. Retrieved from https://www.capp.ca/publications-and-statistics/publications/333595
Canadian Horizontal. (2019). *Company*. Retrieved from https://www. canadianhorizontal.ca/company
Canadian Visa. (n.d.). *Service industry*. Retrieved from https://canadianvisa. org/life-in-canada/key-industries/service-industry
China resource map. (2019). *China tourist maps.* Retrieved from http://www.chinatouristmaps.com/china-maps/maps-of-resources.html
China traditional divisions (2019). In *Wikipedia.* Retrieved March 18, 2019, from https://en.wikipedia.org/wiki/Geography_of_China#/media/File:China_Traditional_Divisions.png
Corben, R. (2012, July 2). *Indigenous peoples threatened by resource exploitation*. DW. Retrieved from https://www.dw.com/en/indigenous-peoples-threatened-by-resource-exploitation/a-16065981
Department of Justice Canada. (2013, January 1). *A consolidation of the constitution acts 1867 to 1982*. Department of Justice Canada 26-31. Retrieved from https://laws-lois.justice.gc.ca/pdf/const_e.pdf
Deranger, E. (2015, June 23). *Canada's tar sands aren't just oil fields. They're sacred lands for my people*. The Guardian. Retrieved from https://www.theguardian.com/ commentisfree/2015/jun/23/canadas-tar-sands-oil-fields-sacred-lands
Dezan Shira & Associates. (2016, May 27). *China's resource tax reform presents new opportunities and restrictions in the mining sector*. China Briefing. Retrieved from https://www.china-briefing.com/news/chinas-resource-tax-reform-presents-new-opportunities-in-the-mining-sector/

Dudley, D. (2019, January 11). *China is set to become the world's renewable energy superpower*. Forbes Media LLC. Retrieved from https://www. forbes.com/sites/ dominicdudley/2019/01/11/china-renewable-energy-superpower/#4a8ae65d745a

Economy Watch. (2019, March 12). *2018 economic statistics and indicators*. Retrieved from http://www.economywatch.com/economic-statistics/year/2018/

EIA. (2018, February 5). *Today in energy.* Retrieved from https://www.eia.gov/todayinenergy/detail.php?id=34812

English Online Inc. (2016, November 21). *Canadian cultural values and beliefs*. Live & Learn. Retrieved from https://livelearn.ca/article/about-canada/canadian-cultural-values-and-beliefs/

EnviroWiki. (2019). *Monitored natural attenuation (mna) of fuels.* Retrieved from https://www.enviro.wiki/index.php?title=Monitored_Natural_Attenuation_(MNA)_of_Fuels

Epp, T., Armstrong, J., & Biggar, K. (2002). *Guideline development for use of monitored natural attenuation at contaminated sites in Alberta*. University of Alberta. Retrieved from https://www.researchgate.net/publication/240616569_guideline_development_for_use_of_monitored_natural_attenuation_at_contaminated_sites_in_alberta

Fan, S., Kanbur, S., & Zhang, X. (2009). *Regional inequality in China: Trends, explanations and policy responses.* London: Routledge.

Farchy, J., & Kynge, J. (2016, May 9). *Map: Connecting central Asia*. Financial Times. Retrieved from https://www.ft.com/content/ee5cf40a-15e5-11e6-9d98-00386a18e39d

Feng, K., Siu, Y., Guan, D., & Hubacek, K. (2012). Analyzing drivers of regional carbon dioxide emissions for China. *Journal of Industrial Ecology*, *16*, 600-611. https:// doi.org/ 10.1111/j.1530-9290.2012.00494.x

Finlayson, J. (2018, September). *China and Canada lead the way in global borrowing*. MacLeans. Retrieved from https://www.macleans.ca/economy/ economicanalysis/the-most-important-charts-to-watch-in-2019/

Geng, Y., Fu J., Sarkis J., & Xue, B. (2012, March). Towards a national circular economy indicator system in China: An evaluation and critical analysis. *Journal of Cleaner Production*, *23*(1) 216-224. Retrieved from https://www.sciencedirect.com/science/article/pii/S0959652611002460?via%3Dihub

Gerson, J. (2018, February 3). *The Alberta vs. B.C. pipeline fight. Now it's war*. CBC News. Retrieved from https://www.cbc.ca/news/opinion/road-ahead-jen-gerson-alberta-versus-bc-pipeline-fight-1.4517400

