ALBERTA'S NATURAL RESOURCES: TODAY'S WEALTH FOR FUTURE GENERATIONS

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Abstract

This study examines how Alberta can use its non-renewable resource wealth to attain sustainable economic growth for the benefit of future generations. Alberta's large natural resource abundance has allowed it to enjoy strong economic prosperity. Unfortunately, current government policies don't ensure that future generations will also be able to benefit from this resource wealth. This study compares the government policies of Norway, Chile, Botswana and Alaska in order to identify best practices in sustainable non-renewable resource management. The best practices identified include the collection of resource rent, government involvement in the extraction of resources, systematic allocation of resource revenues in a long-term fund governed by legislation, transparent and accountable use of resource revenue and investment in human and natural capital. I recommend Alberta invest 50% of resource revenues into the Alberta Heritage Savings Trust Fund and use the investment income to fund programs targeted at increasing human and natural capital.

Keywords: Economic Sustainability; Resource curse; Non-renewable resource management

Subject: Alberta; Non-renewable resources; Sustainability

Executive Summary

In recent years, Alberta has been able to attain large economic growth by extracting its non-renewable resources; however, Alberta's strategy is not sustainable. The province is not compensating for the depletion of its natural resources by investing in physical, human or natural capital. As a result, once the non-renewable resources are exhausted, future generations of Albertans will not be able to benefit from Alberta's large resource wealth. This study consists of an in-depth examination of sustainable policies in place in non-renewable resource dependent jurisdictions. The goal of this research is to identify policies that Alberta can implement to ensure its economy is sustainable and that future generations can also benefit from Alberta's resource wealth.

Results

There are a number of important findings derived from the case study analysis. These include:

- Collection of resource rent
- Government involvement in the extraction of resources
- Investment of resource revenues in a long-term fund
- Strict rules on fund investment and withdrawal
- Use of resource revenues to invest in other types of capital
- Limited use of resource revenues to finance the budget
- Investment in human and natural capital

Policy Recommendation

The policies developed in this study solely focus on the use of resource revenues. Four policy alternatives are developed and they are evaluated against a set of predetermined criteria. The policy I recommend is for Alberta to invest 50% of its resource revenues in a long-term fund such as the Alberta Heritage Savings Trust Fund. The investment income coming from the fund should be used to fund programs targeted at increasing human and natural capital.

Dedication

To my wonderful parents, Ted and Irena. Your support and belief in me made this all possible. Dziekuje wam za wszystko!

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I would also like to thank my family and friends. Thank you Andrea and James for putting up with me the last two years and for forcing me to see the light of day. Thank you to Helen and the Placewicz family for doing all you cold to make sure I stayed happy and healthy. Finally thank you to all the amazing people in the MPP program.

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1: Introduction

Alberta's large oil and gas deposits have allowed the province to achieve above average economic growth, record low unemployment rates and large government revenues. It is clear that the extraction of non-renewable resources has been key in shaping Alberta and the province would be a different place without them. However, the Government of Alberta's current policies do not secure Albertan's high standard of living for the future. Albertans have been enjoying Alberta's resource wealth and leaving little behind for future generations.

The theory of weak sustainability states that in order for an economy to be sustainable in the long run, it must keep its stock of physical, human and capital at least constant. This has not been the case in Alberta. Since the early 1980s, Alberta has been rapidly depleting its non-renewable energy resources. Currently, it has less than half of its 1983 crude oil reserves left. The extraction and use of these energy resources, has had large damage to its environment. In 2007, Alberta was responsible for one third of Canada's carbon emissions. In addition, Alberta's human capital formation has been below average with Alberta's university enrolment rates being among Canada's lowest. This is not a sustainable path for Alberta's future.

This study addresses the fact that Alberta is not utilizing its resource wealth in an economically sustainable way and aims to identify ways that Alberta can transform its natural resources into long-term economic growth. This is done by performing a case study analysis of other natural resource abundant economies that have been identified as sustainable economies, specifically Norway, Botswana, Chile and Alaska. The study focuses on the use of resource revenues and the findings show that in order to ensure long-term prosperity, Alberta must

systematically invest its resource revenues in the Alberta Heritage Savings Trust Fund and invest in human and natural capital.

This study begins with an overview of Alberta and its non-renewable resources and then explains non-renewable energy management and sustainability. The analysis section follows with an overview of the methodology used and the research findings. A set of evaluatory criteria and measures is then established. Following, a set of policy options are identified and evaluated against the criteria .

2: Policy Problem:

The policy problem for this study is that Alberta is not utilizing its natural resource wealth in an economically sustainable way. Alberta is fuelling its current economic growth by extracting non-renewable resources but it is not replacing them with other types of capital. Alberta's natural stock is declining with the depletion of non-renewable resources and the environmental degradation due to extraction. Although Alberta is dedicating funding to education Alberta's university participation rates remain very low. This will have serious repercussions on future generations when non-renewable resource stocks run out. Alberta's resource wealth belongs to all Albertans, including current and future generations. By using up non-renewable resources and not investing in other types capital, Albertans are enjoying the provinces wealth today and leaving little behind for future generations.

The stakeholders affected by Alberta's lack of a sustainable policy for its resource wealth include:

- The Alberta Government – The Government of Alberta has a vested interest in long-term economic success. Natural resource revenues currently contribute a large share of government revenue and the province's success relies on non-renewable resources. Without sustainable strategies in place, the government will be in a tough position when it can no longer rely on natural resource wealth.
- Alberta citizens (present and future generations) – the high standard of living Albertans enjoy is closely linked to non-renewable resources. Without sustainable policies in place, once these resources are exhausted Albertans will be face a difficult reality which will include job losses, program cuts and tax increases. In addition, future generations have

much to gain or lose from the policies the Alberta government puts in place today. This will determine whether future generations will also be able to enjoy economic well being and stability.

3: Alberta and Non-Renewable Energy

Alberta contains one of the largest concentrations of energy resources in the world, which has allowed Albertans to enjoy large incomes and comfortable lives. Alberta's non-renewable energy resources are comprised of three different types of fossil fuels: coal, natural gas and oil, which consists of conventional oil and the oil sands (for a detailed description see Table 1). Alberta is generously endowed with all three of these types of fossil fuels; however, because of its large overall share, oil is the province's most important non-renewable resource. Alberta contains one of the largest concentrations of oil in the world, ranking second only after Saudi Arabia. The province's total oil reserves account for approximately 13% of total global oil reserves and over 99% of these reserves are found in Alberta's oil sands (Government of Alberta, 2009e).

Table 1: Non-Renewable Energy Resources in Alberta

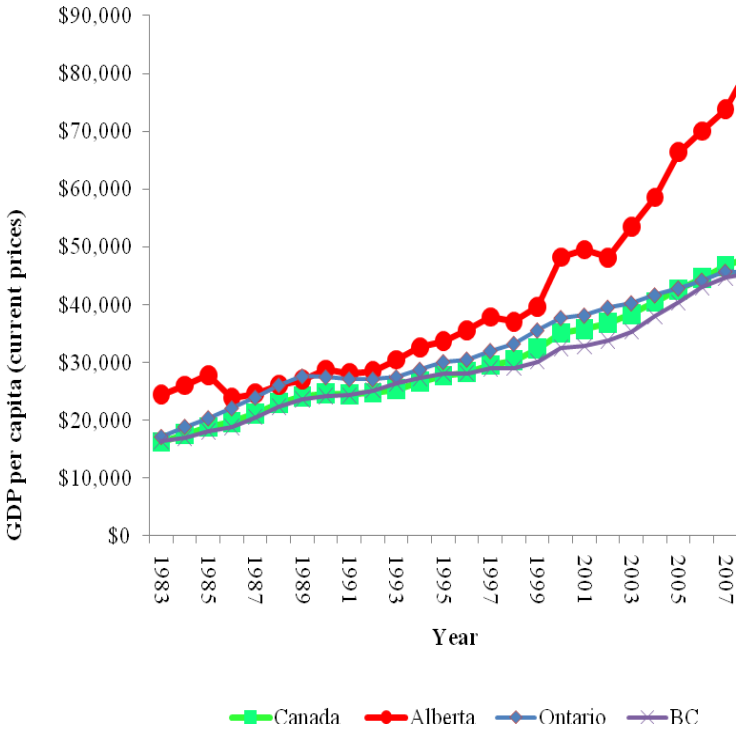
Type	Description	Alberta's Reserves[1]
Coal	Coal is the most abundant fossil fuel in the word and is commonly used to generate electricity.	34 billion tonnes
Natural Gas	A mixture of gases found in oil deposits or in coal beds. It is used to heat homes and generate electricity.	39 trillion cubic feet
Conventional Oil	It is commonly used for transportation fuels such as diesel and gasoline.	1.5 billion barrels
Oil Sands	A heavy oil that is more difficult to extract than conventional oil. It is usually used for transportation fuels such as diesel and gasoline.	170.4 billion barrels

[1] A reserve is the portion of a resource that is economically exploitable. The size of the reserve is constantly changing because resources are used up, new resources are discovered and market conditions and technological advances change the feasibility of resource exploitation (Jaccard, n.d.).

Sources: Heritage Community Foundation (2002) and Government of Alberta (2009e)

Alberta's vast resource endowment has allowed the province to become Canada's most economically successful province. As seen in Figure 1, over the last 25 years Alberta's GDP per capita has consistently been higher than Canada's average. During this time, Alberta's GDP per capita has also been higher than BC and Ontario, which are among Canada's most economically successful provinces. In the last 6 years, Alberta's GDP per capita has grown much faster than that of the rest of Canada. Between 2003 and 2008, Alberta's GDP per capita grew at an average rate of 12% per year, which is double Canada's average of 6%. In 2008, Alberta's GDP was $81,352 which is over one and half times larger than that of Canada ($48,105).

Figure 1: Alberta and Canada GDP per capita: 1983 - 2008

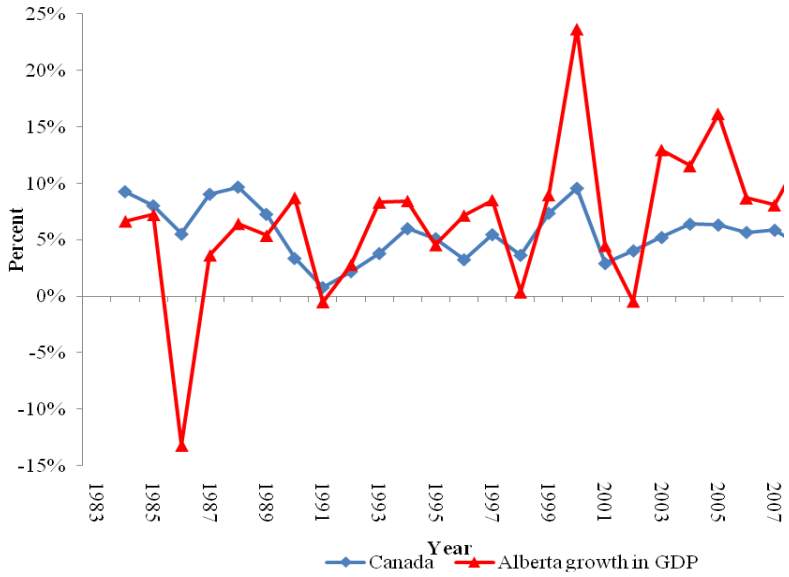


Source: Statistics Canada (various years)

While, overall Alberta's economic performance has remained robust, it has also been very volatile. Figure 2 shows the change in GDP in both Canada and Alberta from 1984 – 2008. Compared to Canada's GDP growth, Alberta's growth shows much wider variations. Between

1983 and 2008, Canada's highest economic growth reached 10% and its lowest was 1%. Over the same period, Alberta's highest economic growth was 24% while its lowest was -13%. Although Canada's economic growth didn't reach levels as high as Alberta, it also didn't have such extreme lows. The variance for Canada's economic growth was 0.0005, while Alberta's was 0.004. This means that Alberta's growth was much further dispersed from its average than Canada, and thus much more volatile. Specifically, Alberta experienced much more variability in the 1998 to 2003 period , where one year GDP increased by nearly 15 percentage points and the next year it dropped by 20 percentage points. This is prime evidence of the boom and bust nature of Alberta's economy.

Figure 2: Change in GDP, Alberta and Canada: 1984 – 2008

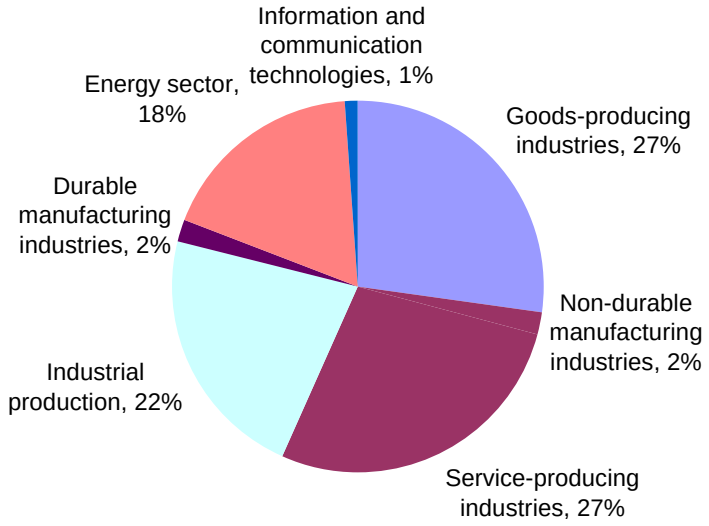


Source: Statistics Canada (various years)

One of the main reasons for Alberta's volatile economic growth is that its economy relies greatly on the fossil fuel sector and it is highly susceptible to changes in energy prices. The energy sector contributed 18% to Alberta's 2006 GDP (Figure 3). This is large when compared

to other provinces.[1] The energy industry only accounted for 2% of Ontario's GDP, 15% of Saskatchewan's and 5% of British Columbia's (Statistics Canada, various years). However, only looking at this measure does not accurately account for the total impact that fossil fuels have on the Alberta economy. The oil and gas sector also has indirect impacts, such as the creation of spin-off industries in construction and financial services that support the sector. Using an input-output model, which traces the flow of goods and services among industries, Mansell and Schlenker (2006) estimate that the cumulative impacts of the oil and gas industry were 1.3 trillion in GDP over the 1971-2004 period. They also estimate that without the oil and gas sector Alberta's economy would be 42% smaller. It is clear that Alberta's resource abundance plays a large role in its economic prosperity.

Figure 3: Proportion of Alberta GDP by Industry, 2008

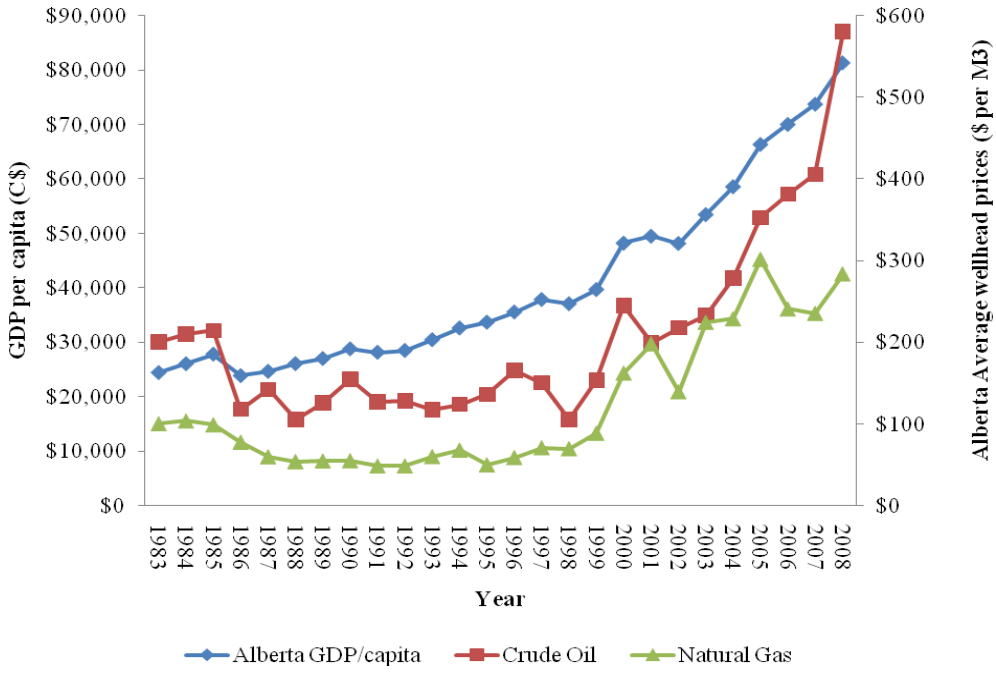


Source: Statistics Canada (various years)

[1] The energy sector is defined in accordance with the North American Industry Classification System and includes: Mining and oil and gas extraction, petroleum and coal products manufacturing and pipeline transportation. It is important to note that using this definition the energy sector is larger than it otherwise would be since it is not limited to extraction.

Considering the importance of non-renewable resources for Alberta's economy it is not surprising to see that changes in oil and gas prices are highly correlated with Alberta's GDP per capita (Figure 4). When average crude oil and natural gas prices started dramatically increasing in 1998, GDP per capita also started to rise.[2] This suggests that changes in the province's economic performance are closely linked to shocks in the petroleum sector over which it has relatively little control.

Figure 4: Oil and Gas Prices and Alberta GDP per capita: 1984 - 2008



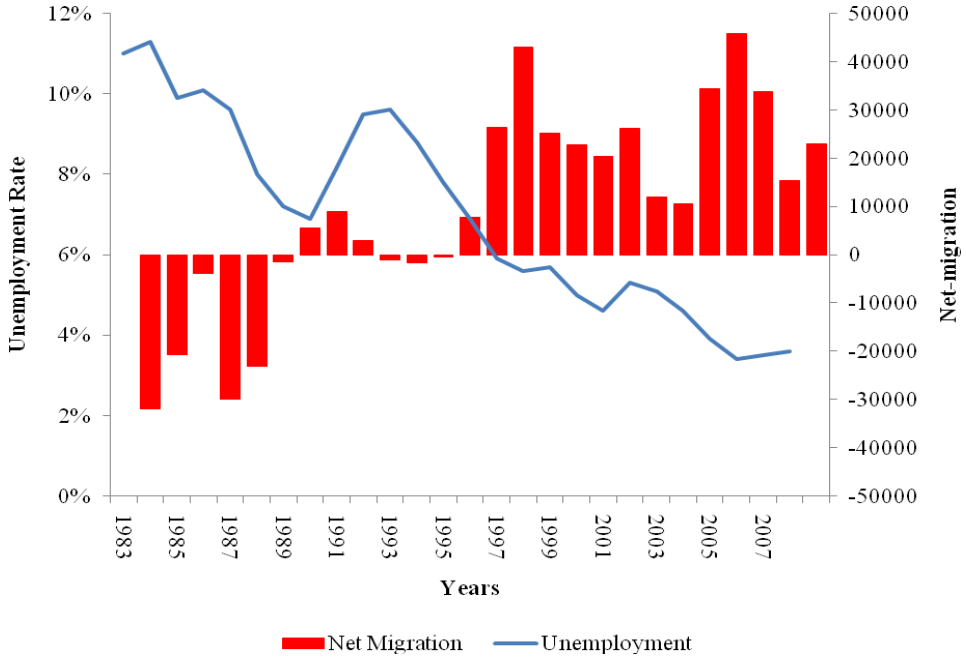
Sources: Statistics Canada (various years) and Canadian Association of Petroleum Producers, (Various Years)

Fossil fuels also have had an impact on the provinces employment. Nearly 1 in 6 jobs in Alberta are related to the oil and gas sector, which contributes approximately $39 billion to the

[2] Alberta's GDP per capita and crude oil prices have a correlation coefficient of 0.89. Alberta GDP per capita and natural gas prices have a correlation of 0.92 suggesting a strong positive relationship between GDP/capita and oil and gas prices.

economy annually (Government of Alberta, 2008). The recent resource boom has resulted in a high demand of labour, which in turn has produced a very low unemployment rate (Figure 5). Alberta's unemployment rate has been consistently lower than the national average and in 2006 it reached a record low of 3.4 %. This has resulted in labour shortages and large in-migration from other provinces and from abroad. Figure 5 shows that Alberta's unemployment rate and net migration are inversely correlated; when the unemployment rate dropped below the 6% mark in 1996, net migration became largely positive.[3]

Figure 5: Alberta Net Interprovincial Migration and Unemployment Rate: 1983 – 2008



Source: Statistics Canada (various years)

[3]Alberta's net migration and the unemployment rate have a correlation coefficient of -0.86. This correlation is close to -1 which suggests that there is a strong negative relationship between migration and the unemployment rate.

