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Green Action Centre's Response to *TomorrowNow*

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Introduction*

Finding the path to green prosperity

Green Action Centre is pleased with the Province's commitment to create the conditions for green prosperity in Manitoba. We share *TomorrowNow's* goal for Manitoba "to be one of the most sustainable places to live on earth." That is a very ambitious goal, which invites comparison with sustainability leaders around the globe. Our own mission is to promote green solutions in pursuit of that goal.

A full-blown plan would provide an analysis of the issues to be addressed and include targets, milestones, actions, evidence that actions will lead to objectives, indicators and monitoring to track progress, a budget, and appropriate governance and oversight. We recognize that *TomorrowNow* is not a full-blown plan, but more a sketch of where we want to be and an invitation to Manitobans to help create strategies to get there. We accept that invitation by identifying challenges and recommendations for progress.

Green Action Centre's entire submission consists of this introduction followed by a series of briefs written by members on themes in *TomorrowNow*. The styles of the briefs may differ, but the content of each has been reviewed by Green Action Centre's policy committee and is consistent with our mission and principles. Reading this overview is not a substitute for careful study of the component briefs. Rather we here identify more general "lessons learned" to guide the transformations needed to realize the good intentions of the *TomorrowNow* project.

Manitoba has wonderful natural endowments, which we value for their own sake and for numerous ecological goods and services that undergird and enhance our lives and livelihoods. Upon these natural foundations, Manitobans have built an economy that strives for prosperity and justice. A green economy is one that recognizes this dependence, values and protects the natural systems that sustain us, and provides opportunities for sustainable, low-impact livelihoods and ways of life that enable Manitobans to live well and contribute to a sustainable, peaceful and just world.

Lessons from *OurWinnipeg*

The launch of *TomorrowNow* as a sustainability planning exercise invites comparison with Winnipeg's recently completed *OurWinnipeg* planning, designed with the paramount goal of achieving a sustainable Winnipeg. *OurWinnipeg* was also "a strategy of strategies" consisting of five cross-referenced reports on different dimensions of sustainability and followed by more

* by Peter Miller

technical and specific plans to guide implementation, such as the Garbage and Recycling Master Plan (GRMP) and the Transportation Management Plan (TMP). Despite growing pains at launch, the GRMP in its first month of implementation has already increased the proportion of recycled and composted materials and reduced landfilled garbage. Moreover the collection trucks are fueled by compressed natural gas - a great improvement in emissions over gasoline and diesel and potentially sourced from captured methane at Brady landfill.¹

What can be learned from the OurWinnipeg exercise that could guide *TomorrowNow*? Here are some lessons.

- The City (and Province?) showed great wisdom in engaging the Placemaker team to work with city staff to facilitate, research, design and write the planning documents. **Professional leadership** from folks whose careers are built on adapting best practices to local situations around North America is an important ingredient for a province that wants to be compared with the best. Similar remarks apply to the other professionals engaged to develop the GRMP and TMP.
- A second lesson is to **educate and engage citizens at different levels**, (a) with broad opportunities to learn of the rationale and alternatives for a plan and provide feedback, and (b) establish workshops and **advisory groups of citizens with special knowledge**, skills and well-articulated concerns, who can negotiate specific recommendations. Although the GRMP and TMP permitted this, one of the best examples is Manitoba's Active Transportation Advisory Group that produced *Greater Strides: Taking Action on Active Transportation*. We are pleased to see that the Province plans to continue with an AT stakeholder advisory group. We believe that this successful strategy could be repeated in many areas of concern.
- A third is that, given that the transportation sector accounts for over a third of Manitoba's GHG emissions, **sustainable transportation is central to any effective green plan** and that **community design that integrates transportation and land-use planning** to create "complete communities" and "complete streets" is crucial to enabling sustainable livelihoods and ways of life. The path to a sustainable Manitoba leads through sustainable Manitoba municipalities, since that is where most of us live.
- In particular, over half of Manitoba's population lives in Winnipeg and two-thirds in the Capital Region. **Cooperation with the City and support of its sustainable initiatives** is absolutely crucial to making Manitoba "one of the most sustainable places to live on earth." If Winnipeg fails, Manitoba fails.