Glen, J. (2013, November). *Communism vs. democracy*. Business Dictionary. Retrieved from http://www.businessdictionary.com/article/1086/communism-vs-democracy-d1412/

Global News. (2018, September 5). *Trudeau talks trans mountain with Alberta's notley* [Video file], Global News. Retrieved from https://globalnews.ca/video/4430097/trudeau-talks-trans-mountain-with-albertas-notley

Going Global Phase 3. (2018). *JWN Energy.* Retrieved from http://www2.jwnenergy.com/going-global-phase-3

Gordon, L. (2016, December 12). *What drives demand for natural resources?* Euromonitor International. Retrieved from https://blog.euromonitor.com/what-drives-demand-natural-resources/

Guo, T. (2018, December). Hydrocarbon accumulation conditions and key technologies for exploration and development of yuanba gas field. *Petroleum Research*, *3*(4), 293-305. Retrieved from https://www.sciencedirect.com/science/article/pii/S2096249518300942

Haacke, O. (2015, February 12). Understanding China's 13th Five-Year Plan. *China Business Review*. Retrieved from https://www.chinabusinessreview.com/understanding-chinas-13th-five-year-plan/

Hathaway, M. (2016, February 13). China's indigenous peoples? How global environmentalism unintentionally smuggled the notion of indigeneity into China. *Humanities MDPI*, *5*(54). doi:10.3390/h5030054

He, L., Hou, B., & Liao, H. (2018). Rural energy policy in China: achievements, challenges and ways forward during the 40-year rural reform. *China Agricultural Economic Review*, *10*, 224–240.

Retrieved from http://login.ezproxy.library.ualberta.ca/login?url= https://search.ebscohost.com/login.aspx?direct=true&db=bas&AN=BAS914108&site=eds-live&scope=site
Herrenknecht Vertical. (2019). *Shale gas exploration in China*. Retrieved from https://www.herrenknecht-vertical.com/case-studies/shale-gas-exploration-in-china/
International Energy Agency. (2016). *What drives demand for natural resources?* Euromonitor International. Retrieved from https://blog.euromonitor.com/what-drives-demand-natural-resources/
Intellinews. (2018, February 2). *Tajik energy minister confirms work resumed on central Asia-China gas pipeline*. Retrieved from http://www.intellinews.com/tajik-energy-minister-confirms-work-resumed-on-central-asia-china-gas-pipeline-136162/
Interjurisdictional Immunity. (n.d.). *Constitutional Law of Canada*. Retrieved from http://www.constitutional-law.net/index.php?option=com_content&view=article&id=27& Itemid=41
Jaremko, D. (2017, July 14). F*ollow this visual life cycle of a seven generations energy montney super pad*. JWN Energy. Retrieved from https://www.jwnenergy.com/article/ 2017/7/follow-visual-life-cycle-seven-generations-energy-montney-super-pad/
Jin, X., Yan, Z., & George, Z. (2014, October). *Oil and gas regulation in China: Overview*. Thomson Reuters. Retrieved March 19, 2019, from https://uk.practicallaw.thomsonreuters.com/3-525-3038?transitionType=Default&contextData=(sc.Default)&firstPage=true&comp=pluk&bhcp=1#co_anchor_a379408
Johnson, T. (2019, January 31). *Supreme Court rules energy companies must clean up old wells – even in bankruptcy*. CBC News. Retrieved from https://www.cbc.ca/news/ business/supreme-court-redwater-decision-orphan-wells-1.4998995
Kennedy, S. (2016 March). *State and market in contemporary China: Toward the 13th five year plan*. Yale. Retrieved from https://law.yale.edu/system/files/china-law-documents/horsley_160303_kennedy_statemarketchina_web.pdf
Koty, A. (2018, September 17). *Export tax rebates in China increase for 397 products*. China Briefing. Retrieved from https://www.china-briefing.com/news/export-tax-rebates-china-increase-397-products/
KPMG. (2016, July). *China tax alert – ongoing resource tax reforms significantly expanded*. KPMG. Retrieved from https://assets.kpmg/content/dam/kpmg/pdf/2016/07/china-tax-alert-18.pdf
Kreab, G. (2013, May). *How Polices are "made in china"*. Kreab Gavin Anderson. Retrieved from https://facingchinadotme.files.wordpress.com/2013/06/policymaking-in-china.pdf
Kurlantzick, J. (2008). China's new diplomacy and its impact on the world. *Brown Journal of World Affairs*, *14*(1), 221-236. Retrieved from https://heinonline.org/HOL/Page?handle=hein.journals/brownjwa14&div=23&g_sent=1&casa_token=waulKdeUMSkAAAAA:1KbHlvdRNxUat0rHTNkPJTuU7krUwncPE1MXC-62Ta1HKm_VNjL-9aBX0ljj5WTu8opzxWbHKw&collection=journals#
Kwok, V. (2008, February 27). *Treasury sanctions on Myanmar traffickers implicate cnooc*. Forbes. Retrieved from https://www.forbes.com/2008/02/27/cnooc-myanmar-gulfnarcotics-markets-equity-cx_vk_0227markets02.html#4b0c448555b0
Laanela, M. (2018, August 30). *'We are winning': Several B.C. first nations celebrate trans mountain victory*. CBC News. Retrieved from https://www.cbc.ca/news/canada/british-columbia/trans-mountain-first-nations-federal-court-1.4804734
Liu, J. (2013). *Overview of the Chinese legal system*. Environmental Law Reporter. Retrieved from https://elr.info/ sites/default/files/chinaupdate1.1.pdf
Ljunggren, D. (2017, March 24). *Canada government's ambitious export goals facing big challenges*. Reuters. Retrieved from https://ca.reuters.com/article/topNews/idCAKBN 16V26J-OCATP

