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THE CURSE OF FOSSIL FUELS: ENVIRONMENTAL AND ENERGY SOLUTIONS FOR A WORLD WITH DECLINING RESOURCES

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TABLE OF CONTENTS

LIST OF FIGURES

ABSTRACT

This paper asserts that governments should move away from developing and using fossil fuels for economic growth and energy production and move toward sustainable exploitation of fossil fuel deposits by relying on Canada's indigenous peoples' environmental knowledge and broadening the development of the nuclear power industry. Taking a longer view of economic social and environment issues is necessary to ensure prosperity in a world of dwindling fossil fuels. Moving away from an economy reliant on the use and extraction of fossil fuels governments can protect the environment, repair the relationship with Canada's indigenous people, and become a world leader in assisting other nations to adapt to a world left insecure due to the over-reliance on fossil fuels. By generating electricity from nuclear and renewable sources, enabling micro-generation to support electrical power generation, and rewarding power and fuel conservation, governments can limit the impact of increasing energy costs on Canadians. Building governance capacity within indigenous communities and allowing them to manage the extraction of fossil fuels within their territories will restore the relationship between the Federal and Provincial governments and First Nations. Developing industrial expertise in generating safe and secure nuclear power and a public-service expertise at improving governance will give Canada increased influence on the world stage and maintain the international stability required to maintain open and accessible trade markets for continued economic growth. An examination of the costs and benefits of extracting and burning fossil fuels is conducted. Conclusions are drawn that governments must stop taking Canada's natural resource endowment for granted and adopt a long term view to ensure prosperity for all Canadians.

INTRODUCTION

The globalized economy is heavily reliant on fossil fuels to maintain growth which is ruining environments locally and contributing to climate change globally. This is resulting in a lower quality of life and decreasing international stability which will only become exacerbated as world oil supplies become increasingly scarce. In Canada, governments are attempting to balance the economic benefits that come with the extraction of fossil fuels from the Alberta oil sands and shale natural gas deposits with civil society's desire to protect the environment and limit global warming. The extraction of bitumen from the Alberta oil sands employs many people and gives governments much needed financial resources due to royalties and an increasing tax base. These financial benefits come at the cost of environmental damage by reducing habitat, spoiling fresh water sources, and using large amounts of natural gas to refine the bitumen found in the oil sands.[1]

Causing further friction in attempting to balance this complicated situation is the relationship between governments and Canada's indigenous peoples. As conventional sources of fossil fuel become scarcer and the market cost of the resources rise, the use of the unconventional sources are becoming more viable.[2] The scarcity of the resource increasingly leads development companies into indigenous territories to seek fossil fuels for extraction. Governments' current emphasis on economic benefit to the detriment of

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[1]John P. Giesy, Julie C. Anderson, and Steve B. Wiseman, "Alberta Oil Sands Development," *Proceedings of the National Academy of Sciences of the United States of America* 107, no. 3 (January 19, 2010): 951. http://www.pnas.org/content/107/3/951.full.pdf+html

[2]*Ibid.* For the purposes of this paper, unconventional fossil fuels refer to those requiring new technologies to extract and produce them; specifically bitumen from oil sands deposits and natural gas extracted from shale deposits through the process of hydrofracturing

the environment is directly at odds with indigenous peoples' cultural and spiritually connected relationship with the land and water and puts a focus on the gap between indigenous peoples' demand for recognition and autonomy and governments' current and historical colonial, paternalistic and oppressive approach to interacting with them.

In addition to the environmental and societal costs of fossil fuel extraction, Canadian governments are also challenged by the almost complete reliance on the burning of fossil fuels to maintain the current standard of living. Fossil fuels are a finite resource and there has been much written and opined predicting exactly how finite. Peak Oil theorists have stated that the world has already reached the peak of its production and is now running out of oil.[3] Others have argued that technology will compensate by finding new methods of extracting hard to reach oil and that increasing costs will make more reserves economically viable.[4] While both of these theories have merit, there can be little doubt that the increasing world population will increase the demand for oil which will see an increase in market prices making energy more expensive for everyone. It is not a question of when fossil fuels become too expensive to maintain our standard of living. Rather, there needs to be acceptance that this is an inevitability and that governments should begin to transition to other forms of energy to reduce the societal impact this will have on our way of life.

Much of the electricity in Canada is generated by burning fossil fuels. Homes are widely heated by natural gas or furnace oil and the economy is heavily reliant on a

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[3]David E Geri, and Laurance R. McNabb "Energy Policy in Transition." In *Energy Policy in the U.S.: Politics, Challenges, and Prospects for Change*, 25-44. (CRC Press: 2011),30–32. http://www.crcnetbase.com/doi/abs/10.1201/b10968-4?prevSearch=%255BFulltext%253A%2B%2528Natural%2BResource%2Bexploitation%2529%2Band%2B%2528Natural%2BResource%2Bexploitation%2529%255D&searchHistoryKey=

[4]Nader Elhefnawy, "The Impending Oil Shock," *Survival* 50 no.2 (April-May, 2008): 39.

transportation system that burns diesel and gasoline to distribute goods and services to a relatively small and widely dispersed population.[5] Due to these factors governments are interested in relatively low-cost energy to enable economic performance.[6] This is expected to be more and more difficult as the world reserves of conventional oil become less viable, driving up the cost of oil and related consumer products. On one side of the equation, Canada is well placed to benefit from an increasing price per barrel of oil as there is profit to be made in the vast Alberta oil sands deposits. On the other side, higher fuel and electricity costs limit economic expansion. Are there, then, government policy options that can balance the costs of fossil fuel use and extraction with the environmental and societal costs? This paper asserts that governments should move away from developing and using fossil fuels for economic growth and energy production and move toward sustainable exploitation of fossil fuel deposits by relying on Canada's indigenous peoples' environmental knowledge and broadening the development of the nuclear power industry.

The preceding examples point out the complexity of the relationship between the economy, environmental protection, and relationship between indigenous people and federal and provincial governments vis-à-vis extracting and burning fossil fuels. Further complicating this situation is that there is little political benefit to changing the status quo. Any significant changes would require policies that take a long term view and would require society to drastically change its behaviour and pattern of consumption.

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[5]Canada, National Energy Board, *Canadian Energy Overview 2011*, (Calgary: National Energy Board, July 2012), 3.

[6]Abdullah Al-Salman, Khalifa Ghali, and Nayef Al-Shammari, "Business Cycle Trends and Energy Prices Application with G7 Economies," *International Research Journal Of Finance & Economics* Issue 82 (January 2012): 125.

Government policy is, of course, made by politicians and they typically have a short term perspective due to the election cycle. The short term perspective assumes a linear relationship and that the system is simple. That is, that there is either a choice between economic development or protecting the environment. The system, as indicated by the aforementioned issues, is much more complex. A longer view, then, is required if solutions to the challenges presented by the opportunities of the Alberta oil sands and shale gas deposits are to be found. This paper will attempt to demonstrate that by moving away from an economy reliant on the use and extraction of fossil fuels, governments can protect the environment, repair the relationship with Canada's indigenous people and become a world leader in assisting other nations to adapt to a world left insecure due to the over-reliance on fossil fuels. By generating electricity from nuclear and renewable sources, enabling micro-generation to support the electrical grid, and rewarding power and fuel conservation, governments can limit the impact of increasing energy costs on Canadians. Building the governance capacity and capability of indigenous communities and allowing them to manage the extraction of fossil fuels within their territories will restore the relationship between the Federal and Provincial governments and First Nations. This new autonomy will permit sustainable resource development and restore prosperity to indigenous peoples while the Canadian economy moves away from reliance on fossil fuels. Developing industrial expertise in generating safe and secure nuclear power and a public-service expertise at improving governance will give Canada increased influence on the world stage and maintain the international stability required to maintain open and accessible trade markets for continued economic growth.

Much of the recent debate surrounding fossil fuel use has centered around the causes of global warming and climate change. There continues to be doubt in some quarters on the both the existence of climate change and the causality between burning fossil fuels and the increases in global temperature.[7] Yet it can be demonstrated that there has been a constant increase in world-wide temperatures since the beginning of the industrial age and that this can be linked to human activity, especially greenhouse gas emissions.[8] These contrasting views are irrelevant to the arguments presented in this paper. The solutions presented assume that the global community will not be able to coordinate action to effectively reduce its greenhouse gas emissions. This is due to the aforementioned short term, linear view of governments and a desire to gain economic advantage over other nations. As such, this paper posits that instead of finding ways to reduce the emissions from fossil fuel combustion in an effort to stave off climate change, governments should begin to transition away from fossil fuels as an energy source altogether, thus negating the requirement reduce emissions. Simply stop burning altogether.

H. L. Menken wrote that "there is always an easy solution to every human problem – neat, plausible, and wrong."[9] The economy, the environment, and fossil fuel resource management are extremely complex issues in their own rights and the

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[7]Riley E. Dunlap, and Aaron M. McCright, "*Organized Climate Change Denial*," in *The Oxford Handbook of Climate Change and Society*, edited by John S. Dryzek, Richard B. Norgaard, and David Schlosberg, (New York: Oxford University Press, 2011), 144. http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199566600.001.0001/oxfordhb-9780199566600-e-27?rskey=9nKDtz&result=39&q=

[8]Geri & McNabb "*Energy Policy…", 26-27;* United Nations, *Climate Change 2007: Synthesis Report,* (New York: United Nations Intergovernmental Panel on Climate Change, 2007), 36. http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

[9]H.L. Menken "The Devine Afflatus," *The New York Evening Mail,* 16 November, 1917.

relationship between them is even more complex. When layering the immense challenges facing Canada's indigenous communities over these topics, it becomes necessary to generalize when examining costs and benefits and when searching for policy solutions. This paper will present a long term view of the problems that will confront Canadian governments over the next century. It will make recommendations for generalized solutions without proposing a means of implementation. Similarly, it will treat governments generally and will not differentiate between different levels of government and jurisdiction. Moreover, although other natural resources could be examined as to their economic, environmental, and inter-governmental nexus, this paper will focus solely on fossil fuels that are developed from unconventional sources such as the Alberta oil sands and shale gas deposits.

In arguing for a move away from fossil fuels as a basis for energy and economic performance, this paper will begin with a discussion of the current and future uses for fossil fuels. It will explore the extent to which the transportation and electricity generation sectors are reliant on oil and natural gas and how these resources are distributed across the country. An examination of the anticipated future of the availability of fossil fuels will then be presented with an analysis of what that may mean to Canadians. After setting the stage, the costs and benefits of the current reliance on fossil fuels will be explored. The benefits to be examined are focused on economics and international influence for business and governments. The costs to be examined will be centre on the environment, climate change, and the continued repression of indigenous communities, but will also examine how over-reliance on resources can harm an economy. Lastly, this paper will suggest policy options that transition away from fossil

fuels as means for Canadians to maintain their current standard of living in a world where energy becomes increasingly expensive to the point where it prevents sustainable economic growth.

Current Uses of Fossil Fuels

Fossil fuels in general, and oil in particular, have become ubiquitous in the Western way of life. The ability to easily and cheaply extract, refine and burn oil has enabled food production and distribution, provided heat and electricity to dwellings, produced a myriad of consumer goods, enabled high speed travel, and allowed the development of other forms of energy production.[10] Oil is so important to society as all forms of produced energy and fuels are reliant upon it.[11] Coal is transported with vehicles powered by oil. Nuclear energy is fueled by minerals mined with the support of oil powered equipment. Renewable energy such as wind, solar, and hydroelectric are possible only because advanced societies can produce enough energy to create the technological equipment necessary to transform the energy into a usable source. These technological advances have all been made possible by oil and other fossil fuels.

How have we come to rely so heavily on fossil fuels for our energy? While usable energy is found in many forms today, the vast majority of it comes from nuclear reactions on the sun.[12] Radiation emitted from the sun warms the earth enabling the hydrologic

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[10]James Howard Kunstler, *The Long Emergency: Surviving the Converging Catastrophes of the Twenty-First Century, (*New York: Atlantic Monthly Press, 2005): 23.

[11]John Michael Greer, *The Long Descent*, (Gabriola Island, British Columbia: New Society Publishers, 2008), 16.

[12]Richard S. Stein and Joseph Powers, *The Energy Problem*, (Singapore: World Scientific, 2011), 3.

cycle causing rainfall and water flowing in rivers.[13] The moving water can then be used to spin turbines to generate electricity. The sun's radiation is also photosynthesised by plants and stored as energy used for growth and reproduction.[14] Over millennia under heat and pressure vegetation has been transformed into solids, liquids, and gasses. These are known as fossil fuels and can be extracted from the earth and either refined into liquid fuels or burned directly as a gas to produce heat which can be transformed into different types of energy.[15] In the case of automobiles gasoline and diesel are burned which then move pistons to provide kinetic energy to power the vehicle. The combustion of liquid fuel, natural gas, and coal can also be used to power turbines to create electricity or to directly provide heat to buildings. The closer to solid form these fuels are, the less net energy can be retrieved from them. Coal can be burned directly but there is a large amount of matter that is not combusted resulting in high emissions. Light crude oil can be refined into gasoline, diesel, and other distillates and burned with a greater efficiency. Natural Gas is the cleanest burning and provides the most energy from combustion. It is this ancient source of energy that has enabled mankind to advance through the industrial age and easily survive in climates that in centuries past proved difficult or impossible in which to live.