To summarize, Alberta's large fossil fuel endowment has made it Canada's most economically successful province in terms of GDP per capita and low unemployment. At the same time, this has made Alberta heavily reliant on the oil and gas sector, which has led to economic volatility due to changes in oil and gas prices.

3.1 Government of Alberta Resource Revenues

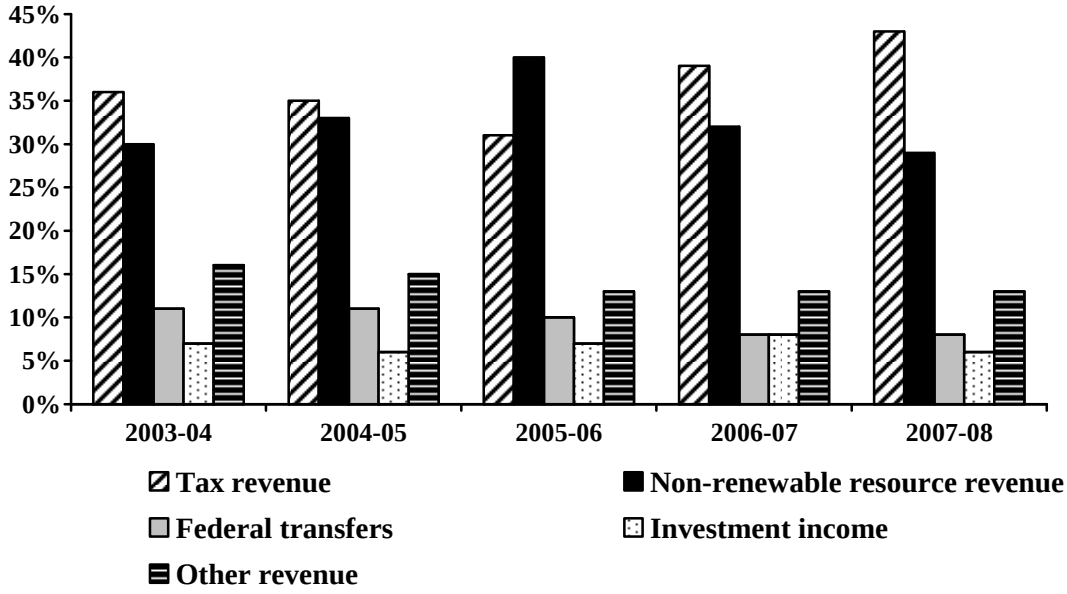
The benefits from Alberta's non-renewable resources are not only limited to the economy as a whole but they also are a great advantage for the Alberta government. It owns 81% of the resource rights of non-renewable energy, which it manages on behalf of Albertans. The rest of the rights are owned by the Government of Canada (2.2%), which it holds in trust for First Nations or in the form of national parks, and by the private sector (8.4%) (Government of Alberta, n.d.a). Within the Government of Alberta, the management and development of natural resources touches a number of government departments but the main responsibility lies with the Department of Energy.

The Government of Alberta charges private corporations for the right to extract natural resources.[4] The money the government collects for the exploitation of natural resources makes up for a very large share of government revenue. Figure 6 provides an overview of the Government of Alberta revenue sources for the period of 2003 to 2008. Non-renewable resource revenue is the government's second largest revenue source after tax revenue.[5] Over the 2003-2005 period, the Government of Alberta collected over $55 billion in resource revenue. On average, non-renewable resource revenue contributes 33% of total government revenue, while tax revenue on average contributes 37%. It is important to note, that the amount of non-renewable resource revenue included in this figure does not include any of the corporate taxes paid by oil and gas companies or freehold mineral rights taxes. As a result, if these taxes were included in non-

[4] These charges are discussed in more detail in section 4.2. .
[5] Non-renewable resource revenue consists of royalties, bonuses bids and rental fees.

renewable resource revenue it is likely that this would be the government's largest source of income.

Figure 6: Alberta Government Revenues: 2003 - 2008



Source: Government of Alberta (Various Years)

In summary, the petroleum industry has allowed Alberta to achieve above average economic growth, record low unemployment rates and has been a large source of government revenue. At the same time, it has made Alberta's economy volatile and susceptible to factors that it has little control over. It is clear that the extraction of non-renewable resources has been a key factor in shaping Alberta and that the province would be a different place without them. As a result, it is important for Alberta to maintain its resource wealth while at the same time reaping the benefits of resource extraction. The following two sections address the challenges of natural resource management and assess whether Alberta's current strategy is sustainable.

4: Managing Natural Resources

This section provides an overview of the issues and challenges of managing an abundance of natural resources.

4.1 The Resource Curse

Many countries in the world that have an abundance of natural resources have not been able to transform it into long-term economic wealth. In fact, these countries often under perform in terms of economic development and governance when compared to resource deficient countries (Auty, 2001; Humphreys et al., 2007). This phenomenon is known as the resource curse.[6]

Generally, the resource curse is associated with developing countries; however, it is possible, that resource rich, developed economies can suffer from adverse effects associated with the resource curse. This section provides a brief overview of some of the aspects of the resource curse and its negative impacts.

4.1.1 Dutch Disease

One of the most widely discussed manifestations of the resource curse is the *Dutch Disease*. The name *Dutch Disease* was first coined by The Economist (1977) when referring to the discovery of natural gas in the North Sea and its adverse effect on Dutch manufacturing. The *Dutch Disease* phenomenon refers to a situation where a boom in one industry negatively affects another industry. This may have a number of negative repercussions for the economy as a whole such as the loss of a historically important industry, job losses and a lack of economic

[6] Unless otherwise cited, the information in this section regarding the resource curse is based on Humphreys et al. (2007).

diversification. The *Dutch Disease* can occur in two ways: 1) the spending effect and 2) the resource pull effect.

1) The spending effect is caused by increased global demand for a country's natural resources. This can be because of a major discovery or a dramatic price change. These resources are then sold abroad which results in an inflow of foreign currency and an appreciation of the domestic currency. This appreciation makes other exports less competitive because it increases their relative price on the global market. In addition, the increased amount of money flowing to the resource sector can result in excess demand in the domestic economy, which can lead to higher prices for factors of production, such as labour, and thus contributing to higher rates of inflation in an economy. The increased costs of production may be difficult for non-resource industries to absorb.

2) The resource pull effect occurs because labour and materials are pulled away from the manufacturing sector to the natural resource sector and non-tradable sectors, such as construction or retail. Specifically, a resource boom leads to increased production in the natural resource sector, which increases demand for labour and produces higher wages in this sector. The higher wages attract workers from the manufacturing sector to the natural resource sector. In addition, because the inflow of resource money is spent on goods and services in the economy, the non-tradable sector also experiences a boom, which increases the demand for labour and yields higher wages in this sector. As a result, labour is also drawn away from the manufacturing sector to the non-tradable sector.

Overall, the extraction of natural resources results in a series of consequences, which favour the natural resource industry and the non-tradable sector but harm traditional export industries. Past empirical evidence suggests that booms in a non-renewable energy sector systematically tend to hurt manufacturing exports of countries abundant in energy. Stijns (2003) finds that a one percent increase in a country's total energy exports will result in a .08 percent

decrease in a country's manufacturing exports, everything else held constant. Econometric analysis shows that Alberta's recent resource boom played a significant role in the appreciation of the Canadian dollar, which in turn negatively affected Canada's manufacturing sector. Bergevin (2006) and Dupuis et al. (2006) find that the relatively high value of the Canadian dollar and high unemployment in the manufacturing sector suggest that Canada appears to have symptoms of the *Dutch Disease*. However, they both conclude by stating that although there have been losses in the Canadian manufacturing sector, overall Canada's economy remains strong. Because Alberta does not have a fully developed manufacturing sector, most of the negative aspects have affected other parts of Canada. As a result, this is not as a serious issue for the province of Alberta, rather one for the rest of Canada.

In summary, by negatively affecting traditional exporting sectors, *Dutch Disease* leads to deindustrialization. This in turn, makes an economy more reliant on the resource sector and is thus more exposed to fluctuations in world energy prices and external shocks. In other words, as a region become less economically diverse it becomes more sensitive to boom and bust cycles. In addition, the decline of a long established industry can lead to many job losses and economic disparities.

4.1.2 Revenue Volatility

Another issue that may result in a resource abundant country's inability to achieve long-term economic prosperity is revenue volatility.[7] Government resource revenues are largely reliant on commodity prices, which can vary drastically from year to year. These variations create problems in a government's ability to make long-term plans due to the uncertainty of future income.

[7] Unless otherwise cited, the information in this section comes from Humphreys et al. (2007).

It can also lead to government overspending and large deficits. Due to changes in commodity prices and other factors affecting the natural resource sector, it is difficult for governments to predict the exact amount of resource revenue that they will receive. As a result, when factors are favourable, the government receives extra resource revenue that has not been budgeted for. Governments may then be inclined to spend this money on new projects or programs thereby committing government finances. This may become problematic when commodity prices drop and the government no longer has the additional income because governments have committed to funding additional projects based on large resource revenues. When governments no longer receive large revenues it may become difficult for them to balance their budget which may result in a deficit or budget cuts.

As seen earlier in Figure 6, Alberta depends largely on its resource revenues but these revenues can vary greatly from year to year. The Alberta government collected $7.7 billion in resource revenues (30% of total government income) in 2003-04 and $14.3 billion (40% of total government income) in 2005-06. In 2007-08, Alberta's resource revenues dropped to $11 billion (29% of total government income). In a span of 3 years, Alberta's revenues nearly doubled and then fell by more than $3 billion. As a result, it is difficult for the government to forecast the amount of resource revenues it will collect yearly. Alberta's inability to manage the volatility of its resource revenues has been especially noticeable during the recent economic recession, with Alberta incurring a much larger deficit than anticipated. This has been attributed to inflated government spending and over reliance on non-renewable resource revenues (Henning, 2007; Boessenkool, 2010; Milke, 2006)

4.1.3 Weak Unaccountable States and Transparency

Humphrey et al. (2007) argue that another factor contributing to the resource curse is that resource rich states are paradoxically more likely to be less accountable than states lacking in

natural resources. Specifically, resource abundance can lead to weak ties between citizens and the government, which can lead to a lack of transparency and mismanagement of resource revenues.

Resource rich governments tend not to tax citizens heavily because they are able to generate income from natural resources. As a result, because citizens are not paying much taxes, they may feel like they are not directly contributing to government income and may feel disconnected with the government. Because of the weakened ties between the public and its government, citizens may be less inclined to demand accountability and prudent government spending of resource revenues. This may lead to a lack of transparency about revenue management spending, which can result in mismanagement of natural resources themselves. In addition, because governments are collecting a large share of income from the resource sector, they may believe that it is more important for them to be accountable to resource companies than to the citizens.

Nevertheless, natural resources belong to the citizens and therefore, citizens are entitled to voice concerns regarding their management. Moss and Young (2009) find that extractive economies that have successfully avoided the resource curse are those in which citizens are able to hold their governments accountable. They argue that in order for this to happen, an influential constituency that has a stake in the responsible management of resources and the means to hold government accountable must exist. This often consists of providing citizens with a vested interest in the prudent management of resources. Alaska's annual dividend cheque is a prime example of this. The money that Alaska collects from the extraction of natural resources is invested in a long-term fund. The investment income from this fund is used to provide Alaskan's with an annual cheque. This cheque has become an important income source for Alaskans and as a result, citizens demand that the government manage its natural resources prudently to ensure Alaskan's receive their cheque. Failure to do so could result in a government losing popularity or votes.

4.2 Managing Resource Revenue

Earlier sections made reference to government resource revenues, this section explains in detail why resource revenues are collected, what should be done with them and how Alberta collects and manages its resource revenues.

4.2.1 Resource Rent

Governments in resource abundant economies generally collect money from companies involved in the extraction of natural resource in addition to general taxes such as corporate taxes or sales taxes. The government charges these companies more for two main reasons: first, it is possible to collect any excess profit from resources without leading to economic inefficiencies and second, natural resources belong to the citizens and it is only fair that the rewards from using these resources should accrue to their owners (Boadway and Flatters, 1993).

The first reason for collecting excess profit is based on the concept of economic rent. Economic rent is defined as payments that are received for a product which are in excess of the minimum cost of producing it.[8] Economic rent is generally available in industries where there is limited free market competition. This can occur because there are barriers to entry, such as high start up costs or fixed factors of production. In the oil industry, the initial start up costs are large and they require huge investments in machinery and infrastructure. This stops many firms from being able to enter and compete in this market. In addition, governments often limit entry by requiring that firms purchase extraction licenses. Generally, there is only a set amount of licenses available per year which tend to go to the highest bidder. As a result, due to the lack of competition, firms can then sell products for more than the cost of production. In these cases, economic rent refers to the difference between the price at which a product can be sold and the

[8] Unless otherwise cited, the information regarding economic rent is from Stiglitz and Boadway (1994) and Varian (1996).

cost of producing it. For example, if it costs a company $1 to produce a barrel of oil, any price over $1 is economic rent.

It is important to note that in the case of economic rent the costs of producing a good or service includes a normal return for the company. For example, the costs associated with the production of oil include exploration costs, extraction costs, the cost of processing the oil and a normal profit for the company. Therefore, economic rent can be seen as additional profit to the producer above the normal rate of return (Warnock, 2006). Since economic rent is additional profit going to the producers, one of the main arguments of collecting this rent is that there is no loss in allocative efficiency. The firm will make the same choices regarding production even if their rent is smaller (Boadway and Flatters, 1993). As a result, taxing economic rent does not create economic distortion and allows the government to capture some of the excess profit.

Another reason as to why natural resource industries are more heavily taxed than others is that natural resources belong to the citizens and as a result, the benefits from exploiting natural resources should go to the citizens. Extractive companies earn surplus profit on exploiting natural resources, this is called resource rent. This rent exists because of the fact that these resources are non-renewable and are depletable. As we use up the resources, there is less available to use tomorrow. By depleting the resources, a company is faced with an opportunity cost, which is leaving the resource in the ground to be extracted at a later date. To account for this opportunity cost the company sets a higher price for the resource, which in turn results as a larger profit for the firm (Hartwick and Olewiler, 1986). This extra profit then accrues to the private sector and not to the owners of the resource, the citizens. The companies are not the owners of these natural resources and as a result, it is unjust for the additional wealth to go to them. Therefore, the government collects this rent on behalf of the citizens through various policy measures such as royalties and land tenure. Once captured, the economic rent can be redistributed to the citizens in a number of ways such as program spending, dividend cheques or tax reductions.

While the concept of economic rent provides a theoretical framework for collecting government resource revenues, in reality, resource rents are very difficult to measure. The amount of economic rent available in oil and gas industries varies because it depends on a number of factors such as the value of the resource and the costs of production (Taylor et al., 2004). Resource rents also can vary depending on the size, concentration and quality of the oil field. They are also affected by the market price of oil and any political and technical risk associated with the company operations (Warnock, 2006). In determining how much resource rent the government can collect, it first must assess all of these factors in order to determine how much rent is actually available.

Furthermore, not only must the government determine how much resource rent is actually available but it must also decide how much of the rent to collect. Although the government may opt to capture all of the resource rent, in practice, governments want to find a balance between rent capture and other goals such as promoting exploration and development and enhancing efficiency. For example, if the government collects all of the resource rent, there is no incentive for companies to become more efficient because all of the benefit goes to the government and not to them (Taylor et al., 2004). In addition, a government may allow corporations to keep more economic rent at earlier stages of production when costs are high and risks are higher. By allowing companies to keep more profit, the government is providing an incentive to develop certain areas where they perhaps would not have if the profits were lower (PricewaterhouseCoopers, 2009). Hence, it is important that royalties and other charges be set at a rate that accurately reimburses citizens but also remains competitive and provides a profit for the developer. Rates that are set too low will give an unfair profit to the developer, while rates that are too high will not accurately reflect the risk and investment required for the endeavour and will result in underinvestment.

4.2.2 Hartwick Rule

In addition to figuring out how much rent to collect from the extraction of natural resources, the government must also decide what to do with this additional revenue. This issue was first examined in the 1970s, at the time of the first oil crisis, by economists who asked what will happen to the standard of living in economies dependent on exhaustible resources when the resources are depleted? (Hamilton, 2001). The so-called "Hartwick rule" states that a constant level of consumption can be achieved if the rents collected from resource extraction are invested in other assets (Hartwick, 1977). In other words, by investing the resource rents a government collects from the depletion of natural resources into other types of capital, such as human capital or physical capital, economies are able to transform their resource wealth into a different form of wealth. By doing so, a country is able to ensure long-term economic growth even though it is depleting its natural resources. This is only the case if assuming a theory of weak sustainability which states that different types of capital can be substituted for one another. This is discussed further in Section 4.2.1.

4.2.3 Alberta Royalty Regime

The Government of Alberta manages the provinces natural resources on behalf of its citizens and charges a number of fees (see Table 2). It allows private corporations to extract natural resources by allotting annual leases. These leases are granted through a competitive auction in a sealed bidding process and the lease is given to the highest bidder. The money received from the bidding is collected by the government in the form of bonus fees. When purchasing these leases, companies must adhere to a set of rules and guidelines, which include paying an annual land rental fee and production royalties on the amount of revenue they make. In Alberta the royalty is similar to a tax and is used as an instrument to charge companies for the extraction of natural resources and to collect resource rent. Table 2 provides an overview of the different ways the Government of Alberta collects resource revenue.

Table 2: Alberta's Oil and Gas Resource Revenue Sources

Type[1]	Description	Rate
Bonus Fees	The Department of Energy leases mineral rights to companies to exploit resources. This occurs through a competitive bid auction, where annual rights are leased to the highest bidder. The bids received are known as bonus fees.	Highest Bidder
Land Rental Fees	A fixed fee of $3.50 per hectare of land is charged for leases.	$3.50/ hectare of land
Production Royalties	A royalty is the price charged to develop the resources of federal government lands. The value of revenue or net revenue is multiplied by the relevant royalty rate to determine the production royalty.	*Conventional oil:* 0%-50% *Oil sands:* 1% - 9% pre-payout 25% - 40% post-payout *Natural Gas* *5%-50%*

[1] Corporate and Property Taxes are not included in this analysis as they are not specific to the natural resource sector.

Sources: Adapted from PricewaterhouseCoopers (2009), Government of Alberta (2009d) and Government of Alberta (2009f).

