ALBERTA'S ENERGY LEGACY

Ideas for the Future

edited by

Robert ROACH

CANADA WEST FOUNDATION

An Investing Wisely Project Publication

About the Canada West Foundation

Our Vision
A dynamic and prosperous West in a strong Canada.

Our Mission
A leading source of strategic insight, conducting and communicating non-partisan economic and public policy research of importance to the four western provinces and all Canadians.

Canada West Foundation is a registered Canadian charitable organization incorporated under federal charter (#11882 8698 RR 0001).

In 1970, the One Prairie Province Conference was held in Lethbridge, Alberta. Sponsored by the University of Lethbridge and the Lethbridge Herald, the conference received considerable attention from concerned citizens and community leaders. The consensus at the time was that research on the West (including BC and the Canadian North) should be expanded by a new organization. To fill this need, the Canada West Foundation was created under letters patent on December 31, 1970. Since that time, the Canada West Foundation has established itself as one of Canada's premier research institutes. Non-partisan, accessible research and active citizen engagement are hallmarks of the Foundation's past, present and future endeavours. These efforts are rooted in the belief that a strong West makes for a strong Canada.

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This publication was edited by Canada West Foundation Director of Research Robert Roach and is part of the Canada West Foundation's *Investing Wisely Project.* The *Investing Wisely Project* has explored two key issues: 1) the case for saving a larger portion of Alberta's non-renewable natural resource revenue for future use; and 2) creative and strategic ways of using the earnings on the savings to transform the province in positive ways. The project has been funded by over 60 foundations, businesses and individuals (see the Appendix). The Canada West Foundation expresses its sincere appreciation for this generous support.

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We would also like to thank Brett Gartner for his chapter on existing savings vehicles in Alberta, Casey Vander Ploeg for his contributions to the *Investing Wisely Project* from its early days onward, the many funders of the project (see the Appendix), the numerous individuals who took time from their busy schedules to participate in the project's various consultation exercises, and the staff of the Canada West Foundation for their hard work on the project and for their ongoing encouragement. The Canada West Foundation also greatly appreciates the support of the *Calgary Herald* and *Edmonton Journal* and would like to thank both Al Rach and David Evans for their help. Thanks are also due to the contributors to the earlier *Investing Wisely Project* volume *Seizing Today and Tomorrow* (Loleen Berdahl, Bev Dahlby, Herbert Emery, Ronald Kneebone, Michael Robinson, and Allan Warrack) and to Harvey Krahn for his work on the survey of Albertans that was conducted in 2005.

Finally, thanks are due to Canada West Foundation Vice-Chair Brian Felesky for his tireless efforts to secure the funding for Phase III of the *Investing Wisely Project*.

Foreword

Alberta is in a unique position in Canada. It is the only province with no debt, a large stash of cash in the Heritage Fund, and enough energy revenue flowing into its coffers to keep taxes low, and—with just a little bit of discipline—double or triple the size of the Heritage Fund in just a few years. We have our hands firmly around the financial brass ring.

At the risk of mixing too many metaphors, Alberta's finances are like Tiger Woods two feet from the hole. We can't miss. We have the chance to secure our financial future and make sure that the Alberta advantage lasts a long, long time.

So why haven't we taken the shot? Why aren't we packing money into the Heritage Fund while we are seeing record levels of energy revenue and posting multi-billion dollar surpluses? What gives?

The main reason given for why we have been timid when it comes to saving our energy revenue in this province is that we need to spend the money now. A visit to the emergency room in Calgary or Edmonton gives a lot of credence to this argument. A pile of money in a bank account doesn't do us much good when we have pressing needs in health care, education, social services, infrastructure and so on. If the money is for a rainy day, many are arguing that it's coming down pretty darn good right now.

This still doesn't mean that we shouldn't be saving and here's why. First, no one is suggesting that all resource revenue should be saved for future use. The Canada West Foundation has suggested that half be saved (averaged over good and bad years) and others have suggested more modest amounts such as 30%. If we do this, we will transform our dwindling stocks of oil and gas into a permanent financial asset and make sure that Albertans 5, 10, 20 and 50 years from now get their share of this bounty while leaving half or more for current consumption.

Second, and perhaps most importantly, saving does not mean that the money gets stuffed in a mattress for a rainy day. On the contrary, the earnings generated by what is saved (after inflation-proofing the principal) are available for current use. If we grow the Heritage Fund, we also grow the annual cash flow it generates. We won't have quite as much to spend right away, but we will have lots to spend year after year after year. Saving is actually about being able to spend—on a *permanent* basis rather than in one-off splurges.

Indeed, if our luck holds and energy revenue stays high, we could have enough money saved in the Heritage Fund to do all sorts of things—from replacing the inevitable decline in energy revenue or an permanent annual dividend cheque to massive investments in post-secondary education or the environment. We have the chance to secure not only our financial future, but also to transform the province in positive ways.

Investing Wisely Project Phase III

The first phase of the *Investing Wisely Project* involved background research on how other jurisdictions such as Alaska and Norway manage their non-renewable natural resource revenue and roundtable consultations with over 100 business and community leaders from across the province. Based on the research and input from Albertans, the Canada West Foundation recommended that the province save 50% of its annual non-renewable natural resource revenue. This money would be set aside in a fund (or funds), inflation-proofed, and used to generate earnings that could then be used for a variety of purposes. This recommendation was rooted in several interrelated arguments including the value of creating a permanent source of stable revenue that would reduce the fiscal volatility created by fluctuating oil and gas prices and protecting the interests of future generations.

A second phase of the project was launched to inspire and inform additional debate on the best use of Alberta's non-renewable natural resource revenue. Four additional meetings with community leaders were held; a special edition of the Canada West Foundation's *Dialogues* magazine was released; a public opinion survey was conducted; a seminar on non-renewable natural resource revenue was co-hosted by the Foundation and the Economics Society of Calgary; research papers were prepared by prominent economists; and a summary report entitled *Seizing Today and Tomorrow: An Investment Strategy for Alberta's Future* was published.

The first two phases of the project informed and increased debate about the option of saving a portion of non-renewable natural resource revenue rather than spending all of it as it comes in. However, it was pointed out during the first two phases of the project that the case for saving begs a critical question: saving for what? There was general consensus among consultation participants that saving makes sense because it reduces revenue volatility, creates a permanent financial asset, and ensures that future Albertans will benefit from the province's bounty of non-renewable resources, but there was also a strong sense that more work was needed to prepare a menu of options for using the earnings generated by the proposed savings. Simply saving for a "rainy day" does not have broad appeal in Alberta.

The third phase of the project was launched to provide a more detailed answer to the question of how the earnings on the saved revenue could be used to improve the lives of Albertans and other Canadians. The goal was not to determine a single, definitive answer, but to generate a short list of exciting and thoughtful options for consideration by Albertans.

To this end, the Canada West Foundation commissioned 10 accessible research papers. The papers provide a range of answers to the following question:

> Assume that Alberta has saved non-renewable natural resource revenue in a permanent fund that is generating several billion dollars a year in revenue (after inflation-proofing). What could some or all of this revenue stream be used for and why? How will it transform Alberta and Canada for the better?

The idea was to explore practical, yet transformative, ideas that would see Alberta do something "special" with the earnings generated by the fund. The goal is to stimulate and inform debate among Albertans about how the earnings on a larger fund could be used and, in turn, the value of building such a fund in the first place.

Although focused on Alberta, the transformative ideas presented here are applicable to the rest of Canada in at least two ways: 1) If Alberta is able to act on some of these ideas, this will benefit the country in a variety of ways. For example, if Alberta embarks on a successful new approach to wellness, other provinces could learn from the Alberta experience. Similarly, if it becomes a world leader in alternative energy research, the results of this research would be of great value to the nation and to the world. 2) While the specifics would be different, many of the ideas make sense as public policy options in any part of the country. They are, as such, worth pondering no matter what part of Canada one is from.

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Chapter 1

Save Your Money!

Robert Roach

"Now, more than ever, the government must work with Albertans to ensure the good fortune we enjoy today is not squandered. We must respect and build on the work and the sacrifices that were made in the past.

We must plan ahead to ensure the prosperity this province enjoys today is secured for our children and grandchildren."

—Speech from the Throne, March 7, 2007

YOU know the kid in high school who seemed to have it all—good looks, smarts, solid upbringing, a scholarship to a top university? It is sad when you run into him 20 years later and you find out that he did not live up to his potential. Alberta is that kid. If we continue to spend our non-renewable resource revenue pretty much as it comes in, we will kick ourselves for doing so. We will wonder where it all went and why we did not save more of it for both ourselves and for our children. We may be doing "okay," because we can get by without non-renewable natural resource revenue, but we will have to live down the fact that we could be doing much better.

Luckily, the province still has a chance to change its future and ensure that the "Alberta advantage" does not slip away. All it has to do is exercise a modest amount of discipline and save more of its current non-renewable natural resource wealth.

That modest amount of political discipline is, however, very hard to muster when Albertans are not solidly behind the idea of a more aggressive savings program. Spending now is a lot more attractive than saving for later unless there is strong support from voters to do otherwise. This is true despite a long list of benefits associated with saving a larger portion of non-renewable natural resource revenue.

The province could have saved half of the resource revenue that it took in over the last three years (over $36 billion) and it would have still posted a surplus over that period of about $4 billion. In other words, we could have covered a generous budget, doubled the Heritage Fund, and still had billions left over for additional spending.

The province has socked away a few billion dollars in the Heritage Fund and other endowments in recent years. This is nothing to sniff at, but compared to what we can and should be saving, it is chump change. Plus, it comes after raiding the earnings of the Heritage Fund and spending every single dollar of resource revenue for 20 years.[1]

We also have billions stashed in the Sustainability Fund, but this is not a permanent endowment. This money is being parked temporarily until there is a dip in resource revenue when it will be spent in the blink of an eye to keep the province in the black.

It is important to point out that we paid back the provincial debt, but paying off our credit card is not the same as saving for the future. We need to face the facts: we have been chopping away at our endowment of natural resource wealth when we should have been transforming it into a permanent asset. Oil and gas are non-renewable resources—they will run out. Prices will go up and down. The oil sands will likely generate a significant amount of revenue for the province, but this is not a sure thing. Given this uncertainty, you hope for the best, but prudence demands that you plan for the worst. And that means saving a good-sized chunk of our resource revenue as it comes in rather than looking back and wondering where it all went.

We know that saving will help wean the province off its addiction to resource revenue (an addiction that is no more sustainable than an addiction to crack), greatly improve intergenerational equity by ensuring that future Albertans benefit from its endowment of natural resources, and provide a permanent and more stable source of revenue that can

1. For more information on how Alberta has spent its resource revenue, see Chapter 2.

be used to replace falling resource revenue, avoid having to raise taxes, help pay for core services, or to fund special projects.

Unfortunately, these theoretical arguments do not cut it when it comes to getting voters to demand more saving. The Canada West Foundation and other groups have been stressing these benefits for several years, and while there is soft support for more saving, it is drowned-out by the clamour for more spending. A 2005 survey conducted on behalf of the Canada West Foundation found that 54% of Albertans felt that spending surplus revenue on health care was an excellent idea compared to just 16% who said building up the Heritage Fund would be an excellent use of the cash.[2]

Indeed, in discussion after discussion with Albertans, we learned that the idea of saving for a rainy day simply does not capture the imagination of a province characterized by its "can-do" attitude; people want to know what the earnings generated by a larger savings fund will be used to accomplish. It was easy enough to get consensus that saving is prudent and that this should trump spending every dollar of resource revenue as it comes in, but the big question that emerged was "saving for what?"

This is where *Alberta's Energy Legacy* comes in. In order to provide Albertans with concrete examples of what could be done with the earnings generated by a larger savings fund, the Canada West Foundation commissioned 10 papers designed to outline a range of possibilities that would stimulate debate. These 10 papers appear in this volume and, while far from the only possible answers, they provide Albertans with a sense of what we can achieve if we save more. The ideas also stand on their own and are things that Albertans should consider, indeed that Canadians should consider, even if the connection to a wellspring of natural resource revenue is not available to pay for them. These are good ideas that also happen to bolster the case for increased saving in Alberta.

It is important to stress that these ideas are not aimed exclusively at Alberta's elected representatives. The debate about whether to save more and about what to do with the money if we do save it is something that Albertans need to embrace. Politicians should

2. For a full summary of the survey results, see Berdahl, Loleen. 2006. "What Do Albertan's Think? Saving and Alberta Public Opinion" in *Seizing Today and Tomorrow: An Investment Strategy for Alberta's Future.* Roger Gibbins and Robert Roach (eds.). www.cwf.ca

show leadership in this regard, but Alberta's natural resource endowment belongs to the people and it is our responsibility to get involved with the decisions about how to use it.

We may choose to be greedy and spend it as fast as it comes in. We may say to hell with future Albertans and their right to share in this bounty, but we should do so consciously and knowing full well that we are spending our children's money so we can have more than them for less.

Alternatively, we may choose to save and use the earnings to fund a permanent dividend program on the grounds that the money is used best if it is put into the hands of individual Albertans (not "back into" their hands because it is not tax dollars). This preserves intergenerational equity, but it precludes public projects that could transform the province. Note here that it is not "government" projects that are at issue. Albertans need to understand that it is *our* decision how to use the money and, if we decide that we want to pool it to pay for transformative public projects, this is not tantamount to Big Brother imposing his will on us.

Albertans may decide to use the earnings on a larger savings fund to replace future declines in resource revenue and, in this way, keep taxes lower than they otherwise would need to be. Or, we may decide that we want to do something special with the earnings—something that will have a dramatic effect over the long-term. The chapters in this volume provide some thought-provoking options in this regard.

Perhaps the best way for Albertans to get involved in this debate is for the issue to be put to a referendum after a citizen assembly has had a chance to weigh the various options and to present Albertans with its suggestions. If Albertans do not get involved, if we do not demand a new approach, we should not blame our elected representatives if they continue to spend most of our natural resource revenue as it comes in. It is hoped that the possibilities outlined in the chapters that follow will inspire Albertans to think about saving and, more importantly, what it can achieve for those of us here today as well as for those who come after us. We have a chance to leave a positive legacy and we should not let this opportunity pass us by.

Why Save? Three Analogies

The case for saving is rock solid: we take a large portion of a non-renewable and unpredictable revenue stream and convert it into a permanent, stable, transparent, intergenerational fund that provides a revenue stream in perpetuity. In this way, current residents benefit (although on a smaller scale at first) as do residents 5, 10, 20 and 50 years from now. Saving is the *only* way to guarantee that future generations receive their share of the province's bounty of oil and gas resources and it is the *only* way to ensure that future generations have a direct say in how their share should be spent. We may want to spend it on roads or health care, but future Albertans may have other priorities.

In addition, even if we save half of what we take in, we will still have lots left over that we are not putting in the bank that could be used to keep taxes lower and/or spending higher than they otherwise would be. If resource revenue falls, we would have a fund in place to offset this. If it stays strong or spikes, we have somewhere transparent and permanent to put it.

Three analogies illustrate the case for saving::

1. A Child's Trust Fund

Imagine that a kindly grandparent left her son and her grandchild $1 million each. Also imagine that the grandchild's money was put into a trust fund controlled by the child's parents until the child reached age 18. Mom and dad decide that the child needs a good education and a nice place to live, so they spend some of the money in the trust fund (even though they have steady incomes and the $1 million that was left to them). Fair enough, but most people would take the parents to task if they found out that there was only a few thousand left in the account when the child turned 18. It is just not right to rob from the future.

2. Pharaoh's Dream

The story of Joseph's interpretation of Pharaoh's dream in Genesis is instructive. Joseph tells Pharaoh that he should expect seven years of plenty followed by seven years of famine and that he should store up food during the years of plenty so that there will be enough during the years of famine. You save when times are good and use the savings when times are not so good. If history teaches us anything, it is that oil and gas prices, the costs of extraction, and the non-renewable natural resource revenue that the province relies upon all go up

and down. We also know that, no matter how much we can squeeze from the oil sands, Alberta's conventional stocks of oil and gas will eventually run out. Saving now, when the revenue stream is relatively strong, is the only way to prevent the short and long periods of famine that will come our way.

3. Saving For Retirement

A typical scenario for many Albertans involves them working into their 50s or 60s, retiring, and drawing on what they saved while working to ensure a more comfortable retirement than Old Age Security and the Canada Pension Plan provide. It is common sense: you save when you have a relatively strong income stream and you live off those savings when that income stream dries up. You exercise some restraint, pay off the mortgage, and sock away a few bucks in RRSPs. Alberta needs to do the same thing; it needs to prepare for the day when oil and gas revenue is a thing of the past. Like someone scraping by on minimum wage or mired in debt, the other provinces do not have the luxury of building a large nest egg. Alberta does. If it doesn't, Albertans are going to be in for a big shock when the inflow of oil and gas revenue becomes a trickle (read tax increases, budget deficits, or spending cuts). The province is not going to retire in the same sense as individuals do, but it will see its income drop and should, therefore, think ahead and prepare for this future.

Ten Big Ideas

"At first dreams seem impossible, then improbable, then inevitable."
—Christopher Reeve

As noted, saving more of Alberta's non-renewable natural resource revenue makes sense for all sorts of reasons: intergenerational fairness, fiscal prudence, reducing revenue volatility, better planning, and increased accountability. But without an answer to the question of what we should be spending the earnings on, Albertans are not going to support more saving.

To help rectify this gap in the public debate, the Canada West Foundation commissioned a group of thoughtful experts to come up with 10 big ideas for what Albertans could do with the earnings on a super-sized Heritage Fund. We asked these big thinkers to imagine that Albertans had decided to save more of their natural resource revenue and

that this resulted in a new permanent annual revenue stream of several billion dollars. We then asked them to outline what they would do with the money to transform Alberta in some significant way. The ideas range from a dramatic revamping of the province's university system to a permanent annual dividend program. And while all 10 ideas point to the transformative potential of a more aggressive savings program, they are not meant to be a final list of priorities. Instead, the goal was to generate a short list of exciting and thoughtful options for consideration by Albertans.

The 10 ideas present Albertans with options. It is up to us to decide what we want to do with the money generated by our natural resources. Do we want to save it and use the earnings in transformative ways or do we want more of the same? Do we want to have the best university system in the world? Do we want to be the world leader in the area of wellness? Do we want to have the best high-speed rail system on the planet? What do we focus on? What are we willing to sacrifice to achieve greatness in certain areas and to secure our long-term economic competitiveness and quality of life?

This is a debate that Albertans should be having around the water cooler and the dinner table. And we need to move quickly from debate to action because we may not have that many more chances to save on a grand scale.

The commitment to save and the decision regarding how to use the earnings generated by the fund are not matters that Albertans should slough off and leave to the government of the day. As owners and stewards of our resources, we should be involved. This is a defining moment for the province—we will either have $50 billion in the bank or we won't; we will either spend the earnings wisely or we won't.

One thing is particularly clear: regardless of what Albertans decide to spend their resource revenue on—be it core programs, infrastructure, lower taxes, dividends, or transformative initiatives—spending the revenue as it comes in is pure folly. We should not rely on a volatile and depleting source of revenue when we have the option of creating a permanent source of cash through disciplined saving. Albertans have spent a lot time and energy debating the appropriate level of royalities but we have neglected to debate what we want to do with the revenue that we actually collect. This debate is long overdue.

Chapter 2

Alberta's Money Jars: Current Provincial Savings and Endowment Funds

Brett Gartner

THE Alberta Heritage Saving Trust Fund—the Heritage Fund for short—is the best known of Alberta's provincial savings and endowment funds. But the province has a number of other funds and accounts—"jars of money"—in its fiscal arsenal. The list includes: the General Revenue Fund, the Sustainability Fund, the Capital Account, the Debt Retirement Account, the Alberta Heritage Foundation for Medical Research Endowment Fund, the Alberta Heritage Science and Engineering Research Endowment Fund (a.k.a., Ingenuity Fund), the Alberta Heritage Scholarship Fund, the Alberta Cancer Prevention Legacy Fund, the Energy Innovation Fund, the Access to the Future Fund, and the Ultimate Heir Trust Fund "B."

The purpose of these other funds—if any—in the context of non-renewable resource revenue management can be confusing. A general understanding of the role of these various funds and accounts is useful in the discussion of the disposition of resource revenues. The intent of this chapter is to provide an overview of the various funds, as well as other information that helps to put them into context.

The General Revenue Fund, the Sustainability Fund, the Capital Account, and the Debt Retirement Account are part of the province's broader fiscal management system. While these funds and accounts are significant in size and play an important role in provincial finances, they are not entirely pertinent to the relatively narrow discussion of long-term saving of non-renewable resource revenues. However, because of its relationship to resource revenue and its prominent role in provincial finances, a brief overview of the Sustainability Fund may be helpful.

The Sustainability Fund is not a vehicle for long-term saving. Created in 2000 by the *Fiscal Responsibility Act,* the Sustainability Fund is an account within the General Revenue Fund. Alberta's "Fiscal Framework" dictates that no more than $5.3 billion of non-renewable resource revenue can be used for general budget purposes. Resource revenues above $5.3 billion that are not saved (e.g., allocated to the Heritage Fund) or allocated to the Capital Account are retained in the Sustainability Fund. It can be used by the Alberta government to cover things such as the cost of emergencies, disasters, natural gas rebates, and unexpected declines in budget revenue. At the end of the 2006-07 fiscal year, the Sustainability Fund contained assets of $7.7 billion. Legislation dictates that assets above $2.5 billion may be allocated by the Treasury Board for government spending.

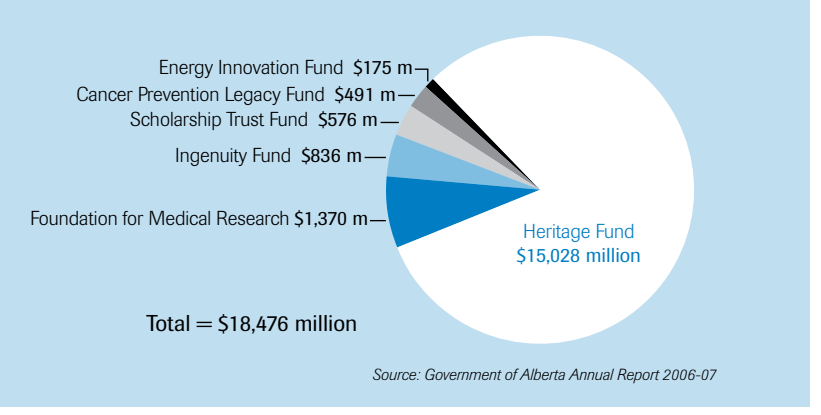
A number of funds fall under the category of endowment funds, which, along with the Heritage Fund, are central to the discussion of non-renewable resource revenue management. Alberta's endowment funds include the Foundation for Medical Research, the Ingenuity Fund, the Scholarship Fund, the Cancer Prevention Legacy Fund, and the Energy Innovation Fund.[1]

The focus of this chapter is largely on the various endowment funds, including the Heritage Fund. The combined value of these funds was $18.5 billion at March 31, 2007. The Heritage Fund is far and away the largest of the various funds (see Figure 1). Alberta Investment Management (AIM)—an arm of Alberta Finance—is currently responsible for the financial management of these financial assets. However, in 2008, provincial investment operations will be separated from Alberta Finance and moved to a new stand-alone organization called the Alberta Investment Management Corporation. This change in policy is consistent with the best practices of other major public sector investment funds in Canada.

The Government of Alberta also recently established the Financial Investment and Planning Advisory Commission. The province has asked this five-person panel of independent experts to "ensure Albertans are receiving the maximum long-term benefits from the province's savings and investment funds, including the Alberta Heritage Savings Trust Fund." In developing its recommendations, the commission will evaluate the fundamental nature and purpose of Alberta's various funds and review the appropriateness of the funds' management and governance processes.

1. The Access to the Future Fund is not a distinct or stand-alone endowment fund but is part of the Heritage Fund. As such, it is addressed in the section devoted to the Heritage Fund. The Ultimate Heir Trust Fund "B" is an obscure fund that accounts for a small fraction (0.1%) of the total value of endowment funds. In the rare situations where an Alberta resident has no family and no will, the person's assets become property of the province and are placed in this fund. Interest earned from this fund is directed to scholarships to Alberta universities. Therefore, it is not relevant to the discussion of the management of non-renewable resource revenue.

Figure 1: Financial Assets of the Heritage Fund and Endowment Funds, at March 31, 2007



What follows is a brief overview of the history and current situation of the Heritage Fund and other endowment funds. In order to view the Alberta experience in a broader perspective, this chapter includes a summary of two international examples of governments that have executed plans for saving natural resource revenue—Alaska and Norway.

Alberta Heritage Savings Trust Fund

- created in 1976 with a $1.5 billion transfer from general revenue and $620 million in resource revenue
- financial assets of $15.0 billion at the end of the 2006-07 fiscal year
- over 80% of total endowment fund assets
- web presence: finance.gov.ab.ca/business/ahstf

The Alberta Heritage Savings Trust Fund was created by the provincial government in 1976 in response to a surge in natural resource revenue. Actions by the Organization of Petroleum Exporting Countries (OPEC) in the fall of 1973 caused the price of oil to rise four-fold. As a result, oil and gas royalty revenues reached unprecedented heights.

The purpose of the Heritage Fund at the time was captured by three goals: saving for the future, strengthening and diversifying Alberta's economy, and improving the quality of life of Albertans. The Fund was started with a $1.5 billion transfer from general revenue and $620 million in resource revenue. When it was created, the Heritage Fund received 30% of all resource revenue annually, and income earned by the Fund was re-invested (less amounts that were spent on capital projects).

In the years directly following its inception, the Heritage Fund was quite different from its current form. Of course, saving remains central to the Heritage Fund. But many of the actions taken to achieve the original goals of strengthening or diversifying the economy and improving the quality of life of Albertans are a thing of the past. For example, the Heritage Fund was used to make direct investments in private sector commercial enterprises. It also financed a wide range of physical and social infrastructure projects.

The Fund initially had three divisions. The Capital Projects Division funded Alberta-specific projects, the Canada Investment Division provided loans to other provinces, and the Alberta Investment Division held equity in provincial Crown corporations and loaned funds to the private sector though a bevy of Crown corporations. Loans from the Heritage Fund were generally made at favourable rates.

Additional divisions and endowments were created in the early 1980s. The Commercial and Energy Investment Divisions were created to maximize returns and develop Alberta's energy resources. The Alberta Heritage Foundation for Medical Research and the Alberta Heritage Scholarship Fund (details on these follow) were established as separate entities with money from the Heritage Fund.

Economic conditions took a turn for the worse in 1981-82. Alberta's economy stalled in the face of a deep recession, high interest rates, and the National Energy Program. Lending under the Canadian Investment Division was stopped. Investment income from the Heritage Fund was used to reduce Alberta's first budget deficit in years. This was supposed to be a temporary change in policy, but it did not turn out that way.

The days of windfall-style natural resource revenue came to an end with the collapse of oil prices in the mid-1980s. The annual deposit of royalty revenue was reduced from 30% to 15% and Heritage Fund earnings were transferred to general revenue. A 50% drop in world oil prices and mounting provincial debt led the government to stop transfers to the Fund in 1987. The Heritage Fund was "capped"—all resource revenue and annual income were diverted to general revenue on an ongoing basis.

In the early and mid-1990s, more changes were made to the Heritage Fund. For increased liquidity, the Heritage Fund sold its investment in Alberta Government Telephone to Telus, and mortgages held by the Alberta Home Mortgage Corporation were sold to private institutions. These two privatizations combined were worth $1.6 billion. A loss of roughly $600 million was incurred as investments of the Heritage Fund were written down. The *Alberta Heritage Savings Trust Fund Act* was amended in 1996 and the fund's investment framework was revised the following year. The changes meant that the Heritage Fund was to be managed as an endowment Fund with the goal to maximize long-term investment returns. Usage of the Fund for direct economic development or social investment purposes was prohibited.

The value of the Heritage Fund has stagnated over its lifespan. During the decade spanning 1993 to 2003, the average value of the Fund was $12.0 billion, lower than the

Another New Fund?

Alberta's Value-Added and Technology Commercialization Task Force made a recommendation that puts a new twist on the old idea that government wealth can be invested in a way that strengthens and diversifies the Alberta economy. The task force released its final report in the spring of 2007. The first of the report's seven recommendations was that the Government of Alberta should devote $100 million to create the Alberta Enterprise Fund. The Fund would partner with private sector investors to create $300 million in new venture capital. The purpose of the Alberta Enterprise Fund would be to stimulate a more effective venture capital market for knowledge-intensive firms. The task force recommended that the government's role would be as a passive investor, with no influence or direct input on actual business decisions.

value of the Fund in the mid-1980s. This comparison is based on nominal values and does not factor in erosion of value from inflation. The effects of inflation are significant. From 1985 to 2007, the average annual rate of inflation was 2.6%. Something that cost $1 in 1985 would cost $1.77 today. In other words, the $12.0 billion that was in the Heritage Fund in 1985 would now be worth $21.2 billion, had it been inflation-proofed.

In fact, the Heritage Fund was not protected against inflation for most of its history. Regular inflation-proofing began in 2005-06, only after Alberta's accumulated debt was eliminated. However, from 1996 to 2000, the government occasionally left a portion of investment income in the Fund to offset inflation.

In 2005, the *Access to the Future Act* created the Access to the Future Fund, an endowment within the Heritage Fund. It was designed to benefit post-secondary education in Alberta. The government put $750 million in the Access to the Future Fund in fiscal year 2005-06. According to the legislation, this endowment for advanced education within the Heritage Fund can reach a maximum value of $3 billion.

There have been some significant injections of cash into the Fund in the last couple of years. Alberta made a $1 billion deposit in the Heritage Fund and retained $382 million for inflation-proofing in 2005-06 (in addition to the $750 million earmarked for the Access to the Future Fund). In 2006-07, $1 billion was transferred to the Heritage Fund, $283 million was retained for inflation-proofing, and $250 was allocated to the Access to the Future Fund.

The current mission of the fund, according to the *Alberta Heritage Saving Trust Fund Act*, is: "To provide prudent stewardship of the savings from Alberta's non-renewable resources by providing the greatest financial returns on those savings for current and future generations of Albertans."

While the raison d'être of the Heritage Fund is stewardship of the savings from non-renewable resources, there is currently no legal requirement for the Alberta government to make regular transfers of a proportion of resource revenues to the fund. In addition, the legislation governing the Fund says that all investment income is to be transferred to general revenue except the amount required to preserve the value of the Fund in the face of inflation.

Harvard University's Endowment Fund

The Heritage Fund is a significant financial asset. But, many people are surprised to learn that it is less than half the size of the endowment fund of Harvard University.

Harvard University's endowment was valued at $35 billion US in June 2007. This equates to roughly $2 million per Harvard student.

Investment income from the endowment is a key source of funding for the university, accounting for one-third of Harvard's total income in the 2007 fiscal year. The endowment fund is handled by the Harvard Management Company (HMC), a subsidiary of Harvard University. The endowment is not one large fund, but a collection of around 11,000 funds. Many of these individual funds are targeted at specific aspects of university operations, such as scholarships, libraries, or research activities. Harvard aims to spend approximately 5% of total endowment funds annually. This policy is consistent with the "5% rule", a long-term spending guideline followed by many other educational institutions and endowments.

The Ministry of Finance has ultimate responsibility for the fund. The assets in the Heritage Fund are currently managed by Alberta Investment Management, the investment management arm of Alberta Finance. Two committees help with the governance and management of the fund. The Standing Committee on the Alberta Heritage Savings Trust Fund is tasked with reviewing and approving business plans and annual reports, and holding public meetings to inform and receive input from the public. This committee is comprised of MLAs from government and opposition parties. The Endowment Fund Policy Committee brings a private sector financial and business perspective to the fund's governance. It is made up of government MLAs and members from the private sector.

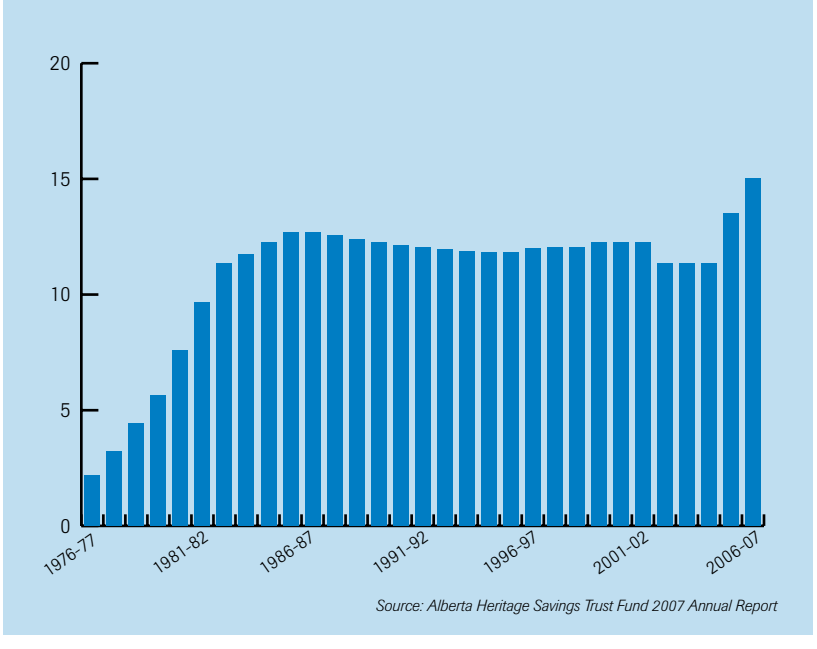
At the end of the 2006-07 fiscal year, the Heritage Fund was worth $15.0 billion if valued at cost.[2] A brief overview of Heritage Fund finances and resource revenue collected by the Alberta government over the past three decades helps to put the fund's current value into context. Figure 2 shows how the Heritage Fund has evolved over time in

2. Cost value is the value at which assets were acquired. Alternatively, the assets in the Heritage Fund can be expressed in terms of fair value, the amount for which the asset could be sold in a current transaction to a willing and knowledgeable buyer. This is analogous to market value. At fair value, the Heritage Fund was valued at $16.6 billion at the end of the 2006-07 fiscal year.

terms of total value. Although infusions of cash have given it a boost in recent years, the value of the Heritage Fund essentially stood still for 20 years. Again, it is important to note that these are nominal values and do not include the effect of inflation.