In Canada the energy sector contributes approximately seven percent of the gross domestic product.[16] Energy is consumed in four primary areas: residential, commercial,

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[13]*Ibid.*, 5, 6.
[14]*Ibid.*, 8.
[15]*Ibid.*
[16]Canada, National Energy Board, *Canadian Energy Overview 2011*, (Calgary: National Energy Board, July 2012), 2.

industrial, and transportation.[17] Figure 1 details the proportion of energy consumed in each area over a five year period. Generally, residential, commercial and transportation usage has remained fairly constant while industrial usage has been more variable. Approximately half of all energy consumed is done so by the industrial sector with one quarter being consumed by the transportation sector and the remainder being used in the commercial and residential areas. Canada, however, produces more energy than it needs is a net exporter of energy. Both crude oil and natural gas as well as generated electricity are exported. Despite this, Canada still imports energy, in the form of both fossil fuels and electricity. Quebec and Atlantic Canada get almost 90% of their energy from foreign sources.[18] How much of this energy, then, is generated by fossil fuels?

Domestic Secondary Energy Consumption (petajoules)

	2007	2008	2009	2010 [a]	2011[a]	% Change (2010-2011)
Residential [b]	1 439	1 461	1 419	1 424	1 446	1.5
Commercial	1 475	1 489	1 466	1 474	1 481	0.5
Industrial [b][c]	5 292	5 061	4 803	4 973	5 107	2.7
Transportation	2 630	2 630	2 611	2 653	2 684	1.2
Total	**10 836**	**10 641**	**10 298**	**10 525**	**10 718**	1.8
Annual % Change		-1.8	-3.2	2.2	1.8	

(a) Estimates
(b) Includes biomass (wood and pulping liquor)
(c) Includes producer-consumption energy use and non-energy use

Figure 1 – Domestic Energy Consumption 2007-2011.
Source: National Energy Board, *Canadian Energy Overview 2011,* 3.

The National Energy Board produces statistics on the sources of energy production. Figure 2 details the trends form 2007 to 2011. In 2011, fossil fuels accounted

[17]Canada, National Energy Board, *Canadian Energy Overview: An Energy Market Assessment 2009*, (Calgary: National Energy Board, June 2010), 5.
[18]*Ibid., 17.*

for eighty-six percent of all energy generated in Canada.[19] Renewables accounted for 8% of the total and nuclear generated energy less than 2%.[20] However when looking purely at electricity generation for Canadian consumption, fossil fuels account for 21% with renewables accounting for more than 63%. Of note is that part of the industrial uses of natural gas is in the production of crude oil from the Alberta oil sands. This amount increased 10% in 2009 and was 400% greater than the previous decade. This means that increasing amounts of fossil fuels are being burned to extract an increasing amount of fossil fuels from the unconventional oil sands.[21]

Domestic Energy Production by Energy Source (petajoules)

	2007	2008	2009	2010	2011 (a)	% Change (2010-2011)
Petroleum (b)	6 939	6 839	6 785	7 090	7 506	5.9
Natural Gas (c)	6 657	6 385	5 984	5 772	5 765	-0.1
Hydroelectricity	1 311	1 346	1 314	1 253	1 350	7.7
Nuclear Electricity	318	326	306	308	324	5.3
Coal	1 539	1 512	1 379	1 524	1 500	-1.6
Wind, Tidal and Solar Electricity	11	14	24	35	37	7.3
Other (d)	581	575 (a)	534 (a)	523 (a)	516	-1.4
Total	17 356	16 996	16 327	16 505	16 998	3.0
Annual % Change		-2.1	-3.9	1.1	3.0	

(a) Estimates
(b) Petroleum includes crude oil and gas plant NGLs, upgraded and non-upgraded bitumen and condensate
(c) Marketable natural gas
(d) Includes solid wood waste, spent pulping liquor, wood and other fuels for electricity generation

Figure 2 - Domestic Energy Production by Energy Source
Source: National Energy Board, *Canadian Energy Overview 2011*, 3.

Another major use of fossil fuels is the production and transportation of food. With the advent of synthetic fertilizers agriculture takes place in central locations and the

[19]Taken from Figure 2, aggregates of petroleum, NG, and Coal as percentage of total.
[20]*Ibid.*, aggregates of Hydroelectricity and Wind, Tidal, and Solar Electricity as percentage of total.
[21]Canada, *An Energy Market Assessment 2009…*, 14.

product is then shipped long distance to consumers.[22] Moreover, centralized industrial farms use large and heavy machinery that further burn large amounts of fuel. This change in the scale and methods of production from the smaller family-run farms has resulted in a thirty fold increase in the amount of energy required to produce the same amount of food.[23]

To summarize the current use of fossil fuels, one quarter of all energy produced (be it electricity, extracted natural gas, or crude oil) is used to power motorised vehicles. Additionally, one fifth of all electricity generated in Canada is done so through the combustion of fossil fuels. The industrialized world is heavily dependent on fossil fuels for the production and distribution of the agricultural system. Moreover, due to the complex production requirements to extract energy from the Alberta oil sands, increasing amounts fossil fuels are currently being used to produce fossil fuels. Fortunately, Canada should be able to sustain this level of dependence on fossil fuels for many years to come.

While Canada currently has enough energy reserves in the Alberta oil sands to last many decades, what is the forecast for the global supply and demand of fossil fuels?[24] Worldwide, eighty-five percent of all energy is produced using fossil fuels.[25] While the overall percentage of fossil fuel use is expected to drop marginally in the next twenty years, the total combustion of fossil fuels is expected to increase by forty-two percent.[26]

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[22]Stein & Powers, *The Energy Problem*, 19.

[23]Jeff Rubin, *Why Your World is About to Get a Whole Lot Smaller*, (Toronto: Random House Canada, 2009), 223.

[24]Isidro Morales, "The Politics of Energy Markets in North America: Challenges and Prospects for a Continental Partnership," in *Requiem or Revival? The Promise of North American Integration*, edited by Isabel Studer and Carol Wise, (Washington, DC: Brookings Institution Press, 2007), 216.

[25]United States of America. Department of Energy, Energy Information Agency. *International Energy Outlook 2011*. Washington, DC: Department of Energy, 2011), 217.

[26]*Ibid.*, 217

This increase is due to the expected swell in worldwide population and the continued industrial and economic development of China and India.[27] As a net energy exporter Canada will be well placed to benefit from the increased demand for fossil fuels, especially oil. Worldwide demand for oil is expected to increase by thirty percent over the next thirty years and the price will continue to rise.[28] The projected increase in demand has created little debate. The subject of estimated levels of supply, however, is much more contested. This is especially true in the case of oil.

The future worldwide availability of oil has created much debate. The theory of Peak Oil was first described by the geologist Marrion King Hubbert in 1949.[29] This theory states that the production of an oil well will follow a bell shaped curve (see Figure 3). The entire curve represents the entire life of the well with the rate of production increasing rapidly at the beginning, then peaking when approximately half of the oil has been extracted, and then decreasing at a similar rate.[30] Hubbert went on to further extrapolate this theory from a single well to an entire country and was able to accurately predict the peak of American domestic oil production when it occurred in 1970. Despite finding more oil, the United States has never produced more oil than they did in 1970. This is due to the fact that the while there continue to be many discoveries, there have been no finds of the huge oil fields that were found in the nineteenth century.[31]

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[27]*Ibid.*, 9-10.

[28]*Ibid.*, 9-10, 207; The Economist Intelligence Unit. Commodities: Hards – Crude Oil. Accessed 27 January 2013. http://gfs.eiu.com/Article.aspx?articleType=cfh&articleId=1410046925

[29]James Howard Kunstler, *The Long Emergency: Surviving the Converging Catastrophes of the Twenty-First Century, (*New York: Atlantic Monthly Press, 2005): 42.

[30]Elhefnawy, *The Impending Oil Shock*…, 39

[31]Kunstler, *The Long Emergency*, 49

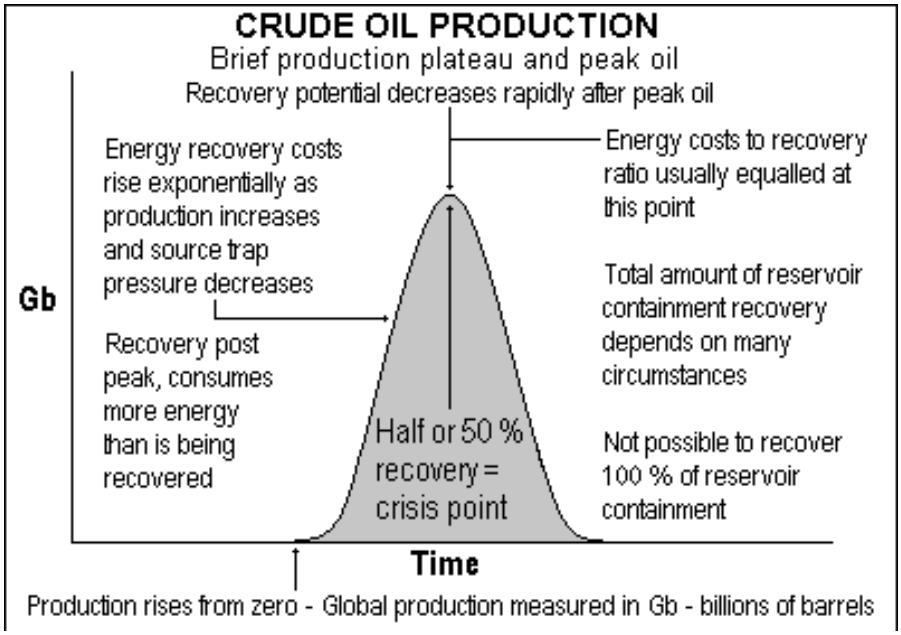

Figure 3 – Hubbert's Peak Oil Curve
Source: Hiramcanton.com, *Peak Oil: The End of Progress*, accessed April 7, 2013.

Peak Oil theory is now being discussed at the global level. As Geri and McNabb point out, there are many different opinions on when the world might meet its production peak.[32] This divergence of opinion is based on the challenge to the theory that when it is applied on a global scale, more oil can be discovered and technology will be developed to improve the efficiency of drilling operations. This allows more oil to be extracted from each well and permits hard to reach or difficult to process oil more to become economically viable.[33] Part of this argument has merit. Modern drilling techniques and technology allows more oil to be extracted from wells during operation.[34] Traditionally, not all oil has been recovered due to economics and much has been left in the ground.[35] This, however, does not increase the amount of oil in a well. It only allows more of the

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[32]Geri & McNabb, *Energy Policy in Transition*, 30-31.
[33]Elhefnawy, *The Impending Oil Shock*…, 40.
[34]*Ibid.*, 59 note 22.
[35]Kunstler, *The Long Emergency*, 34

existing oil to be extracted. Essentially, it just creates a plateau on the top of the Peak Oil bell curve. The impact of this is that while the peak lasts longer, the downward curve in the life of the well is much steeper resulting in a higher rate of decline.[36] While more oil becomes available for any given field or well within a field, new technology cannot replace oil or allow the earth to replenish itself.[37]

The second part of the Peak Oil discussion concerns the oil (and by extension all fossil fuels) available to be extracted. This volume is referred to as oil reserves and are classified as either proven, probable, or possible.[38] Proven reserves have a ninety percent chance of being economically viable, while probable and possible have fifty and ten percent chance respectively.[39] The problem with stated reserves is transparency with the process for determining them. As Elhefnawy points out, many countries do not diminish their stated reserve despite continued production year after year.[40] Further to this, the vast majority of the oil and gas bearing areas of the earth have been searched and even if more fuels are discovered, there are no longer the huge fields such as those in the Middle East.[41] The arctic regions of the earth remain largely unmapped, but the environment is so hostile that any potential economic benefit to oil producers will only become available with a substantial increase in the price of oil. Moreover, the reserves in the middle east are assessed to be much lower than stated by nations in that region and regardless of

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[36]Elhefnawy, *The Impending Oil Shock*…, 59 note 22.
[37]Kunstler, *The Long Emergency*, 34.
[38]Elhefnawy, *The Impending Oil Shock*…, 37.
[39]*Ibid.* 37
[40]*Ibid.*, 40.
[41]Kunstler, *The Long Emergency…, 49.*

improvements in technology the fields there have passed their peak and are on the downward trajectory of production. [42]

To summarize, the human population of the earth has discovered almost all of the oil available and while technology may allow more of that oil to be available, there is a finite limit on the amount of oil that is available. Many scientists believe that peak oil production was reached in in the first decade of this century.[43] Another estimate is that the world had 200 trillion barrels of oil available and that we have consumed all but about 40 trillion of this over the century and a half.[44] The bottom line is that we are going to run out of a finite resource upon which our way of life is almost completely dependent. What, then, does this mean for Canada?