Long, C., & Zhou, Y. (1999, December 10). Indigenous community forest management of Jinuo people's swidden agroecosystems in southwest China. *Biodiversity and Conservation*, *10*, 753-767. Retrieved from https://doi.org/10.1023/A:1016671003027

Leach, A. (2018, February 5). *Western Canadian oil pricing*. Andrewleach.ca. Retrieved from http://andrewleach.ca/uncategorized/western-canadian-oil-pricing/

Lu, Z. (2019, April 5). *What changes has China already made to meet US trade war demands?* South China Morning Post. Retrieved from https://www.scmp.com/news/china/ diplomacy/article/3004807/what-changes-has-china-already-made-meet-us-trade-war-demands

Lynch, D. (2018, December 25). *Economic growth is slowing all around the world.* The Washington Post. Retrieved from https://www.washingtonpost.com/business/economy/ economic-growth-is-slowing-all-around-the-world/2018/12/25/e2337206-0491-11e9-b5df-5d3874f1ac36_story.html?noredirect=on&utm_term=.991c90cfa3aa

MacVicar, A. (2019, January 24). *'This is B.C. vs. Canada': Alberta has spent $23M on keep Canada working campaign*. Global News. Retrieved from https://globalnews.ca/ news/4884829/keep-canada-working-campaign-trans-mountain/

Mah, D. (2019). Community solar energy initiatives in urban energy transitions: A comparative study of Foshan, China and Seoul, South Korea. *Energy Research and Social Science*, *50*, 129–142. https://doi-org.login.ezproxy.library.ualberta.ca/ 10.1016/j.erss.2018.11.011

Manning, L., & Tamura-O'Connor, B. (2017, June). *Oil and gas regulation in Canada: Overview*. Thomson Reuters. Retrieved from https://uk.practicallaw.thomsonreuters.com/3-633-1728?q=3-633-1728&__lrTS=20190324161030932&transitionType=Default&context Data=(sc.Default)#co_anchor_a967985

Mao, X. (2017). *The Core Values of Chinese Civilization*. China: SDX Joint Publishing.

Mason, J. (2018, March 18). *China picks rising star to run new natural resources ministry*. Reuters. Retrieved from https://www.reuters.com/article/us-china-parliament-resources/china-picks-rising-star-to-run-new-natural-resources-ministry-idUSKBN1GV04F

McDiarmid, M. (2017, October 11). *Indigenous communities embracing clean energy, creating thousands of jobs*. CBC News. Retrieved from https://www.cbc.ca/news/politics/first-nations-renewable-energy-projects-1.4348595

McKinsey & Company. (2018). *Global gas & LNG outlook to 2035. McKinsey & Company*. Retrieved from https://www.mckinsey.com/solutions/energy-insights/global-gas-lng-outlook-to-2035/~/media/ 3C7FB7DF5E4A47E393AF0CDB080FAD08.ashx