Royalties are the largest source of government resource revenues (over 80%). Alberta's first royalty regime for oil and natural gas was set in the 1970's. In 1997, a royalty regime specific to the oil sands was introduced to encourage investment and development in this new and risky area. During this time oil sands technology was new and the costs were high and there were not many companies interested in this area. Overtime, the oil sands industry has changed drastically. The technology is more developed and is not as expensive which eliminates some of the original risk involved and the hesitation to invest in this sector. In addition, higher energy prices and lower production costs suggest that there is more economic rent that could be collected by the government. As a result, in an attempt to reflect the new realities of the oil sands, the Alberta Government introduced a new royalty framework in 2009. The new royalty framework had higher royalty rates which were not well received by Alberta's oil and gas industry. Oil and gas corporations believed the new royalty structure to be uncompetitive with other jurisdictions and that the higher royalty rates made many of their current operations no longer feasible. In response to this, after conducting a competitiveness review, in March, 2010 the government

lowered its royalty rates to levels that are similar to those before the new royalty framework was introduced.

Due to a lack of data and limited comparability between jurisdictions it is difficult to accurately estimate the amount of resource rent available for capture. Past studies have attempted to calculate this by examining the amount of oil and gas produced, the cost to produce it and its market value (Taylor et al., 2004). It is estimated that the government of Alberta collects approximately 60 - 70% of resource rent (PricewaterhouseCooper, 2009; Alberta Royalty Review Panel, 2007;). However, these estimates are for the period before the new royalty framework was introduced in 2009 and 2010. As a result, due to the recent changes to the royalty regime, it is difficult to estimate how much resource rent is currently being captured.

4.2.4 Alberta Savings Fund

In 1976, the government of Alberta created the Alberta Heritage Savings Trust Fund (AHSTF) as a way to save for the future and to provide Albertans with a better quality of life.[9] The government originally committed to investing 30% of resource revenues in the AHSTF. In the late 1980s, due to a serious recession, the government reduced the percentage of resource revenues going to the AHSTF to 15%. In 1987, all transfers to the AHSTF fund stopped and resource revenues were directed to general revenues. During this time, resource revenues were used to balance the government budget and to pay off provincial debt. In 2003, after a period of strong economic performance and large resource revenues, through the Fiscal Responsibility Act, the government limited the amount of resource revenues that could be used for general budget spending. In 2006 and 2007, the government transferred some resource revenue to the AHSTF.

The Alberta Heritage Savings Trust Fund Act, which governs the investment of resource revenues in the AHSTF, currently does not stipulate how much the government must invest in the

[9] Unless otherwise cited, the information in this section comes from Boessenkool (2010) and Government of Alberta (2009a).

fund annually. The only requirement for the government surrounding the AHSTF is that it must annually compensate for any losses in fund value due to inflation. As a result, any additional transfers to the fund are made at the discretion of the government. The government is also able to use the income revenue from the AHSTF for general budget spending.

The AHSTF currently amounts to $14 billion and it is comprised of a variety of assets, such as stocks, bonds and real estate. In the past, the money in the AHSTF has been used to create a number of endowments including the Alberta Heritage Medical Research Endowment Fund, the Alberta Heritage Science and Engineering Endowment Fund and the Alberta Heritage Scholarship Fund.

The Alberta Heritage Savings Fund has been ranked as one of the most transparent sovereign wealth funds (Sovereign Wealth Institute, 2009). Although Canada is not a member of the Extractive Industries Transparency Initiative, it has met all of the criteria to be one (Natural Resources Canada, 2009a). The amount of resource revenue collected by Alberta is well documented and published in the annual budget.

In summary, economies that are abundant in natural resources must be cautious of their resource wealth because it can lead to adverse problems such as the *Dutch Disease,* government revenue volatility, budget overspending and weak and unaccountable states. An important part of managing natural resources is the collection and use of resource rent. If it is invested, it ensures that an economy's wealth does not decrease. The Government of Alberta collects resource rent through a number of policy tools such as charging royalties, bonus bids and land leases. The use of this extra government revenue is at the discretion of the government and it is often used to finance budget expenditure. On occasion, the resource revenue is allocated to a long-term savings fund aimed at preserving resource wealth for future generations. In other words, the money coming from the extraction of Alberta's natural resources is annually spent by the government instead of being invested in the AHSTF and saved for future generations. By doing this, current

generations are enjoying the benefits of Alberta's natural resource wealth and leaving little behind for future generations.

5: Sustainable Economic Growth and Alberta

This section provides an overview of the theory of sustainability and I assess the sustainability of Alberta's current policies.

5.1 Sustainability Theory

Sustainability is based on the principle that future generations should be no worse off than present generations.[10] In 1987, the Brundtland Commission produced a report that brought the world's attention to the issue of sustainability and the need to consider resource depletion and environmental damage in achieving economic growth. In their report, the Brundtland Commission (1987, p. 43) defines sustainable development as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs". The difficulty, however, lies in the ability to define precisely what is meant by not "compromising the ability of future generations to meet their own needs". It is impossible to predict what the future will look like and as a result, it is equally difficult to foresee what the needs of the future generation will be and what tradeoffs the current generation should make.

In relation to growth, two concepts of sustainable development have been put forward: weak and strong sustainability. These two concepts provide different approaches to the use of inputs for economic growth.

Weak sustainability assumes the substitutability of different types of capital, such as human capital, natural capital or physical capital. Weak sustainability argues that it is important to maintain constant levels of the total capital stock but the proportion of each type of capital can vary. If one type of capital decreases, it must be compensated by an increase in a different type of

[10] Unless otherwise cited, the information in this section is from Neumayer (1999)

capital so long as the total stock does not decrease. For example, the depletion of natural resources can be substituted with an increase in human capital or man-made capital, such as factories or infrastructure. In other words, a sustainable economy is not necessarily one that conserves everything, but rather, is one that replaces whatever it takes with other types of capital.

Strong sustainability states that natural capital and man-made capital are not substitutable, that is the total amount of capital as well as the total value of natural capital must be held constant. In other words, proponents of strong sustainability argue that we cannot compensate the future generation for the depletion of natural resources and the degradation of the environment with other types of capital. Therefore, current generations must conserve non-renewable resources such as fossil fuels.

The debate between these two paradigms poses a number of ethical dilemmas. By adopting one of these theories, we are in essence deciding on the preferences of future generations. By opting for weak sustainability, we decide what the acceptable limit of capital depletion is. By choosing the theory of strong sustainability we are compromising economic growth for the maintenance of natural capital. As the Nobel laureate Robert Solow (1991, p. 180) argues, “I doubt that I would feel myself better off if I had found the world exactly as the Iroquois left it. It is not clear that one would really want to do that”.

The current structure of our society, which includes meeting basic human needs, requires the depletion of some natural capital. Many technological advances have been made to limit the impact that humans have on the environment and the need to deplete natural resources. There already exist a number of substitutes for non-renewable energy, such as solar, geothermal and hydro power. However, many of these technologies have not been universally adopted across Alberta and non-renewable energy is still in high demand for a number of purposes, such as for fuelling cars. As a result, the current structure of our society, requires the exhaustion of non-renewable resources such as oil and gas. It is therefore, impossible to maintain the exact level of

current natural capital constant in the short run. As a result, for the purpose of this study, I assume that capital is substitutable and I focus on total capital maintenance through substitution by using the measure of adjusted net savings.

5.2 Sustainability and Adjusted Net Savings

Adjusted net savings (also known as genuine savings) is a measure used to evaluate sustainability by incorporating changes in physical, human and natural capital.[11] In national accounting, traditional economic indicators, such as GDP, focus solely on physical capital and labour and do not include other key inputs to sustaining economic growth, such as natural capital. Adjusted net savings (ANS) is defined as:

$$ANS = GS – CFC + E – (NRG + M + F + A)$$

It is gross savings (GS) minus consumption of fixed capital (CFC) plus government expenditure on education (E) which is investment in human capital. Then, depletion of natural capital is subtracted from it. It is measured as energy depletion (NRG) plus mineral depletion (M), plus forest depletion (F) plus air pollution (A).

Using this formula, economic growth is only sustainable over time as long as it is able to maintain its total capital stock constant, i.e. as long as ANS is positive. If the adjusted net savings is negative, total wealth is decreasing and economic growth is unsustainable.

5.3 Alberta and Capital Maintenance

In assessing sustainability in extractive economies, it is important to identify how resource wealth is transformed into other types of capital and whether economic growth is in fact sustainable or merely purely funded by exhausting natural capital without maintaining total

[11] Unless otherwise cited, the information in this section comes from The World Bank (2006).

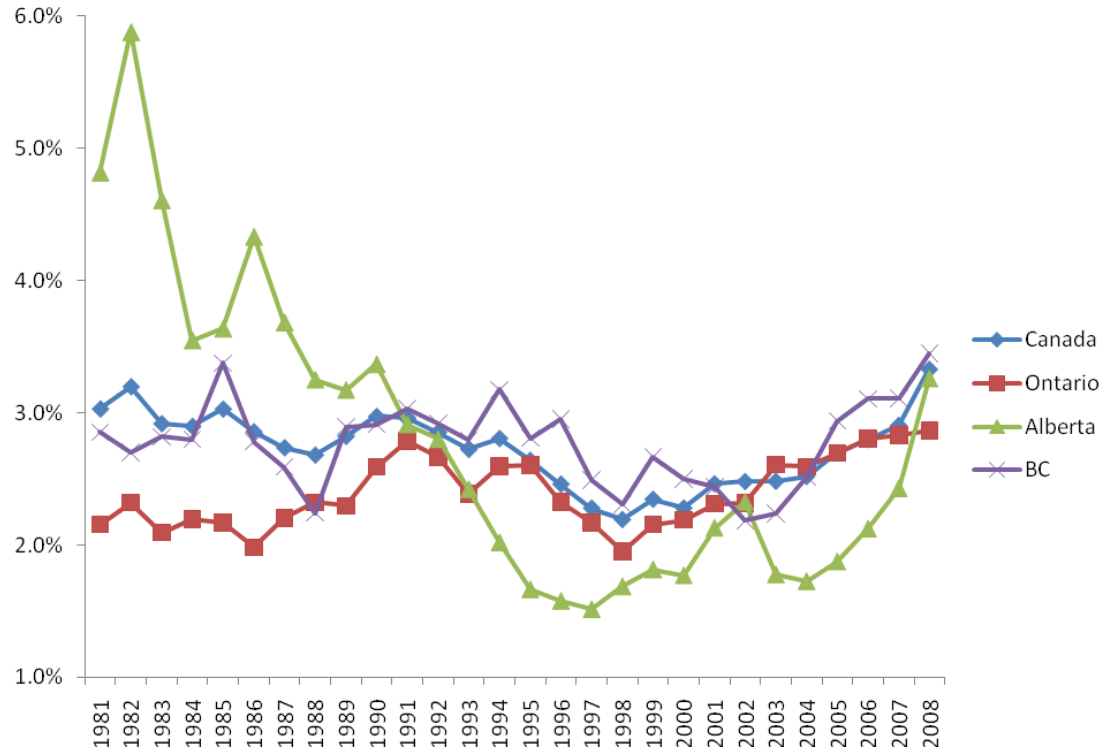
capital. The following section discusses how Alberta is maintaining different types of capital, such as physical, human and natural capital.

5.3.1 Physical Capital

Before the 1990s, Alberta's investment in physical capital was very high, much larger than that of other Canadian provinces and the Canadian average (Figure 7). During this time, Alberta's average investment in physical capital was 4.1% of GDP, which is nearly one half more than that of other provinces (Ontario 2.2% and BC 2.8% of GDP).

However, although Alberta's investment in physical capita was higher than other provinces, it was also declining. In the 1990s, physical capital investment fell below the national average and remained below that of other provinces. Recently, since 2004, Alberta's physical capital investment has been increasing and in 2008, Alberta's investment in physical capital (3.3% of GDP) reached comparable levels to BC (3.4% of GDP) and the national average (3.3%).

Figure 7: Government Gross Fixed Capital Formation as a Percent of GDP: 1983 - 2008



Source: Statistics Canada (various years)

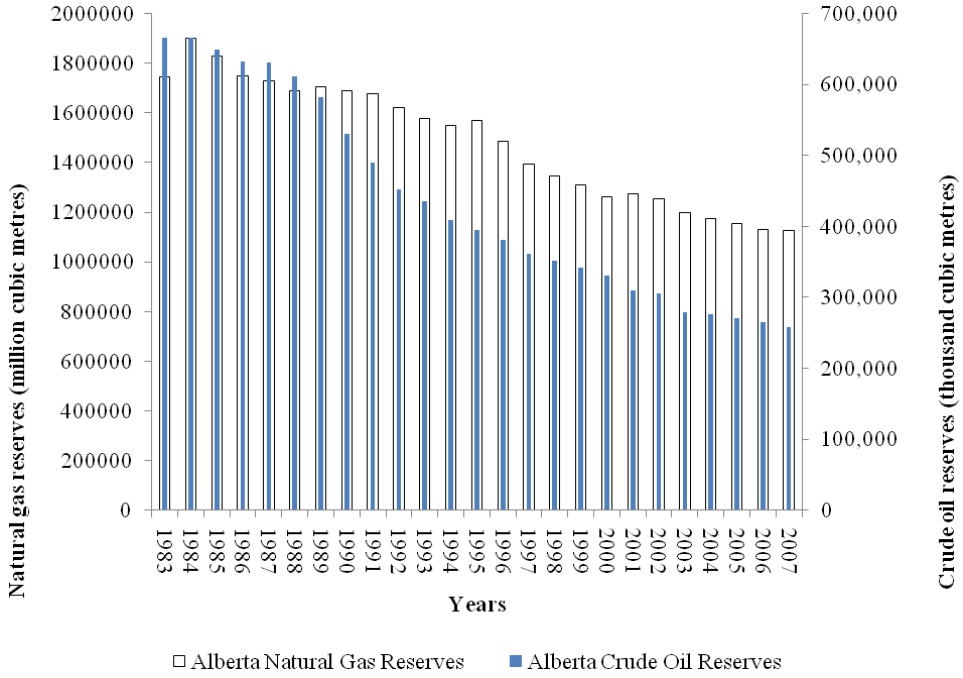
5.3.2 Energy Depletion

Measuring Alberta's stock of non-renewable resources poses a number of challenges as the size of the reserve of resources is constantly changing. A reserve refers to the portion of a resource that is economically exploitable and this can change as resources are used up, new resources are discovered and market conditions and technological advances change the feasibility of resource exploration and use (Jaccard, n.d.).

However, as seen in Figure 8, in the past, Alberta has been depleting its non-renewable resources at a very fast rate. In the early 1980s, Alberta had more than 1.8 trillion cubic metres of natural gas reserves and more than 600 million cubic metres of crude oil (Canadian Association of Petroleum Producers, Various Years). Over the last 20 years, Alberta has decreased its stock of crude oil to less than half of 1980s levels. In 2007, Alberta had only 258 million cubic metres

of crude oil left. Alberta's reserves of natural gas have also diminished, although not as quickly as those of crude oil. In 2007, Alberta had less than 1.2 trillion cubic metres of natural gas reserves. Based on this data, it is clear that Alberta is depleting its stock of non-renewable energy assets.

Figure 8: Alberta Natural Gas and Crude Oil Reserves

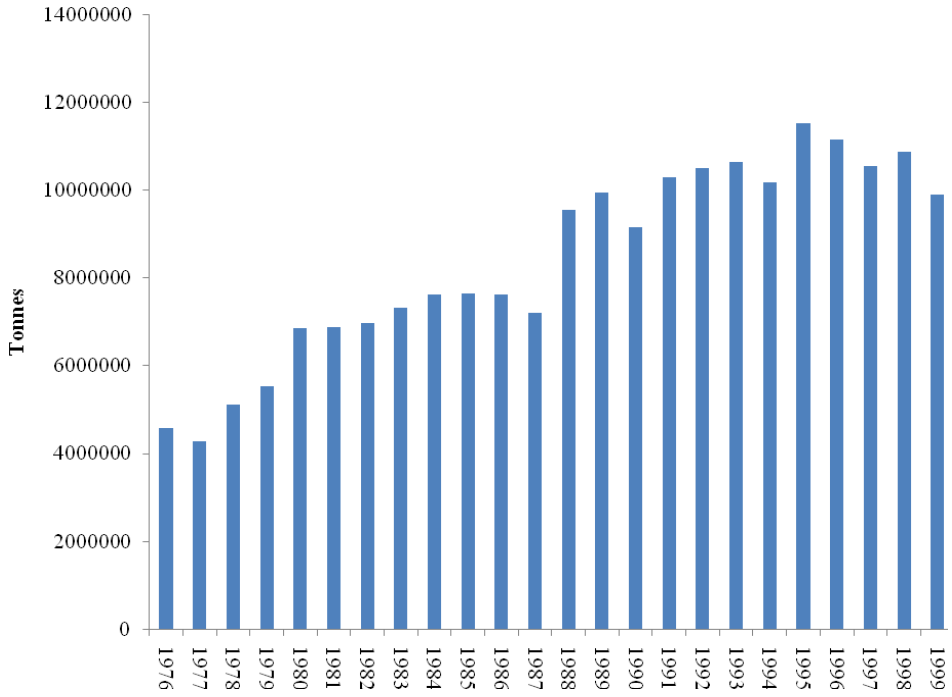


Source: Canadian Association of Petroleum Producers (Various Years)

Alberta's coal reserves are among the largest in Canada. Alberta has approximately 70% of Canada's coal reserves, which contain more than twice the energy of all other provinces non-renewable energy resources (Government of Alberta, 2008). The majority of Alberta's electricity comes from coal. Using coal for electricity generation is very polluting and as a result, Alberta's electricity generation emits more air pollution than any other province (Bell and Weis, 2009).

In addition, as can be seen in Figure 1Figure 9, over the 1976 to 1999 period Alberta's depletion of coal reserves has been rising. In 1976, Alberta was depleting 4.6 million tonnes and in 1999 it was depleting 1 billion tonnes of coal.

Figure 9 Alberta Depletion of Recoverable Bituminous Coal Reserves, 1976 - 1999



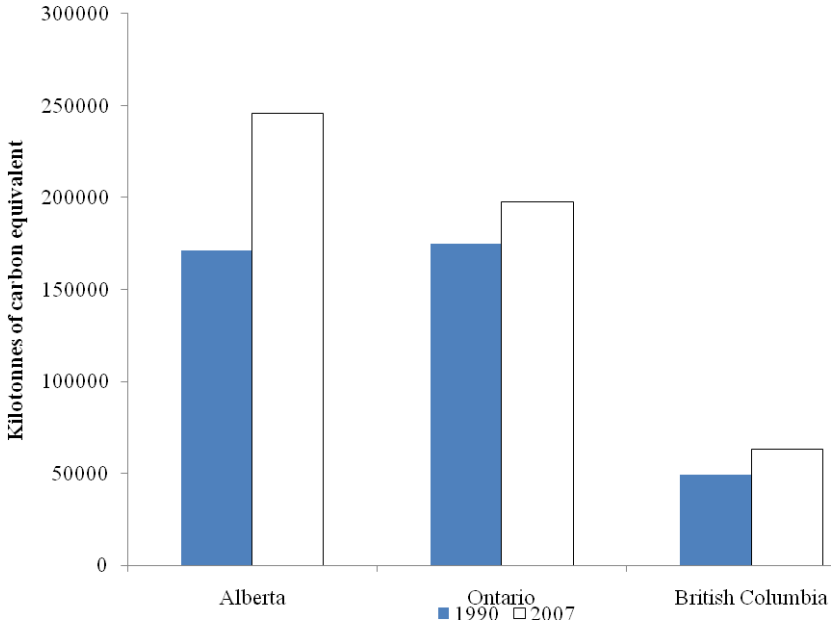
Source: Statistics Canada (various years)

In order to address the finite nature of non-renewable resources as well as Alberta's growing environmental concerns, the Government of Alberta has undertaken an Energy Strategy focused on the use of renewable and clean energy. This strategy focuses on the environmental footprint of energy, energy consumption behaviour and innovation in energy technology (Government of Alberta, 2008). To meet these goals the Alberta government has invested $2 billion in carbon capture and storage, such as a pipeline system that transports carbon dioxide. The government has also introduced mandatory greenhouse gas reductions for large industrial emitters with emission penalties going to a clean energy fund of to purchase offsets. Since the inception of the mandatory reductions, there have been more than 10 million tonnes of reductions (Government of Alberta, n.d.c).