As previously noted, Canada is well situated in that it has vast quantities of reserves in the Alberta oil sands. There will be much economic benefit from extracting this resource for those in western Canada. But what will it mean for the rest of the country when worldwide demand continues to rise and outstrips supply and the cost of everything from food to gasoline to homes and electricity increases? Alternative solutions and adaptive responses to these challenges are necessary if Canada is to maintain its standard of living and position as one of the most envied countries in the world.

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[42]Matthew R. Simmons, *Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy,* (Hoboken, New Jersey: John Wiley & Sons, 2005), 100.

[43]Kunstler, *The Long Emergency…,*25.

[44]*Ibid.,* 49.

CHAPTER 1 – THE GREAT GIFT OF FOSSIL FUELS

The industrialized world owes its entire way of life to the discovery of fossil fuels. Unlocking the energy stored in these fuels has permitted all of the advances in western society in the last 150 years. In the mid-nineteenth century coal was burned to create steam which powered machinery to enable mass production, electricity generation and long distance overland travel. The discovery of the multitude of uses for oil enabled the development of the internal combustion engine which led to more efficient transportation including air travel. Natural gas enabled widespread use of lighting in homes, improved the output of arable land through synthetic fertilizers, and allowed for easy heating of individual houses and office buildings. Even further, the advances in science has been enabled by the ability of industrialized nations to bring to bear the energy released from fossil fuels. Advanced materials and production methods have allowed the development of nuclear energy stations, medical advances and space exploration. Oil and gas are used to create lightweight materials and plastics that are the main components of computers, telecommunications devices, and clothing.

While civil society revolves around fossil fuels for its way of life, there are other benefits that can be identified for continuing to use fossil fuels as a source of energy, especially for Canada. Most importantly Canada possesses huge wealth trapped in ground as part of the Alberta oil sands. Additionally, a resurgence of hydrofracturing for natural gas has the potential to be developed in Atlantic Canada. The possession of fossil fuels in a world where they are becoming more and more scarce will mean economic growth for much of the country and will allow Canada to have greater influence on the international

stage. This will allow Canadians to maintain the standard of living to which it has become accustomed. The economic potential of the energy sector is huge.

Economic Benefits

In addition to enabling the western way of life and standard of living, as noted above the energy sector generates just under seven percent of the Canadian economy and this has changed little between 2005 and 2011.[45] This is the largest percentage for any of the resource based sectors. Noting that resource development has contributed up to twenty percent of the Canadian economy over the past century (and even greater if agriculture is included), the Alberta oil sands have the potential for great contribution to Canada's economic growth. The Alberta oil sands constitutes the current single largest area of development in Canada and in the past decade there has been greater than $100 billion invested in their development and over the next quarter century an additional $364 billion in investment capital will be injected into the region.[46] What does this seemingly large figure represent? It represents a long term economic potential for the country.

Economic activity is generated from the Alberta oil sands in a number of different ways. As described by Plourde, the economic activity in Alberta tripled between 1991 and 2006 as a result of higher world oil prices and a "royalty and revenue system designed to stimulate investment [that] was put in place in 1997."[47] Royalties and

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[45]Canada, *An Energy Market Assessment 2009…*, 4. Canada, *Canadian Energy Overview…*, 2.

[46]Conference Board of Canada, *Fuel For Thought: The Economic Benefits of Oil Sands Investment for Canada's Regions*, (Canada, 2012), i. http://www.conferenceboard.ca/e-library/abstract.aspx?did=5148,

[47]Andre Plourde, "Oil Sands Royalties and Taxes in Alberta: An assessment of Dey Developments Since the mid-1990s," *The Energy Journal*, 30, (No 1, 2009): 112-113.

revenues are the key income streams for governments. Plourde further describes the royalty and revenue regime for the Alberta oil sands. They are generated by holding lease auctions for the rights to extract resources from crown lands and then charging annual rents to business interests for continuing to hold the rights. The leases contain agreements that a certain portion of the profits are returned to the government as royalties. Finally, governments receive revenue because the corporations are then taxed on their income. These revenue streams can be quite significant, although that has not always been the case. With the increases in the world price of oil over that past decade, Alberta examined the royalty regime and discovered that it favoured the oil companies.[48] Under the new regime, the oil producers returned royalties of $3.7 billion to the Province of Alberta.[49] And while Alberta benefits directly from oil sands development, the Federal government also gains a direct positive benefit and the economic activity stimulated impacts almost all regions of the country to some degree.

The return to the federal government is truly illustrative of the positive benefit that Alberta oil sands has on the overall economy. Development provides jobs which provide an income and requires goods and services which provide further employment. When more people are employed there is more money spent in the economy, more taxes levied, and expenditures on employment related social programs. The Conference Board of Canada research indicates that Alberta oil sands returns to the federal government will see growth through the year 2030 that will be equivalent to about nineteen percent of the

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[48]*Ibid.*, 136.

[49]Canadian Association of Petroleum Producers, "Basic Statistics," accessed 17 February 2013, http://www.capp.ca/library/statistics/basic/Pages/default.aspx

total revenue of the government in 2011 (with dollars adjusted to 2010).[50] This large amount of benefit is due to the aforementioned greater economic activity that is expected to occur due to the increasing price of oil. The Conference Board expects over three billion person years of employment to be generated from the Alberta oil sands which will result in increased income taxes and higher employment insurance premiums.[51] Over the next twenty-five years Alberta oil sands development is expected to contribute $2.106 trillion dollars to the Canadian economy, $788 billion in royalties to the federal and provincial governments, and create 905,000 jobs in Canada.[52] Additionally, because Canada is expected to become the fourth largest oil producer, provinces too are expected to see great benefit from Alberta oil sands development over the coming years.

Provinces benefit in a manner similar to the federal government except for the absence of royalties. The largest source of income for Provinces will be through the direct taxation of corporate profits taxes from companies supporting the oil sands development.[53] Yet there will be increased personal income taxes because of the large number of seasonal and migratory workers that support families in their home provinces.[54] However, there will be increased investment related to Alberta oil sands development that will occur, especially in developing pipelines and other infrastructure such as ports and refineries necessary to support expanded oil sands mining.[55]

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[50]Conference Board of Canada, *Fuel for Thought …*, 37.
[51]*Ibid.*,
[52]Canadian Association of Petroleum Producers (CAPP), *The Facts On Oil Sands*, (February 2013), 21-22. http://www.capp.ca/UpstreamDialogue/OilSands/Pages/default.aspx
[53]Conference Board of Canada, *Fuel for Thought …*, 35-36.
[54]*Ibid.*
[55]Afshin Honovar, *et al.*, *Economic Impacts of Staged Development of Oil Sands Projects in Alberta (2010-2035)*, (Calgary: Canadian Energy Research Institute, 2011), *39.* *http://www.api.org/~/media/Files/Oil-and-Natural-Gas/Oil_Sands/Economic_Impacts_of_Staged_Development.pdf*

The economic benefits from developing the Alberta oil sands are quite clear. Yet there is much concern about the use of the Alberta oil sands due to the method of production emitting a large amount of greenhouse gasses. Most government and industry publications are focused on the methods and processes used to ensure that minimal impact to the environment in the production of the heavy crude that comes from the sands. The Oil Sands Development Group, a group that represents oil sands operators and developers, states that the industry accounts for less than five percent of Canada's emissions and less than 0.1 percent of worldwide emissions.[56] On the other side of the debate Grant *et al* submit that this is misleading. They assert that while only a small part of the total national emissions, because Canada is one of the top ten greenhouse gas producers the total amount of gasses emitted from the Alberta oil sands is very large.[57] So large, in fact, that these emissions are greater than that of some entire countries. While the contribution to climate change from Alberta oil sands development may be disputed, a more important question to be asked is what is the impact of climate change on the economy? Very little as it turns out and most of Canada will fare better than much of the world in a warming global environment.

According to Mendelsohn, appropriate government policy should permit human societies to adapt to changing climates with little impact to the economy.[58] He further notes that farmers have shown the ability to adapt by adjusting crops and irrigation in the

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[56]Oil Sands Development Group, "Oil Sands Facts," accessed 17 February 2013. http://www.oilsandsdevelopers.ca/index.php/thank-you/oil-sands-facts/ .

[57]Jennifer Grant, *et al.*, *Beneath the Surface: A Review of Key Facts in the Oilsands Debate* (The Pembina Institute, 2013),12. http://www.pembina.org/pub/2404.

[58]Robert Mendelsohn, "Economic Estimates of the Damages Caused by Climate Change." In *The Oxford Handbook of Climate Change and Society*, edited by John S. Dryzek, Richard B. Norgaard, and David Schlosberg, (New York: Oxford University Press, 2011). http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199566600.001.0001/oxfordhb-9780199566600-e-12?rskey=UyBxjn&result=60&q

past when faced with weather and climate fluctuations over the long term and if governments allow markets the freedom to adjust to changes then adaptation will be more efficient than if they try to impose adaptation through regulation and policy. Other viewpoints indicate that the economic impacts will be great, but there appears to be little purely economic emphasis. The Stern Review notes that the much of climate change problems will be social costs faced in the developing world rather than reduction in the standard of living or development in western societies.[59] To further complicate this, Mendelsohn also points out that climate change models are hard to apply to the future as they have often assumed impacts on current economic activity rather than an assumed future and discount the ability of the society to adapt to changes over the long term. Moreover, he indicates that most of the climate change impacts will be felt in low-latitude countries. Countries further away from the equator will enjoy longer growing season improving agriculture, the limit of tree lines will extend increasing the amount of forestation, and the heating season will be shortened reducing the cost of maintaining dwellings at a comfortable temperature. The preceding points indicate that the Alberta oil sands will have an extremely positive effect on Canada's economy and is an opportunity that should not be missed. Just as important as Canada's economic future, is its energy security.

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[59]Nicholas Stern, *Stern Review: The Economics of Climate Change*, accessed 17 February 2013, (London: Her Majesty's Treasury, 2006), vi – ix, 25,27. http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/stern_review_report.htm

Energy Security

As the world runs out of fossil fuels competition for scarce resources will increase. The United States' Energy Information Agency expects global energy demand to increase by fifty-three percent between 2008 and 2035 and energy produced from oil to continue to the be largest proportion consumed.[60] The agency also notes that the proportion of energy produced from oil will decrease in relation to other forms of energy due to steadily rising oil prices which will cause switches to other forms of energy consumption.[61] The expected rising price is related to increasing demand for fossil fuels in comparison to the supply. Canada's security will benefit from having the world's second largest oil reserves in an environment where demand is increasing and supply is falling.[62] Further benefit comes from our geographical situation in North America and that our current domestic consumption of energy is not as dependent on fossil fuels as many other countries, especially the United States.

The United States is Canada's biggest trading partner accounting for 73% of our exports.[63] In 2011 the bilateral trade between the two countries was in excess of $680 billion.[64] The two countries collaborate and cooperate on the military defense of the North American continent through the North American Aerospace Defence Agreement and their energy markets are linked with electricity and fossil fuels flowing between the

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[60]United States of America, *International Energy Outlook 2011…*, 9.
[61]*Ibid.*, 10.
[62]*Ibid.*, 211.
[63]United States of America, Central Intelligence Agency, *The World Factbook-North America-Canada*, accessed 18 February 2013. https://www.cia.gov/library/publications/the-world-factbook/geos/ca.html
[64]Canada. Canada-US Relations – A Unique and Vital Relationship, accessed 18 February 2013. http://www.canadainternational.gc.ca/san_diego/bilateral_relations_bilaterales/welcome-bienvenue.aspx?lang=eng&view=d

two countries.[65] Canada's position as having the second largest proven oil reserves in the world with a market integrated with the nation with the largest military in world will ensure its security into the future. America is the world's biggest consumer of energy, wants to be free from the potential manipulation of Middle Eastern governments, and has the refining capability to upgrade the heavy oil produced from the Alberta oil sands.

Today, seventy-seven percent of worldwide oil reserves are controlled by governments through nationally owned oil production companies.[66] Canada has half of the oil reserves that are accessible to international corporations and thus not easily manipulated by foreign governments.[67] This makes Canada's exports extremely desirable to the United States. As Levi points out in his report on American energy security, diverting incomes from governments that are opposed to United States' policies is a benefit to American, and therefore Canadian, security.[68]

In a further example of the interrelationship between the two countries, Canada is heavily reliant on the United States as a market for the Alberta oil sands. America already has the refining capability necessary to upgrade bitumen. If other markets were sought for Canadian products, the crude would need to be refined prior to export or new technologies developed that would allow the crude to be diluted while in transport.

Lastly, maximizing the output of the Alberta oil sands will stabilize the world price of oil.[69] As Yergin notes, the biggest challenge to stability in world oil markets is

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[65]*Ibid.*

[66]American Petroleum Institute, *Canadian Oil Sands: Enhancing America's Energy Security.* (Washington: API, 2011), 4. http://www.api.org/~/media/Files/Oil-and-Natural-Gas/Oil_Sands/OIL_SANDS_PRIMER_MAY_2011.pdf

[67]*Ibid.*

[68]Michael A Levi, *The Canadian Oil Sands: Energy Security vs. Climate Change*, (New York: Council on Foreign Relations, 2009), 22. http://www.cfr.org/canada/canadian-oil-sands/p19345

[69]*Ibid.*, 23.

not what happens below ground, but rather political considerations and the interactions of states.[70] Canada's stable political climate, open market conditions, and predictable tax regimes will ensure that oil supplies are relatively constant. This will ensure that shocks to the oil supply chain are minimized. This will result in a more stable economic environment which benefits Canada as a nation that requires open access to foreign markets to continue economic growth.