Morgan, G. (2018, October 31). *Canadian oil output to hit nearly 7 million bpd despite pipeline constraints: NEB*. Financial Post. Retrieved from https://business.financialpost.com/ commodities/energy/canadian-oil-output-to-hit-nearly-7-million-bpd-despite-pipeline-constraints-neb

NationMaster. (2019, March 31). *Economy: Canada and china compared*. Nation Master. Retrieved from http://www.nationmaster.com/country-info/compare/Canada/ China/Economy

Natural Resources Canada. (2018a, September 13). *Energy and the economy*. Government of Canada. Retrieved from https://www.nrcan.gc.ca/energy/facts/energy-economy/20062

Natural Resources Canada. (2018b, December 5). *Energy innovation program*. Government of Canada. Retrieved from https://www.nrcan.gc.ca/energy/funding/icg/18876

Natural Resources Canada. (2019, January 25). Production by province (2014). *Statistics Canada "other": Nova Scotia, Ontario, and the northwest territories, includes crude oil, condensates and pentanes plus*. Government of Canada. Retrieved from https://www.nrcan.gc.ca/energy/oil-sands/18086

Natural Resources Canada. (n.d.a). *Clean technologies – oil and gas*. Retrieved from https://www.nrcan.gc.ca/19663

Natural Resources Canada. (n.d.b). *Forward regulatory plan*. Retrieved from https://www.nrcan.gc.ca/acts-regulations/18316

Natural Resources Canada. (n.d.c). Frequently asked questions (faqs) concerning federally-regulated petroleum pipelines in Canada. *Natural Resources Canada.* Retrieved from https://www.nrcan.gc.ca/energy/infrastructure/5893#h-4-1

Proctor, J. (2018, April 12). *'A tough lesson': Do first nations hold trump card on trans mountain debate?* CBC News. Retrieved from https://www.cbc.ca/news/canada/british-columbia/first-nations-kinder-morgan-transmountain-1.4615263

PwC China. (2017). *The people's republic of china tax facts and figures*. PricewaterhouseCoopers Consultants (Shenzhen) Ltd. Retrieved from https://www. pwccn.com/en/tax/people-republic-of-china-tax-facts-2017.pdf

Qian, H., Zhang, Y., & Chen, Z. (2018, February). Characteristics of petroleum-contaminated groundwater during natural attenuation: A case study in northeast. *Environmental Monitoring and Assessment*, *190*(80). Retrieved from https://link.springer.com/content/pdf/10.1007%2 Fs10661-017-6449-6.pdf

Qiu, J. (2011, November 11). China to spend billions cleaning up groundwater. *Science Mag*, *334*(6067), 745. Retrieved from http://science.sciencemag.org/content/334/6057/745?casa_token=Z8ptvCyu-o0AAAAA:_ZNj6cA86SSqFR8zR_2GZAWn627nAhkY0cnra 6zLupxfYBdcEIzclepN3n2_AuD43dv97q-QMGSs4Hs

Rieger, S. (2018, November 28). *Canada's oil industry growth can go hand-in-hand with indigenous reconciliation: Report*. CBC News. Retrieved from https://www.cbc.ca/ news/canada/calgary/oil-indigenous-1.4924732

Rioux B., Galkin, P., Murphy, F., Feijoo, F., Pierru, A., Malov, A., . . . Wu, K. (2019, May). The economic impact of price controls on China's natural gas supply chain. *Energy Economics*, *80*, 394-410. Retrieved from https://www. sciencedirect.com/science/ article/pii/S0140988319300052

Sanger, T. (2018, December 4). *Morneau's misguided $14 Billion bet*. MacLeans. Retrieved from https://www.macleans.ca/economy/economicanalysis/the-most-important-charts-to-watch-in-2019/

Shaw, K., Cook, D., Fitzgerald, E., & Sayers, J. (2017, October 12). *BC First Nations are poised to lead the renewable energy transition*. Policy Note. Retrieved from https://www.policynote.ca/bc-first-nations-are-poised-to-lead-the-renewable-energy-transition/

Sinha, M. (2013). *Canadian Identity, 2013*. Statistics Canada 89-652-X. Retrieved from https://www150.statcan.gc.ca/n1/pub/89-652-x/89-652-x2015005-eng.htm

Solomon, D., Cai, J., & Haacke, O. (2017, May 17). New five-year plans promote industry reform. *China Business Review*. Retrieved from https://www.chinabusinessreview.com /new-five-year-plans-promote-energy-industry-reform/