5.3.3 Carbon Dioxide Damage and Forest Depletion

Despite the government's commitment to cleaner energy, Alberta is still responsible for a large share of Canada's air pollution. In 2007, Alberta was responsible for one third of Canada's total carbon emissions (Environment Canada, 2009). As seen in Figure 10, in 1990 Alberta emitted 171 megatonnes of CO_2. In 2007, Alberta's CO_2 emissions increased by 44% to 245 megatonnes of CO_2. This amounts to approximately 70 tonnes of CO_2 per capita in 2007. This is much higher than the average for other high income countries which was 12.6 tons per capita in 2005 (The World Bank, 2009).[12]

Figure 10: CO_2 emissions by province, 2008



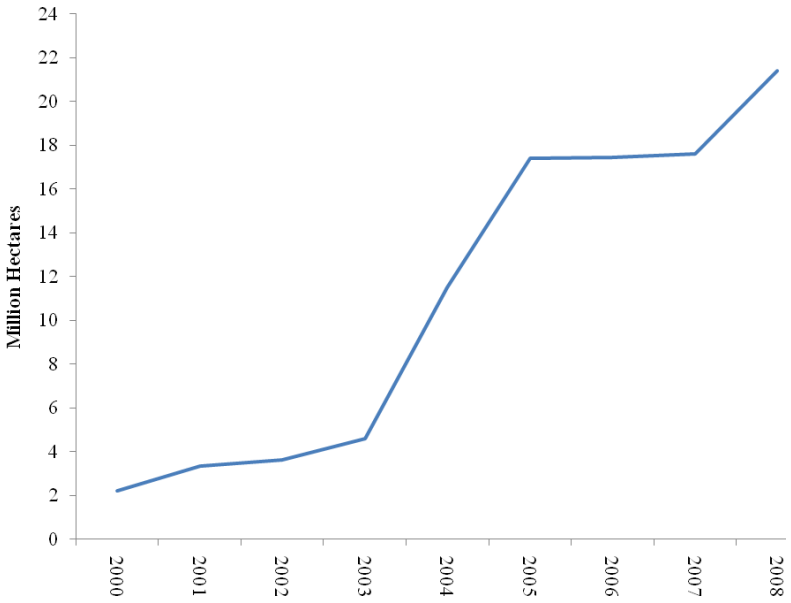
Source: Environment Canada (2009)

As shown in Figure 11, over the past eight years, Alberta's forest area has greatly increased. In 2000, Alberta's certified forest area was 2.2 million hectares and in 2008 the forest

[12] Throughout this study high income countries are defined, as per the World Bank's definition, as countries that have a GNI per capita of $11,906 or higher.

area was 21 million hectares. A part of this increase can be attributed to better forest management where not as many forests have been lost to forest fire and insects.

Figure 11: Alberta Certified Forest Area: 2000 - 2008



Source: Natural Resources Canada (2009b)

In addition, although water is not typically included as part of the ANS measure for natural capital, it is important to note Alberta's management of its water supply. Water scarcity is becoming an important issue facing southern Alberta (Martel, 2008; Griffiths and Woynillowicz, 2003). This is largely due to Alberta's large population growth, agricultural irrigation use and increasing water demands by the energy industry. Many Alberta water bodies are suffering from poor water quality due to increased water demand and wetland destruction (Schindler, 2006). In addition, the oil sands industry has largely contributed to the pollution of water bodies in Northern Alberta (Greenpeace, n.d.). In response to this, the Alberta government implemented the *Water for Life* strategy which is a water sustainability strategy that guides water management policy. While this strategy has been largely successful in bringing attention to the issue of water

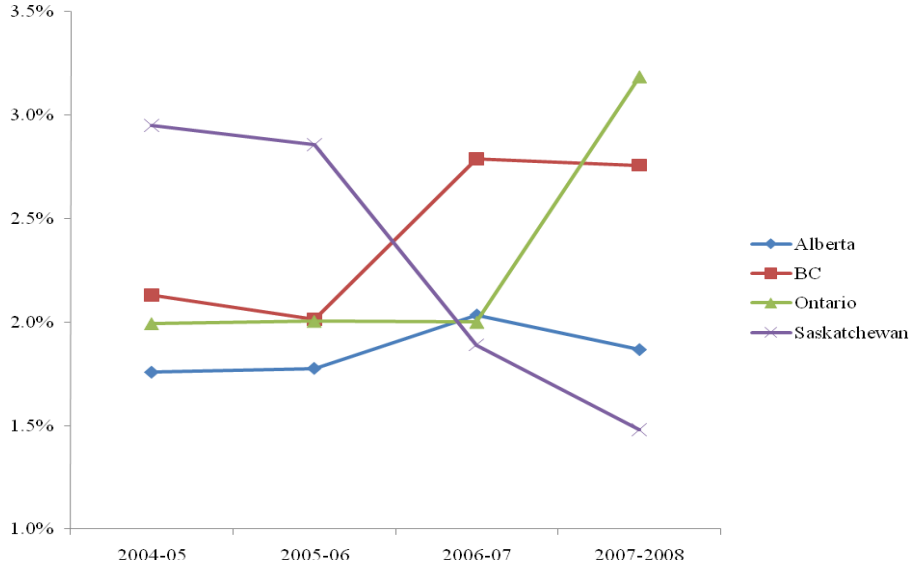
scarcity and the need for action, little has been done in implementing actual solutions to the problem (Taylor, 2009).

Overall, this suggests that Alberta's natural capital is declining. Although the government has made large progress in increasing its forest area and has acknowledged the need for a provincial water strategy, the province remains Canada's largest emitter of carbon dioxide and it still faces major challenges with water scarcity.

5.3.4 Human Capital

In Canada, the Ministry of Education is responsible for primary and secondary education (K-12). On average, Alberta spends a little less than 2% of its GDP on the Ministry of Education. This ministry is funded slightly less in Alberta than in other Canadian provinces such as BC and Ontario, both which spend nearly 2.5% of its GDP on the Ministry of Education (Figure 12).

Figure 12: Ministry of Education Funding as a % of GDP

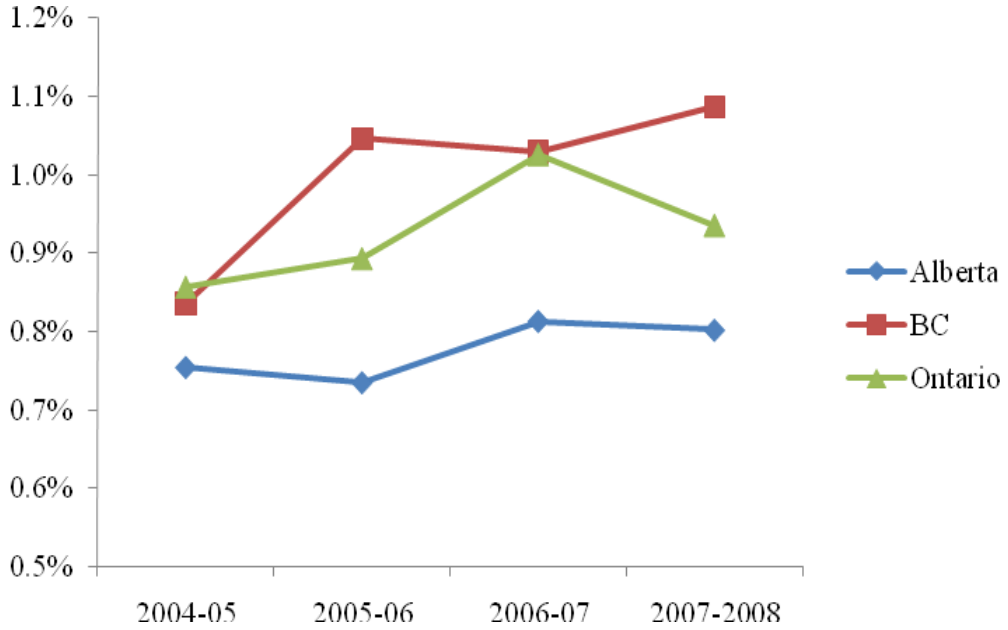


Sources: Government of Alberta (various years), British Columbia Ministry of Finance (various years), Saskatchewan Ministry of Finance. (various years), Ontario Ministry of Finance. (various years) and Statistics Canada (various years)

However, despite the lower amount of funding that Alberta schools receive, Alberta elementary and high school student's performance is high. Alberta students typically outperform other students, both nationally and internationally, on a number of international assessments, such TIMSS, SAIP and PISA (Alberta Ministry of Education, 2010).

The Ministry of Advanced Education and Technology is responsible for post-secondary education. Similarly, Alberta's Ministry of Advanced Education and Technology receives slightly less funding than in other provinces, where BC spends on average 1% of its GDP on advanced education and Ontario spends 0.9% of GDP (Figure 13).

Figure 13: Ministry of Advanced Education and Technology Funding as a % of GDP



Sources: Government of Alberta (various years), British Columbia Ministry of Finance (various years), Saskatchewan Ministry of Finance. (various years), Ontario Ministry of Finance. (various years) and Statistics Canada (various years)

Alberta's performance on post secondary education is below average when compared to Canada and other provinces. As seen in Table 3, only 22% of Albertans have a bachelor's degree

or higher. This is lower than the Canadian average (23%) and other economically prosperous provinces such as Ontario (26%) and BC (24%).

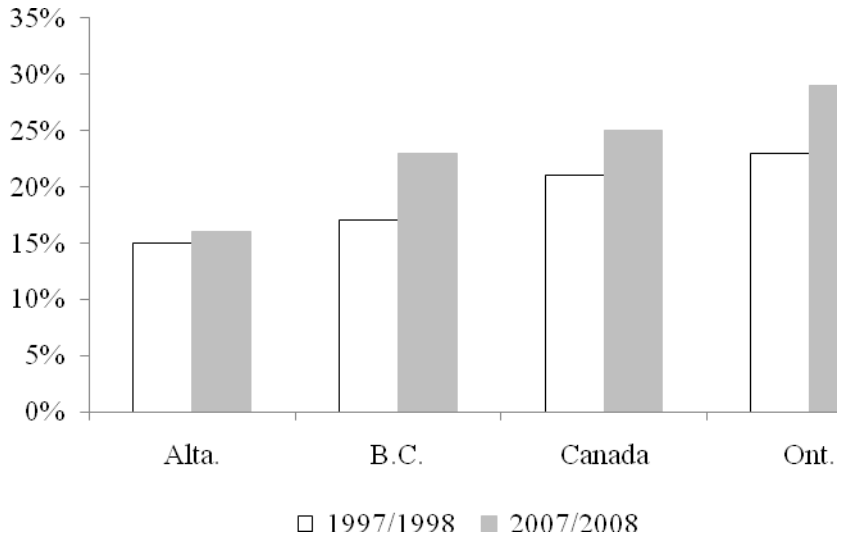
Table 3: Highest Level of Educational Attainment 2006, ages 25 to 64

Province	High School or lower	Post Secondary below Bachelor level	University at Bachelor's level or above
Canada	39%	38%	23%
Ontario	39%	36%	26%
Alberta	40%	39%	22%
British Columbia	38%	38%	24%

Source: Statistics Canada (Various years)

Moreover, Alberta's university participation rates are among the lowest in Canada (Figure 14). In the past 10 years, university enrolment rates have been increasing significantly across Canada, but not in Alberta. Alberta's participation rates increased by a mere 1 percentage point, from 15% in '97/98 to 16% in '07/08, while Canada's average increased by 4 percentage points, from 21% to 25% during the same period.

Figure 14: University Participation Rate among 20-24 year olds, 1997/1998 and 2007/2008



Sources: Statistics Canada and Council of Ministers of Education (2007)

The results from Alberta high school final diploma examinations have remained high over the last 5 years (Government of Alberta, 2009c), which suggests that the problem is in the transition from high school to university. There are a number of factors that could influence university participation, including demographic, family-related and school related factors (Tomkowicz and Bushnik, 2003). Another potential factor is the opportunity cost of obtaining a post secondary education. Considering the nature of Alberta's economy there exists a high demand for trades people. This has increased the salary a young Albertan can earn with little or no formal education after completing high school with hearsay evidence of high school drop outs earning $20 - $30 per hour (Edmonton Journal, 2006). In fact, the salaries for Albertans who have finished trade school are very comparable to salaries of Albertans who have completed a university degree. The average annual salary for someone aged 25 – 34 who finished trade school is $46 685 while someone who has a bachelor's degree earns $51 323. This is a difference of less than 10%, the lowest gap in Canada (Statistics Canada, 2008). As a result, considering the high costs of university education, Albertans have a low incentive to complete university.

Furthermore, it is important to address the effect that both inter-provincial and international migration have had on Alberta's labour force. Given its strong economy and high demand for labour, Alberta has had a large inflow of people (44,320), more than double the provincial inflow of BC (19 140; see Table 4). Ontario's interprovincial migration was negative, suggesting that people are leaving Ontario to move to the Western provinces. Most of Alberta's interprovincial migrants have some post secondary studies (12, 775) and nearly 25% have a university degree. Also, over 30% of Albertan's with a bachelor degree or higher are immigrants (Statistics Canada, 2006). This suggests that a large part of Alberta's highly skilled labor force is actually composed of migrant workers.

Table 4: Number of persons who moved to a province different than the one they lived in five years earlier by level of educational attainment, 2006 (ages 25-64)

Provinces	High School or lower	Post Secondary below Bachelor level	University degree	Total
Ontario	-7720	20	-750	-17,930
Alberta	16,325	2,015	10,760	44,320
British Columbia	3,325	1,110	9,890	19,140

Source: Statistics Canada (2006)

Overall, this data shows that Alberta is performing very well in primary education; however, this is not the case for post secondary education. Alberta's low funding for advanced education and low university enrolment rates suggest that the province is not increasing its human capital at a comparable rate to other Canadian jurisdictions.

To summarize, the theory of weak sustainability argues that in order to be sustainable it is necessary to preserve the total amount of capital constant, while substitution of different types of capital is possible. As a result, an economically sustainable country is one where total capital is at least maintained. Using available statistics, Alberta's past investment in physical capital was declining and only recently has it reached levels comparable to other provinces. Alberta is

largely depleting its non-renewable resources and it is damaging its natural environment through carbon dioxide emissions. It does however make an attempt to compensate by increasing the stock of Alberta's forests; however, overall Alberta's natural capital is declining. Furthermore, although Alberta's primary education is strong, the province's post secondary funding and enrolment is low, suggesting that Alberta's human capital formation is lower than other Canadian provinces. As a result, the indicators discussed earlier suggest that Alberta does not appear to be on an economically sustainable path and the evidence suggests the need for policy action to ensure that Alberta's strong economic performance and quality of life are sustained.

6: Case Study Analysis

This section outlines the methodology used in this study and justifies the case study choices.

The primary methodology used in this study is a case study analysis to identify how some resource abundant economies have managed their resource wealth. The analysis identifies best practices by sustainable, non-renewable resource abundant economies and compares them to the current policies in place in Alberta. The research question guiding this study is how can Alberta better manage its non-renewable resource abundance to sustain the provincial economy and ensure long term well being for its citizens?

6.1 Case Study Selection

The cases chosen for this analysis are Norway, Botswana, Chile. The three criteria used to select the case studies are: non-renewable resource abundance, strong and stable economic growth and sustained economic growth as determined by adjusted net savings (see Table 5). Alaska is also used as an additional secondary case. Although Alaska does not meet most of the case study selection criteria it has often been commended for its resource revenue use (see for example, Fasano, 2000; Moss and Young, 2009). It also provides a good jurisdictional comparison for Alberta. Other resource abundant states in the US, such as Texas and New Mexico, were also considered as potential case studies. However, due to time restraints, it was only possible to examine one US state. Based on past research, Alaska provided the best example of sustainable initiatives in non-renewable resource management.

Table 5: Case Study Selection Criteria

	Non-Renewable Resource Abundance	Economic Growth (1960 – 2008)	Economic Sustainability (Adjusted Net Savings) 1970 - 2007
Norway	Oil and Gas	2.9%	10.6
Botswana	Diamonds	6.3%	39.4
Chile	Copper	4.4%	6.3
Alaska	Oil and Gas	7.6%	NA

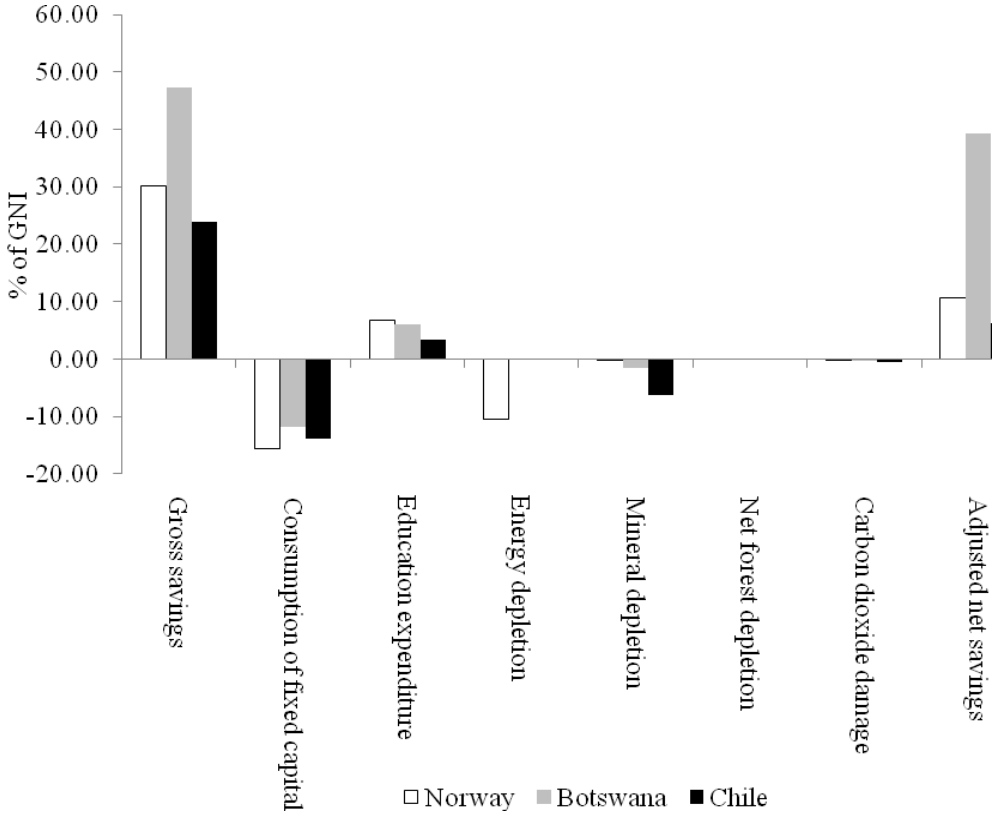
Oil and gas extraction and production are Norway's largest industries. In 2006, Norway was the world's largest oil exporter and the tenth largest oil producer (Norway Ministry of Petroleum and Energy, n.d.). Botswana is abundant in minerals, specifically diamonds, which represent over 30% of its GDP (Botswana Central Statistics Office, 2009). Chile leads the world in copper production, with over 1/3 of the world's production (US Geological Survey, 2009). In 2005, mining accounted for 17% of Chile's GDP (Banco Central de Chile, 2005). Finally, Alaska is rich in oil and gas; four of the ten largest known oilfields in North America are located in Alaska. Alaska's petroleum industry accounts for an average of 20% of U.S. domestic oil and gas production (Alaska Oil and Gas Association, n.d.).