For example, we now have a Mayor and Council who have accepted the argument that motor vehicles are underpaying for the tremendous infrastructure investments they require. Yet the City has no legal power to raise funds from motor vehicles through special taxes on parking spaces, special registration fees, road or bridge tolls, or assessing

¹ I believe the Province helped fund the *OurWinnipeg* planning exercise. In any case it deserves a tree/milestone in the sequence at the bottom of the page.

vehicles for property taxes. With the powers they have, the City is forced to perversely subsidize motor vehicle infrastructure from taxes on homes and businesses (or sharp increases in transit fares), even though they have a sustainable transportation plan to encourage a modal shift away from cars. The Province needs to grant the City and other municipalities fiscal powers for fairer, more sustainable revenues.

- Finally *OurWinnipeg* stressed the importance of **early actions to address obvious deficiencies and seize opportunities** to counter the common cynicism that follows when the public invests considerable energies in a planning process only to see the results pushed to a remote future ("tomorrow, not now"), forgotten or ignored. Naming the plan *TomorrowNow* suggests it should be fast out of the starting blocks. Don't disappoint!

An example of slipping into deferral mode occurred at the October 9th, 2012 public forum on *TomorrowNow*. In response to questions on Climate Change targets, timelines and actions, such as changing the economic incentives, Minister Macintosh indicated that the first action would be to extend the emissions reporting requirement to more industries, "because you can't manage what you can't measure." Only then would work on targets, timelines or changed economic incentives begin. However, as our climate change brief makes clear, we already know in extensive detail where GHG emissions in the province come from (even if some details can be refined further) and know that over a third come from the transportation sector. For decades, this information has been reported to the UN Framework Convention on Climate Change.² We have the knowledge we need to develop a course of action ***now***, not tomorrow; governments have put off action for decades. Indeed the province collects tax on transportation fuels and thus knows in detail what is consumed (from which emissions can be calculated) and has the mechanisms in place for collecting more. The 2.5 cent per litre fuel tax increase in the spring budget is a start, and we commend the provincial government for that. But we need a strategy, within which complementary and incremental series of actions are components, not a one-off to meet an immediate budget problem.

Other lessons

Green Action Centre's experience and review of *TomorrowNow* have identified other general lessons for Manitoba's green prosperity project.

- An effective strategy requires **a realistic assessment of where we are, where we need to go and effective ways to get there**. This may begin with but must quickly go beyond informal SWOT analyses (strengths, weaknesses, opportunities, and threats) and glass-half-empty-glass-half-full debates between "nattering nabobs of negativism" and defenders of achievements to date.

² Manitoba's inventory is in Table A14-14 in ***2012NIR - PT3-final.pdf*** of Canada's recent UNFCCC submission at http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/can-2012-nir-11apr.zip.

For example, in our climate change mitigation brief, we report on Manitoba's inventory of GHG emissions and trends, identify sources and drivers of emissions, calculate the gaps between legislated Kyoto targets and the inventory, and propose mitigative measures and the potential magnitudes of their effects. This analysis needs to be extended to interim goals beyond Kyoto, such as exceeding Canada's Copenhagen commitment and ultimately meeting Manitoba's share of a scientifically estimated cap on total emissions limits to avoid catastrophic levels of climate change.

- **Good defensible policy and strategies should be at once principled and pragmatic,** with a sound rationale. Green Action Centre grounds policy recommendations and programs on **principles of sustainability and justice with practical application to Manitobans for "living green, living well."** We recommend public education, dialogue and negotiation backed by these principles as an antidote to being held captive to the most regressive voices. On the whole, Manitobans respond well when engaged respectfully and are willing to embrace doable changes that are part of real solutions.
- In our experience, Manitobans want to live greener lives and care about the world our children will inherit. But we must be wary about loading too much onto individual actions. **A co-ordinated and integrated approach is needed, including infrastructure as necessary to make sustainable choices possible along with price signals and incentives to encourage sustainable choices. Individuals are more likely to make the right choices if those options are practical, safe, affordable, efficient, healthy and enjoyable.**
- **Efficiency and synergy are important virtues for achieving green prosperity.** Efficiency means getting something desirable at least cost or, alternatively, getting more benefits at the same cost. However benefits and costs should not be construed narrowly. Producing a good cheaply while endangering health, well-being or the environment and wasting resources is not true efficiency under full-cost accounting.

An action or policy that achieves multiple benefits or goals simultaneously is synergistic. In our energy brief, we argue that Power Smart conservation measures plus Power Smart utility rates plus a low-income affordability program constitute a synergistic, mutually reinforcing bundle of policies that simultaneously promote conservation, justice, affordability and economic goals. Creative policy development looks for similar synergies in all sectors.