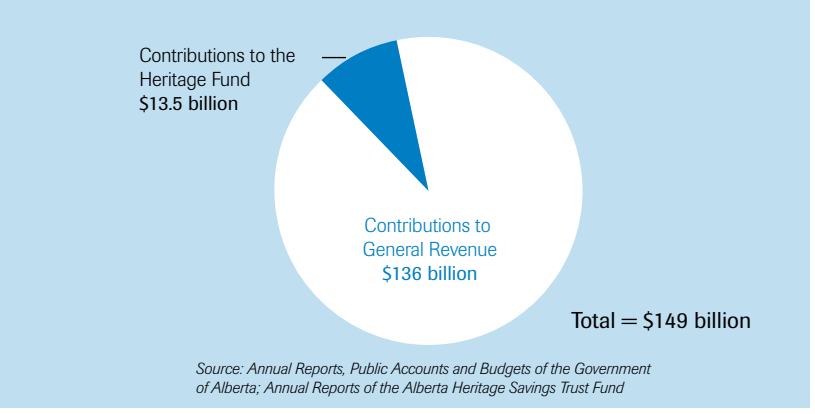
From the creation of the Heritage Fund to the 2006-07 fiscal year, the province collected a total of $149.6 billion in resource revenue (see Figure 3). Of that amount, $13.5 billion (8.3%) was deposited into the Heritage Fund. The remainder—$136.0 billion—was transferred to general revenue. As Albertans know all too well, resource revenues are notoriously volatile from one year to the next (see Figure 4). In contrast, annual income earned by the Heritage Savings Fund is much more stable. In the early years of the Heritage Fund, income was re-invested. This policy was short lived and, as a result, the majority of the $30.0 billion in investment income earned since the fund's inception has accrued to general revenue.

Figure 2: The Value of the Heritage Fund, 1976-77 to 2006-07 (fund equity at cost value)
billions of dollars



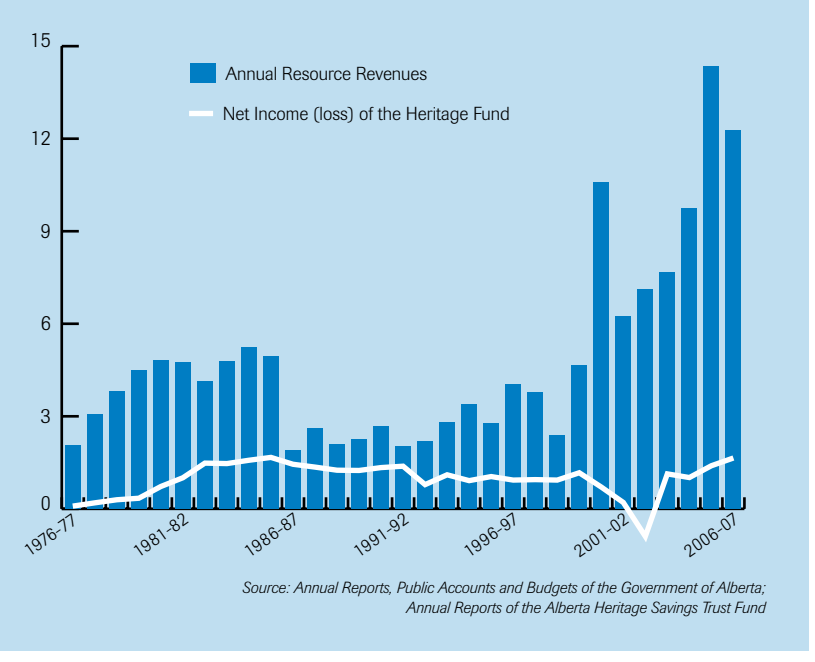
Source: Alberta Heritage Savings Trust Fund 2007 Annual Report

Figure 3: Alberta's Resource Revenues, 1976-77 to 2006-07



Source: Annual Reports, Public Accounts and Budgets of the Government of Alberta; Annual Reports of the Alberta Heritage Savings Trust Fund

Figure 4: Alberta's Resource Revenues and Heritage Fund Income, 1976-77 to 2006-07
billions of dollars



Source: Annual Reports, Public Accounts and Budgets of the Government of Alberta; Annual Reports of the Alberta Heritage Savings Trust Fund

Alberta Heritage Foundation for Medical Research

- created in 1980 with an initial investment of $300 million from the Heritage Fund
- financial assets of $1.37 billion at the close of the 2006-07 fiscal year
- 7.4% of Alberta's total endowment fund assets
- $500 million addition to the Foundation announced by the Alberta government in 2005
- web presence: ahfmr.ab.ca

The Alberta Heritage Foundation for Medical Research (AHFMR) supports and funds health research at Alberta universities and related institutions through a variety of grants and awards. As of May 2007, over 600 medical researchers were receiving funding. The AHFMR has provided more than $850 million in funding since it was established. According to the Government of Alberta's 2006-07 Annual Report, the Foundation was valued at $1.37 billion at March 31, 2007.

In addition to its primary role of funding medical research, the AHFMR has other programs. For example, through the Health Research Transfer Network of Alberta, it helps with the process of moving research into practice. The AHFMR also helps medical researchers commercialize their innovations.

The provincial government created the AHFMR in 1980 with a $300 million transfer from the Heritage Fund and an Act of Legislature. The AHFMR is wholly independent and is distinct from the Heritage Fund. Operating funds come from a portion of the investment revenue from the AHFMR endowment fund. As is the case with the Heritage Fund and other endowment funds, it is managed by Alberta Investment Management.

The provincial government announced a $500 million addition to the Foundation in 2005: $200 million in 2005-06, $150 million in 2006-07, and $150 million in 2007-08. This infusion of money has allowed the AHFMR to pursue some innovative programs. For example, the ten-year, $10 million Polaris Award will be used to recruit a top-level "superstar" medical researcher to Alberta. Three of these awards—which are the largest in Canada—will initially be available.

The AHFMR is governed by a Board of Trustees comprised of representatives from the universities, the medical profession and the general public. Board members are appointed by the Lt. Governor of Alberta. The AHFMR reports to the Minister of Advanced Education and Technology, but operates at arm's length from government. The AHFMR is audited annually by the province's Auditor General.

The endowed nature of AHFMR makes it unique among foundations for medical research Canada. Other provinces have foundations for medical research (e.g., the Michael Smith Foundation for Health Research in British Columbia), but they are largely reliant on ongoing government funding.

Alberta Ingenuity Fund (Alberta Heritage Foundation for Science and Engineering Research)

- created in 2000 with an initial investment of $500 million
- financial assets of $836 million at the end of the 2006-07 fiscal year
- 4.5% of Alberta's total endowment fund assets
- $500 million addition to the Fund announced by the Alberta government in 2005
- web presence: albertaingenuity.ca

The Alberta Heritage Foundation for Science and Engineering Research operates under the name Alberta Ingenuity Fund. Following the model of the Alberta Heritage Foundation for Medical Research, the Government of Alberta created the Fund in 2000 with an initial endowment of $500 million from the General Revenue Fund. Alberta Ingenuity supports science and engineering research and promotes the importance of discovering and applying new knowledge for a strong economy and society.

Alberta Ingenuity manages an annual grant program that funds more than 300 researchers working in industry and at universities. It also operates several "institutes" and "centres." These include the Alberta Prion Research Institute (prions are thought to cause Bovine Spongiform Encephalopathy, or BSE) and the Alberta Water Research Institute.

The value of the Fund was stated as $836 million as of March 31, 2007. However, the 2005 *Access to the Future Act* included a $500 million expansion to the fund. This additional funding is being added in installments and the Fund is expected to increase to nearly $1 billion by 2010. Recent installments include $100 million in each of 2005-06 and 2006-07.

Since its inception, annual spending from the Fund has increased from $600,000 to about $24 million in 2006-07. A recent change to the *Alberta Heritage Foundation for Science and Engineering Research Act* lays out annual spending limitations. Like the AHFMR, the Alberta Ingenuity Fund is independent of the Heritage Fund. Operating income comes from a portion of the investment revenue generated by the fund.

The Government of Alberta is charged with appointing the Board of Trustees that governs Alberta Ingenuity. It operates at arm's length from government but reports to the Minister of Advanced Education and Technology. Alberta Ingenuity submits an annual report to the Legislature and is audited each year by the Auditor General of Alberta.

Alberta Heritage Scholarship Fund

- created in 1981 with initial investment of $100 million
- financial assets of $576 million at March 31, 2007
- 3.1% of Alberta's total endowment fund assets
- $1 billion addition to Fund announced by the Alberta government in 2005
- web presence: alis.gov.ab.ca/scholarships

The Alberta Heritage Scholarship Fund currently administers more than 50 types of scholarships to Alberta high school, undergraduate and graduate students. In 2006, 11,610 scholarship recipients received $23 million. Scholarships vary in size and eligibility requirements. The Fund was created in 1981 with an initial $100 million transfer from the Alberta Heritage Savings Trust Fund. Since the inception of the program, more than 180,000 students have received nearly $305 million. The rules were changed in 1995 to allow endowment donations from the private sector—individuals, corporations, organizations, and other groups. However, this is a relatively minor aspect of the Fund.

Australia's Higher Education Endowment Fund

The Government of Australia established the Higher Education Endowment Fund in 2007 to help the country transform its universities into world-class institutions. The Fund was created with $5 billion (AUD) from the Australian government surplus. An additional $1 billion (AUD) was subsequently added to the Fund and Australia has promised to make additional deposits to the endowment out of future budget surpluses. The Fund will provide an ongoing source of revenue that universities can direct towards capital requirements and research facilities.

According to Alberta's 2006-07 annual report, the Fund was valued at $576 million as of March 31, 2007. A significant addition to the fund—$1 billion—was promised in the 2005 *Access to the Future Act*. Transfers of nearly $500 million have been made to the Heritage Scholarship Fund since fiscal year 2005-06. In addition to $250 million in 2005-06 and $20 million in 2006-07, $227 million was announced after the 2006-07 annual report was released.

The Alberta Heritage Scholarship Fund is administered by the Ministry of Advanced Education and Technology and is independent of the Heritage Fund. Scholarships are paid out of investment earnings generated by the fund, which is currently managed by Alberta Investment Management. The financial statements of the Fund are included in the Ministry of Finance's annual report.

Alberta's Latest Funds: the Alberta Cancer Prevention Legacy Fund and the Energy Innovation Fund

The Government of Alberta recently created two new funds, the Alberta Cancer Prevention Legacy Fund and the Energy Innovation Fund.

The *Cancer Prevention Legacy Act* established the Alberta Cancer Prevention Legacy Fund in 2006. This fund, which received $500 million in 2006-07, will support initiatives in cancer prevention, screening, education and research.

Also in 2006, the Alberta government announced the new $200 million Energy Innovation Fund. Although the initial plan was to bring the Fund up to $200 million over three years, the full amount was allocated in 2006-07. The Energy Innovation Fund will be used for research and other projects focusing on energy supply and environmental protection.

Alaska and Norway

Two widely-cited international examples of governments that have executed plans for saving natural resource revenue are Alaska and Norway. Both of these cases show the power of following through on a plan to invest natural resource wealth. However, this is not to hold up Alaska or Norway as models that Alberta should emulate. Each has had success and encountered difficulties. The wisdom of their respective decisions continues to be debated. Further, differences between Alberta, Alaska and Norway prevent direct and thorough comparisons. Alaska is one of the smallest US states and its political and economic decisions are hardly felt in the rest of the nation. Norway is a sovereign nation rather than a province within a federal state. Nonetheless, knowledge of the experiences of Alaska and Norway is helpful in the evaluation of past decisions and future plans for Alberta's natural resource wealth. Figure 5 shows how Alberta's Heritage Fund stacks up against those of Alaska and Norway.

Figure 5: Relative Size of Alberta Heritage Saving Trust Fund, Alaska Permanent Fund and Norway Government Pension Fund – Global

	Heritage Fund	Alaska Permanent Fund	Norway Government Pension Fund – Global
Year established	1976	1976	1990[a]
Market value (billions $US)[b]	15.3	40.5	322.8
Population	3,435,511[c]	670,053[d]	4,681,100[c]
Per capita value ($US)	4,744.6	59,995.3	68,966.7

a The first deposit was not made until 1996
b To facilitate comparisons, the value of the Heritage Fund is expressed as fair value, rather than cost value. Fair value—which is analogous to market value—is the amount for which the asset could be sold in a current transaction to a willing and knowledgeable buyer. Values are current as of June 2007.
c As of January 2007
d As of July 2006

Sources: Alberta Finance, Alaska Permanent Fund Corporation, Norges Bank Investment Management, Statistics Canada, The Bank of Canada, US Census Bureau, Statistics Norway

Alaska Permanent Fund

In 1969, Alaska auctioned off the drilling rights to state-owned land at Prudhoe Bay, netting the state $900 million US—an amount equal to eight times the state's annual budget. The consensus was to invest the windfall in much needed state infrastructure. Within a few years, the entire amount of money was spent. At the same time, oil prices were increasing substantially and the completion of the Trans-Alaska pipeline was on the horizon. Alaska was poised to generate much more income from its natural resources. But, there was also a desire to safeguard future income and save a portion of revenue from mineral resources to benefit future generations. So Alaskans voted in 1976 to amend the constitution to transfer a proportion of oil money into a dedicated fund: the Permanent Fund. According to the state Constitution, 25% of certain oil tax revenues must be deposited annually into the Permanent Fund. The remaining 75% is available for general revenue.

A key feature of the Permanent Fund is the dividend paid out every year to each resident of Alaska. Dividends are paid out of earnings generated by the Permanent Fund—by law, the principal cannot be spent. Alaska has the ability to spend realized investment earnings. Earnings from the Permanent Fund have been used to protect the principal against inflation, make special appropriations to the principal, and cover some fund-related state expenses. However, the majority of spending from the Fund has been for dividends. Dividends are calculated according to a formula—the last five years of Fund earnings are averaged, and then half of this amount is distributed. The other half has been retained by the fund, largely to protect the principal against inflation. Over $15 billion US has been paid out in dividends from the beginning of the program in 1982. The 2007 Permanent Fund dividend was $1,654 US. It has averaged $1,430 US over the past 10 years.

In the summer of 2007, the market value of Alaska's Permanent Fund reached $40 billion US. According to the Alaska Permanent Fund Corporation—the state-owned body that

manages the fund—it is larger than any endowment fund, private foundation, or union pension trust in the US. The Fund hit a fairly remarkable milestone in 1998, when the earnings of the Permanent Fund exceeded Alaska's oil revenues for the first time. Oil production from Prudhoe Bay peaked in 1988 and, as a result, Alaska is faced with an inevitable decline in resource revenue. However, projections indicate that Fund earnings will grow steadily. The Alaska Permanent Fund Corporation expects earnings to more than double from 2006 to 2022, from roughly $2 billion US to over $4 billion US.

Norway Government Pension Fund – Global (formerly Petroleum Fund)

The Norwegian Government Petroleum Fund was established in 1990 by an act of the Storting (Norway's Parliament). In broad terms, the government's goal was to manage petroleum revenues over the long term. Norway wanted to offset the effects of an anticipated decline in resource revenue and to reduce the fiscal disruptions created by volatile oil prices. While the Fund was established in 1990, the first transfer did not occur until 1996. Until that time, the budget of Norway was in a deficit position. The government decided that deposits to the Petroleum Fund would only occur when the budget was brought into surplus. In 2006, the Petroleum Fund was renamed the Government Pension Fund – Global (GPFG). The name change was part of extensive changes to Norway's pension system and highlighted the fund's crucial role in saving for substantially higher pension obligations in the future. However, the underlying purpose and investment strategy of the Fund remained the same.

All oil and gas resource revenue, plus the net earnings of state oil and gas interests, are deposited annually into the GPFG. Interest earned in the Fund is re-invested. The government draws up a budget that includes no resource revenue. This budget anticipates a "non-oil" deficit, which is then funded at the end of the year by an appropriation from the GPFG principal to general revenue.

The effects of Norway's strategy are hard to ignore. The Fund grew from just over $0.3 billion US ($300 million US) in 1996 to $278.0 billion US a decade later. The market value of the Fund was pegged at $322.8 billion US at the end of the second quarter of 2007. Norwegian government predictions indicate that it could reach $450 billion US by 2010.

A unique set of circumstances has landed Norway in this position. First, world energy markets since the mid-1990s have been robust—prices have risen to levels not seen since the early 1980s. This has been accompanied by a drastic increase in oil production from the North Sea. In 1996, oil production in Norway exceeded the 3 million barrels per day mark (roughly twice Alberta's current conventional and oil sands production). In 1973, Norway was producing 32,000 barrels per day. It has taken decades for Norway to develop its North Sea oil resources. At the same time that production was being maximized, prices soared. The result has been very large resource revenue windfalls.

The GPFG falls under the jurisdiction of the country's Ministry of Finance. Operational management is the responsibility of Norges Bank, Norway's central bank. However, GPFG activities are completely separate from the other functions of Norges Bank, notably monetary policy.

Conclusion

One can only speculate about what the future holds for the Alberta Heritage Savings Trust Fund and the other endowment funds. The Government of Alberta has taken some steps that indicate a renewed commitment to saving its natural resources wealth. But, when it comes to money, politics, economics and public policy, even the best plans can be derailed very quickly.

Will the value of the Heritage Fund grow to $50 billion by 2017, as suggested by Finance Minister Lyle Oberg? Will unforeseen economic or political developments cause the Heritage Fund to languish—as it has in the past—for an extended period of time? Will the province create more and more special purpose funds? Will Alberta take the long view and create a stable and permanent financial resource out of its finite and volatile natural resources?

Only time will tell.

Chapter 3

The Butterfly Effect: Transforming Alberta's Post-Secondary Education System

Martha C. Piper

Chaos theory has taught us that even small perturbations can have a significant impact on systems. This phenomenon is sometimes referred to as the "butterfly effect," suggesting that major weather patterns can be determined through the flapping of a butterfly's wings. This chapter proposes that a "butterfly effect" could be initiated in Alberta through a strategic investment in post-secondary education, such that the impact of educated Albertans is felt well beyond provincial borders.

Such an investment will require more than money. Rather than "fixing" the current system, a major transformation of post-secondary education in the province is proposed. Five initiatives are advanced including the establishment of the Alberta University System, a commitment to building a global learning and research environment, the hiring of 20-25 Nobel Laureates, a new social contract between the universities and society, and the development of the Alberta Creativity Fund.

By focusing its incremental resources on building a global learning and research environment to educate individuals who are scientifically literate, culturally sensitive, and creatively intelligent, Alberta will be positioned uniquely to make a difference in the world, thereby inciting a "butterfly effect."

"The trouble with our time is that the future is not what it used to be."

—Paul Valery

CHAOS theory has taught us that even small perturbations can have a significant impact on systems. This phenomenon is sometimes referred to as the "butterfly effect" given that even the minute disturbance of a butterfly's wings can affect major weather patterns halfway around the globe. Translated into more human terms, the "butterfly

effect" suggests that transformations— be they in institutions or societies—are often the result of singular actions by a few courageous individuals who are willing to flap their wings.

Such is the opportunity before the province of Alberta: to invest its resources wisely so that the impact of those investments is felt well beyond its own geographic borders. Few jurisdictions, if any, have the ability to change the world through a strategic investment—to incite the butterfly effect.

The investment in post-secondary education is clearly that type of an investment. Whether it is the development of a responsive citizenry, the education of a skilled workforce, or the expansion of knowledge through original research, the case for excellence in higher education is well documented. This chapter addresses the opportunity for an Alberta "butterfly effect" in post-secondary education. Unlike the recent reviews undertaken by the provinces of Ontario (Rae 2005) and British Columbia (Plant 2007), this chapter does not constitute a comprehensive review of the needs and demands of the overall system. Instead it focuses exclusively on universities and the effect an annual investment of $2-$3 billion would have on the world and its citizens—thereby constituting a "butterfly effect."

The Opportunity

> "Systems which cannot respond to radical change in their environment will always fail in the end in the short-term, there are always some productivity gains from working the machine harder, reprogramming more often from the top, tightening specifications and quality standards, and setting ambitious targets. But in the end, if the only response to a new environment is to run the machine harder, the result is that its components break down faster."
>
> —Tom Bentley

According to *The Economist* (2005), over the next several decades, the world will see the emergence of between 25 and 50 elite research universities which in turn will become the foundation for regional innovation. This trend is readily apparent in places like California, Texas, Singapore, Boston, Oxford, and Cambridge where the presence of a world renowned university drives economic, social, and cultural development in the region.

It makes sense for Alberta to invest significantly in building elite universities. The question that must be asked, however, is what form the investment should take. There is no shortage of needs facing Alberta's universities. Old and decaying classrooms, outdated laboratories and equipment, demands on library holdings, large class sizes, and shortages of student financial aid are only a few examples of areas deserving of investment. All of these needs are justified, and could easily consume $2-$3 billion on an annual basis.

But would an investment directed to current needs and funding shortfalls result in the desired outcome? Should new money be used to do the same thing only at a bigger and better level? Is the present system of education appropriately aligned with the future needs of Alberta, Canada, and the world in the 21st century?

There are clear indicators that this is not the case. The current university system arose after World War II when the world was seeking a means of educating returning veterans and a venue for conducting research important to governments. The North American public research university, as we now know it, was developed and expanded accordingly.

Today, we face another era of change—one that has moved from national interests to global concerns; from military defense to international terrorism; from the production of things to the production of knowledge; from faculty-centered teaching to student-centered learning; from European immigration to multicultural societies; from wired communication to ubiquitous messaging. This time of great change provides the context for a shift in the education paradigm and argues for a transformation of our universities.

The Transformation

> "We must take great care not simply to extrapolate the past, but rather to examine the full range of possibilities for the future."
>
> —James Duderstadt

We are living in the most remarkable of times. Over the past several decades, we have experienced the decline of communism, the increase in computing power, and the discovery of the human genome. We have seen the development of new areas of science, such as nanotechnology, and highly specialized equipment, such as high-power telescopes and light sources.

Yet, even with these incredible scientific advances, and associated wealth creation, the world continues to be challenged. We see major shifts in our economy—moving from national economies to a global economy and the concomitant rise of India and China. There has been a worldwide explosion of ethnic and cultural tensions; our cities are reeling from over population and environmental pollution. Global warming is occurring as a result of human activity, and the social disparities between rich and poor countries continue to increase. Ethical issues, such as those associated with stem cell research, remain unresolved, and many of our traditional social structures, such as the integrity of our neighborhoods and families, are threatened.

Some believe that we are going through a period of change as momentous as any in our earlier history. The disciplines that have dominated the late 20th century, and to some degree the late 20th century university, have been primarily those associated with the "science" agenda. And while science will continue to inform innovation and discovery, there are signs that we are yearning for something more; that our values are shifting to honour wisdom rather than knowledge, creativity rather than analysis, meaning rather than production, design rather than "things."

The view that education in the 21st century must encompass more than scientific competence was expressed several years ago in a meeting with Lee Kuan Yew, the father of modern Singapore. Mr. Lee was asked what he would advise his grandson to study to prepare for the competitiveness of the next century. His answer went something like this: "Given the changing global context that includes the rise of India and China, the linkage of prosperity with innovation and the cultural conflict and rise of international terrorism, I think my grandson should concentrate his studies in three areas:

1) languages—he should be able to speak English, but should also be proficient in other languages including Mandarin and Punjabi;
2) science and technology—while he does not need to be a scientist, he should be scientifically literate; and
3) cultural and religious studies—he should have an understanding of the cultures and religions of the world" (Lee 2004).

Mr. Lee's list of three areas of expertise succinctly describes the educational challenge for the 21st century. He understands the importance of educating individuals who can compete in an increasingly technological and scientifically sophisticated world. But he also believes that scientific expertise is not enough. By highlighting language requirements and cultural sensitivity, he has expanded considerably the task for today's educators. That view is also echoed by Daniel Pink who notes that we have moved over time from an Agricultural Age to an Industrial Age and now to an Information Age. He argues that the current Information Age will be followed by a Conceptual Age, where economies will be driven by a nation's ability to create and empathize, to design and make meaning. In short, we have progressed from a society of farmers to a society of factory workers to a society of knowledge workers. And now we are progressing yet again—to a society of creators and empathizers, of pattern recognizers and meaning-makers (Pink 2005).

If this is the case, the university of the 21st century will also need to expand its intellectual focus to include not only the process of analysis of knowledge, but also the process of concept formation and "creation." As Duderstadt notes, the tools of creation are expanding rapidly in both scope and power (2000). Today we have the capacity to create objects atom by atom; to create new life-forms through the tools of molecular biology and genetic engineering; to create new intellectual life-forms through artificial intelligence and virtual reality; to create new forms of entertainment through media design; and, hopefully, to create world peace through increased understanding and tolerance.

As a result, the university needs to transform itself, stressing forms of instruction and activities that, in addition to scientific inquiry and analysis, teach and nurture the art and skill of creation and meaning-making, with more emphasis on integration of knowledge, language and communication, creative design and expression, and imagination and emotional intelligence. The challenge, as Duderstadt observes, is significant. For while universities are experienced in teaching the skills of analysis, they have far less understanding of the intellectual activities associated with creativity.

If we are to prepare students to live in both the Knowledge and Conceptual Ages, while at the same time preparing them to contribute to Canada—a country committed to democracy, competitive global markets, multiculturalism, environmental sustainability, and world peace—the challenge for Alberta universities becomes enormous.

This, then, is our call to action. To build upon the current excellence within Alberta universities to educate a citizenry that is scientifically literate, culturally sensitive, and creatively intelligent.

The Vision

To create a university system in the province of Alberta that will serve the people of the world by educating students who are prepared to live in and contribute to the global society of the 21st century. This education will be informed by original inquiry and research and will address the changing needs of the knowledge society with an increased focus on creativity and concept formation. Graduates will be scientifically literate, culturally sensitive, and creatively intelligent.

The Investment

> "The significant problems we face cannot be solved at the same level of thinking we were at when we created them."
>
> —Albert Einstein

While there are numerous paths that might be taken to achieve the outlined vision, five initiatives are outlined below. Cost estimates for each initiative are listed in Figure 4 at the end of this chapter.

1. Creating a University System

Currently, Alberta has three campus-based universities (University of Alberta, University of Calgary, University of Lethbridge) and one distance-learning university (Athabasca University), each of which is independently governed.

Various examples of collaboration exist, yet they tend to be spurious in nature and are often the result of individual efforts. This collection of independent universities has served the province relatively well, with perhaps one exception. The ongoing rivalry between Calgary and Edmonton and its two universities is well known and has often led to the duplication of costly programs as a result of the "me too" phenomenon. On the other hand, the strength of the universities is well recognized and all four universities are widely acknowledged throughout the country as being excellent.

The future challenge for Alberta universities is to become distinguished globally. Not one of them is consistently ranked in the top 50 world universities, and it is unreasonable to assume that all four will independently achieve such recognition. This situation argues for the development of a more unified, coordinated, and collaborative system of university education in the province—building on the current strengths, preventing unnecessary duplication, networking faculty and students, and sharing resources and governance.

The challenge is similar to that encountered in California in the 1960s when *The California Master Plan for Higher Education* was developed by Clark Kerr (1994). While the University of California already existed, the plan transformed the university campuses into a coherent system for post-secondary education. At the time, the state's legislators were focused on the surge in university enrollment due to the coming of age of the baby boomers. The new system provided both universal access and the delineation of excellence.

Today, over 45 years later, the University of California system is credited as being one of the most important and influential innovations in higher education in the 20th century. It has a combined student body of more than 191,000 students, 10 campuses with 6 ranked among the top 50 universities in the world, and 28 Nobel Laureates.

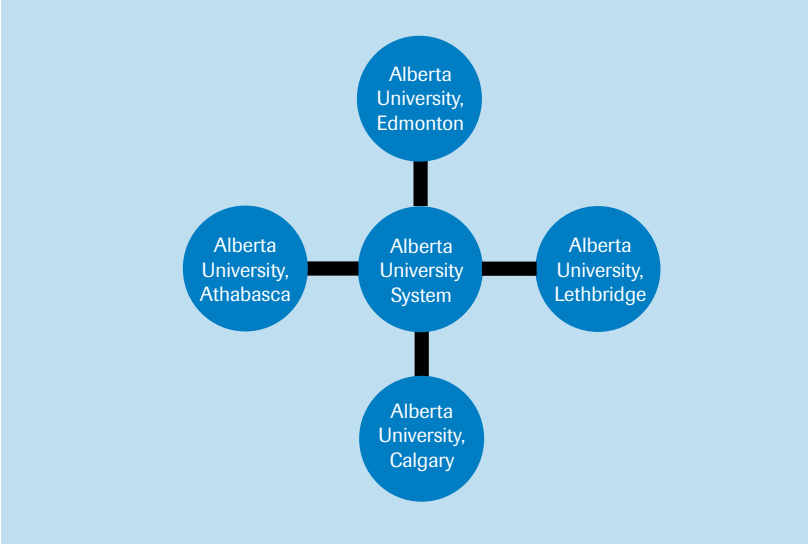
While the University of California is perhaps the best known university system, university systems are extremely common in the US. Specifically, a university system is a set of multiple, affiliated universities that are geographically distributed. Typically, all member universities in the system have a common component among their various names, share a set of values, standards and purpose, and are governed by a system-wide governing body, such as a board of trustees or regents. A university system should not be confused with a multiple-campus university. A university system contains several universities whereas a multiple-campus university simply has more than one campus.

There is a case for a university system in Alberta. Such a system would coordinate academic programs and research, network students, staff and faculty, and share and leverage resources. It would reap efficiencies and prevent duplication of efforts in areas such as library acquisitions, laboratory facilities, student recruitment and admissions, financial aid, procurement of goods and services, endowment management, and hiring of faculty. While allowing each university to retain its unique identity, a formal system would unite the universities through a shared sense of purpose and aspirations—eliminating provincial competition for resources, faculty, and students. An Alberta University system could truly take on the world.

The purpose of the Alberta University system would be different than that articulated for the University of California in 1960. An Alberta University system needs a futuristic direction and should be focused on the learner and the requirements of a global society. The Alberta University system would become known for its commitment to global learning and global research—to its unique approach of educating the future global citizenry by embracing creativity as well as analysis—by ensuring cultural and linguistic excellence as well as leading science and technology.

Finally, the governance of the system would continue to be bicameral in nature, with each university having its own academic governing body, but with one unified board of governors to oversee the overall direction of the system, as well as its fiduciary responsibilities and public accountability.

Figure 1: Proposed Alberta University System



2. Learning and Research Environment

The creation of the appropriate learning and research environment is the key factor in meeting the vision for the transformed university system. Such an environment will require a renewed curriculum and the integration of research into the undergraduate learning environment, and will entail a decreased student/faculty ratio, an increase in graduate students and a networking capability across the system's campuses.

Renewed Curriculum/Integration of Research

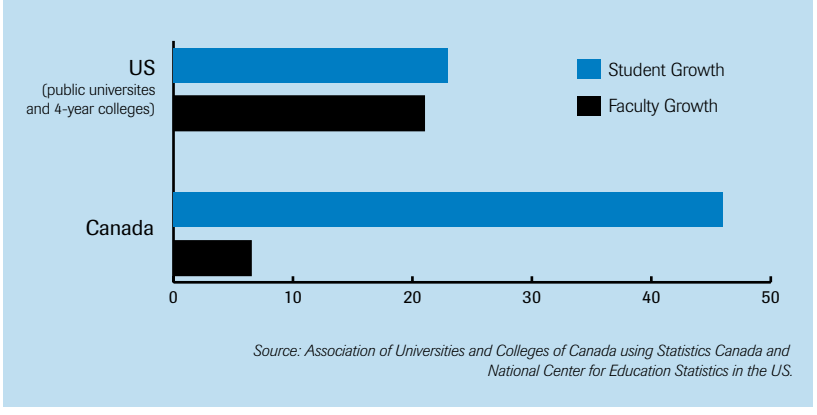
In addition to the professional or disciplinary majors selected for study, all students graduating from Alberta universities in the 21st century should be scientifically and numerically literate, possess proficiency in a second language, have an understanding of the cultures and religions of the world, and have cultivated their "creative" abilities. Undergraduate students will also participate in original research and inquiry, thereby cultivating both the skills of scientific analysis and intellectual creativity.

Student/Faculty Ratios and Graduate Students

The means of achieving the renewed curriculum rests with two factors: the student/faculty ratios at the universities and the overall quality of the faculty and students. The student/faculty ratio is one of the most significant measures of the overall quality of student/faculty interaction. In the prestigious private universities in the US, such as Princeton, the student/faculty ratio can be as low as 5:1. Such low student/faculty ratios permit universities to offer small classes, individual tutorials, and independent research experiences.