All four economies examined have managed to achieve long-term economic growth. Norway is one of the world's richest countries and from 1960 – 2008, its GDP per capita growth has been very stable, averaging an annual rate of 2.9% (The World Bank, 2009). Similarly, Botswana's economic growth has been strong, averaging annual growth of 6.3% during the same period. Botswana's GDP per capita in 2008 was $4,400, which is 18 times larger than the 1960 GDP per capita of $246. This is one of the world's highest economic growth rates (Central Intelligence Agency, 2009). Chile also sustained strong economic growth between 1960 and 2008 averaging an annual rate of 4.4%. Chile has become one of Latin America's richest countries.

Although long-term historic data on Alaska's GDP growth is not readily available, between 1998 and 2007 it averaged 7.6% (U.S. Census Bureau, 2000). While all these economies have demonstrated strong economic growth, it is important to determine if it is sustainable and the adjusted net savings rate (ANS) is used to evaluate sustainability.

Figure 15 shows the average ANS and its components over the 1970 – 2007 period. As explained earlier, ANS is a measure used to identify the sustainability of an economy by identifying investment or disinvestment in a nation's assets. ANS is calculated as a percentage of gross national income (GNI). Its components include gross savings, consumption of fixed capital, human capital investment, energy, mineral and forest depletion and carbon dioxide damage. Gross savings is measured as the difference between GNI and public and private consumption. Consumption of fixed capital is the decrease in the value of produced assets. Human capital investment is measured by non-fixed-capital expenditures on education. Energy and mineral depletion is measured by rent; forest depletion is measured by the rent on wood extraction that exceeds the natural increment in the country; and carbon dioxide damage is estimated to be $20 per ton of carbon times the number of tons emitted (Bolt et al., 2002; World Bank, 2009). The measures for natural capital used by ANS attempt to quantify environmental degradation but it does not include some important types of natural capital, such as water, wildlife and land quality. It does however provide an internationally comparable measure of investment in natural capital.

Figure 15: Average Adjusted Net Savings for Norway, Chile and Botswana, 1970-2007



Source: The World Bank (2009)

During the period, Botswana had the highest average ANS at 39.4% of GNI. This can be attributed to its high gross savings rate (47.4% of GNI) and high rate of investment in education (5.9% of GNI). Norway's average ANS was 10.6 %. Although Norway depleted a lot of its oil and gas (10.5% of GNI), it had a high gross savings rate (30%) and high rate of investment in education (6.7%). Chile's average ANS was 6.3%. While this is positive, it is, however, the lowest of the three countries. Chile depleted its resources less than Norway (6.3%) and also had a lower savings rate (23.8%) and investment in education (3.3%). It is important to note, that because Chile and Botswana are developing countries, it is even more difficult for them to manage their natural resources in a sustainable way. Both countries have been able to overcome the challenges associated with natural resource abundance. Botswana has been recognized by a number of researchers as a prime model for sustainable non-renewable resource management (see

Lange and Wright, 2002; Shyamsundar, 2001). Chile has often been used as a case study of how best to manage mineral wealth (see for example, International Council on Mining and Metals, 2006; Ruiz-Dana, 2007). Even though they vary, all three countries have largely positive ANS.

6.2 Characteristics and Measure

The theories of natural resource management and sustainability, as discussed in previous sections, have identified a number of characteristics as important in achieving sustainable economic growth in extractive societies. They are listed in Table 6 where they are grouped into four main categories: Resource Rent, Use of Resource Rent, Capital Maintenance and Governance.

Table 6: Independent Characteristics and Measure

Characteristic		Measure
Resource Rent	*Resource Ownership*	Who owns the resources?
	Extraction Rights	How are extraction rights awarded?
	Revenue Instruments	What revenue instruments are used to collect resource rent?
	Rent Capture	How much rent is collected?
Use of Resource Revenues	*Savings/Stabilization Fund*	Does a savings/ stabilization fund exist?
	% Invested in Fund	What percent of resource revenues is invested into a long-term fund?
	Amount in the Fund	How much has accumulated in the fund?
	Fund Withdrawal	When can money be withdrawn from the long-term fund?
	Legislation	What is the legislation governing the use of resource revenues?
	% Invested in Other Types of Capital	What percent of resource revenues is invested in other types of capital?
	Used for Budget Expenditure	Are resource revenues used for general budget expenditure?
Capital Maintenance	*Natural Capital*	Is natural capital being maintained or increased?
	Human Capital	Is human capital being maintained or increased?

The next section provides a detailed analysis of what the case study countries are currently doing for these characteristics.

7: Case Study Analysis

This section provides an analysis for each case study in the light of the characteristics listed in Table 6. Comparisons are then made to identify best practices and identify priority areas for Alberta.

7.1 Norway

Norway is one of the world's richest countries and has been repeatedly acknowledged as a prime example of sustainable use of natural resources.

7.1.1 Resource Rent

Norway's natural resources are owned and managed by the state and private corporations are granted rights to develop these resources through the allocation of production licenses. The licenses are awarded to a company or a group of companies that have put in an application for a license. There is no bidding for these licenses; instead, the winning applicants are selected depending on how they rank on a set of predetermined, impartial criteria. The licenses are free but the licensees must follow the terms set out by the license including paying production taxes and area fees

Until 2006, Norway collected a large share of its resource revenue through royalties. The rates could be as high as 16%. Currently Norway collects a large portion of its resource revenues through taxes. The taxes charged to oil and gas companies include a normal corporate tax (28%) plus a special petroleum tax of 50% on company profits.[13] This petroleum tax makes up the majority of Norway's resource revenues. The Government of Norway also collects an area fee per

[13] The information in this paragraph comes from Norway Ministry of Finance (n.d.) and Eriksen (2006).

square kilometre of land used. This fee is not intended to be a way for the government to capture resource rent, rather it ensures that productive land is not idle. This fee is only collected after the expiry of a certain period and it is meant to be an incentive for companies to return land once they are no longer using it.

The Norwegian government is also directly involved in the ownership and production of oil and gas. In 1972, the government founded Statoil, a private oil company which had to consult with the government on important decisions and submit an annual report to parliament. In 2001 the company was privatised but the government retained majority ownership of the company, owning 71% of the shares. Currently, StatoilHydro accounts for 80% of Norwegian oil and gas production. The dividends from this company are considered another form of resource revenue.

Table 7 provides a summary of the various sources of resource revenue and the rates.

Table 7: Sources of Resource Revenue – Norway

Type	Description	Rate
Petroleum Tax	This is a special tax on profits from the petroleum industry. This tax is applied on top of the ordinary corporate tax of 28% making the marginal tax rate 78%. This is the government's most important source of resource revenues.	50%
Area Fee	The Government of Norway collects an area fee for each square kilometer of land used by the petroleum company. The fee is only collected after a certain time period. The intention of the fee is to encourage the return of land once companies are no longer using it. The fee varies depending on the amount of time that has passed since the expiry of the initial time.	NOK 30,000 – 120,000 per square kilometer (approx. $5,500 - $22,000 CDN)
State Direct Financial Interest	The government has a direct role in the ownership of petroleum fields and as a result, it is entitled to a share of the revenues.	Varies
Dividends	The Government of Norway owns 71% of the shares of StatoilHydro. This company is a major player in the production of Norway's oil and gas and the dividends from the shares are part of Norway's resource revenue. The amount of revenue received from the dividends varies depending on production and other factors.	Varies

Source: Norway Ministry of Finance (n.d.)

Over the 2001-2008 period, Norway collected an average of NOK 291 billion (CAD$54 billion) in resource revenues per year (Norway Ministry of Finance, various years).[14] This is approximately CAD$0.46 per m^3 of oil and gas produced. As the amount of resource rent available for government capture depends on a number of factors such as the cost of production and the market value of the resource, it is difficult to accurately assess it. Past studies have estimated that the government of Norway collects approximately 75 – 84% of resource rent (PricewaterhouseCooper, 2009; Alberta Royalty Review Panel, 2007). Taylor et al. (2004) estimate that over the 1995 – 2002 period the government of Norway collected on average of 88% of economic rent.

PricewaterhouseCooper (2009) find that the oil production and exploration cost in Norway is approximately $10.50 per barrel. Taylor et al. (2004) show that Norway is a region where the cost environment for oil and gas producers is high.[15] The value of Norwegian oil is quite high because it is considered high quality, premium oil. During 2001-2008, the average price of a barrel of oil from Norway was US$51 (Energy Information Administration, 2009).

7.1.2 Use of Resource Rents

The Act on the Government Petroleum Fund, states that when there is a budget surplus, all petroleum revenues collected by the Government of Norway must be transferred into the Norwegian Global Government Pension Fund (NGGPF) through the state budget.[16] Since 1990, Norway has had only budget surpluses and since then, resource revenues have been consistently allocated to the fund. Withdrawal from the NGGPF is governed by a spending rule that states the real return from the NGGPF's (approximately 4%) can be used annually for general budget

[14] The average 2001- 2008 Norway – Canada exchange rate is CAD$1 = NOK5.34 (Oanda , 2009).

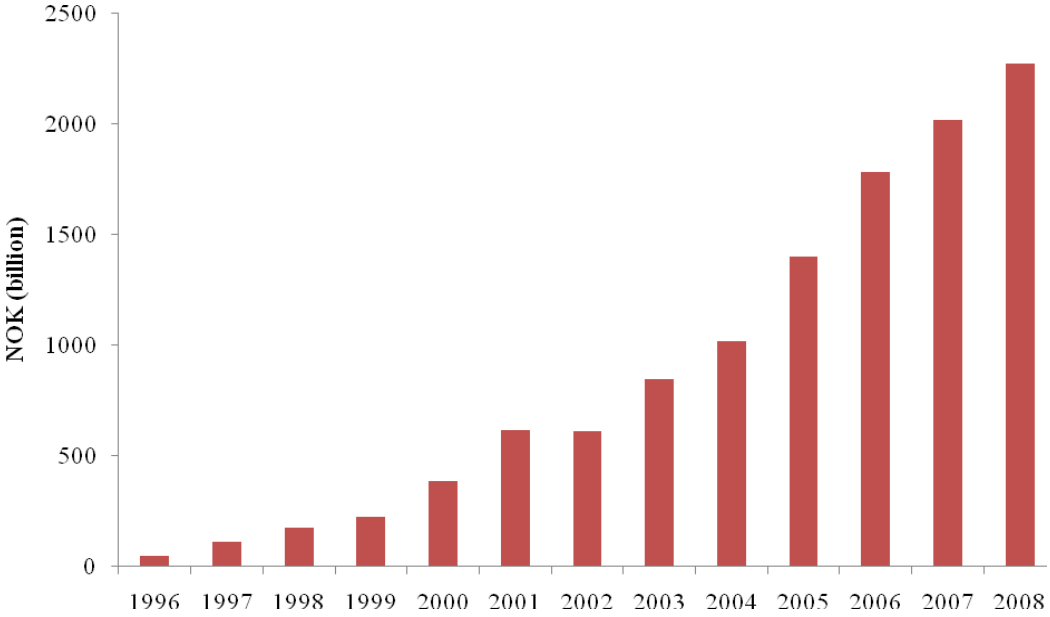
[15] The production and exploration costs for Norway are comparable to the two other oil and gas producers in this study. PricewaterhouseCooper (2009) estimate that Western Canada's costs are $9.75 and US onshore production costs are $8.52 per barrel.

[16] Unless otherwise cited the information in this section comes from Eriksen (2006).

spending purposes. Any transfer to or from the Fund require parliamentary approval (Davis et al., 2001).

The purpose of the NGGPF is to save oil wealth for future generations and to limit government dependence on petroleum revenues. As seen in Figure 16, the Fund's growth has been strong. In 1996, the Fund had NOK 48 billion (CAD$10 billion) and in 2008, it had NOK 2, 275 billion (CAD$413 billion).[17]

Figure 16: Current Market Value of Norway's Government Pension Fund, 1996 – 2008



Source: Norges Bank (2006)

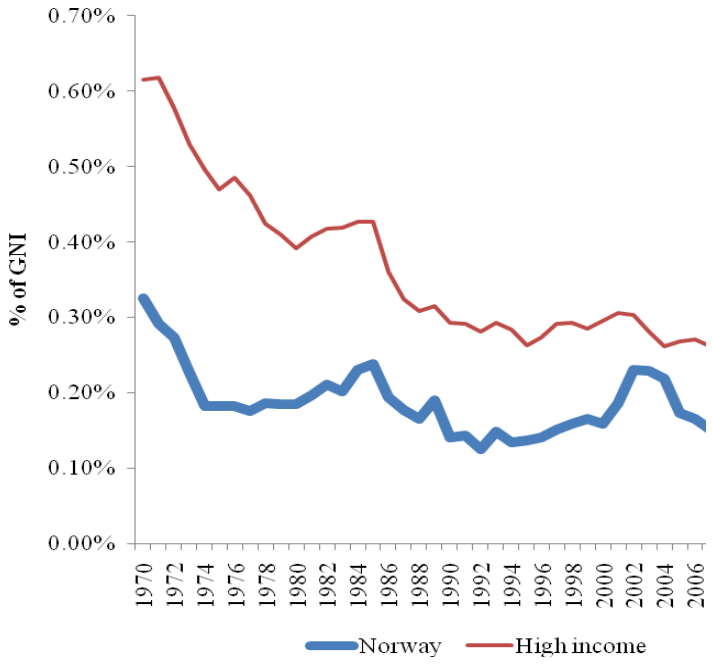
Investing resource revenues in the NGGPF is a fiscal management tool to promote transparent use of resource revenues. The NGGPF is also used to assist the government in saving for increasing demands in future public pension expenditures. The NGGPF is managed by the central bank of Norway. It is comprised of both fixed income (60%), such as bonds and equities (40%) and ethical guidelines were introduced to the fund in 2004.

[17] The Norway - Canada exchange rate for 1996 is CAD$1 = NOK4.67 and for 2008 is CAD$1 = NOK5.5 (Oanda, 2009).

7.1.3 Capital Maintenance

Norway is a world leader in environmental policy and green initiatives. Norway has introduced a number of acts protecting national natural habitats and wildlife, it was among the first countries to adopt a carbon tax with the aim to be carbon neutral by 2030. Norway has also been active on the international stage in helping developing countries adopt green policies and in the advancement of carbon capture and storage technologies. As seen in Figure 17, over the 1970 – 2007 period, Norway's carbon dioxide damage has decreased drastically in percentage of GNI.[18] In 1970, Norway's carbon dioxide damage accounted for 0.33% while in 2007, it was 0.15% of its GNI. Norway's damage from carbon dioxide has been consistently lower than the average for other high income countries.

Figure 17: Norway and High Income Country Carbon Dioxide Damage: 1970 - 2007



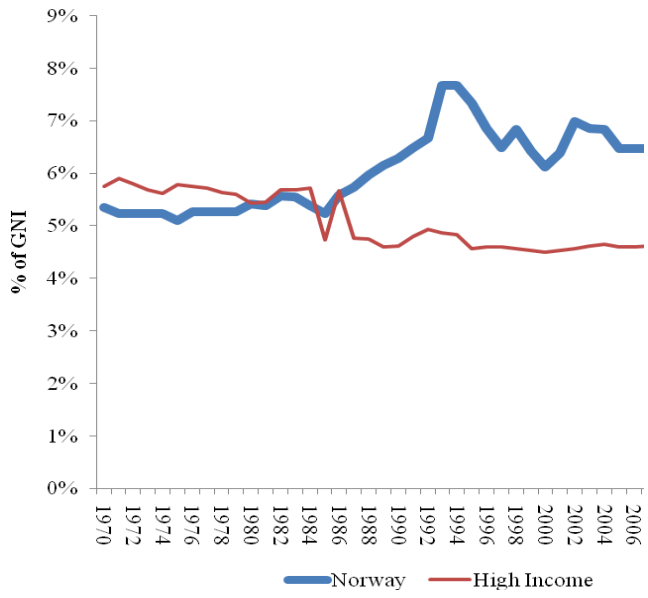
Source: The World Bank (2009)

[18] Where carbon dioxide damage is estimated to be $20 per ton of carbon times the number of tons emitted.

In addition over the 1990 – 2005 period, Norway increased its national forest area by over 2000 km^2 from 91,300 km^2 to 93,870 km^2. In 2006, 40% of Norway's energy use was provided by clean energy (The World Bank, 2009).[19] As a result, through increased regulation and government commitment, Norway has succeeded in limiting the depletion of its natural capital.

As seen in Figure 18, between 1970 and 2007 Norway has slightly increased its expenditure on education from 5.3% to 6.4% of GNI. Starting from the mid 1980s, Norway's expenditure on education has been approximately 2 percentage points higher than other high income countries. The increase in education expenditure in Norway in the 1980s has been attributed to high unemployment during a prolonged recession in the 80s. As young people were not able to find employment, enrolment in post-secondary education greatly increased as they tried to improve their employment prospects (Van Den Noord, 1997).

Figure 18: Norway and High Income Country Education Expenditure: 1970 - 2007



Source: The World Bank (2009)

[19] Clean energy is defined as non-carbohydrate energy that does not emit carbon dioxide. This includes but is not limited to hydro, nuclear, geothermal and solar power.

Norway's gross tertiary school enrolment was 76% in 2007. The gross tertiary school enrolment of other high income countries for the same year was 67%. Norway's expenditure per student enrolled in tertiary education is 45% of GDP per capita in 2007. This is much higher than other high income countries whose average expenditure per student enrolled in tertiary education is 28% of GDP per capita (The World Bank, 2009). This data suggests that through above average expenditure on education Norway has been committed to maintaining its human capital.

7.2 Botswana

Botswana has been a prime example of how a developing country can sustainably manage non-renewable resources.

7.2.1 Resource Rents

The Botswana government has very high involvement in diamond mining.[20] The mineral rights are owned by the Republic of Botswana and the Minister of Mines is responsible for their exploitation. There are no fully private diamond mining companies in Botswana; the mining is conducted by Debswana (an equal joint partnership between the government of Botswana and De Beers). As a result, there is no allocation of licenses for diamond mining. For mines other than diamonds, private corporations are awarded licenses to prospect and extract minerals, where the government reserves the right to have 15% participation. These licenses are granted at the discretion of the Minister of Minerals, Energy and Water Resources. In the case of competing applications, the license is awarded to the applicant who will make more beneficial use of the minerals in terms of efficiency and environmental protection. The winners of the licenses are required to conduct their mining in the most environmentally sound manner and submit an Environmental Impact Assessment. The license holders must pay an annual charge for the license. Royalties are also paid to the government on the sale of other minerals. The royalty rates vary

[20] Unless otherwise cited, the information in this section comes from Republic of Botswana (1999) and Taylor et al. (2006).

based on the mineral type. Table 8 provides an overview of the different sources of resource revenue in Botswana.