[70]Daniel Yergin, "Ensuring Energy Security," *Foreign Affairs*, 85, 2, (Mar/Apr 2006): 75

CHAPTER 2 – THE CURSES OF FOSSIL FUELS

The previous chapter detailed the benefits that have accrued to industrialized nations through exploitation and burning of fossil fuels and how continued access to those fuels will be crucial to maintaining the current standard of living. While there are definite benefits, fossil fuels have also been a curse on industrialized nations. This chapter will outline the negative impacts that fossil fuel usage has on Western society in general and Canada in particular. The chapter will begin by discussing anthropogenic climate change and the direct relation that the warming climate has with the use of fossil fuels. Following this, a more narrow focus will be taken regarding the damage to habitat that occurs through the exploitation of the Alberta oil sands and using hydrofracking for natural gas extraction. The relationship between the environment and indigenous peoples will then be explored outlining how the government's permissive approach to environmental damage caused by exploitation of fossil fuels continues to repress indigenous peoples. Lastly, the chapter will explore the unintended economic consequences that can occur if too much emphasis is placed on exploitation of natural resources, especially fossil fuels. To understand the impacts it is necessary to explain the extraction processes for oil sands and hydrofracturing and how they differ from conventional oil and gas exploitation.

Conventional vs. Unconventional Fossil Fuel Extraction

The original method of extracting oil and gas from the ground was very simple. A hole was drilled in the ground, a pipe inserted and the natural pressure within the well expelled the fuel. Early wells focused primarily on the light sweet crude type of oil as that is both easiest to access because it is near the surface and easiest to refine into a usable end product such as gasoline, diesel, jet fuel, kerosene, *et cetera*.[71] Frequently a significant portion of the oil in a deposit was left in the ground when the natural pressure became inadequate to expel the fuel. Methods to continue extraction without natural pressure have been developed but were not initially used because it was not financially rewarding to continue extraction. As light sweet crude has become increasingly scarce and the price of oil has increased there have been two consequences to the exploration for fossil fuels. Firstly, economic conditions now make it worthwhile to maximize the production of conventional wells by inserting large volumes of water under pressure into the well to extract as much oil as possible.[72] Secondly, oil and gas exploration began to expand further afield into locations less easy to reach such as further offshore and into deeper deposits. Both of these secondary impacts of the scarcity of oil have had tertiary effects that were the beginning of a process of searching for oil and gas that is both harder to reach and more difficult to refine.

The first effect of the expanding search for oil is that more energy is needed to extract the oil. This reduces the net amount of energy gained from a unit of energy

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[71]Kunstler, *The Long Emergency*, 26.
[72]Elhefnawy, *The Impending Oil Shock*…, 40.

produced.[73] It would quite foolhardy to expend more than one barrel of oil to extract that one barrel, but as oil and gas become more difficult to reach and are of a lower quality, the industry is getting closer and closer to that situation. The second effect this has is that extraction techniques have become more deleterious to the environment through use of increased amounts of water that cannot be returned to nature. These two cases are especially true of the Alberta oil sands and natural gas hydrofracturing. The Alberta oil sands are extremely hard to refine and energy intensive to extract and shale gas deposits require hydrofracturing that uses large amounts of water and other chemicals to extract fuel.

Oil sands are a naturally occurring mixture of bitumen, water, and clay and in Canada are primarily located within the boreal forest region of north-eastern Alberta.[74] Bitumen is defined by its viscosity in that it is too thick to be pumped or flow without being further diluted or heated and at 10 degrees Celsius has the consistency of a hockey puck.[75] Bitumen is found both near the surface and deeper underground and must be separated from the clay and water prior to refining. As a consequence, there are two different types of operations that occur. About eighty percent of bitumen is below seventy-five metres in depth and as such is recovered using the "in-situ" method that resembles traditional oil drilling. Pipes are inserted into the ground and steam is then injected into the soil liquefying the bitumen which is then extracted. The remaining twenty percent of deposits are close to the surface and mined in a manner similar to other

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[73]This concept is referred to as Energy Returned on Energy Invested (EROEI). As previously noted, oil enables the production of all energy sources. EROEI refers to the net energy that is extracted from the source after accounting for the amount of energy used in production. See Nate Hagens, "A Net Energy Parable: Why is ERoEI Important," The Oil Drum: Net Energy (August 4,2006), accessed April 4, 2013. http://www.theoildrum.com/story/2006/8/2/114144/2387

[74]Canadian Association of Petroleum Producers, *The Facts…*, 5.

[75]*Ibid.*, 6.

minerals using large digging machinery. The oil sands are scooped away and transported by truck to a facility where it is heated with steam to liquefy the bitumen. Bitumen requires further preparation prior to it becoming useful as a consumer product. It requires treatment to enable it to be transported by pipeline and it requires special refining techniques once transported to a production facility.

To gain useful product out of the multitude of steps requires large amounts of electricity and water. Currently natural gas is burned to create electricity or heat that turns water into steam. The water that is used in the extraction process is taken from natural water sources, most of which cannot be recycled. Ninety-five percent of water used in the Alberta oil sands cannot be recycled and is too polluted to be returned to the natural water system and is stored in large tailings ponds on site.[76] The additional refining and transportation requirements further use more energy which contributes to global climate change and lowers the net energy benefit to be gained from the Alberta oil sands.

Conventional natural gas is found in deposits similar to oil. As access to the easy to reach wells has reduced, the use of hydrofracturing technology to extract gas in shale deposits has become more popular. Unlike bitumen production, the gas extracted from unconventional wells is the same quality as conventional wells. The difference lies in the amount of energy and resources required to extract the gas. In the case of hydrofracturing, wells are drilled underground beneath the water table and sealed with cement. A mixture of water and chemicals is pumped into the well fracturing the shale beneath the water table allowing the gas to escape up the encased well to the surface where it is captured and transported to market. In a manner similar to bitumen

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[76]Grant, *Beneath the Surface*…, 27.

production, the water that is used is contaminated and must be either treated for return to the environment or stored indefinitely.[77]

To summarize, as access to high quality fossil fuels decreases, greater amounts of energy and water are needed to continue to meet the worlds energy demands. These unconventional techniques also have a greater impact on the environment due to surface mining operations and the storage of contaminated production waste. This is demonstrably a curse on the global climate and the local habitat for all living things.

Curse on the Climate

The United Nations Intergovernmental Panel on Climate Change has definitively stated that the climate is warming and that human activity is the cause.[78] Global warming is primarily a function of the accumulation of greenhouse gasses in the atmosphere which magnify the effects of the sun's rays on the earth. Greenhouse gas emissions caused by human beings have steadily increased since the industrial revolution but there has been a seventy percent increase between 1970 and 2004 (Figure 4).[79] The mean global temperature has already risen by one to two degrees Centigrade with closer to four degrees at the poles.[80] Although this rise in temperature is the defining indicator of global warming, there are many other effects being observed.

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[77] Rebecca Hammer, and Jeanne Van Briesen, *In Fracking's Wake: New Rules are Needed to Protect our Health and Environment from Contaminated Wastewater*. (New York: National Resources Defense Council, 2012), 3-4. http://www.nrdc.org/energy/files/Fracking-Wastewater-FullReport.pdf

[78] UN, *Climate Change*…., 36.

[79] *Ibid.*

[80] *Ibid.*, 32.

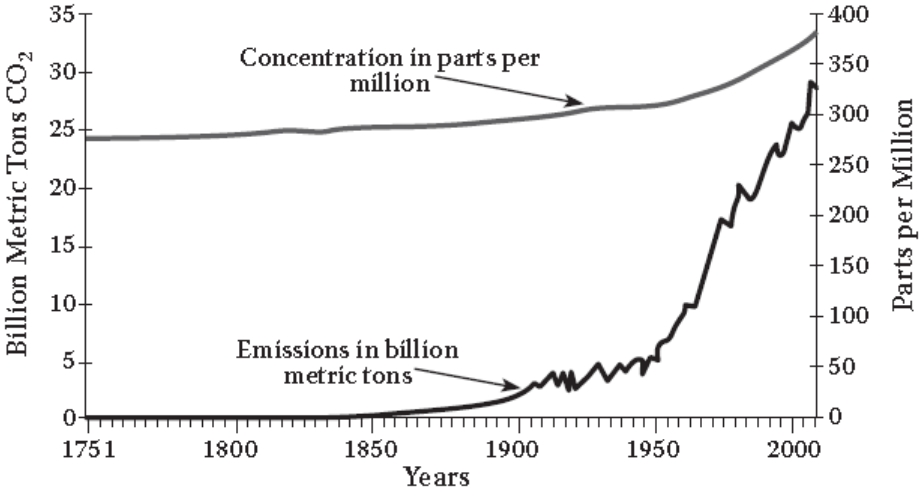

Figure 4 – Carbon Emissions and Atmospheric Concentrations, 1750-2000.
Source: Geri & McNabb, *Energy Policy in Transition*, 26.

One noticeable effect is the reduction in snow and ice coverage in the world's northern regions. Most importantly, there has been a rapid loss of permanent sea ice in the arctic. The rate of reduction has been increasing over the last ten to fifteen years.[81] This loss of ice has also been noticed in the reduction in the size of glaciers worldwide. This retraction of ice will have two effects. Firstly, the smaller arctic ice cover will reflect fewer of the sun's rays away from the ice surface further increasing global temperatures. While this will increase global warming, the opening of the artic sea lanes will shorten the distance required to ship between Asia and Europe or North America. This will have the benefit of reducing the demand for fossil fuels and consequently reduce greenhouse gas emissions.

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[81]S.V. Nghiem, *et al.*, "Rapid Reduction of Perennial Sea Ice." *Geophysical Research Letters* 34, issue 19 (October, 2007): 1. http://www.washington.edu/news/archive/relatedcontent/2007/September/rc_parentID36894_thisID36984.pdf

It has been suggested that ice-free summers are possible within the next quarter century.[82] This will improve access to oil and gas deposits in the last area of the world that has yet to be fully explored, which could result in resource discoveries that could delay the onset of the instability that is expected to arise in a world running short of oil. Access to these regions will not, however, keep the price of fuel from reducing. Although Wang and Overland indicate that summer ice coverage will be greatly reduced, this does not mean that ice will completely disappear. Special technology and ice-hardened ships will be required to explore, extract, and transport any resources that are discovered. This will increase operating costs which will require high market costs of oil and gas to make exploitation economically viable. This is similar to the high operating costs due to the lower quality resources found in the Alberta oil sands.

The second impact of reduced ice worldwide is the dependence on glaciers for a significant portion of the world's freshwater. Approximately two thirds of the world's fresh surface water is frozen in glaciers and ice caps. [83] If these glaciers are not replenished then there is a potential reduction in the availability of freshwater with negative consequences for those people and animals that depend on them.

Another observable effect of global warming is the rise in sea level. Over the past century the worldwide sea level has increased more than fifteen centimetres with the speed of rising levels more than doubling since 1993.[84] While this doesn't seem significant, this amount of rise has damaged coastal habitat and forced the relocation of

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[82]Muyin Wang, and James E. Overland, "A Sea Ice Free Summer Artic Within 30 Years?" *Geophysical Research Papers* 36, issue 7 (April 2009). ftp://spacegrant.hawaii.edu/coastal/Climate%20Articles/Wang%20ice%20free%20arctic%202009.pdf

[83]The National Academy of Science, Water Information Center "Drinking Water Basics," accessed 4 April 2013. http://water.nationalacademies.org/basics_part_2.shtml

[84]UN, *Climate Change*…., 30, 31.

populations from low-lying coastal areas.[85] As this continues it will have negative impacts on those people that live in coastal regions.

As a final example of climate change, there is a melting of permafrost in northern areas of the world resulting in ground instability.[86] This is causing rock avalanches in mountain regions and disrupting northern communities. Northern infrastructure is particularly at risk as it was not built to withstand shifting foundations. Remediating this situation will be challenging as it is very difficult to construct buildings and homes in remote areas as the only access is by sea and in most cases all building materials must be shipped in.

Despite the preceding negative impacts, the real curse of fossil fuels on the climate is that global warming will continue regardless of efforts to decrease greenhouse gas emissions. Humans have used fossil fuels to advance their societies and develop industry and in doing so they have irreversibly changed the climate in which they live and must now focus on adapting to a warmer world rather than attempting to change their behaviour. This is so for two reasons. Firstly, the amount of greenhouse gasses that have already been released cannot be changed and will continue to increase global warming because they persist in the atmosphere for centuries.[87] Secondly, the heavy reliance on continuing to use fossil fuels for economic growth will prevent world leaders from taking concerted action to reduce their emissions. This concerted effort is necessary because

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[85]*Ibid*.; Robert Melchior Figueroa, "Indigenous Peoples and Cultural Losses," in *The Oxford Handbook of Climate Change and Society*, eds John S. Dryzek, Richard B. Norgaard, and David Schlosberg,(New York: Oxford University Press, 2011), 240. http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199566600.001.0001/oxfordhb-9780199566600-e-16?rskey=HC9Cm4&result=82&q

[86]UN, *Climate Change*…., 31.