In Canada, student/faculty ratios have increased dramatically over the past decade as increases in student populations have not been accompanied by similar increases in faculty hires. In the US, full-time faculty growth has closely tracked enrolment growth (see Figure 2).

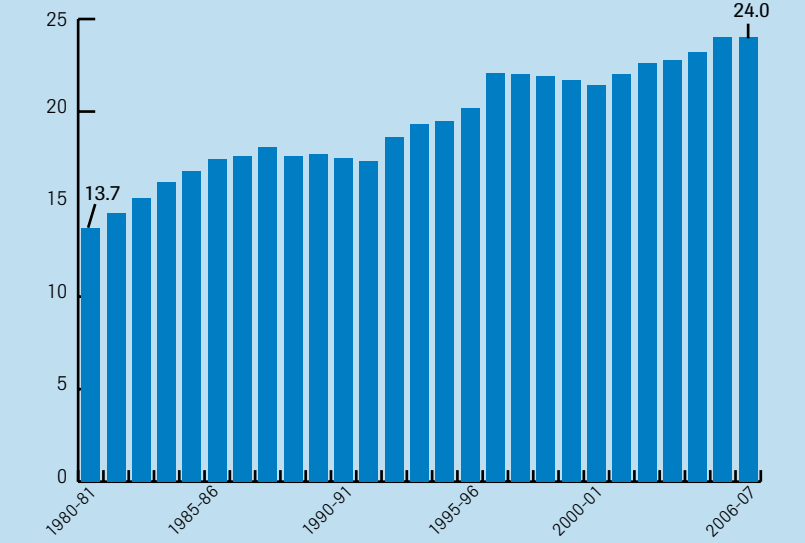
Figure 2: Faculty Growth and Student Enrollment in the US and Canada, 1987-2003
Full-Time Equivalent Students and Full-Time Faculty (% change)



Source: Association of Universities and Colleges of Canada using Statistics Canada and National Center for Education Statistics in the US.

This erosion in the student/faculty ratio has led to increased class sizes, fewer course offerings, less student engagement, and minimal individual instruction or tutoring. The gaps between the individualized learning environments provided by the best private

Figure 3: University of Alberta Student/Faculty Ratios, 1980/81 to 2006/07
Full-Time Equivalent Students and Continuing Full-Time Faculty



Source: University of Alberta University Plan, updated May 2007

universities in North America and that offered by the Canadian public universities have widened considerably. At the University of Alberta, the student/faculty ratio has increased from 13.7:1 in 1980/81 to 24:1 in 2006/07, resulting in one of the largest student/faculty ratios in the country (see Figure 3).

A low student/faculty ratio is a critical feature in creating a rich, vibrant, and innovative learning environment. The AUCC and the Council of Ontario Universities have been calling for a return to the ratios of the 1980s. Alberta has a unique opportunity to reduce the ratios further to be comparable to the best private universities in North America, thereby offering a public "private" university experience. Such a reduction in the ratio would permit Alberta universities to tailor their learning environments to equip students with the necessary scientific knowledge, language proficiencies, cultural sensitivities, and creative abilities for the 21st century.

The full-time enrolment (FTE) for the three campus-based schools is 74,306 (2006/07 data). With a projected 20% increase in enrolment over the next decade, including

a significant increase in graduate students, enrolment will increase to approximately 90,000 by 2015. The current average student/faculty ratio for the three universities is 20:1. To attain a student/faculty ratio of 10:1 by 2015, about 5,000 additional full-time faculty will need to be hired.

As part of the expansion of faculty, an intense recruitment of graduate students should also occur. The education of graduate students, particularly at the PhD level, is essential to implementing the global learning and research environment and to the hiring of outstanding faculty. Alberta is currently educating only one graduate student for every 5-6 undergraduate students, which is considerably fewer graduate students than the world's leading universities. A target ratio of 1:4 (one graduate student for every four undergraduates) should be set for the university system to enhance the learning and research environments and provide the high quality personnel required for the 21st century. If this ratio were employed, of the 90,000 students enrolled in Alberta universities by 2020, 18,000 would be graduate students.

Networking

Networking of the faculty and students across institutions should be enhanced. System-wide networking programs should be developed to permit faculty to collaborate and students to access faculty throughout the system. Courses offered on one campus should be available to students at the other universities through high speed video and interactive networking facilities. This emphasis on system-wide offerings will permit students, regardless of where they are studying, to access the expertise provided by the system-wide professoriate. As Tapscott and Williams argue, "Knowledge can build more quickly within networks of institutions that cross seamlessly over disciplinary boundaries

Scientists involved in OpenWetWare, an MIT project designed to share expertise, information, and ideas in biology, are heralding the arrival of Science 2.0. Twenty labs at different institutions around the world already use the site to swap data, standardize research protocols, and even share materials and equipment.

(Tapscott and Williams 2007). In addition, networking capabilities that provide access to international universities and their programs and faculty should be established.

3. Nobel Laureates

Over the past century, researchers working in Canada have been awarded only 6 Nobel prizes (2 in physics; 4 in chemistry). Compare this record with other countries such as Norway (9), Austria (12), Sweden (29), France (45), and the UK (91) (prizes by country of residence at time awarded) (The Economist 2007). It is clear that we are lagging behind in our ability to foster and support world class excellence. Perhaps more important, however, is the fact that we are not benefiting from the presence of the Laureates on a day-to-day basis in our universities and laboratories. Accordingly, Alberta universities should collectively hire 20 to 25 Nobel Laureates to accomplish several objectives. First, the Laureates will enhance the student experience through enriched course offerings and teaching. Second, they will stimulate excellence in research by attracting outstanding graduate students/faculty. Third, they will draw world attention to Alberta—achieving global recognition of the university system.

4. Social Contract

The above investments will require the negotiation of a new social contract between the government and the universities. The contract should include: the development of a unified university system with its accompanying vision; the renewal of the curriculum to ensure that graduates are scientifically competent, possess proficiency in a second language, are culturally literate and have creative abilities; the hiring/recruitment of faculty and students, including Nobel Laureates and graduate students, to achieve designated student/faculty ratios; and the networking of faculty, students, and programs across the university campuses and around the world. This social contract should be monitored regularly to determine that resources are available and appropriate actions are being taken to ensure the transformation.

5. Alberta Creativity Fund

In the past, Alberta has invested significantly in university research through the creation of the Alberta Heritage Foundation for Medical Research and the Alberta Ingenuity

Fund. In addition to fostering excellence in research, these two funds have been key in leveraging additional research funding into the province and attracting and retaining outstanding faculty. Both funds have clearly addressed the needs of a knowledge society and have achieved international recognition.

In order to prepare for the Conceptual/Creative society and to enhance our understanding of what constitutes "creativity," a third fund—the Alberta Creativity Fund—should be established with a focus on the humanities/social sciences, and the creative and performing arts, with a particular emphasis on inquiry that fosters concept formation, curiosity, design, imagination, and creative intelligence.

Conclusion

> "The solution of virtually all the problems with which government is concerned—health, education, environment, energy, urban development, international relationships, space, economic competitiveness, and defense and national security—all depend on creating new knowledge, and hence, upon the health of research universities."
>
> —Eric Bloch, Director
> National Science Foundation (US) 1986

Rarely has a geographic region been so well positioned to transform its post-secondary education system through a strategic investment. Such is the opportunity before the province of Alberta—to invest its resources wisely in order to transform its post-secondary education system. This investment, however, will require more than money. While spending additional resources is never difficult, spending wisely can be challenging. The case for an annual investment focused on the transformation of Alberta universities is based on the recognition that a knowledge society now requires an educated citizenry that, in addition to being scientifically literate, is also culturally sensitive and creatively intelligent. Five initiatives are advanced in this chapter that, if adopted, will position Alberta uniquely to make a difference in the world through its educated population, thereby inciting the "butterfly effect."

Some may ask, why this investment? Why the focus on post-secondary education? Few will question the importance of developing our human potential—any society's most important resource. But perhaps more than ever, as we begin the 21st century, the case for knowledge and knowledgeable people has never been greater. A transformed post-secondary education system will ensure that Alberta remains globally competitive, promotes a civil and sustainable society, and ensures its people are productive, creative, and fulfilled.

Figure 4: Annual Cost Estimates For Post-Secondary Education Initiatives

Initiatives	Minimum Cost Estimates	Maximum Cost Estimates
Creating an Alberta University System	TOTAL: $100 million annually	TOTAL: $200 million annually
Learning and Research Environments		
a. Student/Faculty Ratios	4,500 Faculty at $250,000 TOTAL: $1.1 billion annually	4,500 Faculty at $350,000 TOTAL: $1.5 billion annually
b. Graduate Students	18,000 graduate students at $30,000 per student/year TOTAL: $540 million annually	18,000 graduate students at $40,000 per student/year TOTAL: $720 million annually
c. Capital Expenditure and Networking	Capital expansion TOTAL: $200 million annually	Capital expansion TOTAL: $300 million annually
d. Creativity and Global Programs	TOTAL: $50 million annually	TOTAL: $100 million annually
Nobel Laureates	20 Laureates at $10 million per Laureate/year TOTAL: $200 million annually	25 Laureates at $10 million per Laureate/year TOTAL: $250 million annually
Alberta Creativity Fund	TOTAL: $50 million annually	TOTAL: $100 million annually
TOTAL	$2.24 billion annually	$3.17 billion annually

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Chapter 4

All Aboard: A Rationale for Extending High-Speed Rail to Greater Alberta

Fred Stenson

This chapter assumes that an Edmonton-Calgary high-speed rail link will be built sometime in the near future and argues that Albertans should not stop there. With the financial advantages afforded by our petroleum wealth, we should build a more extensive high-speed rail network that connects our second level of population centres: Ft. McMurray, Grande Prairie, Medicine Hat, and Lethbridge. There are many reasons why this larger Alberta high-speed rail system should be built, but commercial viability is not one of them. The distances involved are great; the costs are great; and the group served would be a minority of Alberta's population. Rather than the customary economic justifications, the rationale for this project lies in spreading Alberta's wealth around the province and through time. It is about making sure Alberta remains commercially viable outside the Calgary-Edmonton corridor, and that environmentally sound use is made of our water, air, and land.

IN 2004, the University of Calgary's Van Horne Institute completed the "Calgary-Edmonton High-Speed Rail Pre-Feasibility Study." For Alberta, this was the entrance ticket to an exclusive club: places modern and prosperous enough to think seriously about investing in the world's trendiest form of transportation. Japan became the first high-speed rail country in 1964, when it turned loose the *Shinkansen* or Bullet Train on a line between Tokyo and Osaka. The fastest and most space-age expression of high-speed rail (HSR) to date is the maglev, or magnetic levitation train, which uses electromagnetic forces to travel over 500 kilometers per hour without touching the surfaces over which it glides. The first commercial maglev train is the 30 kilometer link between Shanghai and Pudong International Airport.

The Van Horne Institute study of HSR concluded that a high-speed rail line "would bring significant benefits to the Calgary-Edmonton corridor, and Alberta as a whole" and that sufficient ridership exists to support it *now*.

The first assumption I make in this chapter is that an Edmonton-Calgary HSR link *will be built*, probably by a private or private-public consortium. My argument is that Albertans should not stop there. With the financial advantages afforded by our petroleum wealth, we should build a more extensive high-speed rail network that connects our second level of population centres: Ft. McMurray, Grande Prairie, Medicine Hat, and Lethbridge. (Red Deer would already be on the Calgary-Edmonton line.)

There are many reasons why this larger Alberta HSR system should be built, but commercial viability is not one of them. The distances involved are great; the costs are great; and the group served would be a minority of Alberta's population. Rather than the customary economic justifications, this project makes sense because it is about spreading Alberta's wealth around the province and through time. It is about making sure Alberta remains commercially viable *outside the Calgary-Edmonton corridor*, and that environmentally sound use is made of our water, air, and land. Those kinds of social pay-outs will always be too long-term and qualitative to attract private-sector investors. HSR is something the Alberta Government must save for now and build tomorrow—or face the future without.

The World Context: Oil Price and Climate

High-speed rail will make sense in Alberta's future if two predictions come true:

a) the world's climate will go on warming due in part to human activity and governments all over the world will restrict carbon emissions to counteract it; and

b) the world is nearing "peak oil," the point beyond which world reserves of oil will decline.

It would be wasteful of this chapter's space to re-argue either assumption. Suffice to say that the world's scientific community is close to agreement about the existence and dangers of global warming, and that many governments (including Alberta's) are moving to restrict carbon emissions. As for oil reserves, many experts agree that conventional oil is running out and future shortages loom. Even if unconventional oil sources like Alberta's oil sands and US oil shale somewhat offset the decline in conventional oil, and if alternate fuels take up some of the energy slack, rapid growth in the giant economies of China and India will still force a decline in future supply. When it comes to constricted supply of an essential commodity, the one thing you can say without resort to a crystal ball is that the price will rise. Oil prices have already begun to respond to this pressure.

At the same time that the price of oil is rising, global warming will become an increasingly frightening problem. Until carbon is reduced to the bone, or until global warming reverses, ever stronger carbon medicine will be taken. Because the emission of greenhouse gases is so closely married to fossil fuel-based transportation, personal transportation and freight transportation will be hit hard in the name of carbon reduction.

In George Monbiot's book *Heat: How to Stop the Planet Burning,* the author analyzes transportation forms and discovers (not surprisingly) that the personal automobile and the commercial jet are carbon profligates. With the price of oil rising due to market forces and governments adding carbon restriction penalties, private transportation and jet travel will become the travel choices of the rich. As for switching to bio-fuel or hydrogen, Monbiot illustrates how each is impractical—more an outgrowth of our denial than a real alternative. Bio-fuel would use up all the world's arable land. Enthusiasm for the hydrogen car declines more with every attempt to produce it. What *will* work is traveling less far and less often—and using green public transportation systems based on the best existing fuels and technology (including HSR).

Monbiot and many other global warming analysts are predicting a scheme of carbon rationing. Nations will be asked to cut their emissions by a certain percentage. To do so, they may give their citizens a carbon budget against which to debit. When one person runs out of carbon, they will buy from others who have more than they need.

In such a system, people will be looking for the goods and systems that maximize the utility of their carbon fund.

Another source, the UK government's 2006 *Foresight Report on Intelligent Infrastructure Futures,* shows how societies can respond to fuel and climate challenges at an infrastructural level. The report projects four future scenarios. One is a Road Warrior-like world where tribal groups compete for scarce resources. Another scenario sees all public investment going to green initiatives and people living in dense compact cities. In all four scenarios, private cars and air travel are rare luxuries.

The Alberta Context

Much of the information on making the carbon-restricted and high fuel price future work comes from the European Union. Their studies are based on places with more population density and lower travel distances than Canada's. Areas like Alberta where the cities are hundreds of kilometers apart are barely mentioned. Rural areas are entirely absent, as though one could assume rural life would cease to be, or was an option of no societal importance. Obviously, Alberta must come up with its own discussion and solutions.

As owner of the oil sands, one of the planet's last great petroleum banks, Alberta will likely be in a different future position than most jurisdictions. As the world oil supply becomes tighter, it is unlikely that the demand for Alberta oil will slacken, even as the world works to control climate change. Nor does a sustained drop in the price of oil seem likely. In *Pay Dirt: Making the Unconventional Conventional,* a 2005 documentary about the Alberta oil sands, a diverse group of Canadian and American experts were interviewed and agreed that, even given serious efforts to curb oil demand and combat global warming, North America would still need all of Alberta's oil production in order to function.

In such a future, Alberta will be greatly hampered by its 20th century "cheap oil" infrastructure. Like most of North America, Alberta is built for cars, trucks, and jets. Individual transportation choices have been guided by enormous government investments in highways and airports. Responding to this infrastructure, to cheap oil,

and to regional prosperity, Albertans have located their homes farther and farther from the workplace.

Suburbanization and ex-urbanization are not restricted to high earners. Those looking for the cheapest starter homes in Calgary and Edmonton find them on the outskirts where land prices are lowest. Because public transport is often weak in new suburbs, these moves are predicated on car culture and cheap gas.

During Alberta's booms, the province's second rung of cities have experienced rapid growth. Their 2006 Census populations are: Red Deer (83,000), Grande Prairie (47,000), Ft. McMurray (65,000), Lethbridge (75,000), and Medicine Hat (57,000). Ft. McMurray, as the supply centre and bedroom community for the oil sands, has been under extreme growth pressure since the mid-1990s, to such an extent that its city administration has threatened to stop cooperating if growth pressure is not reduced. Generalizations that fit all the mid-sized Alberta cities are: low density; suburban; limited public transport; built for cars and trucks. In other words, they are based on cheap-fuel infrastructure.

Now let's look at Alberta again, *after* projected high fuel prices and carbon restrictions have struck.

In the two big cities, Edmonton and Calgary, local governments would likely take money out of highway improvement and put it into accelerated growth of public transport systems. As urban low-earners and long-commuters feel the pinch of high gasoline prices and run into legislated carbon limits, they will begin to move closer to their work and to public transportation.

But what about all those Albertans who do not live in the two major cities? There are many reasons to believe that Alberta's mid-sized cities will be even harder hit by high fuel prices and carbon limits. In North America, the cost of transportation is said to make up 16% of the retail price of goods, on average. For bulky commodities, that can be 50%. Obviously, distance from manufacturers and growers increases the transportation portion of price. Grande Prairie, at 435 km from Edmonton, must pay for the cost of that additional transport in the price of its goods. When fuel prices go up and carbon limits are imposed, the cost of that transportation will swell in proportion

to distance. A wide cost of living gap between a remote city like Grande Prairie and a central one like Edmonton will form.

Even if the economies of Alberta's mid-sized cities remain viable (sustained by agriculture, oil and gas production, and forestry), the employers are unlikely to make up the cost of living disadvantages affecting their employees. The smaller cities will probably become more expensive to live in (losing advantages they formerly had based on lower land prices).

In this future Alberta, distance will matter. If you live in a mid-sized Alberta city, and your oil-field job is an hour away by truck, your carbon ration could run out by June and leave you no choice but to buy the carbon credits of others to get through the year. At high fuel and carbon prices, the trip to visit the grandparents at Christmas might be a casualty, as well as any long-distance holiday. Even a routine trip to the big city to shop, go to a dentist or doctor, or see a concert, might not be practical or possible.

We can assume that Alberta's mid-sized cities would use their ingenuity to remedy some of these problems. But what they will not be able to do is create a new transportation infrastructure between themselves and Edmonton or Calgary that is fast enough and cheap enough to offset the new disadvantages affecting them.

High-Speed Rail: A Better Future

All over the world, giant cities function as economic magnets. Size creates and multiplies economic activity. The cities become bigger because they are already big. What this magnetism and economic power cannot overcome is pressure on natural resources. The mega-city outgrows the capacity of its water resources, its airshed, and its land. Its environment deteriorates and expensive measures must be taken to counteract problems (water transfers, cleaning of effluents, land fills, etc.). Quality of life usually deteriorates, even if the economic standard of living holds or improves.

If carbon limits and fuel price increases erode the attractiveness of rural life and of small-city life in Alberta, a transfer of population into Edmonton and Calgary would almost certainly occur. If so, it would be precisely the wrong thing for the province's future.

People would be leaving places that have adequate water, clean air, and ample land for large cities struggling with shortages of those very things.

Britain's study of intelligent infrastructure recommended small, dense cities as the best future alternative—cities placed and spaced on the landscape to make the best use of natural resources. Many of Alberta's mid-sized cities are already in the best places one could choose as population centres: river confluences; places closely associated with productive agriculture; places associated with ample energy resources.

Allowing Calgary and Edmonton to grow beyond their means, while draining greater Alberta of its population, could be deemed inevitable, a kind of urban survival of the fittest, but only if one excludes both environmental health and future sustainability from the definition of survival. Alberta should be doing the opposite: investing to preserve its mid-sized cities and their associated towns, in order to make best use of the province's natural gifts.

There are international precedents for resisting urban centralization through the construction of high-speed rail networks. If we look at Japan during its post-war reconstruction, one of the problems it faced because of its "economic miracle" was extreme centralization. Tokyo and other urban giants were such powerful economic magnets that the big cities were choked with population—and air pollution—while other parts of Japan stood, if not empty, then relatively under-developed. Japan took action to lure its population into places where the land, air, and water resources could sustain development, and a key method for doing so was transportation. Japan extended its bullet train system into the areas where growth was desired. Lured by HSR, as well as cheaper land-prices and a healthier life, the population followed.

The French TGV line from Paris to Lyon and Spain's AVE route from Madrid to Sevilla are also examples of high-speed rail lines that caused growth and rejuvenation in under-developed areas.

These are important precedents, but Alberta has the capacity and opportunity to go them one better. Whereas most HSR systems in the world have been responses to transportation congestion in dense areas, Alberta has the financial resources to respond to centralization and congestion *before the fact*. Rather than belatedly introducing HSR

as a kind of inter-urban angioplasty, high-speed rail in Alberta could be a device of intelligent planning. Instead of using our wealth to oppose nature (water transfers) or to fix nature (scrubbing toxins from the air and water), we could grow the population where sufficient natural capacity exists to support it.

The Alberta Advantage—the chance to make money at low rates of taxation—was a popular slogan of the Ralph Klein era. Why not progress toward a new Alberta Advantage that is the chance to live in North America's most intelligently planned and connected network of towns and cities?

When Japan built its early *Shinkansen* lines, the booming populations of Tokyo and Nagoya stabilized. When the Paris-Lyon TGV was built, companies in Lyon were able to do business in Paris without the need of having offices there.

With an HSR system connecting Edmonton to Ft. McMurray, growth in that land-challenged city could be cooled off. People could conceivably work in Ft. McMurray and be home with the family in Edmonton in an hour and a half. In fact, oil sands workers could choose to live anywhere in the HSR system, thus spreading the economic advantages of oil sands mega-development much farther through the province. Another benefit would be depressurization of the Edmonton-Ft. McMurray highway, one of the most dangerous routes in Canada.

For Grande Prairie, Medicine Hat and Lethbridge, the key benefit of HSR would be the ability to go on as they have, enjoying their local employment opportunities and their less congested and hurried lifestyle—while HSR maintains their property values and enables them to do the long-distance traveling they used to do by car, truck, and jet.

The small towns that depend on these small cities will have a much better chance of survival if HSR protects the viability of the cities.

Cost of HSR

This is not an economic study. No independently researched numbers can be imparted. But, given that the proposed province-wide HSR system would cross a landscape

somewhat similar to that between Edmonton and Calgary, a few research numbers can be borrowed from the Van Horne Institute's study of an Edmonton-Calgary HSR line.

Two of the options weighed in the Van Horne report have a per kilometer cost of $5.5 and $8.9 million. These are non-electric systems capable of operating in the 200-240 km/hour range. An electrified system capable of going above 300 km/hour would cost $11.6 million per kilometer. The preferred train for the first two options was the Bombardier Jet Train, a turbine-electric locomotive pulling Acela cars. This system would be capable of operating in mixed traffic (freight and passenger).

For the broader Alberta HSR network proposed in this chapter, these two options would be suitable. The capability for freight and passenger traffic on the same track would be essential. The Jet Train technology can, like urban fast transit, use trains that are longer or shorter as needed. This would allow fuel and carbon economization when traffic is low.

At $8.9 million per kilometre, an HSR line from Edmonton to Grande Prairie (456 kilometers) would cost $2.5 billion. This would be the most expensive of the lines in the proposed system. If Alberta saved enough money to generated $2 billion per year in annual earnings after inflation-proofing, one can see that the Alberta HSR project is possible if it were given a high enough priority.

As for practicality, it is impractical to allow your province to centralize and make poor use of resources. If one believes the proposed HSR system can reverse centralization and make distant cities survive and be truly attractive in history's longer run, then it is practical in the sense that doing the right thing is always practical.

Conclusion: Alberta Precedents

Alberta is known as a free-enterprise province. Some might say that a huge publicly-funded transportation infrastructure project like Alberta HSR would go against that ideology. But the fact is that Alberta has made major infrastructural investments since its inauguration as a province.

Consider the oil sands. Alberta has invested repeatedly in the development of this resource for most of a century. The University of Alberta was involved in oil sands research in the 1920s and 1930s. The province financed oil sands pilot plants in the 1930s and 1940s. Alberta promoted the Great Canadian Oil Sands venture in the 1960s; and took a 10% ownership position in the Syncrude project in the 1970s.

In 1954, the Alberta Government created Alberta Gas Trunk Line Company Limited. The company created a gas-gathering pipeline system in Alberta to facilitate future gas exports. In the 1970s, Alberta's Rural Gas Project invested public money in the delivery of Alberta's natural gas to rural Alberta and Premier Peter Lougheed wanted to see Alberta's economy diversify into petrochemicals. Alberta Gas Trunk Line (Nova Corporation) created an ethane gathering system to backstop the petrochemical complex at Joffre. In 2005, the Alberta Government completed the Alberta SuperNet system, a high-speed Internet connection among thousands of Alberta facilities in hundreds of the province's towns and villages.

This does not even include the billions poured by the province into Alberta's highways and airports. All in all, it would not be out of character for Alberta to invest in a provincial HSR system.

If Alberta invests in an HSR network for the province, it will provide a valuable example to the rest of North America, which has been lagging badly behind Europe and Asia in future-friendly transport. If Alberta were to use its petroleum wealth to build an HSR network, it could be an important step toward reversing this backwardness in transportation.

Investing in a province-wide HSR infrastructure would transfer current wealth to future generations of Albertans in tangible form. HSR would preserve the mobility of Albertans, even in times of energy shortage and carbon restriction. It would battle the market's tendency to produce centralization in the Calgary-Edmonton corridor, thus allowing a more equitable, sensible, and healthy use of our province's air, water, and land. The health of our smaller cities and towns could be protected. When the Japanese invested in decentralization by extending bullet trains into rural Japan, an unexpected benefit was a revival of family and community values. Alberta could see this as well.

Perhaps best of all, the modernization represented by HSR would be an expression of Alberta's confidence—of its desire to remain strong. To rapidly exploit a gift in the ground, live like kings for awhile, then move on, is an oft-repeated pattern in our world. It is no achievement. To build a transportation infrastructure that is strong for the long-term is something about which Albertans could go on feeling proud for generations.

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Chapter 5

Metamorphosis: The Need for Economic Diversification

Deborah Yedlin

Alberta needs to think big when it comes to diversifying its economic base away from the energy sector. Alberta lags behind the other the provinces when it comes to public and private sector funding for research and development (R&D). This must change because there is a direct correlation between higher levels of R&D spending—especially in the private sector—and economic growth.

To do this right, the province must establish R&D initiatives tied to its universities, and those universities must have mandates focused on the creation of technologies and processes that are revolutionary, not simply evolutionary. This requires a shift in mindset away from one that is focused on getting immediate results. It means providing funding with the understanding that the returns may be years, even decades away.

The province's current embarrassment of riches from energy-related sources should be saved and the earnings used to lay the foundation for the development of a diversified economy that is ultimately self-sustaining and a player in the new global, knowledge-based world. Alberta should create a multi-billion dollar fund for Ingenuity, Innovation and Commercialization with a mandate to establish five research and development clusters of excellence throughout the province, incorporating what already exists in both Calgary and Edmonton. Three would be connected to the Universities of Alberta, Calgary and Lethbridge, while the other two would be associated with the Northern and Southern Alberta Institutes of Technology.

"If I am not for myself, who will be for me? If I am not for others, what am I? And if not now, when?"

—Rabbi Hillel

EVER since Alberta won the geological oil and gas lottery in 1947, there has been a call to diversify the provincial economy and decrease its reliance on a declining

non-renewable resource base. The call was loudest in the 1980s in the wake of the infamous National Energy Policy and the collapse of the oil market. Although oil prices have averaged more than $60 US per barrel in the last two years, the storm clouds are gathering. Conventional natural gas production has peaked and concern over climate change is building.

Alberta has all the tools at its disposal to create a diversified economic base: money, an educated workforce, excellent post-secondary institutions, and a highly entrepreneurial culture. Despite this, there is a lack of traction when it comes to fostering the research, development, and commercialization of new technologies. The typical reasons offered for this include not having enough money available to fund companies in their nascent stages, a lack of government tax incentives, and too much emphasis on research compared to the resources needed to take discoveries to the commercial phase.

Now is not the time to give up. Indeed, the province's current embarrassment of riches from energy-related sources should be saved and the earnings used to lay the foundation for the development of a diversified economy that is ultimately self-sustaining and a player in the new global, knowledge-based world.

To do this, Alberta should create a multi-billion dollar fund—a superfund—for Ingenuity, Innovation and Commercialization with a mandate to establish five research and development clusters of excellence throughout the province, incorporating what already exists in both Calgary and Edmonton. Three would be connected to the Universities of Alberta, Calgary and Lethbridge, while the other two would be associated with the Northern and Southern Alberta Institutes of Technology (NAIT and SAIT).

The idea behind this is twofold: the university-based efforts would be directed at what is called "revolutionary" research and development—life changing discoveries—while the focus at NAIT and SAIT would be "evolutionary" developments in existing technologies and processes with practical applications.

As Cornelius Van Horne said so many years ago when he undertook the building of the Canadian Pacific Railway, infrastructure underpins economic growth. Today, this includes intellectual and financial infrastructure as much as it does physical infrastructure.

Historical Context

Alberta has been down the "need to diversify" road before, largely with unfortunate results. We have been good on ideas (e.g., the creation of Vencap Equities Alberta—a provincially-owned venture capital firm—in 1983 with a $200 million loan from the Alberta Heritage Savings and Trust Fund), but bad on execution. Vencap missed the mark on many investments, lost money, and was ultimately sold in 1995 to the Ontario-based private equity firm Onex Corporation. At the time, however, Vencap was the largest venture capital firm in the country.

There were other attempts, like Magcan, Swan Hills, and Novatel, which remain in the psyche of many Albertans as failed attempts at developing industries and technologies that would broaden the provincial economic base and take it beyond energy dependence. Nonetheless, given the context of decreasing conventional oil and gas production, Alberta should take bold steps to diversify its economy.

Current Environment

There is no doubt that the fiscal health of the province, a low tax environment, excellent universities, and proximity to markets have drawn new types of companies and industries to Alberta. Because Calgary has the second largest number of head offices outside Toronto (Calgary Economic Development 2007), the financial services industry has grown exponentially as investment banks and money management firms have set up shop to take advantage of the amount of business being generated. It is no secret that Calgary has a very high representation of investment dealers looking to take a piece of the booming energy sector. The insurance industry has also grown and is a sign of the expanding industrial base. Construction has become a larger component of provincial GDP, largely the result of the massive projects underway in the oil sands, but also includes the commercial and residential construction taking place primarily in the urban areas.

In 2006, the oil and gas and mining sectors accounted for 14% of real provincial GDP. This is less than financial services, insurance, and real estate, which together accounted for 16% of provincial economic output. Given the rapid pace of construction throughout

the province—commercial, industrial, and residential—this segment of the economy made up 10% of 2006 GDP and manufacturing was 9%. The professional and scientific segment made up 5% of economic output (Department of Finance 2007).

The problem with these GDP numbers is that they suggest a higher degree of diversification than actually exists because much of the "diversification" is related to activity in the energy sector. Hence, there is still a need to increase the contribution of the professional and scientific segments of Alberta's economy. The future of the province rests on real innovation, not improving on existing processes in order to reduce costs; new ones—revolutionary ones—need to be developed.

Research and Development

One of the keys to solving this puzzle is investing meaningfully in research and development (R&D).

Canada lags many OECD countries in terms of gross expenditures on R&D (GERD). In 2001, Canada spent 2.03% of GDP on R&D compared with the OECD average of 2.28%. Canada is well behind countries like Sweden, Finland, Japan, and Iceland, all of which have GERD levels of over 3% (Harris 2005). Canada also lags its OECD counterparts on the basis of business expenditures on R&D (BERD). Canada's BERD level is particularly important because research suggests that a dollar invested by *business* in R&D generates more value than one invested by *government* (Harris 2005).

Initiatives such as the creation of the National Institute of Nanotechnology at the University of Alberta and the Institute for Sustainable Energy, Environment and Economy at the University of Calgary are a step in the right direction. But equally important is the access to post-secondary education so that there are people who have the knowledge to do applied research.

Through its myriad endowment funds, the Alberta government has done a reasonable job funding research, with the Alberta Heritage Foundation for Medical Research standing out as the best example. But when compared with the rest of the provinces, Alberta is in 9th place in terms of GERD and 5th in terms of BERD (Harris 2005). Add

the fact that the main driver of global economic growth is shifting away from physical resources to one based on knowledge, and it is clear that—if Alberta is to be a player on the world stage—R&D spending must increase.

In 2005, 10 Alberta firms made Canada's top 100 list of big spenders on R&D. These firms invested $519 million in R&D, an increase of 4.1% from the previous year. Given that the economy was booming, that number should have been higher. Of the 10 companies, Suncor Energy was the biggest spender, with $108 million allocated to R&D. Edmonton-based Biomira was in 92nd spot, with $16.9 million spent on R&D. In total, the top 100 businesses spent $12 billion in 2005, with the majority in the communications and telecommunications sectors. The energy sector accounted for 6% of the total (Research Infosource Inc. 2006).

Both the private and public sector need to do better. At one point, the big oil companies each had their own research labs, but after the collapse in oil prices, many of these labs were closed and the research offloaded to educational institutions. This needs to change. Tax incentives at the provincial level must be put in place to get businesses re-engaged in research activities.