Table 8: Sources of Resource Revenue - Botswana

Type	Description	Rate
State Direct Ownership	All diamond mining in Botswana is conducted by Debswana. This corporation is 50% owned by DeBeers and 50% by the government of Botswana. For other types of mining, the government reserves the right to acquire up to 15% working interest participation in the mine.	Varies
Dividends	The dividends collected from Debswana by the government are part of Botswana's resource revenue. The amount of revenue received from the dividends varies depending on production and other factors.	Varies
Royalties	Royalties are paid to the government on any mineral collected. The rates vary depending on the mineral type. The rate is applied to the gross market value of the mineral.	Precious stones – 10% Precious metals – 5% Other minerals – 3%
License Fee	Every holder of a license must pay a non-refundable annual charge.	P100/km^2 (approx CAD$13 / km^2)

Source: Republic of Botswana (1999)

Over the 2003 – 2006 period, the government of Botswana collected approximately BWP9.3 billion (approximately CAD$2.3 billion).[21] This is approximately BWP289/ carat of diamond produced, or CAD$74/ carat (Government of Botswana, Various Years).[22] It has been estimated that the government of Botswana collects 75% of mining profits (Lange and Wright, 2002). Although specific data on production costs and diamond value is not readily available, diamond mining in Botswana has been often cited by mining companies as having low production costs with high value diamonds (Holman, 2009; Moseki, 2009; RNS, 2009).

[21] The average 2003-2006 Botswana - Canada exchange rate is CAD$1 = BWP3.9 from (Oanda, 2009).

[22] Due to limited data and based on the fact that diamonds make up 95% of Botswana's resource revenue, only diamonds are considered in the amount of revenue collected.

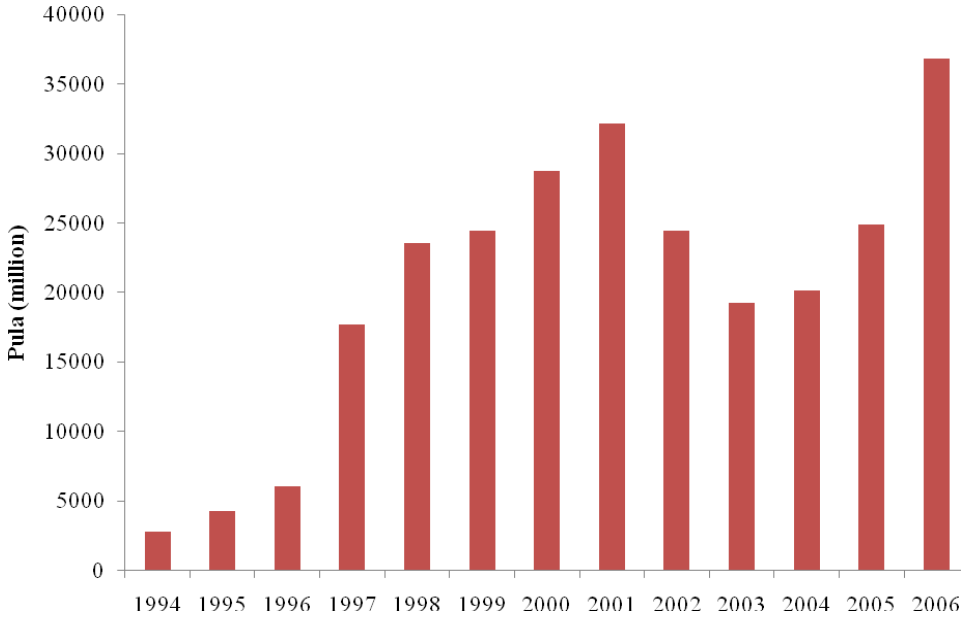
7.2.2 Use of Resource Revenue

The government spending of resource revenues is governed by a formal rule stating that all mineral revenues must be used for investment spending and the accumulation of physical, human or financial capital. In addition, any continuous expenses incurred as a result of mineral revenue spending, such as additional staff or ongoing programs, must be financed by non-resource revenues in future years (Davis et al., 2001). To evaluate its management of resource revenues, the government uses an index called the budget sustainability ratio i.e. the ratio of non-investment spending to non-mineral revenue spending.

The Government of Botswana also saves budget surpluses in the Pula Fund (PF). The main purpose of the PF is to save resource wealth for future generations. The PF is also used as a way to accumulate foreign reserves and manage the exchange rate (Davis et al., 2001; The World Bank, 2007). The Fund is invested in long-term foreign currency assets, such as bonds and equities, in a transparent and accountable manner (Mohohlo, 2010). As seen in Figure 19, the value of the PF in 1994 was BWP2,810 million (CAD$1,465 million).[23]

[23] The Canada- Botswana exchange rate for 1994 is CAD$1 = BWP1.91and for 2006 it is CAD$1 = BWP4.95 (Oanda, 2009).

Figure 19: Current Market Value of Botswana's Pula Fund, 1994 - 2006



Source: Bank of Botswana (various years)

In 2006, it was worth BWP36,852 million (CAD $7,440 million). Although the growth of the fund has not been steady, during this 12-year period the Fund grew by more than 13 times its 1994 value.

7.2.3 Capital Maintenance

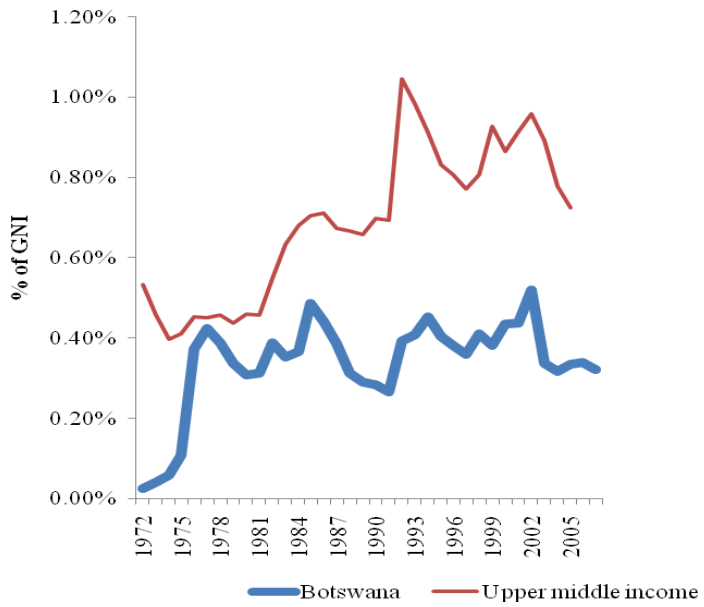
Botswana is endowed with a number of valuable natural resources aside from non-renewable resources, which include land, water and flora and fauna. For example, Botswana's wetlands support a large number of wildlife and have been pivotal in developing tourism. In addition, the country's grasslands are used for farming and provide a livelihood for many rural inhabitants. Botswana has taken an active role in reducing negative effects on its natural environment.[24] Recently, Botswana has undertaken policy initiatives and legislative reforms to

[24] Unless otherwise cited, the information in this section comes from United Nations Development Programme (2010).

limit environmental degradation. The government of Botswana has identified and incorporated key environmental issues in its ninth National Development Plan. Botswana has also been active in the international community by participating in various events such as the UN Conference on Environment and Development and ratifying a number or agreements on the environment and climate change.

As seen in Figure 20, over the 1972 – 2007 period, the damage from carbon dioxide has not surpassed 0.5% of Botswana's GNI and it has been decreasing in the last decade. The damage caused by carbon dioxide has been consistently lower than in other upper middle income countries over the same period. Furthermore, Botswana's CO_2 emissions per capita have been lower than other upper middle income countries. In 2005, Botswana emitted 2.5 metric tons of CO_2 per capita, while the average for upper middle income countries was 5 metric tons of CO_2 per capita. Also, in 2006, 30.8% of Botswana's national area was nationally protected while the average for upper income countries was 10.4% of total area (World Bank, 2009).

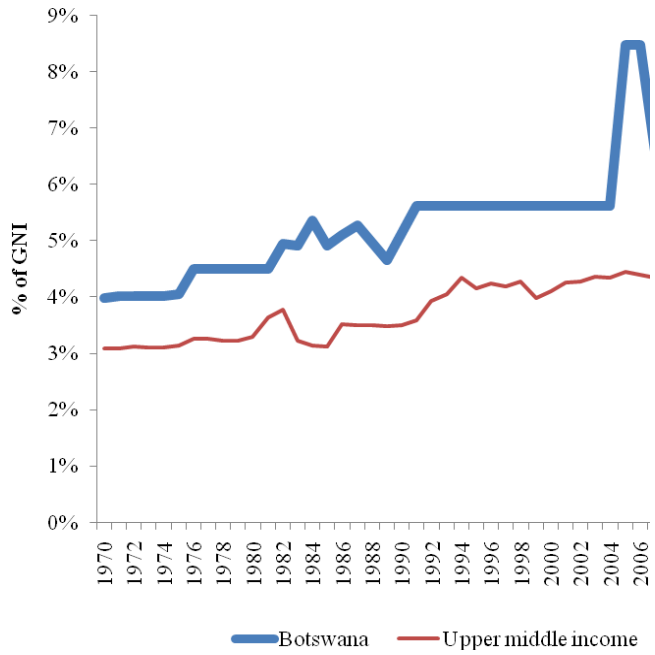
Figure 20: Botswana and Upper Middle Income Country Carbon Dioxide Damage: 1972 - 2007



Source: The World Bank (2009)

Botswana has achieved the United Nations Development goal of universal access to basic education. The government of Botswana also provides loans and financing to students attending tertiary education. Botswana's educational expenditure has been on average higher than other upper middle income economies (Figure 21). Over the 1970 – 2006 period, Botswana's average education expenditure was 5.2% of GNI, while the average education expenditure for upper middle income countries was 3.7% of GNI. In 2005, Botswana's expenditure per secondary school student accounted for 41% of GDP per capita, while that of upper middle income countries accounted for 17% of GDP per capita (The World Bank, 2009).

Figure 21: Botswana and Upper Middle Income Country Education Expenditure: 1970 - 2006



Source: The World Bank (2009)

Despite its above average spending on education, enrolment in secondary and tertiary education remains low. In 2005, in Botswana 76% of all eligible students were enrolled in secondary school and only 5% of eligible students were enrolled in tertiary school. In the same year, in upper middle-income countries, on average, 89% of eligible students were enrolled in

secondary school and 38% were enrolled in tertiary school (The World Bank, 2009). Botswana's low secondary and tertiary school enrolment can be attributed to widespread HIV. The HIV epidemic in Botswana has prevented many young people to be able to pursue more than just basic education.

7.3 Chile

Chile has adopted sustainable strategies for its copper resources to assure that future generations can enjoy the country's non-renewable resource wealth.

7.3.1 Resource Rents

The government of Chile is the absolute owner of Chile's minerals.[25] However, both public and private corporations have access to exploit these resources. The largest copper mining company is a state run company, CODELCO, which produces 32% of Chile's copper, making it the world's largest copper producer.

CODELCO is required to give the government any excess surplus over a pre-established copper price to the government. Private corporations are required to pay a fee for mining patents as well as royalties on taxable earnings. The royalty rate ranges from 0.5% to 5% and the rate charged depends on the corporation's annual sales. Resource revenues for the Chilean government are summarized in Table 9.

[25] Unless otherwise cited, the information provided in this section comes from Government of Chile (2009) and Ruiz-Dana (2007).

Table 9: Sources of Resource Revenue - Chile

Type	Description	Rate
State Direct Ownership	The state owns Chile's largest mining company CODELCO. This company accounts for 32% of Chile's copper production. Any surplus profit, above a pre-established price, must be given to the government.	Varies
Royalties	Private companies must pay royalties to the government on their earnings.	0.5% - 5%
Mineral Patent	Any private company wishing to exploit minerals must have a mineral patent. There is an annual fee for this patent.	NA

Over the 2001 – 2006 period, the Chilean government collected an average of CLP1,584 billion (CAD$3.5 billion) in resource revenue from the extraction of copper.[26] This is approximately CLP298,084 pesos per ton of copper produced (CAD$659/ ton of copper) (Direccion de Presupuestos, 2010).[27] The comparative production costs for copper mining in Chile are not known. The value of Chilean copper in 2006 was CAD$305/lb of copper (Ministerio de Mineria, 2009).

7.3.2 Use of Resource Rents

Chile has three separate types of sovereign wealth funds into which government surpluses from resource revenues are allocated: The Pension Reserve Fund (PRF), The Economic and Social Stabilization Fund (ESSF) and the Bicentennial Fund (BF).[28] These funds are governed by the Fiscal Responsibility Law and a structural surplus rule. The structural surplus rule dictates that the government calculates its annual fiscal expenditure independent of fluctuations in revenues caused by changes in the price of copper and other variables. As a result, any budget surplus is allocated to the funds. This means that the government saves when copper prices are

[26] The average 2001 – 2006 Chile – Canada exchange rate is CAD$1=CLP436.4 (Oanda, 2009).

[27] It is likely that these estimates are an underrepresentation of the current amount of resource revenue collected from the extraction of copper because royalties were first introduced in Chile in 2006.

[28] Unless otherwise cited the information in this section comes from Chile Ministry of Finance (2008).

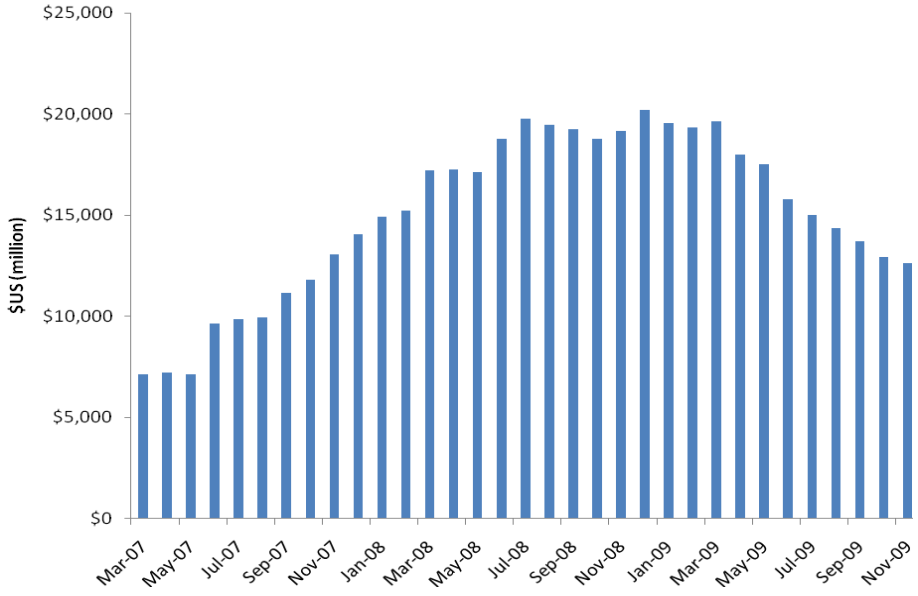
high and avoids excess spending of resource revenues and does not have to cut budget spending when copper prices are low. The Fund is used to offset fiscal deficits and allows spending stabilization by counteracting variability of copper prices.

The PRF was created to fund various types of pensions. The minimum amount allocated to this fund is 0.2% of the previous year's GDP; however if the surplus exceeds this amount, the amount allocated can increase to a maximum of 0.5%.

In 2007, the ESSF replaced the Copper Stabilization Fund (CSF) and thus started with US$2.58 billion.[29] The ESSF is used to accumulate excess copper revenues to offset fiscal deficits due to low copper prices and can be used to pay off public debt. The ESSF receives approximately 0.2% to 0.5% of GDP depending on the size of the government surplus. As seen in Figure 22, since its inception the ESSF grew by nearly 80% of its original value, from CAD$8.2 billion to CAD$12.5 billion.

[29] The CSF was a fund used by the government of Chile to counteract variable copper prices. Money was accumulated to the CSF from resource revenues from CODELCO. Money was deposited into the fund when copper prices were high and there was a surplus and withdrawn when copper prices were low (Davis et al., 2001).

Figure 22: Market Value of Economic and Social Stabilization Fund (bi-weekly)



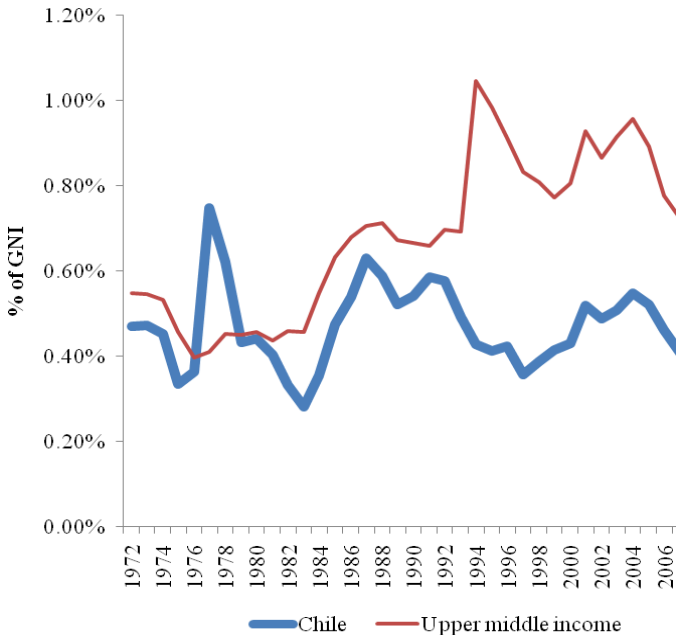
Source: Chile Ministry of Finance (2010)

Over this period, the total contributions to the Fund were CAD$18 billion and the withdrawals were CAD$8.2 billion. The recent decline in the value of the fund is due to the recent financial crisis that dropped the investment value of the fund (Chile Ministry of Finance, 2008).

7.3.3 Capital Maintenance

During the 1970 – 2006 period, the carbon dioxide damage as a percent of GNI has been decreasing from 0.47% to 0.35% (see Figure 23).

Figure 23: Chile and Upper Middle Income Country Carbon Dioxide Damage: 1970 - 2006

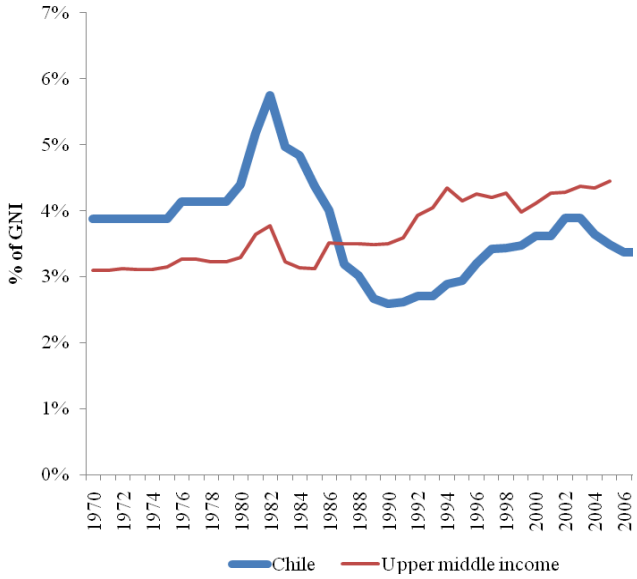


Source: The World Bank (2009)

In 2006, it was nearly half of the average of that of upper middle income countries (0.67%). In addition, in 2006 Chile's CO_2 emissions per capita were 4 metric tons while the average for upper-middle income countries was 5 metric tons per capita. Since 1990, Chile has increased its amount of forest area by nearly 10,000 km^2.