[87]Susan Solomon, *et al*., "Irreversible Climate Change Due to Carbon Dioxide Emissions," *Proceedings of the National Academy of Sciences of the United States of America* 106, no. 6 (February 10, 2009): 1709. http://www.pnas.org/content/early/2009/01/28/0812721106.full.pdf+html

atmospheric pollution crosses international borders. Additionally, persistent doubt as to the causes of global warming and the potential futility of changing lifestyles is preventing definitive action.[88] Moreover, actions that have been taken have proven ineffective.

The solution a number of regions have adopted to attempt to control greenhouse gas emissions is a carbon tax and carbon trading regimes. Carbon taxes appear to be effective. If governments wish to discourage a behaviour, taxing it seems a valid way to do that. There are short term economic consequence to this approach. Taxing an activity as pervasive as burning fossil fuels has the effect of increasing the costs of virtually all goods and services in an economy. As Spash points out, carbon trading for the biggest emitting activities has been the approach taken to reduce this impact.[89] He goes on to note that carbon trading has failed to reduce overall emission due to the fact that emitters are able to purchase credits to enable their continued pollution of the atmosphere. Moreover, the market approach has failed to adequately regulate emissions as can be noted by the precipitous drop in the cost of credits in the European market place.[90] A drop in the cost indicates that there are too many credits being issued by governments which leads to the conclusion that there has not been a successful reduction in emissions.

In summary, the burning of fossil fuels for more than two centuries has created a situation that requires changes in the way humans live on the earth. The environmental

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[88]Harvey Young. "Why We Won't Stop Global Warming," *Aljazeera*, last modified 20 January 2013. http://www.aljazeera.com/indepth/opinion/2013/01/201312094040359963.html

[89]Clive L. Spash, "Carbon Trading: A Critique," in *The Oxford Handook of Climate Change and Society*, eds John S. Dryzek, Richard B. Norgaard, and David Schlosberg, (New York: Oxford University Press, 2011): 558. http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199566600.001.0001/oxfordhb-9780199566600-e-37?rskey=6s6NeA&result=7&q=

[90]The Economist, "Extremely Troubled Scheme: Crunch Time for the World's Most Important Carbon Market," 16 February 2013. http://www.economist.com/news/finance-and-economics/21571940-crunch-time-worlds-most-important-carbon-market-extremely-troubled-scheme

impacts of carbon emissions are irreversible and any attempt to reduce emissions will negatively impact the Western standard of living. As such, concerted and effective actions by governments are unlikely to occur and humans will need to adapt to the changing climate rather than attempt to control it.

Curse on Habitats

The previous section outlined the global effects of long term combustion of fossil fuels. This section will focus more specifically on the damaging effect that the exploitation of the Alberta oil sands and hydrofracturing shale natural gas deposits have on local habitats. These activities are causing the loss of habitat in the Boreal forest, wetlands, and river systems. Habitat loss imperils the existence of species in the area which can then have an impact on other species both above and below in the food chain. This results in lower level of biodiversity which effects all people because this reduces the capacity of the earth to support all forms of life, including human life.[91] Water is necessary to support all life and the use of water in the exploitation of the Alberta oil sands and hydrofracturing shale deposits of natural gas is destroying habitats thus reducing biodiversity.

Although water is crucial for human life, it is taken for granted by most Canadians. As Kreutzwiser and de Loë point out, Canadians use more water per capita

[91]UN, *Convention on Biodiversity…*, 1.

than almost any other country and water security needs to be taken more seriously.[92] As noted above, much of the water used in producing bitumen from the Alberta oil sands and hydrofracturing shale natural gas cannot be returned to the environment and is held in large tailings ponds. This has a negative impact on habitats by removing freshwater from natural hydrological cycle.

All of the water on the earth exists in a closed system and the amount therein has neither increased or decreased for millennia. [93] Figure 5 demonstrates how this system cycles the water through different states without losing or gaining any water. As more and more water is diverted from this cycle, polluted and then stored external to the closed system, it is possible that for the first time human activity is disrupting a natural process that has functioned uninterrupted for tens of thousands of years. The lack of discussion about the impacts of this practice serve to reinforce Kreutzwiser and de Loë's assertion that Canadians take access to freshwater for granted. In addition to the disruption of one of earth's system, exploitation of unconventional fossil fuels directly impacts other ecosystems.

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[92]Reid Kreutzwiser, and Rob de Loë. "Water Security: Current and Emerging Challenges," in *Resource and Environmental Management in Canada: Addressing Conflict and Uncertainty*, 4th ed., ed. Bruce Mitchell, (Don Mills, Ontario: Oxford University Press, 2010), 190.

[93]Marq De Villiers, *Water: The Fate of Our Most Precious Resource*, (Toronto: McClelland and Stewart, 2003), 26.

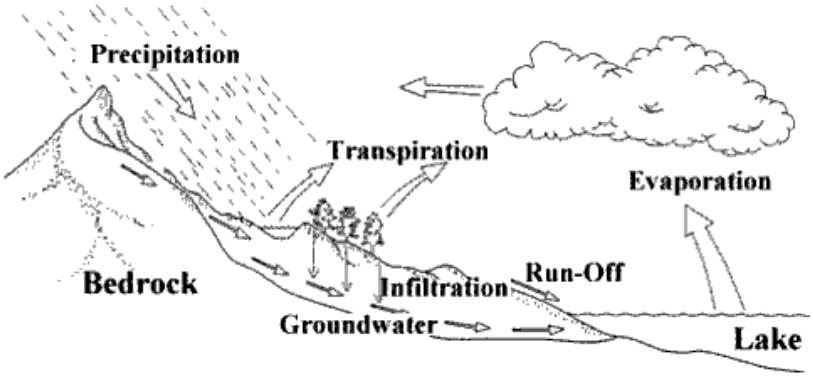

Figure 5 - The Hydrologic Cycle
Source: Lifewater.ca. *Appendix C: Finding Water Underground*. Accessed 7 April 2013.

The tailings ponds that are created in production of bitumen damage terrestrial habitat. These tailings ponds are not just small enclosures, rather they are larger than all of the open pit mines in the Alberta oil sands.[94] Tailings lakes would be a more appropriate way to identify these enclosures. Current environmental regulations require oil sands developers to return the landscape to its natural habitat. As Rooney *et al.* point out, while habitat is restored it is vastly different from the pre-development landscape.[95] One change that they point out is that forested areas become drier due to a loss of wetland. The forest that returns is also much different and has a greater potential for fire. Lastly, they note that there is a reduced ability for the ecosystem to capture carbon due to the reduction in vegetation. This increases the net greenhouse gas emissions that occur with development of the Alberta oil sands.

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[94]Rebecca C. Rooney, Suzanne E. Bayley, and David W. Schindler, "Oil Sands Mining and Reclamation Cause Massive Loss of Peatland and Stored Carbon," *Proceedings of the National Academy of Sciences of the United States of America* 107, no. 3 (March 27, 2012): 4935. http://www.pnas.org/content/109/13/4933.full.pdf+html

[95]*Ibid.*, 4934.

Tailings are also responsible for killing birds. Migratory birds mistake the tailings for natural habitat along their route and are attracted to them to forage for food and for resting opportunities.[96] Landing on the tailings causes some of the birds to become oiled thus losing their ability to fly and retain heat which leads to death. While the tailings harm primarily waterfowl, the Alberta oil sands has been estimated to cause a loss of as many as thirty six million birds over a twenty year period.[97] These losses have occurred due to fragmentation of habitat, loss of breeding grounds, noise pollution, and air and water contamination.[98] The pollution of the air and water within the Alberta oil sands development areas has even further reaching impacts.

Alberta oil sands development releases polycyclic aromatic hydrocarbons and their chemical compounds into land habitats and waterways.[99] These compounds are extremely toxic and are listed by the United States Agency for Toxic Substances and Disease Registry as the ninth out of the 275 most toxic substance in the world.[100] These substance are leached into the soil from tailings and contaminate ground and surface waters. This has led to increased mortality in fish and other aquatic species. Moreover, these compounds are emitted as air pollution and then fall to the ground. Kelly *et al.* noted than an oily slick of these substances had formed on melted snow.[101] This contamination, combined with the reduction in habitat, is destroying woodland caribou

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[96]Kevin P. Timoney, and Robert A. Ronconi, "Annual Bird Mortality in the Bitumen Tailings Ponds in Northeastern Alberta, Canada," *The Wilson Journal of Ornithology* 122, issue 3 (1 September, 2010): 569. http://www.ceaa.gc.ca/050/documents_staticpost/59540/82534/bird_mortality.pdf

[97]Grant, *Beneath the Surface*…, 51.

[98]Grant, *Beneath the Surface*…, 51.

[99]Giesy, "*Alberta Oil Sands…"*, 951.

[100]United States of America, Agency for Toxic Substance and Disease Registry, "Priority List of Hazardous Substances," last updated 25 October, 2011. http://www.atsdr.cdc.gov/SPL/index.html

[101]Kelly, *"Oil Sands Development…"*, 22347.

herds in northern Alberta.[102] Caribou require large tracts of land and are very sensitive to industrial activity. Alberta oil sands activity has resulted in these animals being placed on the Alberta "threatened" species lists.[103]

The impact of these damages may not appear to have great consequences. These operations are in remote and relatively unpopulated areas and have impacts on very few people. Unfortunately, as the scarcity of these natural resources increases, exploitation of the resources increasingly encroaches on the traditional lands of indigenous people. If there is no change to environmental practices the damage to ecosystems and habitat will continue the centuries of repression of Canada's indigenous people by the Canadian government.

Curse on Indigenous Peoples

As previously discussed, burning fossil fuels is directly contributing to climate change. In turn, climate change is having a deleterious effect on indigenous people worldwide. In Canada, exploitation of natural resources in general, and the Alberta oil sands in particular, is continuing the repression of Canada's indigenous people by continuing the colonial and imperial relationship between the government and First Nations.

The relationship between indigenous people and the land upon which they depend is being disrupted by the speed of climate change.[104] Indigenous peoples are connected to

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[102]Grant, "*Beneath the Surface…",* 47.
[103]*Ibid*.
[104]Figueroa, "*Indigenous Peoples...*", 240.

their land through thousands of years of history which has developed a spiritual connection to the environment that enabled a sustainable hunter-gatherer lifestyle until the colonization of their territories by European powers. By being connected to and dependent on the land for their survival, indigenous people developed an ability to observe changes in the environment. As Figueroa notes, climate change is completely destroying environments and effecting the ability of indigenous people to adapt to the changes to their eco systems. He uses the example of the indigenous people of an island in the South Pacific that were relocated to New Zealand due to rising sea levels that made their island uninhabitable. The relocation had the effect of eradicating an entire culture due to the assimilation of the islanders into the broader New Zealand society.[105] Although this case was extreme in that the entire territory was lost, it is important to understand indigenous peoples are connected culturally to the environment. It is more than an economic connection or lifestyle choice; indigenous people feel themselves, and all living things, to be interconnected in a great interdependent system and that changes to one part, not matter how small, impacts the whole.[106]

The literature on Canadian indigenous people reveals discussion about the existence of Indigenous Knowledge which is the body of knowledge that exists within indigenous societies about spirituality, cultural norms, and the environment.[107] This knowledge is sweeping and covers all aspects of the culture specific to a certain indigenous society and cannot be generalized across different indigenous groups. A subset of this is Environment Knowledge. This knowledge is further specific to the

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[105]*Ibid*.

[106]Deborah McGregor, "Coming Full Circle: Indigenous Knowledge, Environment, and Our Future," *American Indian Quarterly*, 28, no 3 & 4 (Summer/Fall, 2004): 387.

[107]*Ibid*., 386.

ecosystems in which tribes and families live. The importance of this knowledge to the health of the environment has been remarked by the United Nations Convention on Biodiversity.[108] McGregor points out in her article on indigenous knowledge that there is a differing view of the accessibility of indigenous knowledge between indigenous and non-indigenous people.[109]

From an indigenous perspective, she relates that knowledge is derived from the relationship between indigenous people and Creation. In this view, people are a portion of the entirety of Creation and that all beings must live within Creation following the principles of harmony and respect. If the harmony is disrupted, or disrespect shown, the entirety of Creation is put in danger. With this as basis of knowledge, it requires a lifetime of an existence where the relationships between beings are cultivated with harmony and respect to truly understand Creation. This is why elders within indigenous communities are revered – they have amassed a lifetime of knowledge and have gained understanding about the world around them. As part of this culture, it is expected that the knowledge of Creation will be passed on to younger generations to ensure the sustainability and survival of not just indigenous peoples, but of Creation itself.