Commercialization

University Technologies International (UTI), the research incubator at the University of Calgary, and its Edmonton counterpart, TEC Edmonton, continue to function as the bridge between science and technology—from the ivory tower to the commercialization of a product. UTI was established in 1989, while TEC Edmonton is the latest iteration of what began as the Industry Liaison Office at the University of Alberta in 1994 and eventually morphed into its current form in 2006.

UTI has established itself as a leading technology transfer and commercialization centre in North America. Since its inception in 1989, it has created 41 companies as a result of research and development activities at the University of Calgary, and commercialized 450 innovations, including 32 in 2005/06 (Cataford 2007).

TEC Edmonton has had similar success. Since 1994, the University of Alberta has secured 230 licences, of which 25% generate revenue. At least 2 have generated revenue in excess of $1 million, and at least 3 have generated revenue in excess of $100,000—but less than $1 million. The rest generated less than $100,000 (Cox 2007).

But the real story in terms of the path to economic diversification is told in the following statistics: less than 1 in 100 reports of inventions are likely to produce revenues in excess of $100,000 and only 1 in 250 will generate revenue of more than $1 million (Cataford 2007). This is why it is not about the number of patents that are filed, but how many of those patents go on to create value in an economic context.

These two organizations are augmented by 23 others, all aimed at fostering the commercialization of technology with the goal being the diversification of Alberta's economic base.

While there are encouraging signs, the Alberta experience pales in comparison with a country such as Israel. Israel has nothing exceptional in the way of a natural resource base, but its support of research, development and commercialization has resulted in 71 companies listed on the NASDAQ stock exchange. That is second only to the number of US businesses that trade on the tech-heavy exchange.

If one believes the axiom that everything comes from the top, then Israel is a good example of a country where research is valued; there is a chief scientific officer overseeing all the research and development in the country. The results speak for themselves. The other thing to note is that Israel's track record in innovation, much like the US experience, is closely tied to the defense industry and health care.

Another country putting significant resources behind research and development efforts is France, where 71 research clusters have been established, each with its own area of expertise. Of these 71, 6 have been recognized as world-class. While France is waiting for its efforts to bear fruit, Finland is already there. Back in the 1970s, there was a push within Finland—from both private and public sectors—to increase R&D funding in three distinct areas: technology, health sciences, and electronics. Today, the private sector invests the equivalent of 3.5% of the country's GDP in R&D endeavours—second-highest in the world—and electronics exports accounted for 33% of exports in 2003 (Expert Panel on Commercialization 2006).

What all this illustrates is that without three key forms of capital—intellectual, human and financial—nothing is possible. Alberta has each of these elements—but they are not being fully developed or effectively exploited.

Intellectual Capital

We should not be fooled by the statistics showing that Alberta secondary schools score very well relative to their peers on a global level. What in fact has been created is a generation very good at writing tests, but not very good at thinking creatively and solving problems. This issue is often cited by university professors, especially in the science-related disciplines. The existing educational philosophy that students within K-12 must be taught more complicated concepts before mastering the basics has resulted in increased reliance on memorization and less understanding of basic concepts. This ultimately manifests itself at the university level in a lack of problem-solving ability. But good research comes from learning how to question and analyze, not memorize.

The fact is that learning is a risky business. And sometimes this means failure. The same is true in business. Indeed, much is made of the lack of appetite for risk in Canada. How many times have we heard recently that Canadian companies need to be more aggressive at becoming global players? A measure of this inability to take a big risk stems from the current approach to education. The paradigm shift must begin in the classroom; this is where risk should be encouraged and rewarded because it is the safest place to start.

While K-12 is one area that needs to be addressed, the other is the need to attract bright minds from around the globe to build Alberta's intellectual horsepower and ultimately grow the R&D efforts at the post-secondary level.

Human Capital

In this, Alberta faces a huge challenge. Existing infrastructure is proving inadequate to support current needs throughout the province. According to recent estimates, Alberta will be short 330,000 workers by 2025 (Conference Board of Canada 2006). In 2006,

31 of the 53 occupational categories tracked by the province were considered to have shortages because their unemployment rates were less than 3% (Alberta Employment, Immigration and Industry 2007).

It does not help that many high school students in the rural areas have opted to start working at the expense of continuing their education beyond high school. In fact, Alberta has the second highest high school drop out rate in the country and the lowest rate of high school students going on to post-secondary education (TD Economics 2007).

More efforts need to be made to encourage the younger generation to stay in school, as well as attract skilled workers to the province from abroad. It goes without saying that part of this undertaking includes boosting access to post-secondary education at all levels; the only way the province succeeds in the long-term is with an educated population.

Financial Capital

This is where the big debate rages when it comes to the diversification argument. Alberta attracts a very small percentage of venture capital investment relative to the rest of the country. "In 2006, total venture capital investment in Alberta (for non oil and gas companies) was less than $40 million—less than 2% of the venture capital invested in Canada. Alberta rarely attracts more than 3.5% of the venture capital investment made in Canada, far below its proportional economic output or population base" (Task Force on Value-Added and Technology Commercialization 2007).

But this does not tell the whole story. A recent study by Brian Elder of the Venture Capital Association of Alberta and Michael Robinson of the Haskayne School of Business at the University of Calgary says venture capital funding in Alberta is much higher than $40 million because of the amount of money raised informally through personal connections (Elder and Robinson 2007). There are many wealthy people in Alberta, especially Calgary, who quietly support new ventures. These informal sources of equity financing are a very important component of Alberta's capital markets. Another reason why the numbers are low is because the money invested by individuals

in new oil and gas companies is not included in this tally. If both sources of capital were included, the number would be significantly higher.

There is anecdotal evidence suggesting that individuals and companies that have developed innovative products in Alberta had to leave in order to take their inventions beyond the nascent stage. A more likely explanation is that the money is here but the right connections are not being made.

Recommendations

1. Establish a Superfund for Ingenuity, Innovation and Commercialization

The proposed fund would be established as a government initiative within Alberta Advanced Education and Technology, but structured to meaningfully involve the private sector. It would be divided into several segments: the creation and support of five R&D and commercialization clusters; the making and monitoring of strategic investments to encourage graduate study; and partnering the private sector with universities and technical schools in order to capitalize on successful R&D efforts.

But this is not enough.

The fund's mandate would include outreach within the K-12 system with a view to inspiring young people to learn about science and math. It would also provide funding for the examination of existing pedagogy in Alberta's school system, involving faculties of education, science and engineering and the development of new curricula and teaching methods.

One of the critical pieces missing in the landscape of the Canadian economy is that we do not sufficiently encourage risk, honour initiative, or celebrate success. Shifting this mindset arguably begins in the classroom.

These efforts would be supplemented by a meaningful investment by the fund in the existing science centers in both Calgary and Edmonton.

2. Increase Post-Secondary Enrolment

There are three pieces to this puzzle. One is increasing access to education and another is having more students pursue graduate degrees. The third challenge is including in the university mindset the fact that, in addition to educating students for the professional or academic worlds, it also must consider fostering the entrepreneurial talents of its students; not everyone who goes beyond the level of a bachelor degree wants to be a professor or sit at a lab bench, but they still might have a lot to offer from an entrepreneurial perspective.

As University of Alberta President Indira Samarasekera has said, Albertans need to extract more value from non-renewable resources and create industries based on renewable resources. This means harnessing brainpower and investing in post-secondary education.

In the 2005 provincial budget, Premier Klein promised $4.5 billion aimed at adding 60,000 post-secondary spots throughout the province. For the academic year of 2006/07, the University of Calgary saw funding for an additional 660 spots. In the 2007 provincial budget, the province allocated $260 million for the construction of the Institute for Sustainable Energy, Environment and Economy which will add 1,000 new students in this inter-disciplinary undertaking. The trouble is that the university asked for more than $260 million and the Premier expected the private sector to pick up the difference. The City of Calgary, one of the fastest growing cities in Canada, has 11,463 fewer spaces for post-secondary students than does Edmonton; there is an urgent need for more post-secondary space in Calgary. The lack of movement on all these fronts suggests that the provincial administration fails to understand how post-secondary education is an integral part of economic diversification.

3. Boost Post-Graduate Enrolment

Canada graduates amongst the fewest PhD students per capita in the G-8 and half of what the US generates. It is these students who go on to conduct research and have the potential to make the exciting discoveries. The US is also better at funding post-secondary education to the tune of $5,000 more per student. Study after study makes the connection between higher levels of education and economic diversification.

4. Enhance Research and Development

The need for more graduate students ties directly into the need to boost research and development activities. One of the ways to address this issue is to create a mechanism that bridges the gap between the academic and business worlds. It is no secret that the business community—especially the capital markets—has little patience for research and development because the time horizon for investment is shorter than ever before. By the same token, the academic world does not necessarily understand the deadline-driven business world or the somewhat foreign concept of the time-value of money. But business needs what research uncovers—and academic research needs more funding.

The proposed fund would be instrumental in establishing mentorship programs, work-study opportunities and encouraging the secondment of business executives into the academic world for meaningful periods of time so as to foster a better understanding of how post-secondary institutions function.

5. Foster the Road to Commercialization

The idea of secondment and work/study opportunities would be key pieces to solving the commercialization challenge. It would facilitate the interaction of the two worlds so that when there are promising discoveries, they can be shepherded accordingly. But it also must be acknowledged that not everything undertaken in the university environment has the potential for being commercially viable. Educational institutions are not always a means to an end. And sometimes basic science remains as basic science.

For all this to work, Alberta's post-secondary institutions must become centres of excellence that will attract the best and the brightest, not just to conduct research and teach, but also to mentor.

Above all, there must be better coordination of research and development activities within the private and public sectors, and not just within Alberta, but across the country. Alberta could be the catalyst to implementing the recommendations put forward by the Federal Expert Panel on Commercialization, which looked at similar issues on a national scale.

All of these objectives could be accomplished through the establishment of a government agency associated with Alberta Advanced Education and Technology that

would oversee the fund while having the sole responsibility of overseeing all research and development activities throughout the province. For Alberta to play a role on a national level, it is critical that there be one place where it all starts; the existing structure is too fragmented.

Conclusion

The biggest hurdle in setting the course for Alberta's economic future is defining what economic diversification means to this province. Is it the extension of existing businesses and services? Does Alberta build on its existing expertise in energy and focus on better extraction processes in the oil sands and unconventional reservoirs? With the western Canadian sedimentary basin becoming increasingly stingy in terms of what it yields, the energy sector has become increasingly reliant on technology. There is no doubt that myriad applications exist for what is already being used in the sector. The issue is how the technology can be applied to other disciplines. Does it become a leading innovator in the development of alternative energy options? If the universities are to become centres of excellence, not unlike the clusters found in the US in places like Silicon Valley, Raleigh-Durham, the US northeast and Texas, in which disciplines do they choose to concentrate?

Once this direction has been set, a champion must be selected to lead the change.

Then there is the issue of how to shepherd the R&D that is determined to have a proof of principle. Much has been made about the lack of capital, but the real issue is lack of appropriate channels to get the money where it is needed. A better network needs to be established so that individuals and companies looking for funding know how to access the "informal" pools of capital. This is particularly important at the seed and start-up levels, where the risk is highest and the capital most scarce.

Assuming the province moves ahead with its $300 million Alberta Enterprise Fund, there will be more money available for those companies lacking connections or at the nascent stages of development. The key, however, is making sure that only the ideas worth moving ahead are financed. The toughest thing to do when there is money available is learning to say no. Remember Vencap.

Alberta has moved ahead in diversifying its economy, but more must be done. The Task Force on Value-Added and Technology Commercialization is a step in the right direction. But beyond creating pools of capital, it falls short because it does not address the underlying issues regarding education, the need to attract talented people to this province, increase access to post-secondary education, and grow post-graduate enrolment. It recommends creating new product commercialization centres, but these should be incorporated into the existing structures where the research primarily takes place: the universities. By doing this, there is a higher possibility of cross-pollination between the hard research and the steps needed to take an idea on the path to commercialization.

This would help to further another recommendation: to promote entrepreneurship within the province. The connection between funding post-secondary education, especially at the graduate level, is critical to moving down the path to diversification. But there is no acknowledgement of this. Instead, the report effectively states the current system is adequate.

Alberta must create an environment that fosters revolutionary discoveries, not evolutionary ones that merely improve on existing processes. The revolutionary discoveries are where real diversification comes from; we must get away from simply concentrating on finding cheaper ways to do existing processes.

No matter how you look at it, the economic future of Alberta lies in strategic, substantive investments aimed at increasing the knowledge of its residents. China and India graduate more than half a million engineers every year—Canada graduates but a few thousand. Their labour costs are lower and they get a higher return per dollar of R&D invested. It is time Alberta realized its economic future lies in the development of technological innovation and commercialization beyond the energy sector; one day the oil and gas will run out.

Through the establishment of research chairs and scholarships, a commitment to creating centres of excellence, a better network for funding companies in the nascent stages of growth, and changing the way young students are taught, the provincial economy could look very different a generation from now.

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Chapter 6

Whither a Heritage Fund Public Dividend Policy?

Allan A. Warrack

Albertans strongly support keeping the Heritage Fund. Despite this, Albertans offer little support for increased investment in it. Why this paradox? The Heritage Fund is rarely on the public mind and receives only occasional media attention. How can this disinterest in the main legacy of our non-renewable natural resource endowment be overcome? Perhaps there is a need for a new vision and for bold new ideas.

Here's a new idea: initiate a public policy of dividend payments to individual Albertans as the shareholders of the Heritage Fund. This would garner some attention for both the Fund and the more general issue of what to do with Alberta's resource revenue. It works in Alaska. The Alaska Permanent Fund continues to grow even after 26 consecutive years of dividend payments to residents totalling over $15 billion.

One of the essential drivers of the Heritage Fund is fairness to future generations. Does anyone think we now are being fair to our grandchildren? Heritage Fund governance weaknesses started in the early 1980s when all financial yields from the Fund were transferred into general revenue and annual allocations to the Fund were halved to 15% of natural resource revenue. In 1987, deposits into the Fund were eliminated altogether. Only recently has any new money been invested into the Fund.

Would the public pay more attention to their Heritage Fund if it perceived a direct stake in its policies and management? Should Alberta establish a new policy for the Heritage Fund that pays Albertans a direct public dividend? The answer to both questions is yes.

Like Alaska, Alberta has boom-bust cycles. Economic strength is not measured only by prosperity, but also by stability. During each bust in Alberta we solemnly say that "next boom we'll be smarter." But are we? Are we not making the same old mistakes?

A permanent annual dividend program (as opposed to the one-time Alberta 2005 Resource Rebate, often referred to as "Ralphbucks") based on the earnings of the Heritage Fund would make the case for greater investment in the Fund, increase public awareness and involvement in the future of the province, and provide residents with a small but reliable stream of public dividend money. This money would be especially helpful for disadvantaged Albertans, young families, and seniors.

Conundrum: n. riddle, a hard question, anything that puzzles

Alberta Conundrum: Albertans strongly support keeping the Heritage Fund; yet Albertans offer little support for increased investment in the Heritage Fund. Why this paradox? How can this conundrum be resolved?

SHOULD Alberta initiate a new public policy of dividend payments to Albertans as the shareholders of the Heritage Fund? Would this result in greater attention and priority in the minds of Albertans regarding their economic and political actions?

This chapter explores these questions. To do so, it is essential to understand the history and underlying principles of the Alberta Heritage Savings Trust Fund. It is also necessary to provide a similar outline and history of the Alaska Permanent Fund (APF) because it is a success story compared to the Heritage Fund. A core element of this success has been Alaska's formulation and handling of a public dividend policy.

Alberta Heritage Fund

Basic Concepts

The Heritage Fund was created to manage economic rents from oil and gas production. Through saving, incoming non-renewable natural resource revenue can be converted into a renewable pool of financial capital. This represents the conversion of a non-renewable resource into a renewable asset. Some or all of the incoming non-renewable resource revenue can be so managed.

A prime condition leading to the idea of the Heritage Fund was the ready availability of unexpectedly large non-renewable natural resource revenue. The high resource revenue was a result of the upward revision of resource royalties by the provincial government and the spike in oil prices in the 1970s. The jump in resource revenue raised a number of immediate concerns including fears that the surge in revenue would induce a level of government expenditure that would be unsustainable over the long-term. Another concern was how to absorb the windfall revenue into the relatively small economy of Alberta without harmful distortions such as inflation. Finally, despite a history of honest governments in Alberta, there was also a fear of corruption.

Economies substantially dependent on natural resources, whether regional or national, are notoriously cyclical. The Alberta economy is no exception. Cycles can be large in magnitude and can occur in rapid surges (booms) and slides (busts). Hence, the core economic policy issues facing natural resource economies include not only prosperity, but also stability. Indeed, economic strength is the blend of prosperity and stability.

When thinking of instability, weather and market variability come to mind, but occasionally there are major and unexpected external "policy risks" such as the actions of the Organization of the Petroleum Exporting Countries (OPEC) and 9/11 and those imposed by another level of government (e.g., the National Energy Program). A well-managed natural resource revenue fund should buffer some of the instability inherent in a resource-based economy.

Another potential benefit of a savings fund is resource conservation. Resource conservation is the attempt to establish the socially desirable levels of resource utilization over time. Having proper regard for future generations, to what extent of finite non-renewable resources should a particular generation feel entitled? Resource "high-grading" (using the cheapest/highest quality resources first) must be taken into account. Draw-downs of non-renewable resource stocks can be offset by setting aside money for future investment uses. If used wisely, a natural resource revenue savings fund like the Heritage Fund can be such an investment instrument.

The environmental context of natural resource development is also important. There need not be severe conflict between economic growth and environmental concerns. There is a responsibility to leave a healthy environment and resource base for

future generations. The central issue should not be "whether," but "how" adverse environmental impacts will be remedied. Timing matters. Environment restoration can be viewed as capital investment, and a capital pool such as a natural resource savings fund may facilitate needed improvements.

The Original Drivers of the Alberta Heritage Fund

Several factors entered into the decision to establish the Heritage Fund:

- the principle of fairness to future generations;
- the goal of strengthening and diversifying the economy;
- the desire for quality of life improvements; and
- the value of having a rainy day fund.

The *single strongest* driver of Heritage Fund policy was to be *fair to future generations*. It was felt that future Albertans should share in the benefits of the current resource boom by saving some of the revenue in the Heritage Fund. There was a recognition that future Alberta residents should be able to express their views and vote and that the current generation has the responsibility to be their proxy.

The second driver—economic diversification—recognized a fundamental weakness in the Alberta economy: while cyclically prosperous, the province's economy had always been subject to damaging instability. It was argued that the economy would be stronger if it was more diversified, and probably also more prosperous. In addition to diversification, it was thought that a stronger economy would emerge if there was extensive and high quality infrastructure, including educational and research infrastructure. It is important to note that the payoffs from this driver would not be directly financial; instead, the Heritage Fund would facilitate persons and businesses to succeed.

The third driver was "quality of life" social dividends. Life and society always contain "nice to have" options for healthy and enhanced lifestyles. These can include both indoor and outdoor facilities such as parks, art galleries, theatres, historic sites, music halls, and world-class medical research and practices. As a bonus, it may be that attracting and retaining skilled workers becomes easier when these benefits are available to individuals and their families.

Finally, a "rainy day" revenue source was expected to be valuable at key junctures. In a cyclical economic environment, with cyclical tax revenue flows struggling at times to sustain public services, a financial buffer is needed from time to time. Though many have characterized the Heritage Fund as *only* a rainy day fund, this is not so as the idea of a having a rainy day fund was only one of four original drivers.

There are many implementation difficulties associated with a policy of deferring benefits into the future. Many individuals have trouble saving for their own or their family's future. It is even more difficult on a societal (government) basis. The future "gain" is distant, diffuse and uncertain; the current "pain" is immediate, specific and certain.

In addition, people sometimes have fanciful, even myopic, demands of what others should do for them and pay for on their behalf. In Alberta now (August 2007), with the price of oil exceeding $US70/barrel and natural gas over $US5.50/mcf, there are Alberta citizens who think it is "raining." Surely it is not even sprinkling! Why should our grandchildren not be accorded a share of the province's resource wealth? Although the economic principle of deferred benefits may be logical and socially just, the politics can be regrettably contradictory. Any jurisdiction should be forewarned of this reality.

Heritage Fund Finances

Until 1976, all provincial resource revenue in Alberta was used simply for the year-by-year general expenditure of government. On August 30, 1976, precisely five years after the new Lougheed government was elected, an initial allocation of $1.5 billion was made to kickoff the Alberta Heritage Fund. A flow to the Heritage Fund of 30% of non-renewable resource revenue began, with the other 70% continuing to support the general budget of the government. The 30% flow was halved in 1982, and then stopped in 1987. As of 1982, all of the earnings of the Heritage Fund were diverted into general revenue.

With the earnings being drained away to general revenue and the deposits stopped, the Fund's purchasing power was severely eroded by inflation. In 1987, the Fund was $12 billion. In 2005, it was still only $12 billion. Inflation-proofing finally began in 2005 and the Fund has seen several billion dollars in new deposits in recent years bringing its current value to over $16 billion.

Nearly $30 billion of Fund earnings has been drained from the Fund over its lifespan and transferred into general government revenue. This money represents taxes Albertans have not had to pay for public services. A debate has emerged regarding whether it is fair to future generations that the earnings of the Fund should be used wholly for current expenditure purposes.

Alaska Permanent Fund

As the trans-Alaska oil pipeline was being built in the 1970s, there was debate in Alaska about the merits of saving a portion of the state's oil wealth instead of spending it as it came in. In 1976, a state constitutional amendment establishing the Alaska Permanent Fund was approved by voters. The Fund created an investment base from which to generate future income; the Fund would prudently take some of the state's non-renewable oil wealth and transform it into a renewable source of wealth for future generations of Alaskans. Implicit in this mandate is the portfolio mix approach of financial instruments. Moreover, the Alaska Permanent Fund is indeed permanent; it can be changed only by another state constitutional amendment approved by referendum. The Fund is directed by arms-length trustees, and managed by a professional staff.

In 1977, by legislative action, the APF received its first deposit of dedicated oil revenues ($743,000). The Alaska Constitution provides a base royalty rate of 25%. All of this revenue must flow into the Alaska Permanent Fund. Wisely, inflation-proofing was done starting from early on (1982). It is a simple concept, adopted in Alaska, but not in Alberta. The objective is to maintain purchasing power of the capital base; the method is to measure inflation in a given year, and re-invest an amount that would offset the erosion of purchasing power due to inflation. Over the life of the Alaska Permanent Fund, about $10 billion has been added back into the APF principal in order to ensure inflation-proofing.

The bottom line is that the APF receives two "hard" reliable and continuous revenue streams: the 25% royalty revenue and inflation-proofing revenue. The APF also receives occasional "soft" revenue flows based on energy revenues in the form of special appropriations. Regardless of revenue source, once the revenues are deposited in the APF, they are truly permanent in its capital base.

With a value of $40 billion (US) and growing for a population of approximately 700,000, Alaska's Permanent Fund is a significant asset. Alberta's population is about 3.5 million and its Heritage Fund is only $16.6 billion. By any measure, the difference in the respective funds is vast. Moreover, the APF is growing rapidly and systematically, from royalty revenue and inflation-proofing. The Heritage Fund is growing neither significantly nor systematically.

A notable feature of the Permanent Fund is the Alaska dividend program. The annual dividend is a permanent program based on the net earnings of the Fund. Legislation for the dividend was passed in 1980; however, dividend payments were held up until 1982 due to a court case over the dividend calculation. The annual amount has varied over the years with the average payment being a little over $1,000. Because of a five-year build-up period and the court case delay, that first dividend was $1,000. The largest amount was paid in 2000 ($1,964) and the 2007 payment was $1,654. Over $15 billion in dividends have paid out of the Fund since 1982 and the Fund's current value stands at over $40 billion.

It is essential to distinguish the Alaska dividend policy from the Alberta "Ralphbucks" episode. In 2005, Premier Ralph Klein decided to give each Albertan $400 (the Alberta Resource Rebate). While lots of people are happy to get cash from wherever, there was much puzzlement among Albertans as the payments were not the result of any discernable policy. Nor did anyone seem to know the answer to the question "what's next?" These payments have not continued.

The Alaska Permanent Fund dividend differs from Ralphbucks in two fundamental ways. First, the money paid out to Alaska residents as dividends has been *earned* by the Fund as distinct from simply skimming from cash flow. Second, though amounts vary according to APF earnings, the Alaska dividends are paid as a *permanent* stream of income. There is well-known economic analysis (Permanent Income Hypothesis) that shows people spend permanent income streams more carefully and responsibly than transitory dollops of cash.

Alaskans pay attention to their Permanent Fund. In a democracy, it is the job of the public to hold government's "feet to the fire." As always, there is need for a balance between independence and accountability. This appears to have worked in Alaska.

Heritage Fund/Permanent Fund Comparisons

There are many similarities between Alberta and Alaska. Their respective savings funds began at the same time (mid-1970s), both funds are based on non-renewable resource revenue, and both economies are vulnerable to boom-bust cycles (for a detailed comparison see Warrack and Keddie 2002 and the matrix at the end of this chapter).

Several of the comparisons need to be highlighted. For the first five years of the Alaska Permanent Fund, only bonds were held. It then adopted an outward view of investments including a stock portfolio. From its outset to 1997, the opposite was true for the Alberta Heritage Fund. As a result, APF investment results have been vastly superior to those of the Heritage Fund. APF has been inflation-proofed from the "get-go," but the Heritage Fund has not. Another comparator is the fundamental means of fund governance; arms-length trustees are appointed to lead the policies and management of the APF. In contrast, the Heritage Fund has been in the hands of a government department and it has been hobbled over the years by legislative restrictions.

For the purposes of this chapter, the biggest contrast is a philosophical one that results in a different answer to the following question: can citizens spend their own money better than government? In Alberta, the choice has been that government can decide better (nationalization); from 1976 to today, all Heritage Fund spending decisions have been made by the Government of Alberta. In Alaska, through its public dividend policy, individual residents and their families decide how to spend the earnings on their money. Individual Alaskans make their own decisions of how to allocate the dividends they receive each year.

A Public Dividend Policy for Alberta?

The concept of a social dividend policy in the history of Alberta is not new. It was a hallmark stance of the Social Credit prairie political populism of the difficult 1930s. The Social Credit Party governed in Alberta for 25 years. Social Credit dividends were to be paid at $25/month. Although the promised social dividend was paid but twice, it is a uniquely Alberta idea in Canada.

Furthermore, the "Ralphbucks" episode in 2005 was not universally scorned in Alberta. There is anecdotal evidence of a significant level of acceptance, despite the lack of policy underpinnings. Some right-leaning citizens viewed the government cash payments favourably because they meant that there would be "less for the government to waste." Some left-leaning citizens favoured the payments on the grounds of social equity; equal payment amounts meant that the needy would get the same amount as the rich, though the value to the needy would be much higher. This is based on the notion of the marginal utility of money—a similar logic basis as progressive income tax. Still others said "just gimme the dough!"

The Alberta Heritage Fund can be managed as a policy instrument to convert non-renewable energy resources value into future renewable financial resources. A shift to this policy mantra is overdue. The Heritage Fund needs to be built up dramatically, inflation-proofed, and managed as an endowment *à la* the well-known Harvard Rule (5% yield taken and distributed). This yield would be the basis for any public dividend distribution. Likely it would be necessary for the Heritage Fund to be built up for (say) five years, before sufficient funds could be available to begin the dividend at a meaningful level. Alaska built up its fund for a few years before the first public dividend distribution.

Like Alaska, Alberta has boom-bust cycles. Economic strength is not measured only by prosperity, but also by stability. Alberta is "on the bubble" today. In Alberta, during each bust we solemnly say that we'll be smarter when the next boom comes (often coarser terminology is used!), but are we? Are we not making the same old mistakes? Conversion of volatile non-renewable resource revenue into stable renewable funds would help immensely. As for a dividend program, even a small reliable stream of public dividend money would be helpful. This is particularly true for disadvantaged Albertans, young families, and seniors.

Conclusions

1. Yes, a permanent divided policy based on the earnings of a larger Heritage Fund is a good idea. It is an idea that could have worked in Alberta from the near-outset of the Heritage Fund.

2. There is a governance rationale that sees citizens instead of government making decisions about their "piece of the pie." Instead of politicians and bureaucrats deciding what is best, why not individuals and families? There are both right-leaning and left-leaning rationales favouring public dividends being available such that individual residents and their families can make their own spending decisions. Thus a broad-based public consensus likely is feasible.

3. A public dividend policy works in Alaska. Residents of Alaska pay attention to the Alaska Permanent Fund and it has both grown over the years and paid out substantial dividends.

4. The track record of the Alberta government's management of the Heritage Fund since 1982 is weak. Governance and management by an arms-length trustee-style mechanism offers hope of real improvement.

5. There is a practical problem of timing. The current Heritage Fund balance is $16.6 billion. For 3.5 million people, the Fund could not immediately offer a meaningful dividend (say $500/person). For the public dividend payment stream to be worthwhile, there would need to be an Alberta Heritage Fund build-up period. A five-year Fund build-up period would be reasonable.

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Figure 1: Alberta Heritage Savings Trust Fund Versus Alaska Permanent Fund

	Heritage Fund	Alaska Permanent Fund
Time Era	Mid-1970s	Mid-1970s
Resources Base	Hydrocarbons	Hydrocarbons
Philosophy	Nationalization	Privatization
Establishment	Legislation	Referendum
Governance	Bureaucracy	Trustees
Economic Development	Yes	No
Social Dividends	Yes	No
Financial Management	Income	Endowment
Stocks Holdings	Not until 1997	Yes
Inflation-Proofing	Not until recently	Yes
Investment Profile	Inward until recently	Outward
Fund Size	Smaller	Larger
Fund Growth	No	Yes

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Chapter 7

Alberta by Design: The Creativity and Innovation Equation

Lance Carlson

If we want to seed our province for innovation and creativity, we must accept that the issue is not detecting and cultivating a few people who can accept the mantle of creative soul or innovative mastermind. Our gaze must instead be turned to creating the circumstances under which scores of individuals can perform innovatively and transform their creative potential into actions that matter.

Knowing how and where to invest for innovative action is extremely elusive: there is no simple formula whereby an investment in "X" (whatever that may be) will produce "Y" (creativity and innovation). This inability to ultimately "buy" the most wanted effects of creative thinking and innovation speaks to the appropriate role of government in this equation. Through astute investments and strategic policy development and implementation, it is possible to nurture circumstances under which original thought and action may flourish.

Hence, this chapter presents ideas that are oriented toward the establishment of a policy framework and investment strategy that will create the conditions for creativity and innovation rather than a laundry list of specific projects.

WE all love buzzwords—that is, until we hate them. In the early days of their use, buzzwords (and buzz phrases) have utility; they help us grasp technical or vague concepts. The problem is that overuse takes buzzwords one or more steps away from substantial content and hoodwink us into thinking we understand a concept when we do not. In this way, they provide comfort, and yet at the same time, possible confusion.

Two of the most injured buzzwords in modern times are "creativity" and "innovation." Like any catchphrase, these two must be considered in greater depth; only by knowing what we are talking about can we reflect on how to invest in creativity and innovation.

Mythical Beasts

Creativity has become the rallying cry for a wide range of causes. It is thought to be the remedy for business, science, the arts, and all variety of enterprise. We speak of wanting to nurture creativity and creative people in our organizations, governments talk about needing to find creative answers for pressing social problems, and we are hopeful that that our children will learn the art of being creative as they move through our education system. The concept is also applied to collectives—we see books on creative cities (places which are described as having an assortment of characteristics ranging from street performers and festivals to more obscure qualities), creative classes of people and workers, and we yearn to create the conditions for creativity in every aspect of life. Creativity is undeniably a sizzling commodity, albeit a mushy one.

Just how mushy is seen when we talk about where it comes from. Creativity as a trait within individuals has variously been attributed to genetics, a mystical or divine gift, personality quirks (for better or worse!), the social environment, or even pure luck. It is instructive that, despite all of the literature on this subject, few experts would harbour the belief that we can magically instill creativity in an individual or a place. The popular view is that we are indeed fortunate when we happen to find a rare "creative person" in our midst (Csikszentmihalyi 1997).

The closely related (and ascending) cousin to creativity is innovation. Just as with creativity, the desire and the need for innovation are almost everywhere we turn. Over the past few years, we have seen innovation as a major topic in the media, education, science, the arts, government, and economics. *Business Week* magazine now has regular online and print sections dealing with the topic and the *Harvard Business Review* routinely features it, to name only two examples. The study of new ideas - how they are generated and implemented - is becoming the fundamental driver of a great deal of organizational theory and practice. Businesses try to hire people who are likely to

be inventive (and creative), and the search is on for innovation in every aspect of our lives.

Turning Down the Buzz

The thing about buzzwords is that it is uncommon for anyone to actually define them. We use them, we speak as if we all understand what we mean, but as with other terms (think about the word "love" as an example), we may actually possess different individual understandings when we chat about them. In the many conversations that occur using these two terms, it is rare for anyone to pause and describe what they mean by creativity or innovation.

Type the word "creativity" into any online bookseller's website and you will find thousands of titles that ostensibly deal with the subject. Some have described it (rather romantically) as energy, but that characterization is less than helpful. However, for all of the various, and varying, opinions about creativity, a serviceable definition can be described fairly concisely. Creativity, for all practical purposes, can be thought of as a human capability or aptitude rather than behaviour. When researchers or philosophers write about the discrete characteristics of creativity, they almost always point to an ability to synthesize ideas that might be otherwise unlinked, a greater tendency to generate unconventional ways of looking at things, the ability to see problems from singular perspectives (and therefore to approach solutions in new or unique ways), and finally, the capacity to hold opposing ideas in the mind at one time—the creative act being the power to resolve the distance between them (Martin 2007). Taken together, this constellation of characteristics is a reasonable working definition of creativity for our purposes.