As seen in Figure 24, Chile's education expenditure fell drastically in the 1980s and its spending on human capital as a percentage of GNI moved below the average of upper-middle income countries.

Figure 24: Chile and Upper Middle Income Country Education Expenditure: 1970 – 2007



Source: The World Bank (2009)

In 2006, Chile's education expenditure was 3.4% of GNI, while the average for upper middle-income countries was 4.4%. Despite the below average spending on education, school enrolment in Chile remains high. In 2007, 91% of Chile's eligible students were enrolled in secondary school and 52% were enrolled in tertiary school. This is higher than the average for upper middle-income countries (89% and 42.4%, respectively) (The World Bank, 2009). In addition, in 2008, the Chilean government created the Bicentennial Fund with an initial contribution of US$6 billion from which the annual returns from the investment are used to finance scholarships for Chileans to study abroad.

7.4 Alaska

Although Alaska is not an ideal example of sustainability it provides a good jurisdictional comparison for Alberta. Alaska has also has been effective in the collection and use of resource

rents as well as government accountability in non-renewable resource management. For this reason, only the collection, use and governance of resources rents are discussed in this section.

7.4.1 Resource Rents

Alaska's natural resources are owned by the Government of Alaska and it allows private corporations to extract the resources by granting leases through a competitive bidding system. In addition to purchasing leases, the government also requires corporations to pay an annual land rental charge, a royalty on oil and gas production as well as an oil and gas production tax.

Alaska's largest revenue source comes from the oil and gas production tax. The base tax rate is 20% on net cash flow and it increases when oil prices are high. The tax also allows a 20% tradable capital investment tax credit and a $73 million annual allowance that creates incentives for investment, exploration and development. The government royalties vary depending on the terms agreed to in the lease. The rates can be anywhere from 5% to 60%, but they are usually around 12.5%. Some leases receive lower royalty rates due to special considerations such as new discoveries (Alaska Department of Natural Resources, 2009a). Table 10 provides an overview of the different types of the Government of Alaska's resource revenue and their rates.

Table 10: Source of Resource Revenue - Alaska

Type	Description	Rate
Bonus bids	The Government of Alaska leases the right to exploit resources to corporations. This occurs through a competitive bid auction, where annual rights are leased to the highest bidder.	Highest Bid
Rent Charges	The Government of Alaska charges annual rent for corporations to use the land.	Not available
Production Royalties	The Government of Alaska charges a royalty rate on oil and gas production. The royalties may be paid in-kind (oil) or as a percentage of the production.	5% - 60% (usually 12.5%)
Oil and Gas Production Tax	This is a special tax charged only on oil and gas revenue. It also includes special credits and allowances to encourage investment and exploration. This tax makes up the largest portion of Alaska's resource revenue.	20%

Sources: Alaska Oil and Gas Association (n.d.) and Alaska Department of Natural Resources (2009a)

During the period of 2001 to 2008, Alaska collected on average US$1.8 billion (CAD$2.2 billion) in resource revenue per year.[30] This amounts to approximately US$0.15 (CAD$0.19) for every cubic metre produced (Alaska Department of Natural Resources, 2009b). PricewaterhouseCooper (2009) find that the cost of producing and exploring for onshore oil is high when compared to other oil and gas producing jurisdictions. They estimate that in the US the cost is approximately CAD$8.52 per barrel. This is comparable to both Norway (CAD$10.50/barrel) and Alberta (CAD$9.75/barrel) This is supported by Taylor et al. (2004) who state that US onshore has high production costs when compared to other regions. The value of the oil coming from Alaska is high. During the same period, the average price of a barrel of Alaskan oil was US$44 (CAD$56) (Energy Information Administration, 2009). Taylor et al. estimate that over the 1992 – 2002 period Alaska collected on average 99% of the economic rent available.

7.4.2 Use of Resource Revenues

As written in Alaska's constitution, 25% of all resource revenues coming from lease rentals, royalties and bonuses must be placed in the Alaska Permanent Fund (APF).[31] This ensures that a large portion of resource revenues are not used for budget expenditures. The main objective of the APF is to save money for future generations. The money in the APF is invested in public and private assets with an acceptable level of risk. The earnings from the APF may be spent at the discretion of the Legislature and Governor. Most of the earnings go to the Permanent Fund dividend program, which pays an annual dividend to Alaska's residents. For example, in 1999 all Alaskan residents received US$1,770 as part of the dividend program. The rest of the earnings are generally reinvested back into the APF. The principal of the APF can't be spent without amending the constitution through a majority vote of Alaskans. The APF's assets have

[30] The average 2001 – 2008 Canada – US exchange rate is CAD$1= US$0.78 (Oanda,2009).

[31] Unless otherwise cited, the information in this section is from Fasano (2000) and Alaska Permanent Fund Corporation (2010).

been growing rapidly, with an annual rate of return of 7% over the 1978 – 99 period. Currently the APF is worth over US$35 billion (CAD$34.5 billion).[32] The resource revenues that are not contributed to the APF are distributed to a general fund and the school fund. In 2009, less than 0.005% of resource revenues were dedicated to the School Fund (Alaska Department of Natural Resources, 2009b).

Alaska also has the Constitutional Budget Reserve Fund (CBR). The purpose of the CBR is to counteract government revenue shortfalls. There is an annual cap on the amount of money that can be borrowed from the CBR. This cap can be reviewed by the legislature if necessary. Any money taken from the CBR is treated as a loan that must be repaid to the CBR when there is a surplus. The money in the CBR comes from yearly settlements on tax and royalty sale proceeds. Because of the Alaska Permanent Fund and the Constitutional Budget Reserve Fund, Alaska's government spending does not follow the amount of resource revenue.

7.5 Summary of Key Findings

There are a number of key findings and best practices that can be identified from the case studies. This section shortly highlights the findings from the previous sections. The findings are briefly summarized in Table 11.

[32] The 2009 Canada-US exchange rate is CAD$1=US$1.01 (Oanda, 2009).

Table 11: Summary of Case Study Findings

Characteristic		Norway	Botswana	Chile	Alaska
Resource Rent	*Resource Ownership*	Publicly Owned	Publicly Owned	Publicly Owned	Publicly Owned
	Extraction Rights	Free licenses awarded based on impartial criteria	Paid licenses awarded based on impartial criteria	Paid licenses	Paid licenses awarded through competitive bidding
	Policy Instruments	Petroleum Tax State Direct Financial Interest Dividends	License Fee State Direct Ownership Dividends Royalties	Annual License Fee State Direct Ownership Royalties	Bonus bids (License Fee) Land use fees Royalties Production Tax
	Rent Capture	Amount Collected- $2.89/barrel Production cost – High Resource Value – High Rent Capture – 75% - 88%	Amount Collected- $40/carat Production cost – Low Resource Value – High Rent Capture – 75%	Amount Collected - $604/tonne Production cost – unknown Resource Value – High Rent Capture - unknown	Amount Collected- $1.2/barrel Production cost – High Resource Value – High Rent Capture – 99%
Use of Resource Revenues	*Savings/ Stabilization Fund*	Yes	Yes	Yes	Yes
	% invested in Fund	100%	Unknown	Dependent on government surplus 0.2% - 0.5% of GDP	Minimum 25%
	Amount in the Fund	NOK 2275 billion (CAD$413 billion) Since 1990 CAD$41.3 billion/year	Pula 2810 million (CAD$7.4 billion) Since 1996 CAD$0.52 billion/year	US$12.6 billion (CAD$12.5 billion) Since 2007 CAD$4 billion/year	US$35 billion (CAD$34.5 billion) Since 1976 CAD$1.4 billion/year
	Fund Withdrawal	Only for a non-oil deficit	Unknown	During a deficit	Only investment earnings
	Legislation	Governed by Act and requires parliamentary approval	Formal Investment Rule	Structural Surplus Rule - Fiscal Responsibility Law	Part of Constitution
	% Invested in Other Types of Capital	0%	100%	Investment in Human Capital	Less than 1% in School Fund
	Used for Budget Expenditure	No	No	Yes (only a limited portion)	Yes (only a limited portion)
Capital Maintenance	*Natural Capital*	Yes Strong regulation and government commitment to protect environment Lower than average carbon dioxide damage Large use of clean energy, increase in forest area	Yes Lower than average carbon dioxide damage Protection of natural areas Below average carbon dioxide emissions/capita	Yes Lower than average carbon dioxide damage Increase in forest area	NA
	Human Capital	Yes Above average expenditure on education and enrolment in education	Yes Above average expenditure on education but poor school enrolment	Yes Below average expenditure on education but high tertiary school enrolment	NA

Resource Rent – In all of the cases, non-renewable resources are owned publically and private corporations are granted permission to extract resources. With the exception of Botswana, all governments collect surplus profits from the corporations using a variety of tools including royalties, leases and bonus bids. In the case of Chile, Norway and Botswana governments also ensure they capture the maximum amount of resource revenue available by having a direct role in the extraction of natural resources either through a state owned company or through a public-private partnership. Past studies estimate that these governments have collected between 75 - 99% of rent available.

Use of Resource Revenue – In all the cases resource revenues are invested into either a savings or stabilization fund. All of the funds with the exception of Botswana have accumulated on average more than CAD$1 billion in the fund per year. The amount of resource revenue invested in the fund varies by case; however, each jurisdiction has strict rules governed by legislation on how resource revenues are to be used including how much money must be invested in the fund and how much can be withdrawn. These rules do not change annually depending on the economic situation. The amount of resource revenues that can be used for general budget expenditure is strictly limited in all four cases. In the case of Chile, Alaska and Botswana, some of the resource revenues are used to increase human capital by investing in education programs.

Capital Maintenance – The countries examined for investment in capital all have above average investment in human and natural capital. Each country has below average damage from carbon dioxide and has increased its net forest area. Also, these countries ensure investment in human capital either by increased education expenditure or above average school enrolment.

Based on the case study findings it is possible to establish a set of priorities required for sustainably managing non-renewable resource wealth. These priorities are listed in Table 12 and they are compared to current initiatives in places for the government of Alberta.

Table 12: Priority Areas for Sustainably Managing Non-renewable Resource Wealth

Area	Priority	Alberta
Resource Rent	Resources are publicly owned	Yes
	Collection of resource rent using royalties, taxes, fees etc.	Yes
	Government involvement in the extraction of resources	No
	Capture 75 - 99% of resource rent	Unknown[1]
Use of Resource Revenue	Invest resource revenues in a fund	Yes
	Large accumulation in fund CAD$1 billion/year	Weak (Alberta has accumulated approximately CAD$0.58 billion/year since 1976)
	Strict rules on fund investment and withdrawal	No
	Use some resource revenues to invest in other types of capital	Weak
	Limited use of resource revenues to finance regular budget expenditure	No
Capital Maintenance	Investment in human capital	Weak (Below average investment in human capital)
	Investment in natural capital	Weak (Below average investment in natural capital)

[1] Due to the recent changes to Alberta's royalty regime it is difficult to determine how much resource rent is currently being captured by the government. For this reason, while I acknowledge that it is important for the government of Alberta to capture the maximum amount of rent available, the policy section of this study will solely focus on the use of resource revenue and capital maintenance.

Based on this comparison, it is clear that Alberta's current policies are not in line with those of other resource dependent jurisdictions. Although Alberta is investing its resource revenues in a long term fund, the amount invested is low when compared to the case study examples. Alberta has accumulated CAD$14 billion in the Alberta Heritage Savings Trust Fund, which is approximately CA$0.58 billion per year. This is weak when compared to Norway's CAD$413 billion accumulated since 1990 (approximately CAD$41.3 billion/ year) and Alaska's CAD$34.5 billion accumulated since 1976 (approximately CAD$1.4 billion/ year). The case study countries have all been able to save large amounts in their funds because they all have strict rules on fund investment and withdrawal and on the use of resource revenues to finance regular

budget expenditure. While Alberta has in the past had strict rules on its fund investment and resource revenue use, currently, none exist. Furthermore, as discussed earlier, Alberta's performance on both education and the environment is below the Canadian average.

Therefore, it is clear that there are a number of priority areas for Alberta so that future generations can benefit from the resource wealth. These include the need to accumulate more money in the AHSTF. In order to do this the government of Alberta needs strict rules on the amount of money to be invested annually and resource revenues should not be used to finance regular budget expenditure. Alberta also needs to invest more in human and natural capital. The next section validates these priority areas by confirming them with findings by other researchers.

7.6 Findings Verification

This sub-section is a brief survey of past research on Alberta to assess whether similar priority areas have been identified by other researchers.

A number of researchers have identified the need for greater savings of Alberta's resource revenues. In a study conducted for the C.D. Howe, Shiell and Busby (2008) identify the need for a long-term plan for Alberta's resource revenues. The authors argue that if Alberta wishes to sustain a constant level of expenditure in the future, current levels of savings should be much more aggressive. A failure to meet this target may lead to a permanent decline in fiscal capacity as resources and revenues diminish. The Canada West Foundation has also strongly argued for Alberta to consider the interests of future generations and save more resource revenues in the AHSTF (Gibbons and Roach, 2006). It focuses on the need for an investment strategy and argues that Alberta needs a serious long-term savings plan which includes a strict investment rule independent of government surpluses or deficits. The savings plan also needs to limit the ability of politicians to adjust the savings plan based on their own agenda. The Canada West Foundation

also argues that because Alberta has been using resource revenue surpluses to fund government spending the province is at risk of excessive and unsustainable levels of government expenditure.

The Alberta Chamber of Commerce and the Certified General Accountant Association of Alberta (Milke, 2006) also advocate for investing more in the AHSTF. In a collaborative study, they argue that Alberta should set a set percentage of resource revenues that should be invested in the AHSTF annually. They also find that government spending has grown more quickly than inflation and population growth.

As a result, based on the case study analysis and the findings of past researchers it is clear that Alberta needs to save its resource revenues in the AHSTF. In order to be able to do this the government needs to set out a strict investment rule through legislation that can't be changed on a yearly basis. The government also needs to increase current levels of human and natural capital to compensate for the depletion of non-renewable resources. The next section uses these findings to create policy alternatives for Alberta.

8: Policy

This section identifies four policy options based on the research findings. It then evaluates them against a set of criteria to select the best option. This follows with a policy recommendation.

8.1 Policy Objectives

In managing Alberta's non-renewable resources, in the long-term the province must ensure sustainable economic growth so that future generations are able to benefit from Alberta's resource wealth. As a result, I set Alberta's long-term objective as reaching an adjusted net savings of 10.6% of GDP. This is Norway's current adjusted net savings and is an attainable benchmark for Alberta.

In order to do this, in the short run, Alberta must reach two short term goals. These include:

- Systematic investment of resource revenues in a long-term fund
- Investment in human and natural capital

Specifically, Alberta must save its resource revenues so that they are available for future use when non-renewable resources are depleted. Consequently, the Government of Alberta must regularly invest resource revenues in a long-term savings fund such as the AHSTF. In addition, the government must also increase current levels of human and natural capital to compensate for the depletion of non-renewable resources.

8.2 Policy Alternatives

Based on the case study findings and the short-term and long-term goals four policy alternatives are identified as potential strategies for the Government of Alberta to achieve long-term economic sustainability. The policies are based on initiatives currently in place in Norway and Alaska, as well, as past studies modeling an optimal savings rate for Alberta.

8.2.1 Policy 1: Investment Rule for 100% of Resource Revenues

This policy reintroduces legislation on the investment of resource revenues into the AHSTF and sets an annual investment rule of 100% of all resource revenues and income interest on the fund. This legislation must be entrenched and can only be changed by a provincial referendum so as to limit the ability of the government to modify the amount invested yearly. As in the case of Norway, some of the money from the AHSTF can then be transferred back into general budget revenue in the case of a non-oil deficit. This should be approximately 4% of the investment income from the fund. There must be a maximum limit placed on the amount of money that can be used to finance a non-oil deficit because, as has been the case with Alberta, access to additional resources can lead to a self-made deficit due to excessive program spending. The amount of money transferred back to the budget must be disclosed publicly in the annual budget. By transferring 100% of resource revenues into the fund and disclosing how much is transferred back, the use of resource revenues is transparent and the public can hold the government accountable.

8.2.2 Policy 2: Investment Rule of 50% and Annual Dividend Cheques

Following the case of Alaska, this policy suggests legislation for an investment rule and paying Albertans annual dividend cheques from the AHSTF investment income. The investment rule would stipulate that the government must annually put 50% of all resource revenues in the

AHSTF.[33] The investment income earned from the fund would be used to provide Albertans with annual dividends in the form of annual cheques. As in Alaska, once citizens receive a direct and tangible benefit from the fund, they have a vested interest in the long-term management of the fund. These dividends would then ensure that Albertans hold the government accountable and demand transparent and prudent management of non-renewable resources.

8.2.3 Policy 3: Investment Rule of 50% and Expenditure on Human and Natural Capital

This policy entails introducing legislation for an investment rule and using the investment income from the AHSTF to invest in human and natural capital. The investment rule would be the same as under Policy 2. The investment income earned from the fund would however, be invested in programs focused on increasing human and natural capital, such as university scholarships, carbon dioxide emission reduction etc.[34] This spending on human and natural capital would be in addition to what the government is currently spending on these budget areas. In order to keep the government accountable and to not sporadically change the investment rule, the legislation must be entrenched and only be amendable through a referendum.

8.2.4 Policy 4: Investment Rule of 50%, Annual Dividend Cheques and Investment on Human and Natural Capital

This policy is a combination of policy two and three. It entails introducing legislation for a 50% investment rule for resource revenues and using 50% of the investment income from the AHSTF on increasing human and natural capital and the other 50% of investment income on dividend cheques.

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[33] Although further studies must be conducted to determine an optimal percentage to be placed in the AHSTF, various studies identify a 50% savings rule as necessary to maintain intergenerational equity (see Busby and Shiell ,2008; Gibbons and Roach, 2006; Kneebone, 2006).

[34] Further research must be conducted to determine the most effective way to increase human and natural capital.

8.3 Criteria and Measures

This section will define and explain the criteria used to assess the policy alternatives identified earlier. These are listed in Table 13 and will be discussed in detail following the table.

Table 13: Criteria and Measure

Criteria	Definition	Measurement	Value
Effectiveness			
Amount invested in the fund	How much resource revenues are annually invested in a long-term savings fund?	0 – 33% 33 – 66% More than 66%	Low (1) Medium (2) High (3)
Continued investment in the fund	What is the likelihood the government will change the amount invested in the fund annually?	Low public involvement Medium public involvement High public involvement	Low (1) Medium (2) High (3)
Investment in Other Types of Capital	How much is invested in other types of capital?	Less than 2.5% of GDP 2.5 – 4% of GDP More than 4% of GDP	Low (1) Medium (2) High (3)
Generational Distribution			
Generational Distribution	How much resource revenue will be used on the current generation?	Less than 50% 50% More than 50%	Low (1) Medium (2) High (3)
Cost			
Cost	How much will it cost to administer?	More than $75/Albertan $1 – $75/ Albertan Less than $1/Albertan	Low (1) Medium (2) High (3)
Stakeholder Acceptability			
Public Acceptability	What percent of the public will support the policy?	Less than 25% 25% - 50% More than 50%	Low (1) Medium (2) High (3)
Feasibility			
Administrative Feasibility	How will the policy affect the government budget?	Budget deficit Balanced budget Budget Surplus	Low (1) Medium (2) High (3)

Effectiveness is measured using three different criteria, which are based on the short-term objectives set out. The first effectiveness measure addresses how much money is invested in a long-term fund (AHSTF). Although the outcome on this criterion can be in theory altered by policy choice, it is an important criterion and as a result, must be included in the policy analysis. This is measured by the percent of resource revenues annually invested in the fund. Because the amount of resource revenues that can be invested in the fund can range anywhere from 0 – 100%, this range is split evenly into three categories where 0 – 33% ranks low (index = 1), 34 – 66% ranks medium (index = 2) and anything about 66% scores high (index = 3).