One friction that has arisen between indigenous and non-indigenous people is because of the acknowledgement that indigenous people have proven that through their understanding of the natural environment that they can extract natural resources from the environment in a sustainable manner. Unfortunately, McGregor points out, is that the Eurocentric idea is that this knowledge is the same as any other type of information and

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[108]United Nations, *Convention on Biodiversity*, (Rio de Janiero: UN, 1992), article 8(j).
[109]McGregor "*Coming Full Circle…*", 396-397.

can be made accessible to all by simply writing it down.[110] However, this knowledge is rooted in culture and tied to living in the society. The knowledge is not an object that can be quantified, but rather is built upon the complex relationships between the person who has developed the knowledge to gain understanding, his or her community, and the greater ecosystem. The knowledge comes from the interconnectedness of Creation and all the living things within it. The people, the knowledge, and the environment are all interrelated and one must be part of all to truly understand it. And while the knowledge can be shared with others, it cannot be gained by those outside the culture.

Having this understanding of the culture and the connectedness to the land, it becomes easier to empathise with the indigenous viewpoint that harming the environment does harm not just to indigenous people but to all living things, because everything is a connected part of Creation. In Canada, this lack of understanding and indifference to indigenous people is rooted in the British colonization of North America. [111] This colonization continues today and extraction of fossil fuels from the environment is causing the already imbalanced and fractious relationship between governments and indigenous people to further deteriorate.

Barker and Bumstead separately discuss the impacts of colonization on indigenous people.[112] The relationship between the British government and North American indigenous people was always one of convenience and disregard. Without regard for the Northern indigenous people, in the late seventeenth century Charles II

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[110]*Ibid*., 398.

[111]Adam J. Barker, "The Contemporary Reality of Canadian Imperialism: Settler Colonialism and the Hybrid Colonial State," *American Indian Quarterly*, 33, no. 3 (Summer 2009): 326.

[112]*Ibid*.; J.M Bumstead, "The Aboriginals." In *Canada's Diverse Peoples: A Reference Sourcebook*. Santa Barbara: ABC-CLIO, 2003. Accessed 21 February 2013. http://ezproxy.torontopubliclibrary.ca/login?url=http://literati.credoreference.com.ezproxy.torontopubliclibrary.ca/content/entry/abccanada/the_aboriginals/0

ceded what was is now the Yukon, Northwest Territories and Nunavut to his cousin Rupert by signing a piece of paper on an assumption that the land was his to give. In the eighteenth century indigenous people were relied upon to provide military support in exchange for economic gifts and the Eurocentric idea of civilization. The imperial practice of establishing colonies imposed a Westphalian system upon the inhabitants of North America whereby land treaties were established. From the indigenous viewpoint, humans were not owners of the land but part of it. From the British perspective, the land was claimed by those who occupy and control it. When indigenous people had nothing to offer the colonizers they were marginalized, previously signed treaties were ignored and indigenous people were excluded from new treaties between European (or recently European) powers as they divided the North American territory up between themselves.

At the conclusion of the war of 1812 the British empire had no need for indigenous people's military support in North America and could thus get on with the business of colonizing those areas that were recognized as hers. The goal of colonization was to continue the economic expansion of the empire through the exploitation of the resources of the colonies.[113] As land settlers expanded further into indigenous territories there was further conflict between indigenous people and British government. The 1885 conflict between the Metis and the government is still labeled as the "Northwest Rebellion." This demonstrates that the imperial attitude of the day persists even now. Resource extraction and agriculture became the basis for the Canadian economy and enabled the way of life that is enjoyed by those that Barker refers to as "the Settler People."

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[113]Damien Lee, "Windigo Faces: Environmental Non-Governmental Organizations Serving Canadian Colonialism," *Canadian Journal of Native Studies* 31, no. 2 (12, 2011): 137

The practice of pushing indigenous people out of their traditional areas has continued from that day to this. Indigenous people have been concentrated in "reservations" and through the residential school system the government has perpetrated abuses on entire indigenous communities. As the government puts the emphasis on economic development through resource extraction in general and the Alberta oil sands in particular, indigenous people continue to be marginalized. While governments view the Alberta oil sands as an economic opportunity, as Lee points out, governments have a history of exploiting resources in indigenous peoples' territory.[114] As resources become increasingly scarce, more and more of the indigenous people's Creation will be forever changed and any Environmental Knowledge currently held will become useless due to the speed with which the environment is being forever altered. The Alberta oil sands and their attendant environmental impacts are crushing the indigenous culture and thus the people themselves. The relationship, however, between indigenous people and the environment has been recognized by governments and they are taking measures to ensure that indigenous people are consulted on resource extraction activities that impact indigenous people. However, Lee asserts that this is further assimilation of indigenous people through colonization.

Lee suggests that governments must begin negotiating on resource extraction with indigenous people as equals with the right to self-determination, rather than as paternalistic colonizers. Extracting resources, in his view, is colonizing the land which is therefore colonization of indigenous people. He further argues that any consultation that occurs with current band leadership is illegitimate because the leadership structure was

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[114] *Ibid*.

imposed by the *Indian Act* rather than being an evolution of the traditional hierarchy within an indigenous society. Young takes this further by emphasizing that involving Environmental Non-Governmental Organizations in discussions is a method to legitimize consultation and spread the risk of blame in the event of negative environmental outcomes.[115]

The preceding has been an examination of the indigenous consideration of the environment and how they see themselves to be a vital part of it. As fossil fuels become increasingly scarce and the amount of environmental damage increases, extraction companies need to increasingly involve indigenous people in their processes. When governments change regulations and impose processes that enable resource extraction without permitting indigenous people to be involved in a self-determined manner, governments are not just disrespecting the indigenous culture and continuing with colonial practices, they are attacking indigenous people themselves and continuing to repress and marginalize this portion of society that is inappropriate in an advanced, wealthy and educated country.

Curse on the Economy

The previous chapter outlined the significant economic benefits that extracting and using fossil fuels has provided to modern Western societies. The economic gift of

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[115]Nathan J. Young, "Environmental Risk and Populations At Risk: The Constitution of British Columbia's Offshore Oil and Gas Controversy." *BC Studies* no. 141 (Spring 2004): 77.

natural resources, especially fossil fuels, can be a double-edged sword.[116] The boom cycle of resource exploitation has the negative effects of reducing overall productivity, makes it challenging for governments to conduct sound fiscal planning due to fluctuating revenues, decreases ingenuity and technical innovation, and can lead to an increase in social problems such as crime, violence, and drug use. As Anderson points out, the boom results in a flood of population which leads to increased inflation that becomes challenging for non-boom related business to overcome and governments struggle to provide increased services. [117] This situation is most often seen in countries that rely heavily on natural resources for their economic output. In the Canadian context, this situation would be most severely felt at local level. It is unlikely that the pressures felt by population growth in Northern Alberta would have much effect on purchasing power or government services in Ontario. While inflationary pressures are felt locally, there is broader negative impact on the entire economy.

Economies that fail to maintain diversification to focus primarily on the extraction of natural resources for economic growth suffer from a "resource curse" that afflicts entire economies. Sachs and Warren initiated this discussion when they identified that relying heavily on the extraction and exportation of natural resources has restrained rather than stimulated economic growth.[118] This study focused mainly on developing countries with homogenous economies. While growth was restrained in developing countries that

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[116]David Greasley, and Jakob B. Madsen, "Curse and Boon: Natural Resources and Long-Run Growth in Currently Rich Economies," *The Economic Record* 86, no. 274 (September 2010): 322.

[117]Owen, L. Anderson, "Introduction, Avoiding Dutch Disease and Bad Policy Choices," *North Dakota Law Review* 87, no. 4 (December 2001): 476. http://ehis.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=7e322afc-76a6-4d9c-b5ee-ba54b8d8fc9f%40sessionmgr4&vid=12&hid=16

[118]J.D. Sachs, and A.M. Warner, "The Curse of Natural Resources," *European Economic Review* 45, nos. 4-6 (May 2001).

suddenly experience a resource boom, it has been noted by Rajan that these countries do not have the industrial technological base to support the resource exploitation and as such are dependent on large multinational corporations to extract the resources.[119] Additionally, these countries have been historically been less stable and have had weak and possibly corrupt regimes wherein the elites are able to exploit resource based rents for personal and/or political gain.[120] As such, Rajan asserts that resources alone are not a curse on an economy, but rather the misuse of the resources by governments and institutions prohibits growth and fails to capitalize on the benefits provided by the resources.

While the traditional resource curse is truly a challenge to nations that are developing an industrial economy and solid institutions, resources can also be a curse to developed nations when the exploitation of resources occurs at the expense of other parts of a diversified economy. Hosein provides a comprehensive discussion of the ills that occur when this situation takes hold of an economy.[121] The key indicator is a slowdown in output from the manufacturing and other industrial sectors as capital investment and labour are transferred to the resource sector. This transfer of human and financial resources results in a number of negative impacts to both the economy and the society in general.

As the industrial sector declines there is a loss of ingenuity and technological innovation. Hosein points out that over the long term it is innovation that leads to

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[119]Sudhir Chella Rajan, "Poor Little Rich Countries: Another Look at the 'Resource Curse,'" *Environmental Politics* 20, no. 5 (September 2001): 621.

[120]*Ibid*.

[121]Roger Hosein, "Booming Mineral Resources and the Imperative of Economic Diversification," *The West Indian Journal of Engineering* 32, nos. 1 & 2 (January 2010).

progress and growth. As intellectual ability and opportunities reduce in the industrial sector the economy fails to grow and this is reflected in the real income per person over time.[122] Moreover, a resource boom causes an increase in the value of the national currency which then further hampers manufacturing and exporting capabilities of the economy as the value of goods produced becomes relatively reduced internationally. This situation, of course, causes a spiral of further decline in the non-resource based sectors of the economy.

Another impact of the resource curse on a developed nation's economy is the instability caused by the boom-bust cycle. This is especially true in a fossil fuel based economy. The world prices of oil are extremely volatile and are effected by the geopolitics, international conflict, and the previously described opaque estimations of world-wide reserves. As prices fluctuate so too do corporate and personal incomes, the value of the national currency, and governmental revenues. When prices fall all of the secondary benefits to the economy, such as in the financial and retail sectors, are impacted as corporate and personal loans perform lower and layoffs result in less disposable income.[123] Moreover, the glut of labour causes wages to fall further causing negative effect on the services sector of the economy.

Governments that rely heavily on natural resources for revenue are thus subject to the fluctuations caused by the boom-bust cycle. Unstable revues make it extremely difficult to conduct accurate fiscal planning. This impacts the ability of a government to consistently support social programmes and longer term government spending which in

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[122] *Ibid.*, 81.
[123] *Ibid.*, 77.

turn have negative impacts to a country's citizens as they are unsure of the long term stability of programmes and capabilities of the government.

Regional examples of the resource curse can be seen throughout Canada. In the Atlantic provinces declines in fish stocks caused great impact because the economies were not well diversified. Newfoundland and Labrador was labelled a "have not" province until they were able to develop fossil fuels within their territory and yet now is suffering reduced revenues due to fluctuating oil prices. New Brunswick is trying to develop natural gas due to declines in the forest industry. In central Canada, manufacturing has declined as economies have contracted. Moreover, there has been a shift of labour from East to West as the resource boom has taken hold. Governments should ensure that economies are broad based and diverse and will be able to support the coming permanency of the bust cycle as fossil fuels are exhausted. The following chapter will identify some areas where government should focus in the long term to maintain a high standard of living as the world transitions away from oil.

CHAPTER 3 – THE SEARCH FOR SOLUTIONS

Previous chapters in this paper have revealed that reliance on fossil fuels provides economic benefits but these benefits come with both costs and risks. What government policy solutions are available in world where fossil fuels will become both expensive and scarce? This chapter will emphasise the main thesis of the paper and argue that reducing our reliance on fossil fuels for electricity generation and agriculture will allow time to adjust the transportation sector and discover alternative technologies. This should be coupled with a rethinking of the relationship between governments and indigenous peoples to permit sustainable resource development and to allow Canada's indigenous people to benefit on their own terms from the prosperity that the rest of Canada has enjoyed over the past two centuries. In assisting indigenous peoples in a culturally sensitive manner to create institutions of responsible government, Canada can develop the governmental capability to assist other nations in a future where energy insecurity can lead to an increased frequency of failing states and governments.

As previously discussed, industrial society has irreversibly changed the earth's climate by burning fossil fuels. Much of the focus of governments is on reducing emissions to limit the impact of the greenhouse effect. Failures of international efforts such as the Kyoto protocol only serve to demonstrate the inability of nations to come together to reduce their emissions. Fossil fuel emissions will reduce of their own accord because there will be less available to burn due to declining world reserves. Moreover, the fuel available will become more expensive resulting in the development of new technology that does not rely on fossil fuel for energy. This chapter will proceed with the

premise that the efforts being invested in reducing greenhouse gas emissions would be better placed in search for strategies to adapt to a warmer world where access to fossil fuels will be the domain of the rich. There is no will to change, and even if there was it is too late. Governments need to proceed with taking a long term approach to adaptation and ensure that western societies can survive the coming fossil fuel scarcity.