S.R. (2015, October 26). *Why China's five-year plans are so important?* The Economist. Retrieved from https://www.economist.com/the-economist-explains/2015/10/26/why-chinas-five-year-plans-are-so-important

Statistics Canada. (2018a). *Ermineskin 138, Alberta (table), aboriginal population profile*. Statistics Canada Catalogue no. 98-510-X2016001. Retrieved from http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/abpopprof/index.cfm?Lang=E

Statistics Canada. (2018b). Fort McKay first nation Alberta (table), aboriginal population profile. Statistics Canada Catalogue no. 98-510-X2016001. Retrieved from http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/abpopprof/index.cfm?Lang=E

Sui, D., Sun, Y., Zhao, J., Zhao, F., Zhu, X., & Xu, J. (2018). The research of new environment-friendly oil-based drilling fluid base oil. *IOP Conference Series: Earth and Environmental Sciences*, *108*(2). Retrieved from https://iopscience.iop.org/article/10.1088/1755-1315/108/3/032001/meta

Sun, J., Tsang, D., Pan, L., & Zhan, Y. (2018, February 15). Organic contamination and remediation in the agricultural soils of China: A critical review. *Science of the Total Environment*, *615*, 724-740. Retrieved from https://www.researchgate.net/publication/320333514_Organic_ contamination_and_remediation_in_the_agricultural_soils_of_China_A_critical_review

Tapp, S. (2018, December 4). *A terrifying escalation*. MacLeans. Retrieved from https://www.macleans.ca/economy/ economicanalysis/the-most-important-charts-to-watch-in-2019/

The Canadian Press. (2018, November 29). *Alberta plans to buy 7,000 railcars to ease 'crisis' in oil price differentials*. CBC. Retrieved from https://www.cbc.ca/news/canada/ edmonton/alberta-railcars-7-000-oil-price-crisis-1.4926318

The Economist. (2019a, March). *Country report China*. Economist Intelligence Unit. Retrieved from http://country.eiu.com.login.ezproxy.library.ualberta.ca/FileHandler.ashx?issue_id =587707642&mode=pdf

The Economist. (2019b, January 15). *Exports and imports both fall due to trade war*. Economist Intelligence Unit. Retrieved from http://country.eiu.com.login.ezproxy.library.ualberta.ca/ article.aspx?articleid=1597540543&Country=China&topic=Economy&subtopic=Forecast&subsubtopic=Exte

The Economist. (2019c, February 20). *"Number one document" promises rural revitalisation*. Economist Intelligence Unit. Retrieved from http://country.eiu.com.login.ezproxy.library.ualberta.ca/ article.aspx?articleid=1547676738&Country=China&topic=Economy &subtopic=Forecast&subsubtopic=Polic...

Thomson Reuters Practical Law. (n.d). *Ministry of natural resources*. Thomson Reuters. Retrieved from https://uk.practicallaw. thomsonreuters.com/w-015-2142?transitionType= Default&contextData=(sc.Default)&firstPage=true&comp=pluk&bhcp=1

Tiejun, W., Kinchi, L., Cunwang, C., Huili, H., & Jiansheng, Q. (2010, June). Ecological civilization, indigenous, culture, and rural reconstruction in China. *Monthly Review*, *63*(9). Retrieved from https://monthlyreview.org/2012/02/01/ecological-civilization-indigenous-culture-and-rural-reconstruction-in-china/

Trading Economics. (2017, January). *Ease of doing business in China*. Retrieved from https://tradingeconomics.com/china/ease-of-doing-business

Trading Economics. (2019). *China exports*. Retrieved from https://tradingeconomics.com/china/exports

Trading Economics. (n.d.). *Canada exports of mineral fuels, oils, and distillation products*. Retrieved from https://tradingeconomics.com/canada/ exports/mineral-fuels-oils-distillation-products

Topf, A. (2015, September 21). *"Walking" oil rigs can make drilling faster, cheaper, safer*. Oil-Price.com. Retrieved from https://oilprice.com/Energy/Energy-General/Walking-Oil-Rigs-Can-Make-Drilling-Faster-Cheaper-Safer.html

Trans Mountain. (2019, March 19). *Expansion project*. Retrieved from https://www.transmountain.com/project-overview