Innovation, although very often used interchangeably with creativity, is quite different. While creativity can be considered a competence and a way of conceptualizing, innovation is behaviour. Innovation can be thought of as an improvement in ways of doing things that add significance or value (which can of course take many forms).

In many respects, the vagaries of understanding innovation are similar to the uncertainty surrounding creativity. As with creativity, there is a popular notion that innovative

behaviour is the property of unique, almost enchanted, individuals—mythic heroes who have the singular ability to look at things in a different way and initiate value-producing changes. According to this school of thought, some have "it" (innovative capacity), but most do not. As Charles Leadbeater of the Demos think tank in London, England observes, if this school of thought is accurate, it follows that we should find these special people, put them in rarefied places of responsibility (think universities and colleges), and we will see progress. The hypothesis is that innovations will be produced by these individuals and then passed along the production chain to the consumer who will then enjoy the fruits of the inspired genius (Leadbetter 2005).

If only innovative actions were so easily conjured. While some popular misconceptions regarding creativity and innovation have been debunked, others remain. For example, consider the contemporary tendency of the scientific and business worlds to embrace the view that these concepts can be "managed" in a formulaic way, so that by doing the "right" things, we can guarantee creative output. Alas, such is probably not the case. In many respects, creative potential is similar to knowledge in that both are abstract *capacities* for action or behaviour rather than activities. It is possible, however, that we can increase the probability that innovation may occur in any given setting.

Collaboration, Not Convention

As with creativity, we must guard against the notion that innovation is so well understood as to lend itself to a perfunctory approach that in every instance provides a desired outcome (that being improvements, however they may be defined). While much is known about innovation, a great deal of this information is narrow and rooted in the technology sector. The hypothesis in many discussions of innovation is that examining technology-related indicators can establish benchmarks by which to measure general societal improvement (i.e., innovation). Yet, a more general understanding of the process of innovation across all domains of endeavour is probably more pertinent. While it is true that technological advances can be one of the signs of innovative activity, they are surely only representative of innovation within one sector. In its 2007 report *How Canada Performs,* the Conference Board of Canada includes a lengthy consideration of innovation in the country, yet virtually all of the indicators applied to the assessment are technology-related (Conference Board of Canada 2007). Clearly this is an insulated approach to the issue that will do little to advance innovative potential across society.

To really begin to come to terms with what actions, policies, or investments might promote an agenda of originality, we must understand the nature of innovation as a phenomenon apart from any particular sphere of enterprise. To broaden our approach, we must appreciate that innovation (or its opposite, customary and highly routine practices) occurs within communities that are characterized by conventions. Conventions are traditional or established ways of behaving (regardless of societal sector or domain of activity) and tend to become constant over time because they are functional. If we do something repeatedly and it "works," there is little motivation, on a mindful or non-conscious level, to change that behaviour or set of practices.

Innovative actions are chiefly born out of the fact that conventions have ceased to be useful; this could apply to accounting systems, medical procedures, government policy, and so on. This lack of performance or functionality of a practice generates an implicit (and sometimes explicit) sense of disquiet, and an awareness that the conventions do not work well. The tendency is then for habituated methods to mutate and adapt in dramatic or subtle ways, which lead to new traditions of behaving that add greater, or new, value to the group, community, or system.

The Alberta College of Art and Design recently engaged in a research project that resulted in the creation of a visual "map" of the concept of innovation. In the course of this work, we learned that innovation normally occurs under very particular circumstances that undermine popularized notions of the extraordinary creative champion (Leadbeater's "special" people). Much of the current literature on how innovation occurs attributes profound improvements to extensive collaboration and social interaction—forces that cultivate the development of new ideas and enhancements. Likewise, while many assume that innovation and original thinking are only about that which is new, researchers have found that collectively building on "old" ideas and shared practices is a vital ingredient for authentic innovation (Hargadon 2000).

T-Shaped People

Another aspect of innovation that must be recognized as tricky is the almost universal (and fallacious) assumption that innovation equals objects (things). Innovation may sometimes involve the invention of new "things," but that circumstance pales when we consider that innovation is above all a technique that applies to every area of enterprise. This is not always easy to remember because among the various domains of activity and knowledge in contemporary society, science (and its physical embodiment in the artifacts of technology) has assumed a preeminent position in the minds of many as the umbrella under which most significant invention, innovation, and relevant creativity occurs. (Most people acknowledge that creativity is also manifested in the arts, however it is arguably the case that the arts are viewed—inaccurately—as less central to broad societal innovation and advancement than scientific endeavours.)

Focusing on enabling an innovation formula for society will yield far more profound results than directing our energy—and our dollars—to the more narrow issue of invention, be it in medicine, policy, or any other area one might identify. A popular (and fine) example of this principle is the iPod. While it is surely the case that the enabling technology needed to be developed before the iPod could be introduced, it was a broad understanding of culture, fashion, and how people actually live that enabled Apple's designers to conceive a device, and an interface, that is revolutionizing the music industry. Other developers attempted to duplicate the early success of the iPod, but in some instances they failed to anticipate the human factors (culture, values, contemporary ideas, and usability) that made the iPod such a triumph.

Until recently, most books and journal articles on innovation focused on the search for the next splendid invention, or the next substantial scientific advancement. And yet experts on innovation estimate that only perhaps 5% of true innovation (and original ideas) involves technology; rather, current thinking underscores the importance of broad human understanding (including culture and values) as the most critical factor in creating the preconditions for innovation (Keeley 2005). Understanding society, values, and how ideas affect us in the progression of innovation is now becoming widely recognized as one of the fundamental prerequisites for innovation and creative thinking.

The ability to think "laterally" requires an aptitude for approaching situations not only in a head-on manner with depth, but also for considering the wide contextual basis for issues and possible solutions. This dual conceptual ability has been recognized by some of the most provocative thinkers in the field. Daniel Pink told us in 2004 that "the Master of Fine Arts is the new Master of Business Administration," and has since written about the deep significance of an integrated mindset in terms of popular notions of so-called left- and right-brain thinking (Pink 2004). Likewise, Tim Brown, the CEO of the innovation and design firm IDEO, strongly advocates for firms to hire "T-shaped" people. By this he means individuals who can work through a situation from their narrow specialty (the vertical leg of the T, be it accounting, engineering, design, or law), but who can also temper that narrow analysis with an open and empathetic understanding (the horizontal bar of the T) that spans other fields such as anthropology, philosophy, or the arts (Brown 2005).

The Goal State

If we want to seed our province for innovation and creativity, we must accept that the issue is not detecting and cultivating a few people who can accept the mantle of creative soul or innovative mastermind. Our gaze must instead be turned to creating the circumstances under which scores of individuals can perform innovatively and transform their creative potential into actions that matter.

But what might those conditions be? One of the first requirements of any problem-solving process is to define what the preferred state of affairs might look like; only by knowing where we want to go can we begin along a path to reach our goal-state. In terms of innovation and creativity, what would a province look like (metaphorically speaking) that aspires to engender original thinking and inventive actions across the population? What is the goal-state for Alberta in this regard?

When we speak about investing resources in creativity and innovation, it can be difficult to articulate the tangible end result of any such investments. Owing largely to the aforementioned tendency to use "creativity" and "innovation" interchangeably and apply them to a wide range of conditions, defining the sort of society we envision and hope for in this regard can be challenging. In the press, and even in academic journals, one reads

about "cultures of innovation," but aside from those generally sentimental appellations, what do we want to accomplish with investments in creativity and innovation?

To establish the goal state, we must first embrace the realization that human knowledge is integrated rather than isolated in discrete academic "fields." Many argue that we are entering a new age with regard to the usual silos of education and understanding. Harvard biologist Edward O. Wilson convincingly argues that if we fail to understand that knowledge domains are dependent on one another for advancement, we will operate at a disadvantage in all of our undertakings (Wilson 1998). Wilson and others maintain that linking seemingly disparate domains such as the arts and sciences enlarges cognitive and inventive processes and that this may help us reform existing institutions that are rooted in a narrow, and fundamentally flawed, model of research and development.

Thinking about the traditionally separated worlds of business, medicine, social sciences, humanities, arts, chemistry, and engineering (as examples) and moving toward an amalgamated view of knowledge and activity in all areas of human activity is both daunting and exhilarating. At the same time, it is atypical today to find a captain of industry or a healthcare researcher who does not speak emphatically about the need for innovation and expansive understandings in their work, or the artistic practitioner or designer who does not acknowledge a need for commercial acumen in order to ply their craft and be successful when working with government, business, or industry. The long-established narrow categorization of knowledge (and action) is no longer functional if we hope to create the conditions for true innovation.

The second necessity for establishing those conditions is a population that has the capability to incorporate and manipulate information in an increasingly challenging world of data and inputs. To say that our experience of the world, especially for those in highly "developed" countries, is daily becoming increasingly complex is axiomatic. The sheer quantity of available information is growing at an enormous rate, meaning that the ability of individuals to sort through, and then understand and synthesize knowledge (thus possibly creating new ideas), must be maximized within a population.

Third, the evidence is irresistible that innovation and creative thought benefit from individuals (and institutional and knowledge domains) interacting with one another so that information, insights, and methods can be shared and combined in new ways. If we

accept that joint effort and the sharing of information is a prerequisite to innovation, then part of our goal must be the facilitation of networking among individuals, institutions, and the private sector. Given what we know about the need for broad, shared understandings and exchanges, it is critical that we support not only collaborations within sectors (such as medicine), but between otherwise dissimilar areas (such as medicine and law, design and health care, cultural enterprises and economic development). As just one example, consider how health care is inextricably intertwined with issues of meaning, economics, social class, history, and ethnicity, among others.

Finally, there should also be attention paid to communication and interaction between research enterprises and the general public as well as efforts to connect "experts" to one another. If Alberta (or a country, or even the globe) wishes to foment innovation and draw on the creative reserves of its population, then we must buttress an "open-source" mindset. Innovation is the result of iteration and total interactions rather than consecutive linear practices enacted behind organizational walls that emphasize secrecy and a lack of openness and access.

Beyond the swap of information between disparate enterprise domains, it is also crucial to ensure that actual collaboration occurs with regard to research and development, and that sufficient resources exist to actualize advances in knowledge and invention. In virtually any enterprise there is a tendency for resources to flow to what already exists rather than to what might be. From a pure enterprise point of view, this is sensible, as the augmentation of existing products and services is less risky than the creation of new directions, especially in a commodity-based economy. To the extent that an economic base is relatively stable, there is likely to be less emphasis on developing capital streams or other resources (by either government or industry) that could finance or support innovative processes and products, and yet those resources are essential if we are to evolve, compete, and innovate.

Precisely because it is so difficult to redirect existing government resources toward the cultivation of authentic creativity and innovation, dedicating the gains from a sizeable non-renewable natural resource fund to these ends makes a great deal of sense. There are so many immediate needs facing government that it is nearly impossible to find money within traditional revenue streams to invest in creating the conditions that would yield a more creative and innovative province. Alberta is in the unique position

to be able to draw on its non-renewable bounty to fund this transformative work. Other jurisdictions are beginning to direct attention to these issues, but are in the position of squeezing financial resources from other revenue streams.

Where to Invest?

The question of how to invest in creativity and innovation within a population is slippery, which is probably why many jurisdictions are so slow to move forward in these areas. As has been discussed, the ability of the population to reflect laterally and embrace new points of view is a quality of mind as much as anything, and one that must be nurtured. Knowing how and where to invest for innovative action is extremely elusive: there is no simple formula whereby an investment in "X" (whatever that may be) will produce "Y" (creativity and innovation). Rather, we must accept that, while we cannot secure innovation and creative thought as fail-safe outcomes, we can perhaps make certain that our policies and investment decisions do not prevent them.

This inability to ultimately "buy" the most wanted effects of creative thinking and innovation speaks to the appropriate role of government in this equation. Through astute investments and strategic policy development and implementation, it is possible to nurture circumstances under which original thought and action may flourish.

Among the wide variety of options, we should consider restructuring curricula throughout all levels of education to successfully integrate conceptual understandings across all disciplines. Such radical change would necessitate investments in not only the process of curricula change, but also teacher (and professor) professional development so that the new curricula are successfully delivered.

In terms of seeding the province for crossover interactions and partnerships, we must provide incentives for collaboration and research between disciplinary domains so that, for example, healthcare research includes cultural understandings drawn from sociology and anthropology, engineering processes are informed by design thinking, and historical research incorporates information from science. Within universities and colleges, funding should be directed at joint faculty appointments and endowed professorships that work within the interstices of academic schools and departments rather than being

rooted in one organizational location. Combinations that impact teacher training for elementary and secondary school instructors would be especially valuable.

With regard to the need to set the stage for broad visionary thinking and knowledge production, we should increase our investment in foundational research with long-term goals that complements research targeted to address more immediate and specific issues. As already mentioned, the path to innovation is anything but linear, and the broad knowledge base and wisdom that can be gained from expansive inquiry into history, culture, science, symbols, and related areas should be integrated at the outset with more traditional targeted scientific and medical research. It is important to incorporate a healthy balance between what may appear to be more utilitarian undertakings and more general research into the human condition.

Perhaps most central to the creativity and innovation equation, government (and perhaps private sector initiatives) should adopt and implement a formal policy framework throughout government departments that includes the following overarching principles.

First, make the ability of the population to assimilate and process information a primary goal. This principle speaks to human comprehension—a primary element for establishing a creative and innovative population. Without this state as a precondition, we will have little hope of nurturing original thought, and in turn, innovation. This points to sufficient funding for all public education entities, but we should not confuse quantity with excellence (a familiar propensity in the public funding of essential services). Without serious and weighty self-critical attention to the *quality* of our education services, we run the risk of failing to provide citizens with effective conceptual tools; we should not assume that more of what we are already doing is necessarily better.

Second, amplify the ability of the population to interrelate, engage in alliances, and interact so that "experts" are in dialogue with the general public, and members of the public with one another. A variety of tactics can be employed in pursuit of this notion including the widespread availability of appropriate technology to ensure access to global information sources for citizens and creating a pattern of ongoing formal events (such as symposia) within communities that import divergent views and encourage conversations in both rural and urban centers. Government should also support funding

for conferences, publications, and other distribution vehicles so that information is distributed to, as well as gathered from, individuals. If innovation is typically the product of interaction, we must facilitate this as a societal characteristic in many forms and through various means.

Third, eradicate stumbling blocks to innovation by identifying government policies (including legislation and institutional structures) that may discourage activity that leads to originality in action and creativity in problem solving. This might mean the reconfiguration of silo-like government ministries and agencies that actually work against imaginative considerations or solutions, or that do little to encourage the quality of action and mind that is needed. The bureaucracy should be redesigned around a provincial vision for innovation, creativity, and imagination that rejects the more traditional approach of assigning responsibilities to departments based on the conventional understanding of functional areas. For example, we would do well to ask ourselves how health and wellness should interact with the arts and cultural undertakings.

In addition to the elimination of obstacles to inventive action, new capital streams for commercial (and research) ventures that intentionally collapse timeworn divisions between domains of activity should be created. Likewise, tax and other constraints that discourage private sector investment in ventures that may explore fresh approaches should be eliminated.

These ideas are oriented toward the establishment of a policy framework and investment strategy that will create the conditions for creativity and innovation rather than a laundry list of specific projects. As has been pointed out, creativity and innovation cannot be considered surefire results from any particular investment, but are more about the development and nurturing of collective attitudes, values, and behaviours. We can invest wisely with these characteristics in mind, but we cannot assume that creativity and innovation will be the automatic and obvious result (despite the plethora of popular management books that would lead us to believe otherwise). Investing wisely means investing with a long view toward innovation and provincial vision rather than with an assumption of immediate (and perhaps unsustainable) results.

The Stakes

What are the ramifications of not attending to these issues? The answer to this question is complex, yet there are essentially two layers to consider. The first is quality of life. One constant throughout a vast range of study as to what makes a community or a place vibrant, engaging, and adaptive is the degree to which "creative" people populate it. Richard Florida and Charles Landry (among many others) have famously articulated and researched these questions (Florida 2002). Community, irrespective of size or geography, is rooted in a sense of place, meaning, and purpose. Because creative individuals and their work enhance these social constructions, the overall quality of life of a community is, by definition, an issue of creativity and innovation. If we ignore these factors, our quality of life will suffer.

The second layer is purely economic. The 2006 World Economic Forum in Davos, Switzerland was heavily focused on innovation and design as economic drivers of contemporary global economies. Similarly, the Conference Board of Canada's report, *How Canada Performs,* addresses innovation as a key indicator of global competitiveness. In terms of innovation, the report ranks Canada 14th out of 17 comparable countries. The report makes it clear that

> "innovation is an important part of the story.… It is an essential component of a high-performing economy; it is also critical to environmental protection, to a high-performing education system, to a well-functioning system of health promotion, disease prevention and health care, and to an inclusive society. Without innovation, all these systems stagnate and Canada's performance deteriorates in comparison with that of its peers. Our competitors are not standing still" (Conference Board of Canada 2007).

Alberta has an opportunity to harness its non-renewable natural resource revenue to greatly increase the opportunities available to its residents to be more creative and engage in innovation. Indeed, we would exhibit both creativity and innovation to invest our riches in this manner.

Clearly the world is paying close attention to creativity and innovation as fundamental conditions for any society that wishes to be luminous and competitive. The cost

of not acting toward this end, or of ignoring creativity and innovation as vital social circumstances, is immense. In a now famous quote, the eminent Toronto designer Bruce Mau challenged us by asking, "Now that we can do anything, what will we do?" It is a question that neatly summarizes the myriad possibilities confronting us, and one that must be meticulously considered. What is undeniable, however, is that in a time when we can do anything, doing nothing is no longer a possibility.

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Chapter 8

An Apple a Day: Creating Demand for a Disease Prevention and Health Promotion System

Penelope Hawe and Alan Shiell

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This chapter contemplates a curiosity. Albertans, like most Canadians, feel entitled to health care and are passionate about it, but they do not seem to have the same thinking about prevention. If they did, we would be forced to be more responsive to their needs and the health of the population could be radically improved.

This chapter outlines ways to reorient the current system more toward disease prevention, health promotion, and wellness. The ideas rest on the premise that to improve any system we have to amplify feedback about its current level of performance, in this case with regard to who is currently benefiting from prevention policies and programs and who is not. The true power for sustained change lies in enabling the people of Alberta to better scrutinise the way their health destinies are shaped by policies and decisions right now. We present a bold new future with a new kind of disease prevention and health promotion system, one that works across all sectors of government and community and provides structural economic incentives for all kinds of constituencies to provide the type of environments in which health thrives. This makes health promotion and disease prevention everybody's business and in everyone's interest. Responsibilities and contributions must work at many levels. But it is not complicated. Good health is within remarkably easy reach. The greatest mechanism for health improvement is a new, broad-based integrated system to tackle the diverse determinants of health, alongside increased accountability to those whom we profess to serve. This is not only possible in Alberta at present, it is imperative that we make it happen.

ON July 24, 2007, *The Banff Crag and Canyon* carried a story about the Calgary Health Region introducing a policy that would reduce heart disease rates by up to 22% ("Health region pushing trans fat ban"). It was not an announcement of more hospital beds or the adoption of new technology. The idea was to avoid premature deaths through prevention—by stopping people getting sick in the first place. The policy called for the elimination of trans fats in the cooking oils used in restaurants located in the region. This is good news, but only for those who dine in the Calgary Health Region.

In August 2007, Statistics Canada released a study showing that workplaces that have smoke-free policies have double the number of smokers quitting smoking for good compared to workplaces where there are no restrictions on smoking (Statistics Canada 2007). Given that a smoker who quits can increase his or her life expectancy by as much as nine years, this is another example of a preventive policy that saves lives (Tsevat 1992). However, some people benefit from it and some don't; it depends on where you work.

Sound fair? Probably not. Canadians care deeply about, and have high expectations of, the health care system. If medical science has a treatment for an illness, we feel entitled to it when we get sick. But if prevention science has a means to avoid us getting ill in the first place and yet local authorities do not provide that means, we don't make a fuss. Why? Because most of the time we simply don't know what we are missing.

The task the Canada West Foundation set the authors of this chapter was to come up with an idea that could be used to transform Alberta in terms of the province's approach to wellness, health promotion, and disease prevention. What would place us out in front in Canada and internationally? We were told to look for ideas that go beyond more money for existing programs. More of the same was not acceptable.

Lots of people we spoke with had suggestions. Eliminating poverty, concentrating on disadvantaged youth, focusing on depression (especially among mothers such that the impact would be felt on a generation of children as well), and addressing issues related to the aging of the population were all mentioned.

These are all worthy ideas. But to make a lasting difference on any or all of the health dimensions of these problems we need to shift to higher order thinking. Tackling one problem well in 2007 or 2008 is not going to make lasting difference to a system that perpetuates neglect of preventive health issues in the first place.

To make a lasting difference with this "blue sky" opportunity, we have to address a more fundamental issue: Canadians don't feel entitled to disease prevention and health promotion in the way that they feel entitled to health care. If they did, the whole population might be a lot healthier because the system would have to bend to meet this new consumer demand.

But if we create demand for policies and practices that prevent disease, could the demand be met? Yes. How to promote health and prevent illness right across our population is not a secret. A lot of the science and expertise is already in place (Zaza 2005). Alberta already has some first rate practitioners in the field. It is not a future 10 years hence. It is also not a future dependent on a new technological or genetic breakthrough. It is a future within reach right now if, alongside the creation of demand for prevention, we invest in some tools to build the capacity of the current system to respond.

We start this chapter by sketching some background about health and health promotion. We then outline vital new strategies to reorient the health system toward prevention and health promotion and to harness sectors outside the current health system for the purpose of averting disease and promoting health. This broader arena constitutes the currently untapped prevention and health promotion system. We conclude by reviewing the Alberta we could become.

Disease Prevention, Health Promotion, and Wellness

Practitioners, researchers, and students in the fields of disease prevention, health promotion, and wellness make fine-grained distinctions between what the various terms mean. Put simply, success in disease prevention means that fewer people have heart disease, cancer, and so on. But that achievement does not really capture the full dimensions of health. According to the World Health Organisation, health includes complete physical, mental, and social well-being, not just the absence of disease (Nutbeam 1998). A spiritual dimension is also recognized. The more one moves toward

the notion of well-being, the more the spiritual and holistic dimensions are emphasized, along with a positive sense of connection and contribution to one's own life and to that of others. In other words, health is both an individual and a community concept.

Some people embrace these ideas as a philosophy. Others need cold hard facts. Happily, since the 1970s, there has been no shortage of studies that demonstrate unequivocally that individual and community health and well-being are inextricably linked. Regardless of an individual's personal risk factors (meaning things like their age, gender, genetics, income, education, employment and lifestyle), health status is additionally determined by where people live (Kawachi 2003). Sometimes the reason for this is obvious. Living next to a hazardous waste dump has a direct effect on health, for example. But so too does living in a neighbourhood which is physically unattractive, unsafe, covered with graffiti, and lacking good schools, parks and places to shop. These types of social contexts seem to erode people's well-being and affect their health even if, ostensibly, their income, education, job and lifestyle might together spell better things for them. In Alberta, for example, a database kept by heart surgeons on people who have undergone cardiac catheterization shows that low income patients have poorer survival rates and lower quality of life scores after a stroke if they live in low income neighborhoods, but not if they live in high income neighborhoods (Southern 2005). Community context matters.

What does this mean for disease prevention and health promotion? It means that the most effective ways to promote health work on two levels simultaneously—at the *individual* level (to improve a person's health related choices) and at the *environmental* level (the places in which we live and work and the policies that affect these). Countries which are ahead of Canada in terms of health promotion are the ones that have taken the policy approaches at the environmental level seriously—being first off the mark, for example, when it came to seat belt laws and the impact on road deaths, bicycle helmets and the impact on head injuries, shade shelters and the impact on skin cancer rates, and restrictions on the use of cell phones in cars and the impact on motor vehicle collisions (Hawe 2001). A national study in the US aptly entitled *The State Sets the Rate* illustrates how the extent of state-level alcohol control policies determines the proportion of people binge drinking (Nelson 2005). In short, if supportive preventive policies are in place, health thrives.

Other examples include: making fresh food available at schools; providing gyms and childcare at work; making our streets safe and walkable; and ensuring smoke free restaurants, shops, and workplaces. *A Framework for a Healthy Alberta*, a plan developed by Alberta Health and Wellness after the Mazankowski Report (Government of Alberta 2002) calls this "making healthy choices the easy choices." It is an approach successfully adopted by jurisdictions around the world (World Health Organisation 1991). The policies do not just benefit the people encouraged to change their lifestyle. We all benefit because we would all otherwise pay the costs—for the treatment of head injuries, lung cancer, diabetes, stroke and so on. That part is not a choice.

How much effort is put into health promotion and disease prevention right now? Not much and not enough. In any given health region in Alberta, only a small number of full time staff will be responsible for designing, implementing and evaluating programs to prevent disease and promote health. About 2% of the total health care workforce is responsible for programs in areas like healthy living, wellness, school health, prenatal and postpartum education and care, disease surveillance and environmental health.

Funding for prevention programs is not guaranteed. Permanent staff often write grants for temporary staff to run particular programs—like a one-year program for substance abuse prevention among school children, or a two-year program for health information and health skill building among newly arrived refugees. These types of programs are not considered routine care (i.e., mandated so that they are always delivered). Instead, the case for having special programs has to be made annually or biannually and a grant written to obtain the funds from private foundations or provincial authorities.

It is a risky business. Funds may not always be available. Sadly, this kind of system is what has sufficed for health promotion and disease prevention up until now. We acknowledge that it has produced some outstanding programs. Take, for example, the success of a team in Edmonton with a falls prevention program for seniors living in the community. It produced a relative reduction in falls of 26% overall and 42% among those with highest risk (Robson 2003). But uncertain funding means that performance overall is always destined to be patchy and not guaranteed. Effective programs often end or are never even implemented. It would be like if we decided to run our health care system by only treating people with diabetes or breast cancer in some years and not others. Or if we made our surgeons write grant proposals every year in order to

fund all the hip replacements they wanted to do. The health care system does not run this way and neither should the prevention system.

We are not the only ones to neglect our power to prevent distressing and premature illness and death. Dr. Michael McGinnis led the development of the US prevention agenda as former Assistant Surgeon General for almost 20 years. He lists several reasons why prevention and health promotion has to work constantly against being put on the back burner, even though evidence for its effectiveness is strong. It includes our society's "technophilic culture" whereby we favour high-tech and dazzling solutions which bring about dramatic results in individuals, but we yawn at the diverse, small, and integrated ways to prevent problems in the first place. He gives the example of a spinal chord injury in a teenager who has been in a car crash after drinking at a party. This represents an immediate and straightforward therapeutic challenge for the heroes in the health system. However, the work to prevent the injury occurring in the first place requires the long haul engagement right across the system of car manufacturers, police, schools, liquor retailers, community groups, the media, and even city planning and zoning officers (McGinnis 2001). No jurisdiction it seems has ever really faced up to this type of multifaceted against-the-odds challenge in prevention and health promotion, but Alberta can and Alberta should.

Four Strategies for Change

To care about something the public first has to know about it. The people responsible for delivering health promoting programs and policies also have to be empowered to improve them and shape them to community needs. The impetus to reorienting any system is to *amplify the feedback* about current performance and bring expectations about accountability to the surface.

1. Create demand for prevention by measuring, mapping and communicating the current distribution of preventive policies and programs

The advent of geographic information systems software has allowed health and social planners to map the distribution of all kinds of phenomena. So imagine how powerful it

would be if, alongside maps of the distribution of smoking rates rate by neighbourhood or obesity, premature mortality, or per capita prescriptions for depression, our analysts were mandated to report on the distribution of health promoting polices and practices (including what is known about their costs and impacts). Imagine how much easier it would be for the public to claim their entitlement to prevention if they could see how unequally policies and programs such as smoke-free public places, affordable housing, early childhood development centres, fresh cheap food, confectionery-free schools, family-friendly workplaces and so on were currently distributed (so that people could see the help they were not getting).

"Geography is destiny" is an old saying. If this was made more public it would be political dynamite, not for the factors the public tend to think they cannot change (who they are and where they live), but because such maps would expose the inertia of the current system in allocating the resources that could alter those destinies (Hawe forthcoming).

Data is the new mantra in business. *Competing on Analytics* is the new source book for companies and even sports teams making tough decisions with limited resources (Davenport 2007). The competitive edge comes from being able to recognise and respond to trends in a way that is not possible if a company is "analytically impaired." Right now the prevention system is analytically impaired and studies of health decision-makers in Alberta show that they are frustrated by it (Shiell submitted).

It would not be hard to build a new data system that mapped the distribution of healthy policies and programs. We have the design capability. We also have the commitment from diverse inter-sectoral agencies to take part. There are precedents in other countries to list or "stock take" their healthy public policies in some fields. But no one has taken the next step to do so routinely and comprehensively and make the information available to the public. Data pooling and data sharing agreements are being devised in the province to map understandings of health and social problems, but not yet the solutions in place to tackle them. Alberta would be the first, thereby setting a whole new landmark in accountability.

The time to act is now. Dr. Paul Veugelers at the University of Alberta, for example, has demonstrated that children in schools with coordinated programs and policies for

healthy eating have healthier diets and significantly lower rates of overweight and obesity than children from schools without nutrition programs (Veugelers 2005). If that is the case, should not every parent be entitled to know if the school that their child attends has the right program? Should not all our schools be assisted to meet the grade in this regard?

2. Make new investments in evaluation and quality improvement in prevention

Unfortunately, just as health promotion and disease prevention are neglected, so too are the research and development that should accompany it. For many programs, we simply do not have sufficient evidence to know whether they are working well or not. Therefore, the second strategy is to ensure investment in evaluation and quality improvement. These are accepted as basic tenets of good practice in most sectors.

The same is true in health promotion, but in this instance there is also an ethical imperative to evaluate. Some interventions in disease prevention and health promotion have done more harm than good. Rather than turn children off drugs, some drug-abuse prevention programs have increased their use (Berberian 1976). Some driver education programs have increased crash rates (Robertson 1980). Some suicide prevention programs have increased the number of suicides (Rosenman 1998). The problem is a combination of good intention coupled with ignorance about the field of prevention science. People mean well, but many do not know the difference between a sound program and one likely to be unsound.

The proliferation of poor programs is potentially greater in Alberta where there is wealth, because it is easier to make a charismatic "sell" for a program direct to donors and foundations, by-passing available expertise of people with the training to detect harmful programs or predictable failures. The tendency for medicine to be seen as science, but prevention to be seen as charity, has made some people feel that rigorous assessment of well meaning programs is not warranted. Practitioners shy away from evaluation, for fear of what it might uncover. Fundraisers understandably also tend to be nervous of anything that might undermine donor confidence. This unwittingly builds a fragile, self-serving system when something far more robust is deserved and possible.

In health care, we readily accept the premise that drugs and new technologies have to be tested. The same is true in prevention, wellness, and health promotion. At any one time, perhaps as much as one half of all the new programs we try might not work. There is, however, no shame in failure. The shame lies in not having a means in place to evaluate the impact of new programs and adjust the course of action accordingly.

The system boost required in this regard would start with the mapping process outlined in strategy 1 (above) and the application of the classification system to rate program and policies on likely effectiveness—based on existing published evidence. This would identify programs and policies that are promising enough to warrant new investment in evaluation. To produce this information well, research and evaluation partnerships between practitioners and university-based researchers are needed. Emphasis should be placed on methods which strengthen the role and contribution of practitioners and communities themselves in the evaluation process (Fetterman 1996).

3. Open pathways to enable the switch from ineffective programs to effective ones with new customized decision-support tools

We anticipate that the two strategies mentioned above will uncover some uncomfortable information. For example, Dr. John MacLennan at the University of Calgary recently published a census and review of all the group-based education programs offered in the field of parenting in an Ontario city about the size of Calgary. Parenting programs are hugely important for providing information and developing parental skills in diverse areas such as nutrition, safety, social skills, reading skills, and behaviour problems. The research team found that none of the 12 programs offered by the various agencies across the city had any evidence of effectiveness to support them (MacLennan 2006). However, there were at the same time several programs in existence that were of proven effectiveness that could have been offered in their place.

This is likely to be a common scenario in many Canadian cities. Entrenched ineffective programs continue unchallenged for historical reasons, doing a disservice to the people who attend them, wasting the money of the people who fund them, and, ultimately, demoralizing the people who provide them. On its own, this kind of feedback has the potential to be quite paralyzing. But imagine if one was able to show that for the same investment of resources (or possibly even less), effective programs could be put in their

place. The constituency would still be served, a better product would be in place, and health gains would be more likely.

Managers of health promotion need concrete tools that enable them to translate evidence about the likely effectiveness of their programs directly into a set of decisions to redeploy their resources more beneficially. This might include web-based "calculators" into which decision-makers could plug local information about the prevalence of the problem they wish to address; the likely effect of the program being considered; local contextual factors likely to boost or dilute the program effect; and the costs of critical inputs such as staff and administration. Together, these would then be used to calculate the savings and health gains to be realized by transferring resources from the less effective programs to the more effective programs.

The process of scrutinizing the current allocation of resources would start within specific service areas, such as programs directed at children and youth. The aim initially might be to see where resources might be reallocated within this service area in ways that improve health at no extra cost. Then another area could be tackled, such as seniors. We could then move on to look at what extra money flowing into the field could buy in terms of health gains. Reallocating resources between service areas, could also be considered (i.e., taking resources from relatively ineffective activities in one area in order to provide more effective services in another area). In this way, moving through all population groups, this strategy would transform the face of our investments in prevention and health promotion.