The Addiction Solution – Go Nuclear, Go Micro, Go Organic

Fossil fuels are a finite resource. As the population grows worldwide and countries such as India and China, with already huge populations, increase their fossil fuel consumption to enable their development the cost of acquiring these resources will increase. Canada is well positioned in the near term and has the advantage of time to develop well thought out strategies to adjust to a future without oil. Currently two-thirds of Canadian electricity is generated using renewable resources with the preponderance of it coming from hydro-electric power plants. However, because of the low population density in such a large land mass, the economy is heavily reliant on the transportation sector to move goods throughout the country. As prices for fuels refined from non-renewable sources increases it becomes an impediment to economic growth as prices for everything increase. By consuming less fossil fuel in generating electricity and for producing and transporting food, the transportation sector will have the time to adapt to rising prices by developing more efficient uses of transportation resources to support Canadians' standard of living. Two methods to reduce the use of fossil fuels to generate electricity are nuclear energy and micro-generation with renewable sources at the

household or commercial level. The reduction of reliance on fossil fuels to support the food system can be done by encouraging a move away from large factory farms to organic and local farming.

Nuclear Power Generation

Nuclear power is the only option available to the world that is scalable and has the capacity to support the worlds future demand without burning fossil fuels. Nuclear power plants can be large enough to support major urban centers or small enough to provide locomotion to ships and submarines. The technology is well developed and rigorous adherence to safety standards has demonstrated that nuclear power generation can occur without undue risk to populations. Moreover, technological advances are working toward nuclear power without radioactive waste.

Energy from nuclear reactions can be created by two methods: fusion and fission. Nuclear fusion is the heating of hydrogen to 150 million degrees Celsius to cause the atoms to collide and give off enormous amounts of heat. This is the type of nuclear reaction that occurs within the sun and stars. The challenge, of course, is developing a safe method to heat hydrogen to such an extreme temperature and then be able to control the reaction. While this may sound impossible, James Lovelock notes that it has been successfully accomplished for a couple of seconds.[124] Since this method only creates helium as a by-product and results in an extremely low level of radioactive contamination of the reactor parts, it is seen to be the ideal solution for energy production in a world

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[124]James Lovelock, *The Revenge of Gaia*. (London: Penguin, 2006), 114.

without adequate fossil fuel resources. Governments need to invest in knowledge and technological development to enable advances in this area of science. In the interim, nuclear fission is the preferred solution.

Fission reactors exist in many parts of the world and are a proven and reliable energy source. Canadian governments should invest in developing this technology as an industry. This investment will provide Canada with the scientific and technological knowledge and an industrial base to compete on the world stage with a diversified economy. By shifting the emphasis from a resourced based economy, to an advanced technological society, Canada will be able to avoid the "resource curse." There are, however, some challenges that must be addressed. The three main arguments against using nuclear power are a nuclear accident, proliferation of nuclear weapons, and a disposal of radioactive waste.

The nuclear accident argument is based on fear rather than informed opinion about radiation and nuclear power generation technology. A nuclear accident is indeed a catastrophic event as was evident at Chernobyl and to a lesser extent at Fukushima. However, as Allison points out, much of the suffering experienced by the populations was due to evacuations that weren't required because of overly vigilant radiation exposure regulations.[125] He notes that there are very few deaths with nuclear accidents and that fatalities and prolonged suffering is much more prevalent with other man-made disasters such as the Bophal chemical spill and the Gulf of Mexico oil spill. Lastly, he points out that as knowledge about the effects of nuclear radiation is broadened, the technology becomes more acceptable as fear of the unknown impacts is reduced.

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[125]Wade Allison, "Life and Nuclear Radiation: Chernobyl and Fukushima in Perspective." *European Journal of Risk Regulation* (3/2011): 374.

In addition to a misunderstanding of the impacts of a radioactive accident, the fear of nuclear technology is based on a lack of information about the technological advances in the area of power generation. Nuclear reactors can operate safely if correct oversight and safety regimes are in place and have done so in many jurisdictions for more than half a century.[126] A nuclear accident occurs when the nuclear core overheats and becomes damaged resulting in the escape of radiation. The key to preventing this event is maintaining temperatures within the correct operating range. Many countries have developed nuclear power capability in conjunction with nuclear weapons and as such, have not necessarily developed the technology to operate safely over a long period of time or in the event of unforeseen disaster.[127] Canada, however, has developed a nuclear power generator that is capable of rapid cooling and avoids the use of fuel that can be used for nuclear weapons programs.

The Atomic Energy of Canada Limited's CANDU reactor is a dual loop system which is unlike many of the other nuclear reactors in service around the world. In this type of system radioactive steam is kept separate from the electrical generating system where the majority of the heat is contained. In the event of a problem, the non-radioactive part of the generator can be vented to the atmosphere causing an immediate cool down.[128] Moreover, it has other safety mechanisms in place that ensure the safe operation of the reactor. There has never been an accident at a CANDU reactor. This is in part due to the strict safety regulations in Canada and it has resulted in a design that can could be in high

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[126]Stein, *"Energy Problem…"*, 147.
[127]Allison, *Life and Nuclear Radiation…*, 373.
[128]Canada, Canadian Nuclear Safety Commission, *Comparison of Canadian CANDU Reactors to Japanese BWR Reactors*, accessed 4 April 2013. http://nuclearsafety.gc.ca/eng/mediacentre/updates/2011/japan-earthquake/march-11-2011-japan-earthquake-comparison-candu-and-bwr-reactors.cfm

demand in a future with declining access to fossil fuels. The accident at Chernobyl was due to human error and reactor design errors.[129] While at Fukushima, the boiling water reactor was unable to cool quickly enough to prevent loss of radioactive material.[130] In addition to its safety record and rigorous design, the CANDU reactor relies on a simple fuel source that cannot be used for weapons.

Many nuclear reactors around the world rely on enriched uranium for fuel. This substance can be weaponised and used in the production of nuclear warheads. The CANDU reactor is able to operate effectively without the additional step of enriching uranium. Moreover, it is proving possible to fuel the reactors with fuels other than uranium.[131] These capabilities in the Canadian product put Canada ahead of other jurisdictions in developing the only alternative for fossil fuels for generating the large amounts of electricity necessary to sustain growth in the future.

The environmental problems created by fission nuclear reactors is over estimated but the disposal challenge needs to be addressed. The used fuel emits radiation for decades and must be stored in concrete facilities. However, this is no less damaging to the environment over time than burning fossil fuels. Carbon dioxide persists in the atmosphere for more than a century and will contribute to the greenhouse effect for that period of time. Many of the nuclear waste protests have taken a "not in my backyard" approach based on the aforementioned lack of understanding the risks of long term

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[129] Barbara Goss Levi, "Soviets Asses Cause of Chernobyl Accident," *Physics Today* 39, no 12 (December, 1986): 17. Andy Brazier, "Accident Avoidance," *Loss Prevention Bulletin* 211 (February 2010): 19. http://ehis.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=d06a577f-c5a3-45f6-8bdd-af6c97978627%40sessionmgr10&vid=5&hid=6

[130] Canada, Canadian Nuclear Safety Commission, "*Comparison...*"

[131] Jerry Hopwood, *The New CANDU Energy and Recent Fuel Cycle Initiatives* (speech, World Nuclear Association 37th Annual Symposium, London, United Kingdom, September 13, 2012). http://www.candu.com/site/media/Parent/WNA%20Speech_Hopwood_2012-09_FINAL(1).pdf

storage. Current science indicates that burying waste underground in granite formations would safely store radioactive waste. While this may be the case, further development of storage solutions is required. However, the technological advances in nuclear fusion power generation should negate the requirement for an ever increasing amount of storage. As the technology is developed, only waste from currently in service reactors will need to be disposed of.

There is a further counter to the assertion that nuclear energy has harmful effects on the environment due to the waste produced. Bitumen production uses enormous amounts of electricity to produce the heat and steam necessary to extract it from the ground and to further refine it into a usable end-product. In addition to increasing carbon emissions, this reduces the energy returned on the energy invested and causes the overall cost of developing the Alberta oil sands to develop. Using nuclear power to generate the electricity used to create steam and heat in bitumen production and refining would actually provide a positive effect to the environment while making bitumen production more efficient. Adopting this approach will require governments to take a long term approach, but should this occur Canada will be well established to adapt to a world without fossil fuels.

Micro-Power Generation of Renewable Energy

Enabling micro generation of electricity through solar, wind, and hydro methods at the household level can further reduce the reliance on fossil fuels. Solar and wind generation is difficult to scale due to the need to store excess electricity for use when the

wind is not blowing or the sun not shining.[132] However, on a smaller scale these technologies can be used in combination with existing power grids to reduce the reliance on fossil fuel generated electricity.

Individual home owners and business can, on a voluntary basis, install solar panels and windmills to generate electricity for their own consumption thus reducing the demand for centrally generated power. The challenge of ensuring an adequate supply during low production periods and storing excess electricity on very sunny or windy days is solved by the existing power grid. In times of inadequate supply, power for the customer would be provided by the central grid and during times of excess production the electricity could be sold back to the power utility for a financial credit to the customer.

This scheme would benefit both the customer as an individual or business and society as a whole. A customer that enters into this scheme would be motivated to be much more energy efficient to maximize the amount of power that could be sold back to the central system. This would benefit society by providing the central grid access to inexpensive power than does not rely on fossil fuels. It is inexpensive due to the fact that the raw material is free and that capital and maintenance costs are borne by the customer rather than the utility company. Moreover, this would make more power available to the society at large thus reducing the cost for all.

While this may seem like a fanciful idea, the technology exists and has been implemented in a number of jurisdictions.[133] In 2009 Ontario embarked on process to implement such a system but progress has been slow due to the changing policies and

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[132]Lovelock, *Gaia…*, 104-105.

[133]World Alliance for Decentralized Energy. "Where Can DE Be Used?" Accessed April 4, 2013. http://www.localpower.org/deb_where.html

pricing.[134] Governments should encourage this endeavour as a means of adapting to future fossil fuel shortages and a way to augment the central power distribution regimes currently in place.

Organic Local Farming

Fossil fuels are used by industry to create synthetic fertilizers that greatly increase the yield of farmland. While this allows the concentration of food growing into centralized areas of the world, the heavy use of these chemicals strips the soil of its nutrients damaging its long term arability.[135] This could potentially damage the future ability of the land to continue to support an increase in the population and the food security of future generations.

Western society has been able to support its economic growth through its ability to grow and distribute enough food for everyone. This has been done through the use of fossil fuels to increase yields and to cheaply transport the food around the world. As a method to attenuate the impacts of increasing food costs due to increased fertilizer and transportation costs, governments should implement policies that reward food growth, transportation, and consumption that minimizes the use of fossil fuels. The key way to do this is to facilitate the establishment of family farms close to urban centers that emphasize organic production and distribution.

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[134]Ontario Power Authority. "FIT Program Introduction." Accessed 4 April 2013. http://fit.powerauthority.on.ca/fit-program/introduction; Canada, *Canadian Energy Overview…*, 30.

[135]Stein, *"Energy Problem…"*, 19.

While policies and subsidies can assist in development in this area, there must be a market for organically grown food. Promoting local food movements will assist but the problem of creating a market is much more difficult. Today, a lot of food that is consumed comes out of a box. People do not buy ingredients and combine them to create food, rather they buy the finished end product that was mass produced in a factory and shipped in an square container to maximize the efficient use of space on the means of conveyance.[136] In addition to the convenience of ready-to-eat foods, they are often less expensive than the original ingredients and due to the addition of salt, sugar, and artificial flavours they are more appealing to consumers.[137]

Governments at all levels need to be involved in remedying this. The value of whole foods and the ability to cook must be taught early in life to create it as a habit and common skill within the population. The economic benefit of eating prepared food must be removed. This can be done by taxing food not meeting a certain level of health criteria and transferring the revenue into locally produced fresh foods. Lastly, mandating the use of organically grown ingredients in any prepared food will provide larger markets for organic producers. These methods will assist Canadian society in adjusting to a world with less fossil fuels and more expensive and less prepared food.

The Equality Solution – Indigenous Government Capacity Building

The previous chapter discussed the inseparable link between indigenous peoples' culture and the environment and argued that damage to one is damage to the other.

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[136]Thomas Pawluck, *The End of Food*, (Vancouver: Greystone Books, 2006). 170.
[137]*Ibid*., 32.

Canada's indigenous people have been repressed to the point where many of them are being left behind in a society that espouses equality, understanding, multiculturalism, and tolerance. The damage to the environment perpetuates the centuries long repression of Canada's indigenous people. The current situation facing indigenous people within Canadian society is one of the biggest moral issues facing all Canadians.[138] There is an opportunity for Canadian governments to repair the relationship with indigenous people by empowering them with the responsibility to sustainably develop natural resources thus protecting the environment.

The North American continent has been inhabited by humans for thousands of years. When settlers arrived they found indigenous people organized into separate groups that used the land. Many of these groups were nomadic but some were agrarian or relied on fishing for sustenance. The settlers relied upon the indigenous people for survival in the new wilderness and were able to co-exist on the land with stable relationships. The War of 1812 resulted in a peace that allowed the British colonies in North America to focus on settling the land rather than fighting wars of rebellion against the empire and defending their territory. Until that point, the British approach to relations with the North American indigenous people was on a nation to nation basis in an effort to achieve military alliance and to ensure peaceful coexistence. After the war, there was no longer a need for military alliance and the British embarked on a program of isolation of indigenous people from the land to better settle the land for themselves.[139] This was done

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[138] Gordon Gibson, *A New Look at Canadian Indian Policy: Respect the Collective – Promote the Individual*, (Vancouver: Fraser Institute, 2009), i.