The second measure for effectiveness looks at the continued investment of resource revenues into the fund. In order for fund accumulation to be successful, it must be sustained over a long period of time. Alberta's institutions do not allow legislation to be binding and as a result governments are able to change legislation. Therefore, in the past, investment rules adopted by the Government of Alberta lacked longevity and the rules were either changed or abandoned with shifting government priorities, such as recessions or energy price drops. As a result, this measure looks at the likelihood of the government to change the amount invested in the fund and is measured by the amount of public involvement in the management of non-renewable resources. If the public is highly involved it will be more difficult for the government to change the policy and as a result, it would score high (index=3). If there is medium public involvement the policy ranks medium (index=2) and if there is little public involvement the government would be able to easily change the amount invested in the fund and as a result ranks low (index=1).

The third measure for effectiveness is investment in natural and human capital. This is measured by expenditure on natural and human capital in addition to current expenditure as a percent of GDP. Currently the Government of Alberta spends less than 2.5% of GDP on average on human and natural capital (Government of Alberta, various years). On average, high income countries spend 4% of GDP on education (World Bank, 2009). Data for high income country

expenditure on natural capital is not available so Norway's expenditure on the ministry of environment is used as a benchmark. Norway spends approximately 0.1% of GDP on the Ministry of Environment (Norway Ministry of Finance, various years). As a result, expenditure on human and natural capital which is 2.5% or less is considered to have low effectiveness (index=1). Expenditure on human and natural capital which is between 2.5% and 4% is considered to have medium effectiveness (index=2) and expenditure above 4% is considered to be highly effective (index=3). In order to avoid giving effectiveness more weight, the average of the three measures of effectiveness is taken to produce the total score.

The generational distribution criterion identifies how equitable a policy will be for the current versus the future generation of Albertans. The effectiveness criterion addresses how much non-renewable resource wealth is passed on to future generations by saving and investing in human and natural capital. Therefore, because the resource wealth belongs to both current and future generations, this criterion measures how fair a given policy is to present generations. This is measured by the amount of resource revenues that are spent on the present generation of Albertans. Past research has argued that spending half of the resource revenue on current generations and the other half on future generations is a fair balance (see Kneebone, 2006; Gibbons and Roach, 2006). For this reason, 50% of resource revenues spent on current generations is used as a benchmark (index=2) and anything below this amount is considered to be inequitable for the current generation as it favours the future generation (index=1) and anything above 50% is highly equitable for the current generation (index=3).

The cost criterion examines how much it will cost to administer a given policy. This is measured by how much it costs to run the policy per Albertan. Currently the AHSTF is administered on less than $1/ Albertan (Alberta Ministry of Finance, various years). Comparing this to Norway, the cost is very low. It costs approximately NOK416 (CAD$75) per Norwegian

to run the NGGPF (Norges Bank, 2008).[35] Using these two funds as benchmarks, a policy that costs less than $1/ Albertan is considered to have a low cost and is ranked as high (index=3). A policy that costs between $1 - $75/Albertan is ranked medium on cost (index=2) and a policy that costs more than $75/Albertan is expensive and ranks low on cost (index=1).

Stakeholder acceptability identifies whether the general public would support a given policy. This is measured by the percent of Albertans that are in favour of a particular policy. This is based on the results of a 2005 survey on Albertans preferences on how to spend resource revenue surpluses (Berdahl, 2006). It is important to note that attitudes are likely to be different in dealing with surpluses as opposed to a deficit. In difficult economic times, the public is not likely to support any policy that deals with sustainability and sets aside resource revenues for future generations. Therefore, this survey is a good proxy for public acceptability assuming that Albertans support the concept of economic sustainability. Any policy that is supported by 50% or more Albertans ranks high (index=3), a policy that receives 25% – 50% ranks medium (index=2). A policy that is supported by less than 25% of Albertans ranks low (index=1).

The final criterion is administrative feasibility. By implementing any policy that decreases the amount of resource revenues spent by the government it is important to assure that the government has enough revenue to finance the current budget. This is assuming that the government will not make any program cuts or tax increases on account of implementing the suggested policies. Over the 1995 – 2005 period, the gap between government expenditure and tax revenue was approximately 50% of resource revenue. In other words, over this period the Government of Alberta used 50% of annual resource revenue to balance the budget (Kneebone, 2006). This leaves an additional 50% of resource revenue that could be invested without requiring major spending or tax changes. As a result, any policy that leaves less than 50% of resource revenues for government spending will lead to a budget deficit and has low feasibility (index =

[35] The Canada – Norway exchange rate used is the average for 2007 and 2008 and it is 5.42 (Oanda, 2009).

1). A policy that allows the government to spend 50% of resource revenues will have a balanced budget and is feasible (index=2). A policy that allows the government to use more than 50% of resource revenues will lead to a budget surplus and is very feasible (index=3).

8.4 Policy Analysis

This section evaluates the suggested policy alternatives using the predetermined set of criteria in order to assess the strengths of each policy. The results from this analysis will be then used to inform the policy recommendations. The total scores resulting from this evaluation are summarized in Table 14.

8.4.1 Policy 1: Investment Rule for 100% of Resource Revenues

Effectiveness: This policy entails that 100% of resource revenues be transferred annually into the AHSTF with only a small amount being taken out to finance non-oil deficits. The policy therefore ranks high (3) in the amount invested in the fund. In terms of continued investment, this policy requires a provincial referendum to change the investment rule. As a result, the government is not able to readily change the legislation without involving the public. The results of a provincial referendum are not binding but a government can expect to lose political support if they implement changes that go against the will of the public. Therefore, although the government is able to change the legislation, it is difficult for it to do so because of the degree of public involvement. As a result, this policy scores medium (2) in terms of continued investment. This policy does not direct any additional money to increasing human or natural capital and therefore ranks low (1) in this criterion. Taking the average of these three measures of effectiveness this policy gets a 2 in terms of effectiveness.

Generational Distribution: Considering this policy directs nearly all resource revenues to the AHSTF, it does not allow the current generation to benefit from any of the resource revenue. For this reason, this policy ranks low in terms of generational distribution and scores 1.

Cost: This policy will result in a large amount of money being accumulated in the fund and will require additional staff to adequately manage and invest this money. Norway, which has a large fund and a number of managers dedicated to investing money from the fund, spends approximately CAD$75/citizen on managing its fund. Using this as a proxy, this policy ranks medium on cost and scores a 2.

Public Acceptability: In a 2005 survey, of all the participants that supported saving for Alberta's future (33.5%), 35% of respondents supported a policy that allocated surplus oil and gas revenue in a long-term savings account. Using these responses as a proxy, this policy ranks medium on public acceptability, scoring a 2.

Feasibility: Considering that this policy invests nearly 100% of resource revenues in the AHSTF, there will be very little left over to be used in the annual budget. For example, between 2001 and 2005, if the government did not have access to resource revenues, it would average an annual deficit of more than $4 billion (Kneebone, 2006). As a result, assuming the government does not make drastic program cuts or increase taxes, this policy would result in a budget deficit, ranking this policy low on feasibility (1).

8.4.2 Policy 2: Investment Rule of 50% and Annual Dividend Cheques

Effectiveness: This policy ranks medium in regards to the amount invested in the fund because this policy dictates that the government must deposit 50% of resource revenues into the AHSTF. This policy ranks high in ensuring continuous investment in the fund. The annual dividend cheques serve as a method to create a high level of public involvement in the management of resources. As Albertans start to receive dividend cheques they will ensure that the

government doesn't adopt policies that will result in a lower payout for the cheques. As has been the case in Alaska, to implement policies that lower the dividend paid out to citizens is a grave political error as it may cost the government votes and popularity with the public. As a result, this will lower the likelihood of the government to change the amount of money invested in the fund annually. Although this policy does not directly invest any additional money into human or natural capital, money accruing to citizens from the dividend cheques can be used for education spending. As has been the case in Alaska, although the majority of the dividend cheques are spent on personal enjoyment, such as buying televisions and snowmobiles, a portion has also been used on education. Between 1991 – 2003, approximately 0.4% of Alaskan dividend cheques were invested in a college savings plan (Permanent Fund Dividend Division, 2003). Emery (2006) estimates that with a 50% investment rule, by 2015 the investment income would be $2.75 billion. If 0.4% (approximately $11 billion) was spent on education that would result in an additional 0.003% of Alberta's GDP being spent on human capital. While this may not account for a large share of GDP, it is more than what is currently spent and as a result, this policy ranks a medium (2) on investment in other types of capital. Overall, by taking the average of these three measures of this policy scores 2.3 in terms of effectiveness.

Generational Distribution: This policy invests 50% of resource revenues and leaves the other 50% for the use of the current generation. In addition, Albertan's will receive an annual dividend cheque that gives them an additional benefit over the future generation. As a result, the current generation of Albertans will receive more than 50% of resource revenues ranking this policy as high in terms of generational distribution and thus scores 3.

Cost: Compared to the current administrative costs of the AHSTF, this policy is expensive to administer. Not only will the increased accumulation to the fund require the government to hire fund managers to oversee the investment ($75/Albertan), but they also must administer the dividend program. Using Alaska's dividend program as a proxy, the program costs

approximately CAD$11/ Alaskan citizen to operate (Alaska Department of Revenue, 2006). This means that it will cost approximately $86/Albertan, this is the total of hiring additional fund managers ($75/Albertan) and administering the dividend program ($11/Albertan). Therefore, this policy is ranked as low in terms of cost, scoring a 1.

Public Acceptability: Albertans are not overly fond of dividend cheques. In the survey responses, only 2% of respondents supported the idea of using resource revenues in a combination of a savings fund and dividend cheques. This policy ranks low for public acceptability (1).

Feasibility: This policy receives a ranking of medium (2) administrative feasibility as it leaves 50% of resource revenues available for budget spending. Over the 1995 – 2005 period, the government needed to use on average 50% of resource revenues to balance the budget (Kneebone, 2006). As a result, by investing 50% of resource revenues, this allows the government to use the additional 50% to balance the budget.

8.4.3 Policy 3: Investment Rule of 50% and Expenditure on Human and Natural Capital

Effectiveness: This policy requires that the government transfer 50% of resource revenues into the AHSTF and therefore it ranks medium (2) in terms of the amount invested in the fund. As in policy 1, to change the 50% investment rule requires a provincial referendum. Therefore, the government is not able to readily change the legislation without involving the public. Although the results of a provincial referendum are not legally binding, it would be difficult for the government to go against the will of the public. Therefore, although the government is able to change the legislation, it is difficult for it do so because of the degree of public involvement. As a result, this policy scores medium (2) in terms of continued investment. This policy entails that the government use the investment income from the AHSTF on human and natural capital. Emery (2006) estimates that with a 50% investment rule, by 2015 the investment income from the

AHSTF would be $2.75 billion. This is approximately 1% of Alberta's 2008 GDP. If this money were targeted at human and natural capital in addition to what the government is currently committed to spending, this would result in 3.5% of GDP being spent on human and natural capital. Meaning, that this option ranks medium (2) in terms of investing in other types of capital.

Generational distribution: This policy invests 50% of resource revenues and leaves the other 50% for the use of the current generation. The additional program spending on education and natural capital is also considered as being beneficial to the current generation. Investment in education and the environment allows present generations to enjoy additional program spending, an educated population and access to clean air and water. Therefore, this policy is very equitable for the current generation, scoring 3 in terms of generational distribution.

Cost: As in previous policies, this policy will result in a large amount of resources being accumulated in the fund and will require additional staff to manage the fund. Using Norway as a proxy, this will cost approximately $75/Albertan. The amount of money needed to administer the program funding is very little because the government itself is not running any programs. Instead the government is giving money to other organizations such as universities, environmental groups, libraries etc. Although this may result in additional indirect costs, such as increased university costs due to increased enrolment, this criterion targets costs directly linked to running the program. The government currently runs a number of funds and endowments that serve a similar purpose, which provide funds to other organizations to increase human and natural capital, for example, the Alberta Heritage Scholarship Fund. It costs the government on average less than less than $0.01/Albertan to administer this fund. As a result, this policy ranks medium on cost, scoring a 2.

Public Acceptability: Albertans generally support program spending especially in the area of education. Based on the survey results, over 27% of Albertans would support a policy that

combines saving of resource revenues and program spending. As a result, this policy is ranked as having medium public acceptability (2).

Feasibility: This policy ranks medium (2) on administrative feasibility as it results in the government having a balanced budget. The government would be able to use 50% of the resource revenues for general budget spending, which, as was explained in Policy 2, allows the government to cover any budget deficits. The additional investment income used for human and natural capital would not help with budget spending as this money is earmarked for special programs and is to be used in addition to regular spending.

8.4.4 Policy 4: Investment Rule of 50%, Annual Dividend Cheques and Expenditure on Human and Natural Capital

Effectiveness: This policy ranks medium (2) on the amount of money invested in the fund as it requires that the government transfer 50% of resource revenues into the AHSTF. This policy requires the government to use the investment income from the AHSTF to fund an annual dividend cheque and to be used to increase human and natural capital. As discussed earlier, the dividend cheques are a way to get the public very involved in the management of non-renewable resources and to demand more prudent management of resource revenues. Because the public has a large vested interest in the fund, the government will not be able to easily change the amount of it invests in the fund without losing a large share of public support. Therefore, this policy ranks high (3) in terms of a continuous investment in the fund. Half of the investment income (approximately 0.5% of Alberta's GDP) would then be used on programs targeted at human and natural capital. That would result in 3% of GDP being spent on human and natural capital. In addition to this, there would be some further spending on human capital (approximately 0.001% of GDP) coming from the spending of dividend cheques on education. As a result, this option ranks medium in investment in other types of capital.

Generational distribution: This policy ranks high on generational distribution as it allows Albertans to enjoy more than 50% of resource revenues. Not only does the current generation receive 50% of resource revenues but it also receives investment income in the form of an annual dividend and program spending.

Cost: This is an expensive policy to administer. The increased accumulation to the fund will require the government to hire fund managers to oversee the investment ($75/Albertan) and administering the dividend program will cost an additional $11/ Albertan. The cost of investing in human and natural capital is less than $0.01/Albertan. Therefore, it will cost approximately $86/Albertan to administer this policy, ranking this policy low in terms of cost, scoring a 1.

Public Acceptability: More than 35% of Albertans stated that they would support a policy that uses government surpluses in a combination of savings, dividend cheques and program spending. As a result, this policy ranks medium (2) in terms of public acceptability.

Feasibility: This policy ranks medium (2) on administrative feasibility. The government is able to use 50% of resource revenues to offset non-oil deficits resulting in a balanced budget.

Table 14 Evaluation of Policy Alternatives

Criteria	100% investment	50% + Dividend	50% + Human and Natural Capital	50% + Dividend + Human and Natural Capital
Effectiveness (average)	**2**	**2.3**	**2**	**2.3**
Amount Invested	High (3)	Medium (2)	Medium (2)	Medium (2)
Continuous Investment	Medium (2)	High (3)	Medium (2)	High (3)
Investment in other types of capital	Low (1)	Medium (2)	Medium (2)	Medium (2)
Generational Distribution	**1**	**3**	**3**	**3**
Generational Distribution	Low (1)	High (3)	High (3)	High (3)
Cost	**2**	**1**	**2**	**1**
Cost	Medium (2)	Low (1)	Medium (2)	Low (1)
Public Acceptability	**2**	**1**	**2**	**2**
Public Acceptability	Medium (2)	Low (1)	Medium (2)	Medium (2)
Feasibility	**1**	**2**	**2**	**2**
Feasibility of the proposed option	Low (1)	Medium (2)	Medium (2)	Medium (2)
Total	**8**	**9.3**	**11**	**10.3**

8.5 Policy Recommendations

Taking into account the short-term objectives and the predetermined criteria, Policy 3, Investment Rule of 50% and Investment in Human and Natural Capital, ranks the highest. This policy receives either a medium or high ranking on all of the criteria, never receiving a low score. While its ranking on effectiveness is similar to the other proposed policies, this policy is very equitable for the current generation. It allows the current generation of Albertans to enjoy more than 50% of the resource revenues today, by spending revenues on programs while investing a fair share for future generations. It is also inexpensive and feasible for the government to implement without resulting in drastic budget deficits.

As a result, based on the criteria assessment, I recommend implementing Policy 3. This policy ensures that adequate amounts of resource revenues are invested in both savings and human and natural capital. It also ensures that the benefits of resource revenues are fairly split between the current and future generations of Albertans.

It is interesting to note, that Policy 4, with the investment income split between a dividend cheque and investment in human and natural capital is a close second. The only reason why this policy did not come out on top in the policy evaluation is due to the high cost associated with administering a dividend cheque. Perhaps a low cost variation on this policy would result in this being the optimal policy alternative. An alteration of this policy could potentially consist of giving Albertans an annual payment coming from the investment income on the fund; however, this would not be distributed in the form of a cheque but would instead be invested on their behalf into different forms of human or natural capital based on their preferences. For example, Albertans could annually mark on their tax return where they would like their share of the funds to go. The options could include post-secondary education for themselves or children through a plan similar to the RESP, a tax reduction for energy efficient home renovations or money being directed at provincial or national parks. Although this would still require additional staff to administer the policy, it would not be as expensive as sending out yearly cheques.

9: Conclusion

This study has shown that Alberta is heavily reliant on its non-renewable resource sector. Oil and gas has greatly contributed to Alberta's economy and its high standard of living. Unfortunately, Alberta's current strategies in managing its non-renewable wealth are not sustainable. In order to sustain long-term economic growth Alberta must increase its stock of physical, human and natural capital. The province is depleting its natural capital by extracting non-renewable resources and degrading its environment. In addition, it is not compensating for this decrease in natural capital by increasing physical or human capital. As a result, in order to be economically sustainable and to ensure Albertans can enjoy a similar standard of living in the future, Alberta must save its resource revenues and invest in human and natural capital. I recommend that Alberta make a commitment through legislation to investing 50% of its annual resource revenues into the Alberta Heritage Savings Trust Fund. The investment income earned from this fund should then be targeted at increasing human and natural capital.

While this study has provided a general overview as to how Alberta can sustain economic growth in the future, additional research must be conducted to identify optimal investment strategies. I have identified a 50% investment rule for resource revenues due to intergenerational equity as this splits resource wealth evenly between current and future generations; however, additional research must be done as to what an optimal investment rule would be to ensure that Alberta has enough resources in the future.

In addition, further research should focus on the best method to increase Alberta's human and physical capital. Alberta's primary and secondary education is among the best in the country; however, Alberta is below average in post secondary enrolment. Research should focus on what the best strategy would be to encourage young Albertans to enrol in post-secondary institutions.

Similarly, it is important to identify how to best increase natural capital in Alberta. While it is impossible to replace the non-renewable resources that have already been extracted, Alberta could focus its efforts on reducing the amount of non-renewable resources it currently consumes by focusing on introducing renewable energy strategies, for example for electricity production. The province could also mitigate the damage to its natural environment by decreasing its air pollution through the adoption of carbon capture and storage.

Finally, this study has focused on the use of resource revenues and has not examined Alberta's resource rent collection. This is an important topic as it will impact the amount of resource revenues the province collects and thus, the amount of money it will be able to target at increasing human and natural capital.

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