4. Create "healthy strings attached" economic incentives to provide prevention policies and supportive environments for health across sectors and government departments

Incentives have always had a role to play in improving health. Family doctors in some parts of Canada are eligible for incentive payments if they provide services such as counseling for smoking cessation, colorectal screening, or diabetes management based on recommended guidelines (Ministry of Health 2006). Since January 1, 2007, Canadian families are eligible for a small tax break if they participate in authorized physical activity programs (Canada Revenue Agency 2007).

Such policies have their place, but they are often expensive and not always effective. We often end up giving money to people who would have undertaken the behaviour in any case. Incentive payments can simply set up a transfer mechanism whereby private sector providers earn more for supplying existing services to the same groups of people (generally people with higher socioeconomic status). Hence, little true change is brought about. If anything, health inequities are increased.

Part of the problem is that most ideas about using incentives to improve health have been narrowly construed. Schemes have been confined to the health sector. But if the evidence of the last 100 years and more is true, and the primary roots of a population's health lie in factors like education, housing, employment, job control, and a personal sense of meaning or coherence (Evans 1994), then our ideas about health incentives will have to become a lot more imaginative. *To have a major impact, we have to look beyond incentives that encourage individuals to be healthy and consider how best to encourage governments, the business sector, and the nonprofit sector to provide the type of supportive environments that benefit everyone.*

Governments, businesses and nonprofit organizations have capabilities and responsibilities to help create a healthier Alberta. The problem is that what is good for Alberta may not always seem good for particular individuals, employers, organizations, or government departments. Early childhood development programs, for example, are typically funded out of the health budget, but they have their greatest impact on improving educational achievement and reducing crime and delinquency. Rigorous enforcement of traffic laws reduces road injuries and benefits the health sector, but costs are born by the police force. Friction and non-cooperation can arise whenever one sector pays the cost, but another sector reaps the benefits. We therefore need to think more systematically about incentives and try to bring into line costs and benefits across all sectors so that promoting health really does become everyone's business and in everyone's interest.

This is an ambitious agenda that requires bold action. It means more than establishing cross-governmental committees in an effort to break down departmental silos that allow one department to say "that's your problem" and another to say "no it's yours." We need to assign responsibility for disease prevention, health protection, and health promotion so that a government's every policy—on employment, education, trade, housing, criminal

justice, welfare and so on—is recognized as potentially affecting public health and is scrutinized according to its affect on the health and well-being of all Albertans.

The Public Health Agency of Canada is encouraging inter-sectoral action in health, based on a review of experiences from 15 countries (Public Health Agency of Canada 2007). Alberta has the capacity to shine at this, given our successes so far, such as the recent groundbreaking data sharing agreement among nine government departments that has been secured in the field of children's health, education, and well-being (Alberta Centre for Child, Family and Community Research 2007). This sets the example of the type of infrastructure needed to track the impact of our policies. It shows that people here have the leadership, confidence, and commitment to do things better by working together.

Pilot projects on structural incentives for prevention could start within the health sector immediately. Our hospitals are major generators of local economic activity. They employ large numbers of people and spend lots on supplies and services. Many other businesses—food outlets and new housing developments for example—wish to locate near them to benefit from their activity. City councils could work with health regions to introduce a "healthy strings attached" zoning policy that would require businesses benefiting from the health sector's location and spending to be healthy-employers with smoke free workplaces, support for smoking cessation, family-friendly employment policies, payment of a living wage, and showers and cycle sheds to encourage people to leave their cars at home. We could require that all contractors wishing to work with a health region would need to demonstrate how they were addressing the health needs of their own workforce by way of policies and programs that are known to be effective.

These sorts of incentives and requirements change social norms. In Australia, for example, for the last 20 years sponsorship of sporting teams and grants to community groups from health promotion foundations in two states have had conditions attached that require agreements to promote healthy policies (Health Promotion Journal of Australia 1993). Sporting venues have to be smoke free and offer healthy food choices and low alcohol beverage choices. Sporting clubs have to provide the means for low income and ethnically diverse groups to take part. Community groups that attract grants to build shade shelters in neighbourhood playgrounds have to require that the building contractors who win the contract follow sun protection policies for their workers. The

effect of such polices is impressive. In Canada, skin cancer has increased by 30% in the last 10 years ("New cases of skin cancer…" 2006). Australia is the only country where rates are going down (The Cancer Council of Australia 2006). Prevention is becoming entrenched as a way of life.

In addition, we could decide as a province that private sector spending on workplace health promotion programs and policies of *proven effectiveness* should qualify for tax deductions. Rather than being a cost to the employer, being able to showcase their investment in employee wellness should add competitive advantage in today's tight labour markets. With our new tracking system on healthy policies and programs by geographic area we should start to see a domino effect whereby these "health zone precincts" start to influence neighbouring workplaces and businesses, with the consequent impacts on health and well-being detected in the regular population surveys that our health regions currently undertake.

Conclusion

Sir Norman Gregg was the doctor who first observed the relationship between German measles in pregnancy and deafness in newborns, which led the way to the development of the rubella vaccine more than 60 years ago. He made the comment that:

> "Epidemics that used to be excused as acts of God are now not excused as the results of the inactivity of mankind. In short, the incidence of many diseases has moved from the area of chance to the area of choice" (Gregg 1949).

Although the choices of individuals matter, the organized efforts of society that shape those choices matter more when it comes to controlling disease rates. That is the observation about public health that Gregg was making, and it still defines the field of public health today (Acheson 1998).

Our vision for a healthy Alberta depends on tapping individual responsibilities *and* collective responsibilities, as well as relying on mutual help rather than self help. Our strategy starts first and foremost with arming a powerful force with hitherto unrevealed

insight: ordinary Albertans. It is totally unacceptable that knowledge exists today that could improve the health of Albertans directly that is not being put into practice effectively or equitably.

The strategy we offer is simple. Make current practice visible and accountable to increase public demand for health promotion and then provide the expertise, information, incentives and pathways to help the system respond to this increased demand. Advocacy for prevention, health promotion and wellness would become commonplace. The opportunity to make a *sustainable* difference to the issues raised in our introduction—youth, depression, poverty, seniors, and more—would thus be created. Transparency. Accountability. Opportunity. Fairness. These are things that matter to Albertans. This is what our strategy provides.

We will need to establish a new, well-placed structure or entity to enshrine the vision of change and further the ideas we hope will come forth in the ensuing dialogue. The role is to lead, enact, implement and evaluate the system's transformation and increase the public profile of prevention, health promotion, and wellness.

Using revenue generated by a large non-renewable natural resources endowment fund would provide a firm foundation for this transformation and set Alberta on the path to becoming a world leader in the areas of disease prevention, health promotion, and wellness.

In pointing out what we could do, and what we should do, it is also important to point to what would not help. Prevention and health promotion require pervasive system-level change and sustained support. What we do not need is a new body set up to give out short-term health promotion and wellness grants to agencies and groups. This tends to prioritize innovation at the expense of the ongoing provision of high quality, effective programs and services, and gives preference to short-term objectives over long term-change. Lack of money is not the problem in Alberta. Lack of *sustained* capacity is.

The current health workforce, spread as it is currently throughout health regions, schools, school boards, municipal government, community groups and private agencies will need to be better supported, funded, trained, facilitated, challenged, empowered, celebrated and prized. They are more than the "delivery system," they are its change agents. A first class disease prevention and health promotion workforce could become our hallmark, the jewel in Alberta's crown—the reason to move or stay here, to study here, to make a contribution here. The universities will also be required to step higher in many of the new roles that are already emerging, such as in public health research and teaching, and in the establishment of inter-disciplinary research alliances with health regions, municipal governments, and school boards.

The challenge of this book was to focus on transformative ideas—not simply tinker on the margins or add more programs into the mix. We have not costed-out the ideas presented here. That is a further task. The point is this: the resources we need to reorient and recalibrate our health system to enable it to better encompass prevention are nothing compared to the resources we will gain—healthy people leading socially and economically productive, creative and enriched lives.

Finally, it is worth remembering that the greatest resource people ever have to solve any problem is how they think about it. The ideas presented here and the conversations we hope will ensue are designed to change the way we as a community think about health and our future entitlement to it. Changing thinking is what changes history.

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Chapter 9

Alberta on the Environmental Cusp

Sydney Sharpe

Alberta has both the wealth and the duty to become the world leader in the planet's next boom industry—environmental technology. To achieve this, the province needs to invest wisely and focus clearly on the specific goal of stimulating environmental industries. Our knowledge of many kinds of specialized carbon production from coal, natural gas, conventional oil, and now the oil sands, gives us the world's best chance to find ways to limit greenhouse gas emissions by perfecting clean coal, carbon sequestration, and other technologies.

The effort should also be extended to environmental leadership in many other areas, including the science and management of watersheds, land use, and boreal forests. Alberta companies could then export the knowledge and technology, creating a sustainable prosperity that will make today's provincial boom seem primitive by comparison. There will be huge markets for such solutions when countries like India and China inevitably see the need to limit their own rapidly growing greenhouse gas emissions.

The most logical source of funding for this transformation is the earnings generated by a large and permanent non-renewable resource revenue fund. The core goal should be to research and discover new environmental technologies and reward best practices in every environmental area.

To move industries in that direction, the province also needs a regulatory system with the clear goal of protecting the environment while stimulating investment, both in resource development and environmental technology. To guide all this, the province should establish a blue-ribbon Premier's Panel on Environmental Progress (PPEP), with a mandate to propose policy and advance the agenda.

THE environment is the most explosive topic on the planet and every politician in the country is caught in its blast. Premiers and prime ministers are tripping over each other to appear environmentally friendly and "green" is the new god. The climate is changing and, in the inimical words of Bob Geldof, "we are all [expletive] conscious of global warming."

Climate change is such a polarized and politicized debate that the dialogue too often descends into belligerent bellowing. The maelstrom has created stars who are media magnets with opinions tossed in the air like volcanic eruptions. "There is disagreement about climate change, but the impact of fossil fuel carbon emissions is a reality," says the University of Calgary's David Keith, Director of the Energy and Environmental Systems Group at the Institute for Sustainable Energy, Environment and Economy (ISEEE). "We have a serious challenge. Alberta needs to do something."

Keith is absolutely right. Alberta not only has the responsibility to act, but enjoys a rare opportunity to become a world leader in environmental technology and practice. Precisely because the province is an energy powerhouse, it has the money, the need, and the knowledge to succeed at this monumental task. "We could be doing a lot more," says best-selling author Peter Tertzakian, the Chief Energy Economist for ARC Financial. "We have the money. Environment and energy can be a focal point that people can be excited about."

Global energy entrepreneurs and politicians seek Alberta's guidance and strategic direction for non-conventional oil production, particularly oil sands and heavy oil development. It was not always so. Thirty years ago, the oil sands were an uneconomic curiosity; today they are the most exciting oil play in the western world—and the most environmentally controversial. Therein lies our opportunity, and we already have the model for success.

The Alberta Oil Sands Technology and Research Authority (AOSTRA) was created in the mid-1970s to develop "new technology for oil sands and heavy-oil production, with emphasis on reduced costs, increased recovery and environmental acceptability" (Wiggins 2007). AOSTRA has been a big success on the first two fronts; but so far, many question the environmental acceptability of extraction processes that produce heavy greenhouse gas emissions.

The government invested several hundred million dollars in oil sands technology through AOSTRA from 1976 to 1999. That "patient funding" is now reaping over $100 billion in announced investment in the oil sands. By any standard, the original investment has been spectacularly successful in developing the technology to produce energy profitably from the oil sands. If the same kind of effort was turned toward research into environmental technology, the rewards could be equally spectacular, both economically and environmentally.

This chapter presents a number of approaches Alberta can take to become a world environmental leader, and in the process, develop and export its expertise and technology.

Bold Goals

A bold approach to sustainability is the only pragmatic way to protect and promote what I have always believed to be the most magnificent place on earth: Alberta. Given this, the provincial government should take the following environmental actions:

1. **The province should create an expanded centre of excellence for energy, environment, and growth.** It should focus on current and future energy sources, develop emission solutions including carbon sequestration, and ensure a healthy dynamic among industry, academia, and government. The University of Calgary's Institute for Sustainable Energy, Environment and Economy should be a major player in this and the cornerstone of this expanded effort.

A key goal of the new centre of excellence should be to discover, encourage, reward, and export best practices in every environmental area (not just energy) so that Alberta's natural capital is protected and promoted and other jurisdictions benefit from the centre's work.

The centre should also stimulate investment in environmental technology. The goal should be to direct private capital toward reduction of environmental degradation in all areas—land, water, air, and energy—and to commercially exploit the technology that is

created as private companies and government agencies seek to meet environmental targets.

2. As the energy driver of Canada, Alberta should lead the way in energy efficiency and solutions to greenhouse gas emissions. The Alberta government should provide a viable funding steam that jump-starts strategic thinking. Alberta should be creating tomorrow's energy solutions today. This is where vision and investment can drive research, innovation and technology to change the world.

3. The provincial government should encourage and fund best practices in the area of natural capital management including the expansion of its Water Research Institute.

4. To advise the government on the merits of environmental projects, and guide broad policy goals, the government should strike a blue-ribbon panel of recognized experts from all environmental fields called the Premier's Panel on Environmental Progress or PPEP. PPEP's makeup must be determinedly non-partisan and its advice should be directed at best practices for effecting environmental change within the broad framework of supporting environmental quality, technology, and future economic development based on environmental sustainability.

"We're entrepreneurial. Let's reconcile the entrepreneurial spirit with sound stewardship of the environment. If one province can do it, it is Alberta," says Benoit Beauchamp, a geologist and Executive Director of the University of Calgary's Arctic Institute of North America. "We could be the Florence of the 21st century. We have the resources and the intellect. Environment is part of the package."

Alberta should be the Silicon Valley of energy, says Tertzakian. "We are an energy-cluster base of hydrocarbons and we can lead." There are global examples of countries that catalyzed such promising clusters. Ireland, through incentives and subsidies, became an economic powerhouse attracting big-name companies.

Satya Das of Edmonton-based Cambridge Strategies Inc. emphatically states that "the environment is a core value of Albertans." In Cambridge's analysis, the environment had more support from Albertans than the next three issues combined. "Environmentalism

in Alberta isn't a radical movement—it's ingrained. It's not a left-right thing—it's an attachment to the land and environment." Most pressure to take decisive environmental action will come from voters right at home, and this in turn will make the government's job easier.

As the only stable democracy with a massive oil reserve, Alberta faces both huge challenges and an historic opportunity. As Das says, "if we don't set the gold standard, who will?" Certainly not India and China, whose economies are surging along with their greenhouse gas emissions. Both are prepared to develop without controls. As Alberta becomes the global leader in carbon capture and other technologies, the province will eventually export its knowledge to those and other countries when their day comes to control emissions.

"Sooner or later the world will get impatient with China and India not playing by the same rules. It's not clear how that's going to develop," says Harrie Vredenburg, a professor at the University of Calgary's Haskayne School of Business and the Institute for Sustainable Energy, Environment and Economy. When that inevitably happens, though, Alberta should be ready to offer the solutions.

Alberta's Greenhouse Gas Emissions and Carbon Storage

Alberta creates a third of Canada's greenhouse gas emissions—the highest of any province—and these are expected to rise by another third in the next five to ten years (Government of Alberta). It is, therefore, responsible and expedient, both politically and environmentally, that Alberta should pursue various emissions reduction plans.

In 2004, Alberta produced total greenhouse gas emissions of 235 megatonnes from all sources. Transportation accounted for 14%; electricity 22%; residential uses 3%; fossil fuel production 36%; other industrial activity 14%; commercial uses 4%; and agriculture and forestry 7% (Government of Alberta).

Clearly, direct fossil fuel production is not the only source of greenhouse gas emissions. The message is that all sectors need to share responsibility. Indeed, the realities of sectoral emissions could be communicated more effectively in order to prevent simplistic

policies that give an illusion of solving the problem by attacking one or two groups that make easy political targets. The oil sands, in particular, are in danger of becoming a world-wide whipping post.

While the intensity levels per unit of production are down, the total emission numbers are rising because of increased production. This fact drives the whole debate about emissions—should they be subject to absolute caps, or is it sufficient for the province first to reduce emissions per unit of production? The government takes the latter position, arguing that technology will eventually reduce absolute emissions. Many critics disagree. "Stop using the atmosphere as a dumping ground," says Pembina Institute Executive Director Marlo Raynolds, who would like to see the government and industry "take a healthy pause" from oil sands approval until appropriate systems are in place. Canadian Association of Petroleum Producers President Pierre Alvarez counters that the key to cutting total emissions is technology and efficiency.

This divisive debate could be resolved through rapid development of technology to sequester carbon. Increased private and public investment into current and future carbon sequestration technologies is crucial to this effort. Major progress toward viable carbon capture and storage has already been made. "Carbon capture isn't too far away from commercial viability," says Vredenburg, noting that other technologies are also within sight. Carbon capture and storage technology has moved from a pipe-dream to a viable method to gather, condense, store and then pipe CO_2 to stimulate production in aging oil fields. Although still expensive, costs will decline as the technology matures. "Carbon sequestration is not cheap to retrofit, but it is cheap to build in," says Das. The Alberta government has to set viable rules to encourage energy companies to invest in this and other clean air technologies. "Influential Albertans see climate change as a business opportunity," states Das, adding that the cost will be upward of $6 billion to build a capture and distribution network for CO_2 sequestration (Das 2007).

In addition, as the energy driver of Canada, Alberta should also lead in renewable and alternative sources of energy, such as wind power, biofuel, and solar. Each, however, brings substantial challenges.

Natural Capital

While critics fixate on the oil sands, often because their massive physical appearance seems offensive and makes them a handy symbol, Keith says that they are far from the most serious threat to Alberta's land base. "The government needs a process to address collective land use impacts. Individual oil sands plants look ugly, but it's a specific point and a relatively small area that is intensively used," notes Keith. "We shouldn't focus on those and forget about larger impact land areas."

Indeed, the biggest environmental challenge is cumulative land use and the pace of development. Our landscapes are being transformed by industries and consumers. This puts pressure on the water supply, wetlands, wild plants, grasses and animals. "Our economy is so over-heated right now. There's a degradation in natural capital as time marches on," says landscape ecologist Brad Stelfox. "We're paying a price. For some companies it's just rhetoric, but there are those that want to be more open and transparent and want to talk about limits."

A financial and political commitment to best practices will ensure that the province's natural capital survives and renews. It will also provide a direct link between industry and government to promote the export of skill and innovative practices to global environmental hot spots

Water

Water is the environmental elephant in the room. Demand will exceed supply if industry and population growth remain unchecked. Growth brings water dilemmas. Far from being a water wonderland, Alberta holds only 2% of Canada's water. "To a water expert, looking ahead is like the view from a locomotive 10 seconds before the train wreck," writes Schindler. "Sometime in the coming century, the increasing human demand for water, the increasing scarcity of water due to climate warming, and one of the long droughts of past centuries will collide, and Albertans will learn first-hand what water scarcity is all about" (Schindler 2006).

Corporate and personal habits must change and government can be the facilitator through investment in best practices and regulatory controls.

In 2003, Alberta introduced a bold and innovative long-range plan to manage water appropriately titled the *Water for Life Strategy*. One of its goals is a 30% increase in water-use efficiency and productivity by 2015 using 2005 levels as the base. The strategy is a great start for the province, but it needs more bite. It is time for the government to increase the funding and scope of its Water Research Institute. A world-class institute is the venue to develop critical technologies and practices that could be exported to global trouble spots.

Government policy should encourage best practices in water management and use. We need to reward the innovation of those ranchers and farmers who forge ahead with their own best practices. Gerald Conaty, senior curator of ethnology at the Glenbow Museum, pointed to some creative ranchers near Cochrane. "They use solar panels to pump water from the creek into water troughs for the cattle. This also keeps animals from trampling the shores." He cites another rancher who has a truck on each side of the creek so she does not have to drive across water. Oftentimes, it is the ranchers and farmers who understand the fragility of water because it rules their entire existence.

A Blue Ribbon Panel

The Alberta government can begin with the creation of a blue-ribbon Premier's Panel on Environmental Progress (PPEP). Too many stakeholder groups are squeezed into various air, land and water quality councils. The voices need to be heard by one panel to provide the big picture and integrated advice that government needs. "You've got all these forces tugging in different ways and they can't have it all. You need to bring stakeholders together to make tough decisions and get a balance," says Tertzakian. "You need a balanced think tank."

This is doable. If warring unions and employers can cross the chasm of their divides, surely environmentalists, industry, residents and government can use similar models to find agreement on an issue as crucial as the environment.

The PPEP would have respected representatives from stakeholder groups and meet regularly. The panel would be chaired by an experienced negotiator/facilitator with no axe to grind.

National arbitrator Allen Ponak points out that in labour negotiations people come to the table because of a deadline and harsh consequences. There is also a target: a new contract. This is not the case with the government and sustainability. "To resolve the blockage, it's crucial that panel members establish goals and implement them," he says. That includes a timeframe and immediate targets. "Get two or three people on each side who are reasonable and who can talk with each other despite their ideological stance. You need a tight group of advisory people. Do it by sector."

PPEP should certainly avoid a membership structure that would lead to debate over climate change. This would be futile. The clear goals for Alberta and the panel should be success in reducing emissions, advancing on numerous environmental fronts, and developing technology both for export and use at home. Everyone would need to be willing to accept the reality of climate change and move on to the practical work. "What are the steps to a cleaner Alberta environment over the next five years?" asks Haskayne School Industrial Relations professor Daphne Taras. "Focus on that and move on."

Conclusion

The PPEP should choose the best ideas that will promote the province as an environmental leader. A major goal is massive emission reductions through alternative technologies and innovation strategies such as carbon sequestration.

Alberta became a leader in non-conventional oil production because the government had the foresight to fund innovation and technologies like steam assisted gravity drainage (SAGD) through a revenue stream called AOSTRA. Now SAGD is a viable technology in oil sands development. The next generation will be energy technologies that use little water and cause no emissions such as geothermal energy.

Sustainability is within our reach when the government will coincides with the drive of its citizens. Bold initiatives can now be envisioned and implemented. Precisely because

of our energy wealth, there is boundless opportunity for Alberta to be both an energy and environmental beacon that attracts investment and respect from around the world. The most logical source of funding for this transformation is the earnings generated by a large and permanent non-renewable resource revenue fund. If we succeed at this task, Alberta will have the prosperity and clean environment to handle every growth pressure, and our prosperity in the early 21st century will be seen as little more than a primitive beginning.

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Chapter 10

Atelier Alberta: Future Home to Art and Artists

Aritha van Herk

Art and its expression have the capacity to transform Alberta in ways that we have yet to imagine. Our distinctive character, as represented by a proud local culture, can provide a heightened identity, as well as satisfaction and resonance beyond the ordinary requirements of daily life.

To achieve this end, investing in culture and the arts will result in immeasurable and yet concrete returns. Artists who are encouraged and enabled reverberate both beauty and innovation in their work. The presence of culturally-focussed companies, organizations, and businesses amplifies the diverse profile of a place. Identifying and retaining space specifically to enable the creation of culture and art will sustain and broaden Alberta's economic advantage, both in larger centres and in small towns. Encouraging businesses and buildings to host some form of cultural expression will make art pervasive and effective. And ensuring that information about Alberta's distinctive culture, both performative and historical, is readily identified and exchanged can feed dialogue among artists as well as conversations between the larger community and its cultural ambassadors.

Sustained support for the arts will contribute to an engaged and energetic place, a dynamism that accurately reflects and portrays the innovative spirit of this province. History and education together enhance Alberta's cultural halo. Investing in this transformative and restorative aspect of life will result in an Alberta that is not only socially comfortable and economically wealthy, but exciting, stimulating, and most of all, a leader of a spiritual rejuvenescence that will echo far into the future.

Atelier: n. a workshop or studio, especially of an artist or designer

Why We Should Support Culture and the Arts

IT is no secret that Alberta has a troubled relationship with culture and the arts. While there is a powerful acknowledgement of individualism, culture and the arts are treated with scepticism, if not suspicion. The extent to which this area of life in Alberta is neglected is nothing less than shameful.

Culture and the arts are the least definable, and yet the most intrinsic, elements of the identity of a place. Culture and the arts speak to the ghosts of the past and the promises of the future. Culture is part of every exchange that occurs, be it two people having a cup of coffee together or dancers using their bodies to depict the wind blowing through a coulee. Culture is critical to every gesture of human life. It connects individuals within communities, and communities within a larger political frame. Culture describes who we are, what we value, how we work and play, how we interact with one another, where we have been, and where we are going. Humans are cultural organisms, just as the verb "culture" means to grow germs or organisms in order to identify and test their effect.

Places generate three kinds of value: social, cultural, and economic. The synthesis of these values creates sustainable communities (Singer 2004). If one of these elements is lacking, a community will not thrive.

Within the cultural enactments of daily life, the arts evoke that space considered the finest demonstration of human expression, ingenuity, and invention. The arts showcase beauty, imagination, hope, and transcendence. They reflect human hopes and fears; they give a place character. They are the transcendent side of quotidian humanity. We must sleep and eat and work, but while such habits keep us alive, they do not give brilliance or significance to life. Only culture can do that.

It is important to remember that culture and the arts are far more than a commodity. They are spirit and flame, they are hearth and home, belief and doubt, markers of change and rejuvenation. Culture and the arts encapsulate the wisdom and memory out of which a people are inspired and sustained. These qualities are difficult to pin down, but this does not make them subsidiary to the more concrete requirements of daily life.

In an increasingly global world, we rely on our distinctive milieu to differentiate and identify us. Our love for the individual, the flawed, the personal, and the local is key to our humanity. These elements must be encouraged if we are going to be proud residents of the Alberta of the future.

The belief that the arts will survive despite benign neglect is perverse. That the arts will flourish on a diet of gruel is a cruel expectation and unworthy of a province so wealthy. Alberta's citizens are keen to enjoy a multi-facetted and textured life. Culture and the arts provide that resonance, not only in terms of pleasure, but through education and transformation.

The elusive nature of culture and the arts makes it difficult to prescribe a fixed program of investment. So little is spent on core funding for the arts that almost any infusion of funds becomes a windfall and a glorious improvement worthy of celebration. It is worth noting that every dollar invested in the arts has an enormous multiplier effect. Witness the effect of investment in culture on Edinburgh, Scotland where a "£5.5 million investment ha[d] an estimated economic impact of some £119 million" (Yoeman 2003).

For too long Albertans have been encouraged to regard culture as a peripheral enterprise. They now need to understand that identifying with and supporting culture and the arts as a significant aspect of life in Alberta is germane to our future. Using the revenue generated by a natural resource investment fund to enhance the potential of the arts and culture would greatly increase the contribution that culture and the arts make to the social and economic well-being of Alberta and would be a real boost for the future of the province.

The challenge is to amplify and celebrate the art around us. We are more than creatures who simply eat and excrete, work and sleep. We are sophisticated beings with an eye for a fine sunset and a sweet breeze. Culture is ultimately a matter of how we live our lives on a day-to-day basis, the shape of our hands clenched inside our gloves on a cold winter morning, the delight that we take in a strand of music, our inward nod of recognition at a favourite building that we pass every day. As a pervasive part of daily life, popular culture shares the same arena as the arts. When we lift a cup of coffee to

our lips, we are touching the designer who made the cup. When we pull on cowboy boots to go line dancing, we are wearing a cultural gesture. When we applaud a fine cello solo, we are rewarding an artistic performance. The arts and culture paint a broad sweep: they delineate the objects we use, they entertain us, they enrich our lives, and they serve as a banner of distinctive identity. Culture is tied to place, and to the people who make that place their home. Culture is who we are and how we live.

The proposals that follow are intended to help create a future in which Alberta is a world leader in culture and the arts and in which Albertans reap the rewards of these investments.

Vision and Identity

Albertans work with a wonderfully intense passion unequalled anywhere in Canada (Wetherall and Kmet 1990). But Albertans love to play as well; they love to engage in activities that combine leisure with the arts and culture. They deserve a future of the very best that these can offer.

The first imperative is a confident assertion that Albertans are not the uncultured rustics that we have been portrayed as. The arts and culture must be part of what makes Alberta an extraordinary place to live. The first requirement of an investment in the future is to announce and follow through on a bold new vision and identity: **Atelier Alberta: Home to Art and Artists.** This vision will be the first step in making the entire province a cultural hothouse. But such a declaration requires more than lip service, and the investment strategies that follow will serve to accomplish this goal. And so it is time to invest.

Tax Relief

It is necessary to begin with those who, despite discouragements and difficulties, work to produce art. Artists are the key to a culturally vibrant place. Who can imagine London without Dickens? Who can imagine any stage without Shakespeare? Who can imagine Rome without Michelangelo? Who can imagine Vienna without Mozart?

Liverpool without the Beatles? Mill Run, Pennsylvania is famous for Frank Lloyd Wright's Fallingwater, not for the coal and coke companies that made a brief fortune fuelling the trains of 1900s America. The benefits that have accumulated from the Sundance Film Festival for several small communities in Utah are enormous. Modena, Italy is known for its balsamic vinegar and Italian sports cars, but celebrated for Luciano Pavarotti. These were artists, not politicians or merchants. Their affect on their contemporary culture and beyond signals the extent to which the arts and its practitioners are canaries in the mine of the time.

If artists are not encouraged, they will not flourish, but will spend too much time struggling to survive. Anna Pavlova and Pablo Picasso did not appear out of thin air. Artists require training, support, and ambiance that encourages their abilities. It is as possible to stifle a great artist as it is to encourage him or her, and that may be a wise warning to heed.

The bottom line for an artist is sufficient financial independence to complete a work. Right now, grants to artists are at a level agonizingly close to threadbare starvation, especially in this over-heated economy. The first investment that Alberta can make is to double the number of grants available to individual artists—ALL artists—writers, painters, composers, filmmakers, dancers, musicians, sculptors—and to double the amount available. This would serve as a life-saving infusion, recognize the importance of artists, and signal the seriousness of this investment strategy.

Financial support is essential. When they choose their "profession," artists confront the fact that they will likely participate in an economically marginal existence. Simply living in a place with high property values makes the future of an artist uncertain. And yet, they DO choose to make art, they DO choose to work at another job to serve as their own patrons, and they DO choose to invest in a place by contributing to its distinctive character. This is the advantage that Alberta already possesses—the culture of volunteerism and passionate commitment. Were artists given more encouragement and resources, that commitment would be strengthened, and artistic determination to contribute to the future of this province would be even more powerful.

The ideal situation would be to emulate Ireland's initiative. For over 35 years, writers, artists, and composers have not been subject to tax. The difficulties of this will be

quickly paraded with critics asserting that rich artists will benefit while the poor ones simply trudge onwards, their sleeves as ragged as always. But the measurable rewards that can be seen in current Irish culture argue for an incentive of this nature, perhaps an adjusted one, where artists who make less than $50,000 per year are absolved of paying tax on income from creative work, and those who make more than that amount are not. It will be necessary to define an Alberta artist to ensure that tax exiles do not take advantage of this incentive: an Alberta artist would be one who has lived in this province for five years or more.

Some kind of tax relief or incentive (in keeping with Alberta's incentives to business) is certain to attract and retain artists, keep culture vibrant, and enhance the somewhat tarnished profile of the province. Leading in this way would make the entire country's head swivel to this place as an innovator, leader, and transformer. Ireland's program cost it €37 million in 2001 (http://books.guardian.co.uk/print/0,,5218777-99819,00.html). But as an inducement to keep and attract artists, that amount is an investment worth many times its dollar value. One could not buy the publicity that such a visionary incentive would guarantee. The sheer audacity of such a program would guarantee Alberta years of cultural attention!

An additional encouragement for cultural organizations and artists to invest in smaller towns and communities would be to absolve artists of property taxes in the smaller municipalities. This kind of incentive would foster additional cultural life in smaller centres.

Cultural Credit Corporation

Traditional lending bodies are often reluctant to take risks on artistic and cultural ventures. Hence, Alberta should establish a Cultural Credit Corporation that artists, small businesses, and cultural organizations can go to get a loan for projects that do not readily fall within the category of "regular" business. The Cultural Credit Corporation would not dispense grants, but would approve loans like those provided by the Farm Credit Corporation that has assisted farmers with their specific needs for years. The income and expenses of farming as a historic way of life are understood and encouraged; why is this not so for the arts? A Cultural Credit Corporation dedicated to serving the financial needs of Alberta artists and cultural organizations would enhance Alberta's cultural energy considerably.

In keeping with the spirit of a Cultural Credit Corporation, Alberta should set up a Musical Instrument Bank for Alberta musicians that echoes, but goes beyond, the existing Canada Council for the Arts Musical Instrument Bank (www.canadacouncil.ca/prizes/musical_instrument_bank).

Space

It is the presence of cultural and artistic activities that helps to create "cool" areas. Unfortunately, these same areas, once established, force artists out because they cannot afford to stay. Alberta must invest in subsidies so that artists and cultural organizations can continue to live, work and operate within areas where commercial development and growth currently force both artists and arts activity to leave. Space should be maintained specifically for arts and culture to nourish the soul and to feed the eye beauty in the midst of commerce. To sustain the energy and liveliness of neighbourhoods, artists must be able to continue to be part of that energy and liveliness.