[139] *Ibid.*, 37.

through a series of treaties that separated indigenous people from their land and herded them into small areas called reserves.

When the colonies formed a new nation in 1867, indigenous people were made the responsibility of the federal government and then in 1876 were made legal wards of the state through the *Indian Act*.[140] This act has been the legal basis for repression of an entire race of people for almost 150 years. Indigenous people were assigned to bands and a legal framework was put in place that legislated how the band leadership would interact with the Federal government. They were not treated as individuals but rather as groups. The attempted assimilation of indigenous people continued through the twentieth century through residential schools and failures of the federal government to provide the same levels of basic services to indigenous people living on reserves as the rest of Canadians have come to expect. The result is that many indigenous Canadians are living in substandard condition as wards of the state and if these were not all of one particular race their situation would be met with outrage by the Canadian population.

Canadian law has established the rights of indigenous people recognizing their existence in the country prior to the arrival of European settlers.[141] These rights recognize that should indigenous groups be able to prove that their ancestors occupied territory, they have the right to continue to occupy and enjoy the use of that territory today.[142] It is this concept that forms the basis for the ongoing treaty negotiations that occur today. However, this approach is arrogant and itself perpetuates the repression of indigenous Canadians. European settlers arrived here and isolated indigenous people from their land

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[140]*Ibid.*, 41.

[141]Patrick Macklem, *Indigenous Difference and the Constitution of Canada*, (Toronto: University of Toronto Press, 2001), 76.

[142]*Ibid*.,77.

when they ceased to be of use. Two centuries later the state that arose from the original colonies now requires proof of occupancy prior to granting the descendants, that are now legal wards of the very same state, access to the fruits of the land that is deeply rooted in their culture.

Placing the burden of proof on indigenous people ignores their cultural differences and effectively prevents them from seeking redress in a timely manner which further damages the relationship between them and governments. Indigenous people are of an oral tradition which makes it very difficult or impossible to present documentary evidence in a manner acceptable to Canadian courts. When such evidence is even admitted into court cases, it is afforded little weight because it does not conform with the standards established by the state.[143] This lack of cultural sensitivity and understanding is a barrier to repairing the relationship with indigenous people.

Canadian governments should broaden their perspective in settling the outstanding grievances of indigenous people. Instead of fighting every step of the way to minimize the amount of land and/or compensation provided to aboriginal groups, they should collaborate with indigenous groups with a view to preserving the environment and finding ways to allow indigenous people to self-actualize and gain autonomy. Governments should cease taking a paternalistic approach to discussions and, in a culturally sensitive manner, take a leadership role in representing the "settler nation" in negotiations with the indigenous nations. They should allow indigenous people to choose their own leaders rather than constrain them by the imposition of the leadership framework imposed by the *Indian Act*. Only by acknowledging indigenous people's

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[143] *Ibid*. 89-90

natural right to the land and admitting that settler colonies absconded with the land can the wrongs of the past begin to be remedied.

Having done this, giving indigenous communities the right to develop their lands in a manner similar to a provincial government will accomplish two goals. First it will provide financial resources to the community to enable them to adapt their society to exist on their own terms within the greater Canada. Secondly, it will ensure that the resources are sustainably exploited and done so in manner that does not irreparably harm the environment. Indigenous peoples' connection to the land is culturally based rather than morally based. As such it is stronger than governments who only see the land as means to generate revenues to provide jobs and services.

This is not to suggest that governments simply capitulate in treaty negotiations. That would absolve governments from their responsibility to remedy the current situation. Governments broke indigenous societies and now they have the responsibility to fix them. Canadian society is based on "Peace, Order, and Good Government" which was outlined in the *Constitution Act* of 1867 defining the distribution of legislative powers within the country.[144] Indigenous peoples have the obligation to grow within these ideals if they wish to be treated as equals within Canadian society and governments have the obligation to assist them in achieving this.

It could be argued that giving land rights to indigenous communities is unjust to the people who currently hold those rights and benefit from the resources that are extracted. While there will certainly be a transfer of wealth from those currently using the land to indigenous people, there is little that is unjust about it. If the situation is viewed

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[144]*Constitution Act 1867*, 30 & 31 Vict, c 3, s. 91.

from the position of the relationship between two equal groups of people over a period of time, then surely the granting of property rights to indigenous people is only the first step in correcting the injustices done them. For centuries indigenous people have been robbed of their cultural relevance, oppressed by a government, and made to exist within a legal and administrative system without their consent. Unless they are given the means, the opportunity, and the autonomy to choose their future, governments are continuing the racist and paternalistic policies of the past.

Canadians expect that government institutions are transparent, honest, and impartial. They expect that their tax dollars provide services that are efficient, effective and have value. For the most part, the Canadian public service is viewed with respect as a professional body of bureaucrats that capably runs the public institution of this country. This expertise should be leveraged in mentoring first nations to establish their own institutions with the ability to professionally administer their communities. This will allow them to be self-determining and effectively manage their public resources and deliver services to their communities. The Canadian School of Public Service should lead the development of training programmes, with the full involvement of indigenous peoples, that are customized for the communities' requirements. This will assure all Canadians that the tax dollars expended on addressing the plight of indigenous people are not being wasted and that the solutions will be durable over time. Only by resetting the relationship between Canadian governments and indigenous people can all Canadians equitably move forward together with a sense of national pride and cohesion.

The Economic Solution – Access to Global Markets and A Diversified Economy

Exporting goods accounts for almost fifty percent of Canadian gross domestic product and because of this reliance on foreign trade Canada requires access to global markets to maintain economic prosperity and its standard of living. [145] The world can expect to experience an increase in security instability in the future resulting from the reduction in availability of fossil fuels for energy.[146] This will only continue the requirement for peacekeeping and peace enforcement activities by the Western world. It is in Canada's interest to maintain a politically stable trading environment to ensure that its corporations can do business freely throughout the world and that exports have access to secure and stable markets.

Canada's largest trading partner is the United States and this relationship accounts for nearly eighty percent of all of Canada's foreign exports.[147] Future growth for both nations will require access to emerging markets and ensuring stability across the globe. In addition to relying on America for economic security, Canada also relies heavily on the United States for physical security. Sharing a continent and jointly defending it though the North American Aerospace Defence Agreement ensures that Canada is able to maintain a relatively small standing armed force for the size of its country. The United States has the most capable and well-funded military in the world and as such, in a future of increasing security threats, Canada need not place a great emphasis on military might.

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[145]Trading Economics. Canada Exports. Accessed 11 March 2013. http://www.tradingeconomics.com/canada/exports

[146]Elhefnawy, *The Impending Oil Shock*…, 49.

[147]Canada, Canada-US Relations – A Unique and Vital Relationship, accessed 18 Feb 2013. http://www.canadainternational.gc.ca/san_diego/bilateral_relations_bilaterales/welcome-bienvenue.aspx?lang=eng&view=d

There is, however, an opportunity for Canada to make substantial commitments to its allies in the domain of international security.

Recent military actions in Iraq and Afghanistan have demonstrated that Western nations have overwhelming military capability and when working together can defeat any adversary. However, these same conflicts have demonstrated that Western nations do not have the ability to move from conflict to lasting peace. As Cordesman points out, Western nations have failed to learn from thousands of years of warfare and have yet to develop the capacity to rebuild the governmental institutions following conflict.[148] An end to military action in Iraq in 2003 led to the dismantling of the Iraq state apparatus and through a number incorrect assumptions and a lack of coordinated interagency action at the government level, a violent insurgency quickly developed.[149] Currently Canada has no claim to be any more effective at offering a coordinated response between multiple government agencies. It does, however, have the perfect opportunity to develop the nation-building ability that will be crucial to world security in the future.

Canada is well respected internationally and has historically been held in high regard as an honest broker with a reputation for being able to settle disputes peacefully. In the future it will have the ability to expand this reputation because it will have more international influence due to the huge fossil fuel reserves that it holds and its status as an oil exporter.[150] By assisting Canada's indigenous people to develop their own institutions, Canada can leverage this opportunity to develop the specialization required to assist its

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[148]Anthony H Cordesman, *Iraq and Conflict Termination: The Road to Guerilla War?,* (Washington, DC: Centre for Strategic and International Studies, 2003), 23.

[149] William Flavin, "Planning for Conflict Termination and Post-Conflict Success," *Parameters* 33, no 3 (Autumn, 2003): 100

[150]Elhefnawy, *The Impending Oil Shock*…, 43.

allies in post-conflict nation building. This will provide a valuable contribution to Canada's military alliances without the expense of increasing military spending. Rather than providing military capability, Canada can contribute its expertise in developing Peace, Order and Good Government and spread Canadian values throughout the world. Moreover, this will not only maintain the international security required for the economic prosperity of a trading nation, but will give Canadian businesses an opportunity to be in on the ground floor as newly repaired nations begin to grow their economy.

An argument could be made that the requirement for Canada's government to focus on developing governance capability and capacity in indigenous communities and reducing reliance on fossil fuels would have a crippling impact on the economy. For this to be true, then the argument must hold that Canada's economy is too homogenous to avoid recession without fossil fuel exploitation. The reverse of this is the previously discussed resource curse where over reliance on the resource sector can also harm the economy. So how can Canadian governments continue to grow the economy in a world without fossil fuels? This paper has already provided the answer.

Canada must increase its investment in science and technology as a means to develop a nuclear power capability. With this investment will come increased innovation and economic opportunity. A future expertise in a safe nuclear technology that cannot be used to develop nuclear weapons will complement the Canada's nation building expertise. In a world without affordable fossil fuels, the country that can offer solutions that enable economic and societal development will easily prosper. By offering the ability to assist in building governance and also exporting nuclear technology around the world will ensure Canada's economic future. Canada has the opportunity to set policies in place

to enable it to transition to a future economic and security environment where affordable fossil fuels do not exist. Without this broad based approach, Canada will soon deplete itself of its natural resources and without a diversified technologically capable economy will find itself in the same situation as other nations that are not energy self-sufficient.

The Culmination – A Secure and Vibrant Canada

This chapter has outlined general governmental policies that will ensure Canada's security and economic prosperity over the coming decades. Future generations will not have the ability to sustain economic growth because there will not be access to cheap energy in the form of fossil fuels . Canada has the opportunity to effectively transition its economy in preparation for the future due to its current energy independence. By developing nuclear power generation technology and promoting organically grown food it will be able to reduce its reliance on environmentally damaging unconventional forms of fossil fuels. By empowering indigenous communities and allowing them to benefit from their resources, sustainable development will be enabled. By assisting these communities Canadian governments themselves can develop a nation building capability and capacity to assist its allies in maintaining international security which will ensure open markets for Canadian goods and services. Canadian governments must begin by taking a longer term approach to leading the country to avoid economic hardships that are sure to arise when the world runs out of cheap fuel.

CONCLUSION

Canadian governments need to shift the focus from developing fossil fuels for economic growth and energy production and emphasize the development of nuclear power for energy while relying on Canada's indigenous peoples to sustainably develop natural resources to protect the environment. By reducing reliance on fossil fuels throughout Canadian society and by transferring the responsibility for natural resource development to Canada's indigenous peoples, governments can protect the environment, enable a diversified economy and develop a governmental capability to contribute to nation building efforts in a future with increased instability due to the waning availability of affordable fossil fuels.

Fossil fuels have enabled the western way of life to the point where advanced societies are entirely dependent on inexpensive energy for their standard of living. Fossil fuels are a finite resource and population growth over the coming century will see the cost of energy rise dramatically. Governments have policy options to avoid the negative economic and societal impacts of unaffordable energy. Investing in nuclear power generating technology will improve the technological and industrial base of the country. Enabling micro-generation of power as an adjunct to centrally distributed electricity will further reduce the reliance on fossil fuels. Encouraging local and organic agriculture practices will ensure the safety and affordability of the food supply by reducing the amount of fuel and synthetic fertilizers used in producing and distributing food to the nation.

These policies will begin to address Canada's reliance on fossil fuels, but adopting sustainable development of current fuel deposits is required to protect the environment for future generation. Canada's governments can repair the centuries old colonizing relationship with indigenous people by empowering them with the responsibility for the sustainable development of the Alberta oil sands and shale natural gas deposits. Through culturally sensitive practices and mentoring of indigenous people, the Canadian government can correct the wrongs done over two centuries of colonization and repression. By doing so, governments ensure the future security of all Canadians.

As the world runs out of cheap energy provided by abundant sources of fossil fuels there will be an increasing amount of instability across the world. By developing the ability to re-build the governmental administration and institutions, Canada can provide much need expertise to its allies without the increasing military expenditures and ensure that foreign markets remain accessible.

The presented policy solutions are general in nature and would require concerted effort by many levels of government with a long term view to ensure success. A general discourse on the future of Canadian society is necessary and taking for granted the current state of fossil fuel abundance will not enable the wellbeing of Canadians for the coming decades. Governments must start thinking now about where Canada sits in the world and how best to prosper from the likely future energy and economic environment.

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