Trans Mountain. (n.d.). *Proposed expansion*. Retrieved from https://web.archive.org/web/20160423093813/https://www.transmountain.com/proposed-expansion

Troutman Sanders. (July 2015). *Why there is no case law in China*. Retrieved from https://www.troutman.com/insights/why-there-is-no-case-law-in-china.html

Understanding the US-China trade relationship. (2017, January). *Oxford Economics*. Retrieved from https://www.uschina.org/sites/default/files/Oxford%20 Economics%20US%20Jobs%20and%20China%20Trade%20Report.pdf

Vodrias, E. (2001, December 7). *Pump-and-treat remediation of groundwater contaminated by hazardous waste: can it really be achieved?* Demokritus University of Thrace. Retrieved from https://journal.gnest.org/sites/default/files/Journal%20Papers/voudrias.pdf

White-Crummey, A. (2019, January 11). *Pipelines, carbon tax pressing issues during Trudeau town hall in Regina*. Regina Leader Post. Retrieved from https://leaderpost.com/ news/local-news/long-lines-are-already-forming-to-greet-and-protest-prime-minister-justin-trudeau-at-the-university-of-regina

Wiedmann, T., Schandl, H., Lenzen, M., Moran, D., Suh, S., West, J., & Kanemoto, K. (2015, May 19). The material footprint of nations. *Proceedings of the Academy of Sciences of the United States of America*, *112*(20), 6271-6276. Retrieved from https://www.pnas.org/ content/112/20/6271

Xing, S., Wang, J., & Feng, L. (2018). Disposal technology of waste oil drilling cuttings in drilling engineering. *IOP Conference Series: Earth and Environmental Sciences*, *208*(1). Retrieved from https://iopscience.iop.org/article/10.1088/1755-1315/208/1/012093/meta

Xinhua. (2015, October 29). *What are China's five-year plans?* China Daily. Retrieved March 19, 2019, from https://www.chinadaily.com.cn/china/2015cpcplenarysession/2015-10/29/content_22311061.htm

Xinhua. (2017, October 9). *Resource tax reform saves Chinese firms 4.2 bln yuan a year*. State Administration of Taxation of The People's Republic of China. Retrieved March 19, 2019, from http://www.xinhuanet.com//english/2017-10/09/c_136667684.htm

Xu, J., Wang, T., Zhao, M., Guan, X., Wang, S., Meng, X., & Lu, M. (2017). The difference analysis of process and automation level between Central Asia-China gas pipeline project of line d and Europe and the USA. *Springer*, pp. 1272-1283 Retrieved from https://link-springer-com.login.ezproxy.library.ualberta.ca/ content/pdf/10.1007%2 F978-981-10-7560-5.pdf

Xueting, G. (1990). *An outline of china's natural resources law*. Natural Resources Law Center, University of Colorado School of Law. Retrieved from https://scholar.law.colorado.edu/cgi/viewcontent.cgi?referer=https://www.google.ca/&httpsredir=1&article=1090&context=books_reports_studies

Yeung, K. (2019, February 14). *US investment in China more than doubles in January despite trade war, hi-tech industry grows significantly*. South China Morning Post. Retrieved from https://www.scmp.com/economy/china-economy/article/2186185/us-investment-china-more-doubles-january-despite-trade-war-hi

Yong, H. (2011, July 8). *China needs zero tolerance for concealing major accidents*. English People's Daily Online. Retrieved from http://en.people.cn/90001/90780/7433972.html

Zhang, B., Guan, S., Wu, X., & Zhao, X. (2018, September 20). Tracing natural resource uses via China's supply chains. *Journal of Cleaner Production*, *5*(196), 880-888. Retrieved from https://doi.org/10.1016/j.jclepro.2018.06.109

Zhang, H., Wu, S., Sun, J., Yang, C., Xie, Y., Chen, C., . . . Wang, J. (2018). Pre-drilling prediction techniques on the high-temperature high-pressure hydrocarbon reservoirs offshore Hainan island, china. *Journal of Ocean University China*, *17*(1) 72-82. Retrieved from https://doi.org/10.1007/s11802-018-3488-8

Zheng, Y. (2019, April 3). *Brookfield in talks to buy shanghai property for US$2 billion even amid China-Canada spat after Meng Wenzhou's arrest*. South China Morning Post. Retrieved from https://www.scmp.com/business/money/markets-investing/article/ 3004535/canadian-asset-manager-brookfield-talks-buy