The greatest difficulty for cultural producers (e.g., filmmakers, musicians, theatre companies) is being able to find affordable space to give birth to their cultural product. Filmmakers need sets and back lots and editing studios; musicians need recording studios; theatre companies need practice and performance space. The amount of energy that seeking out these spaces requires robs many a cultural inspiration of its moment. If it were possible to book a space for a month or six months, to know that good equipment was available, to know that the light and heat were working, many troupes, companies, and other cultural producers could breathe a sigh of relief and focus on bringing a project to fruition.

The launch of the Art Spaces Investment Process by Calgary Arts Development is an example of a great step in this direction, but more can be done with additional funding.

The initiatives, moreover, should not be limited to the larger centres. For example, designating a series of music practice spaces in Camrose or warehouses and areas for film work in Medicine Hat would also assist the diversification so integral to the future health of our province. Rosebud's theatre is an example of how a small town can make culture the base of its economic revival.

Alberta could design a program so that every community in the province would have an opportunity to host an artist or company in residence. The echo effect of even one person working as an artist in a smaller place can have a huge benefit. For example, the Pierre Berton House Writers Retreat hosts a writer at Dawson City in the Yukon and has opened up connections between the town and contemporary writers. The writers interact with the public and local literary community, feature their work in local newspapers and on local radio stations, connect with local media, hold writing workshops in the community, and write about their northern experiences (http://bertonhouse.yk.net/program.html).

The Village of New Norway might seek out and receive funding for a painter-in-residence—one who would work and live within that parkland community, dialogue with its history, and show children that the "artist" is not some distant figure in London or New York. The City of Fort Saskatchewan's library could host a writer in residence, showing children that books come from people who love words. The Wainwright Museum could host a guest musician who might record the lost sounds of trains and their importance to the development of the West.

Art Here, There, and Everywhere

Alberta should initiate a program of fostering the arts and artists by encouraging (through a prescribed program) some hosting or support of culture in office buildings (private and public), retail spaces, schools, libraries, or even unusual venues like garages or extended care facilities. Hosting or supporting culture could include: public art, a piece of sculpture or a painting; a small theatre or space where a performing company could put on plays or where musicians could hold public concerts; an office where a writer could sit and work; a studio where a painter could paint. The integration of the arts into every corner of daily life and work would foster both broad integration and an interest that would enrich both artist and audience.

Information Exchange

Information and the exchange of information are key to cultural energy. Artists and arts organizations need to know what other artists and arts organizations are doing. It is essential that Alberta set up a sophisticated and comprehensive cultural communications network serving multiple functions.

First, such a network would share information on ALL cultural events. The public would be able to search one source to find out what is happening in music, theatre, film, writing, dance, and art. This network would need to be maintained, kept up-to-date, and be completely inclusive. There are already many different "what's on" sources, but a single source would have the advantage of being able to cover ALL the communities in the province and to suggest linkages between events.

This network could become Alberta's travelling road show—the ghost train of the arts. Currently, numerous free newspapers provide this service, and do an excellent job of disseminating information and their contribution to public knowledge should be recognized. There is, however, a need for a more sustained discussion, analysis and critique—for a dialogue between those within a particular artistic discipline, between disciplines, and WITH Albertans.

Such a network could also share information on resources, facilities, and job opportunities for the arts and culture community. It could bring together all the potential spaces and faces that might together bring a project to fruition. For example, a firm making a movie could see a listing of set designers or costume designers, a publisher could look for an illustrator for a book cover, and so on.

Patronage

Patronage is a venerable tradition and can exert a powerful influence on the production of art. We need only look to history to see the extent to which golden ages in culture benefited from patronage. Much of the current support for the arts is provided by private organizations, corporations, and individuals. This support itself must be supported, recognized, and celebrated. Indeed, to truly recognize the extent to which culture is a formative element of our identity and the value of patronage, Alberta should match—dollar for dollar—donations that come from the private sector.

Stable Endowments for Established Organizations

There are a number of established organizations that have worked to provide Albertans with arts and culture for many years. They have often struggled to stay afloat, persisting through good and bad times. Alberta should create endowments for the Calgary, Lethbridge, and Edmonton orchestras and for the oldest and most established theatre companies. In return, they must commit to three commissions each year from different Alberta composers or playwrights with performances of each commissioned piece. They should also be provided with touring budgets so that full or partial ensembles can travel to small towns in Alberta and perform there.

International Atelier for the Arts

Alberta can create an international atelier for the arts and creativity. Its goal would be to enhance and to develop the province's cultural zeitgeist and profile. The very best creative and artistic thinkers in the world would be invited to live here for six months to a year. During that time they would exchange ideas, gather information, and travel and observe the province. This cultural exchange would enhance Alberta's knowledge bank, as well as Alberta's own transportability to the wider world. Inviting and enabling creative people to engage with our culture would benefit both our artists and our global profile.

Film, Television and Publishing

Alberta films need be available to an Alberta audience without having to compete for screens with American imports at the large chain theatres. As part of the support for film, Alberta should re-furbish old movie and stage theatres (in large and small centres) and make them available as venues to show Alberta films. Similarly, Alberta publishers who publish Alberta writers should have access to special grants. That would ensure that this powerful element of Alberta culture would continue to have a voice at home.

History

Albertans and their children know embarrassingly little about their unusual and exciting history. Museums in Alberta work hard to keep the flame of the past alive, but museums need at least double their current funding for programming in order to tell our story to the residents of this province.

Education

Alberta should invest in the cultural education of Alberta children by producing materials relevant to the people of Alberta. Alberta children should be using Alberta history books and collections of Alberta writing in schools—from elementary to high school. Alberta publishers would be the perfect producer to ensure that these materials are available.

Celebrate!

We should establish an Alberta version of *Nuit Blanche,* an annual cultural festival when galleries, museums, and other cultural institutions stay open all night (how about the longest day of the year?) and offer free admission to all. Such a celebration, taking place all over the province, would signal the strength of culture in Alberta and would herald this province's determination to invest in culture as a distinctive part of our character.

Conclusion

It is unnecessary to reiterate the extent to which the arts and culture are part of the fabric of life. Without a vibrant culture, we may be the richest of all provinces, but we will lack a soul. Without strategic investment and encouragement, we are in danger of losing our souls. The value of saving a portion of Alberta's non-renewable resource revenue and using the earnings from that saved revenue to significantly change and improve the lives of Albertans is unquestionable. Investing in projects that would make this province a cultural and artistic Mecca would be truly visionary and transformative not just in the short-run, but many years into the future. It is said that "in Bali, there is no word for art; everything they do is art" (Adams and Goldbard 2005). Alberta and art could form as strong and natural an alliance as this. We have an opportunity to make this province **Atelier Alberta: Home to Art and Artists.**

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Chapter 11

Green Cities are Great Cities: Making Alberta's Cities Global Leaders in the Fight against Climate Change

Byron Miller

Alberta's cities have the potential to become global leaders in the fight against climate change. The need to demonstrate leadership is urgent. But what, specifically, should be done? If we truly want to be global leaders in the climate change battle, we need to begin by addressing the systemic relationships that drive our ever-higher rates of energy consumption. This means attending to the planning and organization of cities where most Albertans, as well as most people around the world, live. Structuring urban energy demand, above all, is the relationship between transportation and land use. Addressing this relationship would be an excellent place to begin attacking the global warming crisis.

It is time to move forward with a comprehensive transit infrastructure program for Alberta's cities. Transit should no longer be considered an afterthought in the planning of our cities. Rather, it should be considered as essential as roads. Mobility choice should be a fundamental principle of urban planning and should apply throughout our cities, not just to select locations.

To facilitate efficient transit systems, the growth of our cities must be focused in dense rail transit-oriented corridors, and transit lines must be built simultaneously with growth, not decades later. Other mobility options should be provided as well, such as grade separated bicycle paths and pleasant pedestrian-oriented pathways. Connectivity across and between our cities should be extensive, not merely oriented toward our downtowns.

Planning for low energy use green cities will require change, but change can be a very good thing. Vibrant public spaces, great mobility options, increased social capital, far fewer traffic deaths and injuries, lower obesity rates, reduced public health costs, a greater emphasis on beauty and livability—these are qualities that almost everyone would embrace. Indeed, these qualities are keys to attracting new investment to diversify our economy, expanding the size of the labour pool available to business, fostering a strong sense of place, and making our cities places where people will want to stay their whole lives, not just live in for a while to make money. The climate crisis compels us to change, but that is not a bad thing. Green cities are truly great cities.

IF we are to effectively tackle the global warming crisis, we will have to develop strategies that are tailored to people in the places where they live. The ways in which the activities of people, industry, and commerce are organized and arranged in space can make a tremendous difference in how much energy is required to conduct those activities. For similar levels of income, differences in urban form, density, and infrastructure can alter energy consumption by several fold.

That Canada can greatly improve its energy consumption and greenhouse gas emission performance is not in doubt. International Energy Agency (IEA) statistics show that, of 30 OECD countries, Canada currently has the third highest per capita energy consumption and the fourth highest per capita carbon dioxide (CO_2) emissions. While not all of our consumption and emissions can be directly attributed to the planning of our cities, urban planning clearly represents a critical dimension of the problem—as well as a major opportunity for action. And the need for action is great.

Most climate scientists believe we can avoid catastrophic climate change if we stabilize greenhouse gas concentrations around 450 parts per million (ppm), a level we are rapidly approaching. "We have," according to Dr. Rajendra Pachauri, Chair of the Intergovernmental Panel on Climate Change (IPCC), "a very short time for turning around the trend… We don't have the luxury of time." In Alberta we have an abundance of knowledge, creativity, and resources to forestall this crisis. Moreover, if Alberta can transform its high greenhouse gas-emitting cities into greenhouse gas misers, we can be a model to the world of how far, how fast, and how effectively the greenhouse gas problem can be addressed.

Our Most Urgent Problem: The Warming of the Planet

Humans have a long history of destroying the environments in which they live. From the societies of Easter Island, the Anasazi, and the Maya to, more recently, the collapse of the Aral Sea agricultural region and the North Atlantic cod fisheries, humans have repeatedly failed to understand the dynamics of the ecosystems they depend upon. Well-intended actions designed to reap the wealth of the natural environment have, time and time again, produced unintended negative consequences, sometimes of disastrous proportions. The saving grace of all previous examples of environmental collapse has been their limited geographic scope. Confined to specific regions of the world, these collapses have not threatened the survival of humanity as a whole. Now, for the first time in human history, we face the threat of *global* environmental collapse. The threat, as everyone knows by now, is global warming.

Since the industrial revolution began over two centuries ago, humans have added carbon dioxide and other greenhouse gases to the atmosphere in ever increasing quantities. Pre-industrial concentrations stood at around 280 ppm compared to 430 ppm today. According to the 2007 report of the IPCC, annual global greenhouse gas emissions increased 70% from 1970 to 2004 and will inevitably increase further over the next few decades. The widespread consensus among climate scientists is that human-produced CO_2 is the primary reason our planet is warming. In a 2007 speech, Dr. James Hansen, director of NASA's Goddard Institute for Space Studies, pointed out that the planet has experienced 1°F of global warming over the past 30 years, can expect another 1°F of warming due to greenhouse gases already in the atmosphere, and yet another 1°F of warming from emissions we are locked into given our existing energy infrastructure. The IPCC has produced six different scenarios of when greenhouse gas emissions will peak, what the overall change in global CO_2 emissions will be by 2050, and what we can expect in associated temperature increases above pre-industrial times. But even under the most optimistic IPCC scenario—assuming rapid and aggressive efforts to reduce greenhouse gases—we can expect at least 2°C of global warming. Under the least optimistic scenario we could see the planet warm 6°C or more.

What would this mean to life on planet Earth? According to Dr. Hansen, if we continue our current practices, "even for another 10 years, it guarantees that we will have dramatic climate changes that produce… a different planet." As Hansen elaborates,

these changes include the melting of arctic sea ice, rising global sea levels, coastal flooding, freshwater shortages and changing climate zones. But to focus on physical changes alone misses the critical human effects. With 11 of the world's 15 largest metropolitan regions located in coastal zones, rising sea levels will cause massive human displacement. Freshwater shortages will lead to agricultural crises and starvation in some areas of the world. In other areas, water shortages will pose a severe threat to water intensive industries, including many conventional energy industries. All of these effects will propel massive migrations, refugee crises, and serious conflicts over food, water, and energy, according to a 2007 study by the International Institute for Strategic Studies.

As if that were not enough, global warming could result in the extinction of up to 35% of all species, according to a 2004 study in the renowned scientific journal *Nature*. Indeed, a 2007 study by the World Conservation Union reports that 39% of all species they examined are now threatened. Widespread loss of biodiversity, coupled with warmer temperatures, means that many diseases and pests that were once restricted to specific regions will now spread around the world, according to studies presented at the 2007 meeting of the American Society for Microbiology. In Canada, the spread of West Nile virus and pine beetle infestation are linked to global warming. Other diseases likely to spread include malaria, dengue fever, and year-round influenza.

We are rapidly approaching the 450 CO_2 ppm benchmark—the threshold which many climate scientists believe will trigger mass extinctions and the melting of the Greenland ice cap. Meaningful measures to deal with it must be taken now and, no doubt, the task will be daunting. As former Chief Economist of the World Bank, Nicholas Stern, concluded in his 2007 review *The Economics of Climate Change,* stabilization of greenhouse gas concentrations "requires that annual emissions be brought down to more than 80% below current levels." Dramatically reducing emissions will require significant investment but, as Stern reminds us, "sustained long-term action can achieve [emissions reductions] at costs that are low in comparison to the risks of inaction."

Energy Systems, Alberta, and Global Greenhouse Gas Emissions

Canada's record on reducing greenhouse gases is poor, to put it charitably. In 2005, Canadian greenhouse gas emissions were more than 25% above 1990 levels and almost 33% above Canada's self-determined Kyoto target. Alberta's emission statistics are even more striking. Despite having a tenth of Canada's population, Alberta emits a third of the nation's greenhouse gases. Since 1990, Alberta greenhouse gas emissions have increased 40%; the province is now the leading greenhouse gas emitter in Canada, surpassing even Ontario. That Alberta leads the nation in greenhouse gas emissions should surprise no one. Alberta's fossil fuel industry has dramatically expanded oil sands production and with this expansion has come rapid growth of greenhouse gas emissions. Fossil fuel production accounts for 36% of Alberta's greenhouse gas emissions and the percentage is rising. Alberta also relies heavily on coal, another major source of greenhouse gases, to generate electricity. Electricity generation accounts for another 22% of Alberta's greenhouse gases.

But before one demonizes Alberta, it is important to recognize that the lion's share of Alberta's energy production goes to supply the needs of other places, especially the energy demands of the United States. Energy is bought and sold in regional, national, and transnational markets and consumers in those distant markets are implicated in the environmental impacts of Alberta's energy production. We live in a world of interconnected energy systems that are not confined by the boundaries of provinces or nation-states. Nonetheless, Alberta must take responsibility for the greenhouse gas emissions it can control.

Recognizing the geographically interconnected nature of energy systems is critical to understanding the dynamics of Alberta's rising greenhouse gas emissions. Greenhouse gas emissions must be understood in the context of three interconnected systems: a global economic system, based in particular technological systems, in turn affecting global ecosystems. Our technological systems, designed to utilize energy dense and inexpensive fossil fuels, mediate between the demands of the economy and the demands on the environment. In modern capitalist societies, economic signals have stimulated the design of ever more productive technological systems, with the natural environment for the most part treated as a source of inputs and a free dumping ground for waste products like greenhouse gases.

Relationships among modern economic systems, technological systems, and ecosystems are frequently problematic. One significant problem is that geographically extensive systems produce geographically uneven distributions of costs and benefits. Some places, for example, may disproportionately suffer from environmental degradation and public health problems while other places disproportionately reap increased material comfort. Rarely do we understand geographically diverse production and consumption effects as related. But today, with more extensive global economic integration, technologies that facilitate interaction over greater and greater distances, and environmental impacts that are increasingly difficult to contain, it is becoming clear that we *must* understand what happens in particular places in terms of their relationships with other places. Alberta, as well as other carbon fuel producing regions of the world, must be viewed not in isolation, but as links in relationships that stretch around the world.

Future growth in Alberta's oil sands production will overwhelmingly go toward meeting growing global energy demand. The International Energy Agency (IEA) predicts that global energy demand—and with it greenhouse gas emissions—will increase by more than 50% by 2030 *if* current energy production and consumption practices continue. Such a scenario, based on *status quo* practices, would be disastrous. Which brings us to a second significant problem—the nature of the relationships among economic sysems, technological systems, and ecosystems.

Capitalism, by design, is based on economic competition, innovation, and growth. Technological systems are designed in accord with the demands of the economic system and they, in turn, determine how human societies interact with the natural environment. Now, due to the sheer number of human beings on the planet and their ever growing demand for energy, we must rethink these relations. Clearly, the planet cannot sustain ever growing concentrations of greenhouse gases (or other pollutants).

While we do not need to abandon market economics or advanced technology, we do need to restructure the way these three critical systems relate to each other. We have reached a turning point in human history when the requirements of sustaining healthy ecosystems must determine the criteria for the design of technological systems; ecologically appropriate technology systems must, in turn, set the framework within which the economy operates. To date, our efforts in this direction have been very modest. Systems relationships are rarely identified, much less addressed. Instead, each

environmental problem that arises is typically treated as an isolated problem to be solved through a technical fix.

Our energy policies exemplify this silo approach to problem solving. From a systems perspective, energy issues entail a multitude of relationships—relationships that shape both the growing demand for energy as well as the means by which those demands are met. But systems relationships are usually off the energy policy radar. Indeed—if we understand energy in terms of systems relationships—much of what passes for energy policy would be more accurately characterized as *fuels* policy. Our policy initiatives aim to make fossil fuels cleaner or to burn more efficiently. Sometimes we even try to develop new fuels. But rarely, if ever, do we address the systems relationships that drive our need for ever greater energy consumption.

This is not to say that fuels policy is unimportant. Given our overwhelming dependence on fossil fuels and the fact that they will play a major role in the fuel mix for some time to come, it is well advised to put substantial resources into the mitigation of their impacts. But to concentrate on fuels at the expense of energy systems presumes that humanity can continue to expand energy consumption *ad infinitum*. The IEA's prediction of a 50% or greater increase in energy demand by 2030 is only the tip of the consumption iceberg. With the global population continuing to grow and the economies of China and India rapidly expanding, the IEA's 2030 estimate represents only a blip on the way to even higher energy consumption. In such a scenario, whatever fuel improvements that are achieved will likely be swamped by the sheer magnitude of growth in energy demand. *If we are going to dramatically reduce greenhouse gas emissions we must learn to effectively manage demand.* Effectively managing demand means understanding the relationships that structure our ever growing energy demand. And that means looking at how we plan our cities.

Cities, Energy Consumption, and Livability

Human societies have been steadily urbanizing for centuries. This year humanity passed a significant milestone: for the first time the majority of humans now live in urban settlements. The world's population is expected to continue to grow to 9 billion by 2050 and most of these additional people will also live in cities. In Canada and the

United States, four out of every five people already live in cities. Clearly, if we want to understand how energy demand is created, we must look at how the planning of cities structures energy demand. The IPCC has said as much, explicitly citing urban policy options such as modal shifts from road transport to rail and public transport systems, non-motorised transport (cycling, walking), land use and transport planning, efficient lighting and daylighting, passive and active solar design for heating and cooling, heat and power recovery, and material recycling and substitution as "key mitigation technologies and practices" that can reduce energy demand and, in turn, greenhouse gas emissions.

It is difficult to get a handle on just how much energy demand is specifically urban. Greenhouse gas statistics are not provided according to whether emissions are urban or non-urban, but are broken out by economic sector. According to the IPCC, global greenhouse gas emissions can be attributed to industry (19%), transportation (13%), residential and commercial buildings (8%), waste and wastewater (3%), energy supply (26%), forestry (17%), and agriculture (14%). Canadian figures, according to Environment Canada, are somewhat different: industry (8%), transportation (27%), residential and commercial (11%), electricity and heat generation (17%), fossil fuel production (19%), agriculture and forestry (0.3%), and non-energy related greenhouse gases (18%). Alberta Environment shows yet a different pattern of greenhouse gas emissions for Alberta: industry (14%), transportation (14%), electricity (22%), residential (3%), commercial (4%), fossil fuel production (36%), and agriculture and forestry (7%).

These figures clearly demonstrate geographic variation in economic activity and emissions. But what role do cities play in greenhouse gas emissions? It is hard to say. One estimate put forward by Partners for Climate Protection, a consortium of 151 Canadian municipalities associated with the Federation of Canadian Municipalities, is that "up to half of Canada's greenhouse gas emissions are under the direct or indirect control or influence of municipal governments." But this statement refers to the domain of municipal governance, not the actual activities that produce greenhouse gases.

The problem with greenhouse gas accounting categories is they condition us to think about greenhouse gas emissions as if they were produced by separate and discrete activities, when in fact they are anything but. Considering emissions from a systems

perspective, one has to trace the linkages and relationships among different greenhouse gas-emitting activities. The relationships among activities make it nearly impossible to parcel out greenhouse gases into urban and non-urban sources. For example, is power generation urban or non-urban? While most power plants are located outside cities, most of the demand they satisfy originates in cities. Clearly, whether an activity is labeled urban or something else is less important than the fact that most of our energy demand originates with the activities and organization of cities. Indeed, there are clear links among the characteristics of cities, levels of energy demand, and greenhouse gas emissions—across all economic sectors.

How strong is the relationship between the structures of cities—things like density, extent and quality of public transportation, land use mixing, pedestrian and bicycle paths, and so on—and energy demand? Peter Newman and Jeffrey Kenworthy have extensively examined this question with regard to transportation in their classic book, *Sustainability and Cities*. Examining large cities with high standards of living around the world, they found that residents of American cities use their cars the most, over 16,000 km per year per person in 1990, while using public transit the least—less than 500 km per person per year. Sprawling cities like Houston, Sacramento, and San Diego had the highest private vehicle usage—all around 19,000 km per year—while residents of New York City, with higher density and more extensive transit infrastructure, travel only 11,000 km per year with private vehicles, but over 1,300 km with transit.

This pattern—higher densities and better transit infrastructure associated with lower automobile dependence and more travel by transit—repeats itself around the world. Australian cities, with somewhat higher densities and better transit infrastructure than American cities, have somewhat lower private vehicle usage (10,800 km per year) and higher transit usage (900 km per year). Canadian cities do better yet—9,300 km per person per year in private vehicles and 1,000 km per year with transit. Further on this continuum are European cities—with even higher densities and better transit infrastructure—averaging only 6,600 km per person per year in private vehicles and 1,900 km per year with transit. Economically advanced Asian cities come out on top in this comparison, with an average of less than 2,800 km per person per year in private vehicles but almost 3,800 km per person per year with transit. Of all cities, Hong Kong tops the list with only 800 km traveled per person per year in private vehicles and almost 3,800 km traveled per person per year with transit.

The implications of density and good transit infrastructure for energy demand and greenhouse gas emissions are clear. Newman and Kenworthy's analysis of 46 major cities in the United States, Australia, Canada, Europe, and Asia shows an extremely strong relationship between urban density and private transportation energy consumption—86% of the variation in transportation energy consumption can be attributed to differences in density. At the extremes, per capita transportation energy use in Houston is over 70 gigajoules (GJ) per year, while Hong Kong comes in at less than 10 GJ—an astounding difference of more than seven-fold. (Calgary comes in at 47 and Edmonton at 44 GJ per capita per year.) While Hong Kong may not be everyone's model of an ideal city, many European cities offer a way of life that is widely viewed as highly desirable. European cities like Paris, Copenhagen, London, Vienna, Munich, and Amsterdam come in around or below 20 GJ per capita per year, more than Hong Kong but still less than a third of the transportation energy consumption of Houston.

Dense, yet highly livable, cities provide a number of other energy conservation benefits. Residential and commercial energy consumption, for instance, is typically far lower in European and Asian cities. One reason for this difference is that dense development means fewer stand-alone detached structures and more shared walls and ceilings. Reduced surface area exposed to outside temperatures means that less energy used for heating and cooling is lost from buildings. A second reason for lower residential and commercial energy consumption in European countries is more stringent building codes. Greater emphasis is placed on the quality and durability of buildings, with energy savings an important side benefit. A third reason residential and commercial energy consumption is lower has to do with the nature of the cities themselves. With an emphasis on vibrant public spaces and extensive connectivity and mobility, the entire city becomes the residents' living space. Home theatres, game rooms, and other features frequently found in large North American homes become unnecessary. With the whole city as an extension of people's living space, it is possible to live very comfortably with less private space.

Significant differences in public space and mobility choice are at the core of the distinction between transit-oriented and automobile-dependent cities. For most of the 20th century, public policy in both Canada and the United States has heavily favoured automobiles, roads, large new homes, and private space. The cost of these policies has

been very high, not only in terms of environmental impacts, but also in terms of public health effects and declining social capital.

The most striking, yet strangely ignored, public health cost associated with automobile dependence is the death and injury toll of traffic collisions. According to the Alberta Motor Association, 372 people were killed and 28,989 people injured on Alberta's roads in 2002 alone. The direct societal cost of these deaths and injuries is estimated at $4.68 billion including health care costs, insurance, and automobile repairs. Adding indirect costs such as lost worker productivity raises this figure further. But the public health impacts of automobile-dependence do not end there. A large body of evidence now demonstrates that development that renders walking and bicycling impractical or unsafe leads to higher rates of obesity and obesity-related diseases. The public health costs of automobile dependence are born by all of us through taxes needed to cover the additional costs to our health care system and lost worker productivity, not to mention the grief and pain suffered by those directly affected. These costs, however, are not reflected in market signals for housing and transportation, thus distorting our market choices.

The cost of declining social capital—the relationships of trust and reciprocity we form with each other through processes of everyday interaction, communication, and bonding—is also absent from market signals. Today it is not unusual for a worker to get to work in a private automobile that she enters in her private garage, drives alone to her place of work, parks in the private company parking lot, then walks across private company property to her office—all without ever setting foot in public space or interacting with another person. One of the unintended but dramatic consequences of our massive investment in road and automobile infrastructure is that we have become more and more separated from each other. Lower and lower levels of social interaction have eroded our social capital.

Social capital produces a wide range of social and economic benefits, from the aid given by a passer-by to someone in need, to the serendipitous conversation at a theatre that leads to a new business venture. Social scientists have documented the many negative consequences of declining social capital. Most famously, political scientist Robert Putnam has suggested that the appropriate metaphor for our social lives is "bowling alone." Many activities that were once communal, like bowling, have increasingly

become solitary pursuits. Putnam and many others have connected this decline to the fragmentation and compartmentalization of our lives associated with automobile-dependent sprawl. Successful transit-oriented cities, in contrast, are never merely assemblages of semi-functional infrastructure. Rather, well-planned public transit serves both as an inclusive public space itself and as a means of linking vibrant public spaces across the city. The public city—of which public transit is a key component—is an inclusive, well connected, and highly livable city.

Why We Consume More Energy:
The Critical Role of Transportation and Land Use Planning

It is not unusual to hear the dramatically different density, transit use, and energy consumption characteristics of European and Asian cities explained as a response to higher European and Asian energy prices. Undoubtedly energy prices have an effect on travel and other behaviours, but after accounting for differences in energy prices and income, Newman and Kenworthy conclude that price effects account for, at most, half the difference in transportation energy consumption among cities. Instead, they point to the critical influence of infrastructure and urban form. Travel choices are always made in a context of opportunities and constraints and these are often a direct result of public policy decisions. In North America, public policy has long heavily favoured road construction and the automobile, while European countries have placed a much stronger emphasis on public transportation, walking, and bicycling.

Think, for example, of a person who lives in a low density suburban neighbourhood with few sidewalks, wide dangerous roads, distant transit stops, and infrequent bus service that would require well over an hour to get to work. In comparison, think of a person living in a dense but pleasant pedestrian oriented community, centered around a light rail stop, served by trains that stop every four minutes that get the commuter to work faster than she could drive. In the first example commuting by transit is hardly a viable option at any price. In the second example commuting by transit is not only viable but desirable, even at higher prices. The choice is summed up by a sign in the very popular Berlin subway that reads: "Cars are fast. We're faster."

To take another example, consider the person who would like to bicycle to work but would have to ride in the street unprotected from heavy vehicular traffic. Then consider the person who has the option of riding virtually anywhere in the city on grade-separated bicycle paths that ensure the cyclist's safety. In contrast to most North American and Asian cities, many European cities have done a great deal to encourage walking and bicycling, such as providing extensive grade-separated bicycle paths and high quality, well-connected pedestrian circulation systems. This emphasis on non-vehicular forms of mobility has, not surprisingly, resulted in much higher rates of walking and bicycle riding. Even in cold northern European cities like Copenhagen and Amsterdam as much as 35% of all work trips are made with bicycles, with a corresponding reduction in energy use and greenhouse gas emissions and an increase in physical activity and public health.

While investment in transit, pedestrian, and bicycling infrastructure is critical to mobility choice, it is not sufficient. For mobility systems to work well there must be coordination between mobility and land use planning. Dense pedestrian and bicycle friendly development must be provided around transit stops. Concentrating density in the vicinity of transit stops means that a higher proportion of residents can walk or bicycle to the transit system, eliminating the need for a private vehicle. Safe grade-separated bicycle pathway systems can extend the range from which people can get to transit stops. To facilitate city-wide transit mobility, a number of cities—most famously Copenhagen, Munich, and Freiburg—have specifically planned for transit-oriented growth corridors that ensure the extension of high quality transit service in new growth areas. Emphasizing transit-oriented development means that agricultural land is conserved, new communities are walkable, a wide range of mobility choices are available, and energy is saved—the opposite of automobile dependent sprawl.

Another key lesson of successful transit cities is that transit systems must provide extensive connectivity across the metropolitan area, facilitating transit access to the entire city, not just the centre. One of the greatest drawbacks of many North American transit systems is their very limited extent, denying service to those who most need to use transit to get to the large number of jobs increasingly found in suburban locations. In contrast, most European transit systems provide extensive connectivity, not only to city centres, but also among dispersed suburban employment centres.

Providing extensive high quality transit service represents a very important expansion of choice. A guiding objective in transit-oriented cities is to provide a range of practical mobility choices for all, rather than forcing reliance upon the automobile. When transit, bicycling, and other mobility options are fast, efficient, and pleasant, many people choose them. Real mobility choice is the key to managing transportation energy consumption.

Providing Clean Energy for an Urban World

We know how to plan energy efficient, highly livable cities. But even efficient cities need to use energy, if less of it. At this point it is appropriate to consider how the energy needs of energy efficient cities might be met with minimal to no greenhouse gas emissions. This is by no means a small or straightforward matter.

Take, for example, the increasingly common use of geothermal heat pumps. These heating systems, driven by electric motors, transfer warmth from the Earth to provide space heat to homes and businesses. Geothermal heat pumps are highly efficient, providing at least 3 kWh of heat energy for every 1 kWh of electricity used. Using geothermal heat pumps would appear to be highly desirable, except for one thing: we have not considered the source of the electricity they use. If the electricity used to run the heat pumps comes from wind, hydro, solar or other zero greenhouse gas forms of electricity generation, geothermal heat pumps represent an emissions free form of space heating—something to be encouraged. But if the electricity to run the heat pumps comes from coal fired power plants, the increase in electricity demand will be supplied by our dirtiest source of electricity generation. In comparison, a high efficiency natural gas furnace would produce less greenhouse gas.

A similar issue arises with public transit. While transit is almost always more energy-efficient than the private automobile, virtually all forms of rail transit are electrified. This raises the question of how the electricity for rail transit is generated. Fortunately, the City of Calgary has pioneered a solution to just this problem. Since September 1, 2001, Calgary Transit has purchased electricity in an amount equivalent to what is required to operate its light rail system from the Castle River wind farm in southern Alberta. Calgary's "Ride the Wind" program is the world's first major greenhouse gas free public transit

system. Building on the success of Ride the Wind, the City has continued to expand its use of zero emissions electricity, most recently contracting with the municipal utility to build a new 80 MW wind farm near Taber that will supply three-quarters of the electricity needs of the City's municipal operations. While municipal operations represent less than 3% of electricity demand for the whole city, the principle is exemplary.

Indeed, in their forthcoming book, *Transport Revolutions*, Richard Gilbert and Anthony Perl propose a transportation future modeled on the Calgary example. They make a strong case that the most viable alternative to our current fossil fuel-based transportation system is a rail-based system, run on the electric grid, with the grid powered by clean renewable energy. Our present transportation system is not only vulnerable to rising oil prices and the possibility of shortages, it presents intractable greenhouse gas problems. Reduction of greenhouse gas emissions in the production of fossil fuels may be possible, but greenhouse gas emissions are inherent to the operation of the internal combustion engine.

Most forms of renewable energy, in contrast, operate free of greenhouse gas emissions. Canada's wind resources are infinitely renewable and among the best in the world—and Alberta's wind resources are among the best in Canada. Alberta currently leads all Canadian provinces in wind electricity generation with over 524 MW of installed capacity, and more is on the way. While only a small fraction of Alberta's renewable energy resources has been tapped, there has been some controversy over whether Alberta is approaching the limits of its green energy potential. Until recently the Alberta Electric System Operator imposed a 900 MW cap on wind-electric generation capacity, or roughly 10% of the province's total generating capacity. The rationale for the cap was based on concern for system-wide reliability at higher percentages of wind electricity, despite the fact that several European countries have substantially exceeded this benchmark without problems.

Although the cap on wind electricity in Alberta has been lifted, the concerns that underlie the cap remain. While wind and solar electricity offer greenhouse gas free forms of power, they are inconsistent energy sources. Neither wind nor solar electricity can be relied upon to provide all the electricity that is needed all of the time. But interestingly, the same is true for conventional electricity sources. Coal power plants reliably provide base load power, but are unsuitable for peak loads. Nuclear power

plants are also suitable only for base load. Gas power plants are better suited to respond to peak loads.

If conventional forms of electricity generation also cannot handle all the demand all the time, why are they not also considered unreliable? The answer is found in the use of the electricity grid. A single type of power plant is not expected to satisfy all possible demand. Instead, the grid connects complementary forms of electricity generation so that different plants come on line when appropriate.

The same principle is used to manage the variability of electricity generation based on renewable energy sources. Wind energy is variable, although not as variable as many people assume. Most wind turbines are able to generate electricity 70 to 80% of the time, with capacity factors in the 20 to 40% range. Still, individual wind turbines clearly cannot cover 100% of electricity demand and complementary generation to cover down time must be provided. Currently, complementary electricity generation typically comes from conventional sources, though that need not be the case. Wind farms in diverse locations can complement each other—at any given time the wind is blowing somewhere. Solar electricity generation—typically from photovoltaics—tends to peak close to daily demand peaks. Hydroelectricity is an ideal form of complementary clean energy. As hydrodynamic energy stored behind a dam, hydroelectricity can be generated anytime other energy sources fall short. In sum, the grid is the key to managing the variability of renewables.

It should come as no surprise that many European countries, as well as the state of California, are far ahead of most North American jurisdictions in the promotion of renewable energy. Denmark is already generating 20% of its electricity from wind. The European Union as a whole is projected to produce 19% of its electricity from renewables by 2010. Germany is now generating 15% of its electricity from renewables, up from 6% just seven years ago. Germany has also adopted the most ambitious renewable energy targets in the world: 27% of electricity from renewables by 2020 and 45% of electricity from renewables by 2030. California has adopted a target of 20% of electricity from renewables by 2010 and 33% from renewables by 2020, as well as a goal of reducing greenhouse gas emissions 80% below 1990 levels by 2050.

The targets adopted by these European countries and California are meaningful, backed by regulations that require utilities to develop and/or purchase renewable energy, such as California's Renewables Portfolio Standard, as well as initiatives to manage the grid for the growth of renewable energy. In Europe, serious consideration is being given to the development of a Europe-wide direct current grid that would allow for efficient electricity transmission over long distances. An extensive direct current grid would facilitate the complementary integration of a wide range of renewable energy sources across Europe, enabling high levels of renewable energy use. There is also strong support for research and development aimed at developing means of storing renewable energy, such as compressed-air energy storage plants. One such plant already exists in Germany, another exists in the American Midwest, and a new generation of compressed-air storage technology is being developed.

The management of a renewable electricity grid is a complex matter, not only because of the variability of wind, solar, and other forms of renewable energy. It is also complicated by the fact that renewable electricity generation is increasingly small scale and decentralized. Photovoltaics are becoming more and more common on individual residential and commercial buildings; in Europe and California, they are frequently connected to the grid. A striking example of renewable energy innovation is to be found in the new Vauban development in Freiburg, Germany. This new suburban development includes a cluster of several dozen "plus-energy" houses—houses that are designed for passive solar space heating with building-integrated photovoltaic roofs that generate electricity at reduced cost thanks to the elimination of the structural duplication of separate roofs and photovoltaic infrastructure. But the most significant aspect of these houses is that they generate more energy—from the sun—than they consume, hence the "plus-energy" moniker. As photovoltaics and miniature wind turbines become more and more affordable, it is quite possible we may see individual homes becoming net generators, rather than consumers, of energy.

Most of the old arguments against renewables are quickly fading. Technical feasibility is no longer an issue. Wind turbines, photovoltaics, hydroelectricity, and biomass generated electricity are all proven and reliable technologies. The economic arguments against renewables are also evaporating as prices continue to fall. Leaving aside the argument that much of the traditional cost advantage of fossil fuels has stemmed from a variety of subsidies and the ability to treat the environment as a free dumping ground

for waste products, renewables are increasingly able to compete head-to-head with conventional energy sources. The City of Calgary's formerly "expensive" contract for wind generated electricity, at 8 cents per kWh, now looks like a good deal as the cost of electricity generated from fossil fuels continues to rise. Photovoltaics, long considered highly uncompetitive with conventional power sources, have experienced dramatic cost reductions and are now at "grid parity" in the sunnier parts of California. The photovoltaic industry is expected to halve costs yet again over the next three to five years, further expanding its capacity to compete against conventional forms of electricity generation. At the same time, the cost of fossil fuels and fossil fuel generated electricity is expected to continue to rise.

At this juncture, the key impediment to the rapid expansion of renewable greenhouse gas-free electricity generation is the design of the electricity grid. As Dr. Hermann Scheer, the principle architect of Germany's grid feed-in laws, has argued, we cannot shove a square renewable energy peg into a round fossil fuel and nuclear hole; the conventional electricity grid was not designed with renewable energy in mind. There is no doubt that a grid designed to maximize the generation of electricity from renewables must differ from a grid designed for fossil-fueled power plants. The location and capacity of transmission lines will differ, attention to the variability of electricity generation will differ, accommodation of a wide range of electricity generators—from large scale to very small scale—will differ. How quickly we move to a zero emissions electricity regime will in large measure be a function of our attention to the design and management of the grid. This, in turn, will play a major role in determining how benign or harmful the effects of our urban activities will be as they reverberate through a variety of interrelated systems.

Making Alberta's Cities Global Leaders in the Fight Against Climate Change

Alberta's cities have the potential to become global leaders in the fight against climate change. The need to demonstrate leadership is urgent. But what, specifically, should be done? If we truly want to be global leaders in the climate change battle, we need to begin by addressing the systemic relationships that drive our ever-higher rates of energy consumption. This means attending to the planning and organization of cities

where most Albertans, as well as most people around the world, live. Structuring urban energy demand, above all, is the relationship between transportation and land use. Addressing this relationship would be an excellent place to begin attacking the global warming crisis.

The evidence that dense transit-oriented cities are far more energy efficient than automobile-dependent cities is overwhelming. Moreover, public opinion polls conducted by the Canada West Foundation and other research organizations show that Albertans clearly want outstanding public transit. It is time to move forward with a comprehensive transit infrastructure program for Alberta's cities. Transit should no longer be considered an afterthought in the planning of our cities. Rather, it should be considered as essential as roads. Mobility choice should be a fundamental principle of urban planning and should apply throughout our cities, not just to select locations.

To facilitate efficient transit systems, the growth of our cities must be focused in dense rail transit-oriented corridors, and transit lines must be built simultaneously with growth, not decades later. Other mobility options should be provided as well, such as grade separated bicycle paths and pleasant pedestrian-oriented pathways. Connectivity across our cities should be extensive, not merely oriented toward our downtowns. For instance, ring road corridors should address not only roads, but also transit lines, bicycle paths, and pedestrian paths. Such an approach would dramatically expand access to jobs for those without cars as well as stimulate the decentralization of jobs across metropolitan areas, a process with substantial commuting reduction benefits.

Moreover, it is important to address the regional dimensions of mobility. Many residents of medium-sized towns in rural areas commute to major cities for employment. These towns should be connected to major cities through commuter rail. Extensive mobility systems, finally, are a key not only to reducing urban energy consumption, but to the success of an eventual high-speed rail line between Calgary and Edmonton, which would also provide greenhouse gas benefits by reducing travel between the cities by private vehicles and airplanes. Prospective passengers, knowing they could be highly mobile in their destination city without an automobile, would be more likely to use high-speed rail.

Rail transit is electrified, which points to the pressing need to transition to zero-emissions electricity generation. We should retire our dirtiest forms of power generation—coal-fired power plants—as quickly as possible and embark upon a dramatic expansion of renewables-based electricity generation, as many European countries are already doing. Alberta's wind resources, which are among the best in the world, can be the backbone of a new zero-emissions electricity grid. But there are other renewable resources as well—small scale hydro, biomass, and solar. The transition to a renewables-based electricity grid will require substantial changes to the grid itself. Research and planning for the construction of a renewables-based electricity grid should begin immediately, including consideration of a more geographically extensive grid that would allow for greater utilization of complementary hydro-electric power from other regions. Grid feed-in regulations based on the successful examples of Germany, Denmark, and Spain should be adopted. And research and development devoted to energy storage should also be a priority.

While higher density cities will foster energy conservation in residential and commercial buildings, even more energy savings can be achieved through more progressive building standards. The model national energy code for buildings being developed by the Canadian Council of Energy Ministers is intended to reduce energy use in buildings by 25%. This code, while a step in the right direction, is very modest. A more comprehensive building code, drawing on the lessons of the Leadership in Energy and Environmental Design program, should be developed by the province of Alberta. Programs that provide technical guidance as well as financing for energy saving projects should be created.

The use of passive solar energy, in particular, should be promoted. Alberta is not only rich in wind resources, it also has great solar resources. Calgary, for instance, is the sunniest city in Canada with 333 sunny days per year. Calgary also has the most sunny days in cold months: 132. Passive solar building design is an obvious fit for places like Calgary, yet is almost never practiced. The reason has nothing to do with technology—passive solar building design has been employed around the world for thousands of years. And it has nothing to do with cost—over time, the energy savings of well designed buildings more than pay for the additional up-front cost. The problem is that the payback period can be five, ten, or even more years.

Failure to implement obvious solutions like passive solar design has much to do with our propensity to discount the future. Our tendency to frequently change residences, for example, means that we tend to dismiss energy-saving capital investments that may take several years to pay for themselves. This, fortunately, is merely an institutional problem. It can be addressed through lending programs that promote investing for long-term energy efficiency payoffs. Berkeley, California is developing just such a program. Under Berkeley's proposed Sustainable Energy Financing District, the City of Berkeley would pay all of the capital costs of installing solar systems and energy-efficiency upgrades to a home or business. The capital cost would then be paid back over 20 years in the form of an addition to property taxes—the same financing mechanism that is used to finance other property-specific improvements like new sidewalks. The difference is that energy upgrades pay for themselves in energy savings. Such a program makes investment for long-term energy sustainability attractive. The province of Alberta, in collaboration with Alberta municipalities, should develop a similar program.

Finally, we must never forget that technology—whether light rail transit or energy efficient buildings or rooftop photovoltaics connected to the grid—only works if people want to use it. One cannot ignore the human dimensions of technology. One cannot plan for energy efficient cities without considering the needs and desires of people. When we think of how wonderful many European cities are, we almost never think that they are wonderful because they are energy efficient. The appeal of European cities is their public spaces, their great mobility options, their social vibrancy, their beauty. The fact that the public realm is exceptional is directly related to why Europeans can live very comfortably with less emphasis on private space. Rather than treating public space, art, architecture, and beauty as mere frills, we must appreciate that they are essential. We must ensure that our planning processes and funding mechanisms produce cities that are not only functional, but also highly livable. When they are not, people retreat into their own private exclusive realms—which almost always entails more individual expense, more energy consumption, and less interaction with fellow citizens.

To that end, we need to be sure that we have all the tools we need to plan our cities well. We need to conduct a comprehensive review of the Municipal Government Act, provincial transportation plans and policies, and other laws and policies that guide development. The barriers to planning sustainable cities and metropolitan regions

must be removed and the powers and funding mechanisms needed to produce vibrant, energy-efficient cities provided.

Planning for low energy-use green cities will require change, but change can be a very good thing. Vibrant public spaces, great mobility options, increased social capital, far fewer traffic deaths and injuries, lower obesity rates, reduced public health costs, a greater emphasis on beauty and livability—these are qualities that almost everyone would embrace. Indeed, these qualities are keys to attracting new investment to diversify our economy, expanding the size of the labour pool available to business, fostering a strong sense of place, and making our cities places where people will want to stay their whole lives, not just live in for a while to make money. The climate crisis compels us to change, but that is not a bad thing. Green cities are truly great cities.

Many of these changes will require money. Money is by no means the only factor, but it is a critical one. Hence, if Albertans choose to save more non-renewable energy revenue, they may want to use the earnings this generates to make their cities both green and great.

Chapter 12

A SURE Thing: Making Alberta a Global Leader in Alternative Energy

Curtis Gillespie

The small gestures that society has been making for years toward the acceptance of alternative energy sources have begun to accumulate toward a clear, if counter-intuitive, decision that it is time for the Alberta government to make. The moment is right for us to devote our resource riches to becoming the world leader in the development, promotion, and use of sustainable and renewable energy (SURE) sources. Crazy? Not when you take the long view, and not when you consider the incontrovertible facts: our planet can't sustain our current fossil fuel patterns, and as the world's energy demands grow, so too will oil supplies dwindle and disappear. Where does the Alberta of 2007 fit into such a future?

There are numerous SURE sources Alberta could make serious commitments to today, such as wind power, solar power, and geothermal power. We should invest all the time, money, and brainpower we have to make Alberta synonymous with SURE source development and use. This province has a history of leading, not following, and it will not sit well with Albertans of the next generation if the global energy industry has left us behind. Nor will it sit well with Albertans if over the next generation our economy shrinks, whimpers, then dies because we did not have the foresight today to imagine the face of tomorrow.

IT is funny what you remember. A recent news cycle about fluorescent versus incandescent bulbs brought back a memory from my days studying history at the University of Alberta in the mid-1980s. I had an unusual and charismatic professor, who I have not seen in at least a decade or so, but who I recall as a peculiar man, with bad breath and coconut flake dandruff. He was also a little person, and every class he would sit in his chair dangling his legs back and forth as he cheerfully pointed out our lack of

insight and originality. He was arrogant, hilarious, and brilliant, and it was impossible to imagine he could be wrong about anything.

But there *was* something he was wrong about, and it only hit me during this recent news cycle. One evening back in 1983 or 1984, after we had all filed out of a seminar, I noticed the lights were still on, so I returned to shut them off. When I came back out, my professor was standing in the hallway. He grinned, happy to have caught me doing something worthy of his sarcasm.

"Don't tell me," he said. "Please don't tell me you're one of *those* people, someone who thinks turning off a light bulb is going to matter somehow."

I cannot remember what I said in reply. And I do not think that he meant it as derisively as it may sound here. But his message was clear: do not be so small-minded, so earnest, as to think individual actions actually conserve energy. It was as if he were mocking idealism, saying, in other words, *"you think a gesture like that matters? Grow up*."

What he was wrong about is that small gestures have potent symbolic value, and that they also accumulate toward larger gestures. Both these truisms are increasingly breaking the surface of the Alberta public consciousness in the energy debate. Further, I think we are on the cusp of accepting, even pushing for, the really big gesture, which is why the Alberta government must now consider what may be the most counter-intuitive policy option imaginable: although we are in the midst of a petro-boom, it is time to think hard about the end of fossil fuels, to recognize that it is not *if* but *when* that train is going to derail, to do real planning rather than chant empty platitudes, and to use our riches to become *the* recognized world leader in the development, promotion, and use of alternative energy.

The science, technology, and industry of both our current oil regime and our future alternative energy dominance are central here, but first I want to examine energy language since it is language that propels ideas into the broader culture. Let's start with the word "alternative." It carries the whiff of mistrust in the mainstream conservative core of Alberta's business community. Alternative culture, alternative sex, alternative parenting, alternative schooling, alternative childbirth. It suggests marginalization, the unconventional, the deviant.

Instead of "alternative energy," I suggest that we use the term "sustainable and renewable energy," which we can further reduce to the handy acronym SURE. Reframing ideas around new language allows the population to gain insight and comfort. Once you have that, certain practices become ordinary, rather than "alternative." A good example is how we now analyze food ingredients. Only hippies used to do it, but the majority of us are ingredient-literate today in a way that was unimaginable 10 years ago. It is about comfort levels.

This emphasis on language is essential early on in Alberta's energy transition, because public opinion can encourage or stunt scientific and technological advance, and public opinion drives government agendas. It is somewhat tautological, but for the government to embrace SURE, it needs to gird itself with positive public opinion, and one of the best ways to secure that good vibe would be to change attitudes through new language, public education, and subtle promotion.

There are numerous SURE sources Alberta could seamlessly adopt tomorrow. Generally, the known and utilized SURE sources include wind power, solar power, tidal power, wave power, biomass, bioenergy, geothermal power, ocean thermal power, earth energy, and hydropower. Of these, hydropower is probably the most advanced and accepted; BC and Quebec already generate up to 75% of their electricity needs through dams. Earth energy (capturing and using the earth's heat) is in wide usage in Europe. Of the rest, wave power, tidal power, and ocean thermal power are not going to be high on our priority list, unless the big quake opens up some waterfront property near the BC border.

The most effective areas of concentration for our new governmental approach to becoming a world leader in SURE development and promotion would seem to be wind power, solar power, and geothermal power (capturing and using energy from steam and hot water held under the earth's surface), with biomass also in play (the use of agricultural waste to create energy, as opposed to bioenergy, which grows a crop for energy production).

Wind energy is the easiest big step we could take right now, but it would have to start with regulatory reform. Alberta is the only province with a hard cap on the amount of wind power it can generate, at 900 megawatts. We are currently producing 450 megawatts, which is, depending on usage rates at any given time, less than 5% of our total requirement. Denmark secures nearly half its electricity needs through wind, and estimates for Alberta suggest we could fill up to 40% of our needs if the wind cap was lifted. Wind is fickle, of course; it does not always blow when you want it to. But battery science, and therefore storage capacity, is rapidly developing. Also, there are global giants like Siemens exploring the use of wind to generate hydrogen to power the oil sands, instead of natural gas.

Solar power is competitive right now for heating water, though less so for electricity. Geothermal is clean and effective, but requires better planning and design foresight than tends to be the norm in Alberta. Biomass, especially in a province like Alberta with its strong agricultural sector, is worthy of our attention.

Of the current SURE sources, wind, solar, and geothermal are areas in which an immediate and significant commitment would begin to demonstrate, to the world and to Albertans, that our province is not an ostrich with its head buried in the tar sand. But during our transition to SURE sources, we might want to first address our current primary energy source with a bit more common sense and even basic business acumen.

One of the best ways to demonstrate our commitment to the future of SURE would be, ironically, to change the way we think about, produce, and use oil today. This essay is about alternative energies, but also alternative *strategies*. A great deal of the current work around energy and environmental research is not about existing SURE sources; it is about finding a better way to produce and use oil. The oil sands are, by a unanimous vote, the dirtiest and most energy intensive source of oil in the world. But if the government made a simple commitment to carbon capture and storage (CCS), a technology that gathers carbon emissions and stores them deep underground, it would reduce oil sands emissions by up to 70%. If this was followed by an aggressive use of offset credits to erase the remaining 30%, what you are left with is a carbon neutral barrel of oil.

There are essentially three paths the government can take to its goal of SURE source leadership. The first is to use command and control instruments—regulatory tools that state and monitor standards. The next option is incentive-based instruments which encourage a certain direction through taxation strategies, pollution credits, and various other incentives and disincentives. The third approach is what I will call the fibre instruments (do it because it is good for you), which involves promotion, education, and the call for voluntary pledges toward change. This third approach is a given, but it must be accompanied by one of the first two options, most likely incentive-based instruments. It will all fail if the government promotes SURE sources with words and no actions. The correct financial and regulatory conditions are necessary for this plan to succeed.

A good place to start with regulatory issues would be in promoting efficiency and common sense in planning strategies. City and town planning, for instance, should be subject to an oversight board to ensure the lowest possible car usage in new developments. Building codes could be revisited, so that things like insulation levels and window glazing adhere to the highest standards. These are un-sexy and non-vote getting issues, but they matter. It also matters that there are companies already able and willing to meet the highest environmental standards available, but many are holding back because it would render them less competitive. The government must set the bar evenly for all…at the high end, that is, not the low end.

I have an unusually strong faith in the talent and sense of Albertans. There's something about this place: the light, the air, the mountains bursting from the beauty of the prairie, the sense of freedom that no other province has, a feeling for which I have no explanation other than the greatness of the sky. Although few places on earth have benefited as much from oil as Alberta, I think deep down we all know that it is not going to last, that we know intuitively, in our guts, that our future economic health does not lie with oil. Fossil fuels obviously are not going to disappear overnight, and no one in their right mind is calling for that. But the question is whether Albertans are ready to start thinking about something other than cheese and wine pairings, or that they are environmentalists because they use a blue box.

Are we ready to demand and embrace a large gesture? There are indications that we are, which is a good thing, because tomorrow is a cheetah running at us from across the

plain; it may look kind of far away right now, but it will be on us soon enough. If we do not come up with a strategy, well, you know what happens to those zebras on TV.

It is difficult to focus on tomorrow when today is going well, but you can force yourself to imagine the future of Alberta, and not just five or ten years from now, but thirty, forty, or fifty years from now. And let's presuppose that we have given no thought to the post-petro world, until, suddenly, the world no longer relies on oil. What will Alberta look like? Well, for starters, Fort McMurray will be a heritage site—the industrial equivalent of Head-Smashed-In Buffalo Jump—another resource extraction mode rendered obsolete by the march of time and modernity.

Albertans will one day accept and embrace SURE sources because we are smart enough to know we have no choice. It is a timing issue, that is all, and Albertans would rather control the timing than have someone dictate it to us. The inevitability of our path rests on two simple facts. The first is environmental: the planet cannot handle what we are doing to it. We can bicker all we like about levels and degrees and timelines, but the arc of our impact on the planet must change. The second fact is that oil will run out: a generation from now world demand for energy will far outstrip the ability of non-renewable resources to meet that demand.

Therefore, the most logical and most self-beneficial course of action will be to plan for the end of oil and to make money from it. Somebody's going to, and it might as well be Albertans. Our children are going to need jobs, and odds are that they, or their children, will be the ones living with the final transition away from fossil fuels, a transition that may end up being a genuine Calgary Stampede if we do not start planning now.

This is the opportunity we need to understand. The world *will* change. Unfortunately, our government's current approach appears to be about the same as my attitude toward the mess on my side of the bedroom—I pay lip service to the problem and every now and then I do something symbolic, like pick up a sock, but I have not yet demonstrated commitment to real change because my wife has not left me. Well, pretty soon we are going to have get our side of the room clean or the planet is going to take the kids and disappear. All our kids.

"You want to commit to SURE sources, study them, support them, promote them," say the naysayers. "Well, fine, but who is going to pay for it all and what is in it for us?"

Yes, it will help save the planet and our economy, but these things are amorphous, indistinct, and have nothing to do with a mortgage payment. Why do it today, instead of tomorrow, or ten years from now? Valid questions, and not at all cynical or selfish. Present moment payoff has always influenced actions that might carry severe long-term consequences (which helps explain, for instance, the continuing existence of French fries).

In Alberta, we have the option of saving billions of our annual natural resource revenue and using the earnings generated by what we save to pay for transforming ourselves into the world's recognized leader in SURE sources.

In some ways, this chapter is about the *why* not the *how*, because the *how* is ultimately not going to be the problem. Let's not be naïve; changing our dominant energy source is going to be extraordinarily difficult and likely to turn society upside down during the transition. We are soon going to be working towards a raft of energy options that we can pick and choose from, but it will not happen on the necessary scale unless we buy into the *why*. To help us along that path, the government's plan to become a world leader in SURE sources should roll out along two fronts.

The first front will be the communications strategy. If there is no strong and coherent narrative around which the public can coalesce, Alberta's SURE process will fail. The narrative must be strong, simple and clean.

The second front will be scientific and technological. There is going to be no claim to SURE leadership unless a massive financial commitment is made, well into the billions.

Because our provincial governments since Lougheed, however, have made no secret of their general mistrust of the intellectual smarty-pants approach to things, it seems best to speak in ways that will reach them. Thus, I propose the following *Top Ten List to Being a World Leader in SURE Sources*. It is pithy, and you can snip it out of the paper to paste on fridge doors, or the agendas of provincial Cabinet meetings.

Top 10 SURE Things

1. Address climate change directly.

2. Develop a coherent and flexible communications strategy.

3. Make carbon capture and storage mandatory.

4. Create a Ministry of Sustainable and Renewable Energy Sources, giving the portfolio rank in Cabinet equal to Finance and to Energy.

5. Reform the regulatory climate to meet and then pass the highest international levels.

6. Establish two world-class Centres for Research into the Development and Promotion of SURE Sources, one each in Edmonton and Calgary.

7. Create a splashy annual awards ceremony celebrating the best and brightest of the Alberta SURE community.

8. Establish an annual conference on the future of energy that invites the smartest people from all over the planet.

9. Create the position of a SURE Source Ombudsman and give the office teeth to act in the energy equivalent of affirmative action.

10. Develop partnerships between government, SURE source providers, and the fossil fuel industry so that, as transitions to SURE accelerate in the decades ahead, the oil industry does not feel abandoned.

These initiatives can all be paid for using non-renewable energy revenue. The best way to ensure that this revenue is available and accessible over the long-term is to save it, create a permanent fund, and continue to use the earnings on that fund to transform the province into a world leader in SURE energy. Of course, one can already hear the guffaws in the Calgary office towers. "A provincial switch to wind power? Solar power?

And they want us to help? And pay for it?!" It may sound about as likely as Donald Trump getting a brush cut, but let's remind the oil barons it was an alcoholic who founded Alcoholics Anonymous. In any case, there is one word that renders all protest not so much illogical as shortsighted, and that word is "non-renewable." From now on this word ought to be in widespread use for two connotations. First, as usual, in relation to fossil fuels. But we should also apply the word "non-renewable" to our planet. What gives Albertans our lifestyle, our reputation, our swagger, our frontier can-do mentality, has mostly come from a blip in the geo-historical timeline. Nothing else. That blip—read, our oil wealth—is not going to last much longer in relative terms.

My history professor from the University of Alberta was wrong about conservation and the environment. Small gestures *can* add up to larger gestures. Albertans are now gathering together near the lip of a tipping point, and are ready for one large gesture to be made by our government: make Alberta the world leader in the development, promotion and use of SURE sources.

If this large gesture is made, all the small gestures will become such unremarkable occurrences that we will look back some day and be surprised at ourselves, vaguely shocked that there was a time when we were not all environmentalists. But if we do not make that large gesture today, if we do not demand it of our government, the classroom light might go dark one day. *Ping!* Just like that. We will all be sitting around wondering what happened and why the switch does not work anymore. That light is our provincial economy. Or worse.

Conclusion

Roger Gibbins

Alberta's Energy Legacy is the capstone to a public policy proposal that the Canada West Foundation has been strongly promoting for the past three years. We have argued that as non-renewable energy resources are developed and sold, as they are converted from assets in the ground to provincial government revenue, Albertans must save a significant proportion of that revenue to ensure the province's sustainable economic prosperity. The policy challenge is to use today's energy wealth to ensure sustainable prosperity tomorrow, and to this end the Canada West Foundation supports an investment strategy that would have the Government of Alberta dedicate a fixed proportion of annual natural resource revenue to savings, and then use the revenue generated by those savings to help transform the provincial economy. Our assumption throughout has been that simply spending more money on doing the same things will not ensure the province's long-term economic prosperity.

Over the past three years of work on this topic, we have found that Albertans are quick to accept the need for a provincial saving and investment strategy. However, they also ask a critically important question: saving to what end? In our personal lives, we generally save with a purpose in mind—to put our kids through university, to buy a vacation property, to take a big trip, or for our retirement. Saving is the means and not the end, and therefore Albertans quite appropriately ask to what ends might a saving and investment strategy be directed? To answer this question, *Alberta's Energy Legacy* lays out 10 transformative ideas for consideration by Albertans. These big ideas sketch in a variety of ways in which Albertans can seize upon today's opportunities to ensure sustainable economic prosperity tomorrow.

These ideas speak with great force and eloquence on their own behalf, and there is no need to summarize the arguments here. Instead, I would like to conclude this volume by addressing two questions. First, why has the Canada West Foundation chosen not to

rank order the 10 ideas, to indicate some relative priority? Second, why should readers outside Alberta be interested in this discussion when they, unlike Albertans, seem to have so little skin in the game?

The Top 10, But No "Best in Show"

We are used to "top 10" lists in virtually every area of our life—the top 10 movies, restaurants, cars, places to see before we die, and even the top 10 worst-dressed celebrities. What these lists have in common, and what sets them apart from *Alberta's Energy Legacy*, is that they are ranked. We are presented with not only the top 10 worst-dressed celebrities, but also the worst-dressed celebrity of all. We are presented with lists that identify not only the 10 best movies of the year, but also the best movie of the bunch. Why, then, have we rejected this approach? Why are readers of *Alberta's Energy Legacy* presented with 10 big ideas, but with no summary statement as to the best of the big ideas?

The answer to this question has nothing to do with cowardice or laziness on our part. First, our primary goal throughout this entire exercise has been to convince Albertans about the benefits that might accrue from a systematic saving and investment strategy. However, if we were to zero in on a single investment option, our own choice for "Best in Show," we may discourage those Albertans who support a saving and investment strategy in principle, but whose preferences for spending the earnings on those savings lie elsewhere. We do not want to narrow the field of supporters, but instead want to broaden that field with a range of investment *possibilities.* Indeed, we would urge Albertans to consider creative ideas well beyond those presented in *Alberta's Energy Legacy.*

Second, the big ideas that our authors have identified are not necessarily mutually exclusive alternatives, for we are not really in a zero-sum game. There are common threads that weave across the various big ideas. For example, the importance of post-secondary institutions, innovation and creativity, and economic diversification are common themes that might be addressed in a number of ways. Furthermore, while it is impossible to do everything at once, many of the big ideas presented in this volume might be addressed sequentially. For example, and for example only, failing to address a high-speed rail system as the province's first priority does not preclude it being addressed in subsequent rounds of investment decisions.

Now it is true, of course, that Alberta is not going to be the best in the world at everything, that strategic choices will have to be made, and this reality takes me to the primary reason why this collection of essays is not ranked. Our task in this volume is to illustrate the range of possibilities that can be opened up by a savings and investment strategy. However, the choice among those possibilities is inherently and necessarily a political choice for Albertans and their provincial government. Politics is all about setting priorities and making choices, and we expect governments to make choices and to be held accountable for those choices. This is not something that we can or should pre-empt. When the time for choices arrives, the Canada West Foundation and countless other organizations will undoubtedly wade into the debate, but this discussion lies further down the road. First we have to get the saving strategy in place, and thus our primary objective is to whet the appetite of Albertans for this policy direction.

Why Should Non-Albertans Care?

But enough about "those Albertans." Why should *Canadians* living in other provinces or territories care about what Alberta does with its energy wealth? Why should this debate be more than an irritant to others? Why should they care?

Perhaps the first point to stress is that Alberta is embedded within the national economy, society and political system. It is not an island, and what happens in Alberta ripples out, for better or for worse, across the region and across the country. If how Albertans seize this opportunity is guided by sound strategic thinking about the future of the provincial *and national* economy, then Canadians as a whole should benefit. And, if Albertans get it wrong, they alone will not be the losers.

Second, being "an Albertan" is a transitory reality for many people. It includes those who today live in Calgary but who may retire in Victoria or back with their families in Saskatoon. It includes those who moved to the province in the last year or decade from Ontario, and who may move back in the years or decades to come. It includes those who are part of the "long commute," residing in the Atlantic provinces but working in

Alberta, and it includes those with businesses in other provinces that depend in part on Alberta's prosperity. Many people living outside Alberta have sons, daughters, fathers and mothers who live within the province. Canada provides its residents with the great gift of geographic and social mobility, and thus we are all potentially Albertans, if only for a time and if only for part of our lives.

Third, the Government of Alberta has an opportunity for policy experimentation that other provincial governments do not enjoy. There is, then, the opportunity for other Canadians to learn from the Alberta case, to see what might work and to learn from Alberta's mistakes. Here a good example comes from the opportunity to invest in wellness programs, something that all Canadian governments endorse in principle but have difficulty supporting financially. Let's see what happens in the Alberta case. Let's find out whether public investment in wellness programs really makes a difference and, if so, what policy tools work and do not work.

Fourth, while the ideas are hooked to what Alberta could do with the earnings generated by a larger non-renewable natural resource savings fund, their applicability to the policy areas they address extends well beyond this. Taking bold steps in post-secondary education, the environment, alternative energy, research and development, the arts, transportation, and wellness are worth considering regardless of where you live.

All Canadians have a stake in sound and creative public policy. If Alberta can serve as a policy laboratory for Canada, then all Canadians can benefit. In short, *Alberta's Energy Legacy* is not just about Alberta; it is about the future of Canada in an increasingly competitive global economy and environment. True, there is an immediate opportunity for Alberta leadership, but it is leadership within the national community of which Alberta is proudly a part.

Appendix

Investing Wisely Project Funders

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saving for what?

Most people in Alberta understand the value of having the provincial government save some of the non-renewable resource revenue it collects for future use. The provincial government has responded by stashing away money in a variety of endowments and by adding to the Heritage Fund. But without a clear sense of what the money will be used for, it is difficult to get Albertans excited about a more aggressive savings program. Rightly so, saving for the sake of saving does not make a lot of sense—you can't take it with you and there are pressing needs facing the province right now. If we are saving for a rainy day, many argue that it is time to break out the umbrella.

As a result, it is hard to justify delaying gratification and saving more for the future. Albertans need and deserve a sense of what the earnings on a super-sized Heritage Fund would be used to achieve. They need a sense of what is possible. That is where this book comes in. It presents ten ideas for how Albertans could use the money generated by a larger savings fund to permanently transform the province in positive ways.

It is up to Albertans to decide where they want their province to go. The ideas found on these pages will help them answer this critical question and they will help them determine if saving for this future makes sense.

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