The 50 by '30 organization provides another example of synergistic and systematic policies. They argue that achieving 50% renewable energy consumption in Manitoba by 2030 will provide Manitoba with economic, environmental and social benefits conjointly. This can be achieved by a review of energy use in all sectors and initiating in each a combination of demand reduction (e.g. driving less), efficiency (more fuel-efficient vehicles), and renewable energy sources (electric vehicles). In reverse order, this spells RED (www.50by30.org).

- Another essential for a green prosperity, largely missing from *TomorrowNow*, is "ecological fiscal reform" or **green budgeting to promote sustainable behaviour by individuals and institutions and help create a more just and sustainable society** by
 - a) Making it easier and more rewarding to do the right thing (e.g. free or low-cost recycling and public transportation services);
 - b) Removing perverse subsidies for less sustainable behaviour like sprawl and fossil fuel consumption;
 - c) Planning and investing for a more sustainable future (e.g. economically and ecologically efficient buildings, communities and transportation systems);
 - d) Taking a full-cost accounting perspective to assess social, ecological and economic costs and benefits of building, energy, location and transportation choices;
 - e) Other things being equal, have users who impose social costs pay for those costs (user pay and polluter pay); but also
 - f) Insure that basic welfare and human development needs (e.g. health and education) are provided for all citizens.

Principles (a) through (d) lead to a more sustainable society. Principles (e) and (f) represent two aspects of a just society that need to be reconciled – paying the costs of ones actions and meeting basic human needs. Despite some potential tension between them, justice requires attention to both.

- Green prosperity means that economic policies are not pursued independently of sustainability policies. Analysis and advice for improving the economy or government expenditures and revenues must always examine what is consistent with sustainability principles and objectives. We wonder to what extent this occurs, say, in the advice given by the Premier's Economic Advisory Council (PEAC), the Priorities and Planning Committee of Cabinet, or the Finance Department. We observe that in Manitoba's 5-year Economic Plan (<http://www.gov.mb.ca/finance/budget11/plan.pdf>) there is no mention of sustainability principles or objectives. Only the ink is green. Likewise for the initiatives identified for the Priorities and Planning Committee of Cabinet (<http://www.gov.mb.ca/chc/press/top/2012/01/2012-01-13-140300-12983.html>).

Green Action Centre proposes explicitly amending the 5-year Economic Plan and the Planning and Priorities Committee of Cabinet objectives to include "*creating conditions for a greener, more efficient and just economy.*" We also recommend that **a Green Prosperity Working Group be established with research support to review in detail budgetary and economic measures to promote the greening of the Manitoba economy.** Such a group could report to the new Priorities and Planning Committee of Cabinet.

- A common objection to investing in environmental initiatives is that we can't afford it. After our investments in health, education, poverty reduction, infrastructure renewal, and

protection from crime, what is left for the environment?

This objection stems from a non-integrated view of the economy and our natural environment. Putting them together, a number of answers emerge, based on concepts of prevention, alternative transportation, efficiency, substitution, stimulus and synergy.

Altogether they mean that **Manitoba's prosperity is not affordable unless it is green.**

- A case can be made that unsustainable land drainage policies and possibly climate change intensification are responsible for the huge hit to the provincial economy from 2011 causing years of provincial deficits. Nicholas Stern and other economists have argued that the cost of climate mitigation investments are orders of magnitude below the costs of runaway climate change. In both cases, **prevention is the most cost-effective policy.**
 - **Urban sprawl based on an auto-centric transportation system is terribly costly.** As Bill McKibben reports (*Deep Economy: The Wealth of Communities and the Durable Future*, p.154), "...[A]ccording to a recent World Bank report, cities that emphasize walking, cycling, and public transport spend a far smaller percentage of their total wealth on moving people around than car oriented cities do: only 4 or 5 percent of their wealth is expended on transport compared with up to 17 percent in freeway-dependent cities like Phoenix."
 - Where will we get the money to invest in renewables? The 50 by 30 organization answers - we're already spending billions of dollars on gas and petroleum products from Alberta for heat and transportation. **Demand reduction, efficiency and renewable energy investments save on fossil fuel expenditures and substitute local expenditures.** Renewable energy is local energy for Manitoba.
 - Moreover, **spending those energy investments in Manitoba stimulates our economy and provides green jobs.**
 - Finally, **green prosperity means looking for synergistic solutions.** *TomorrowNow* rightly highlights the activities of BUILD and its sister social enterprises that have developed a synergistic "successful business model that combines social, economic and environmental objectives." Shaun Loney speaks of his protégés as "million dollar men," reflecting their costs to society from welfare and a life of crime. Providing an alternative livelihood in energy efficiency is obviously a socially, economically and environmentally preferable alternative.
- We earlier noted that *TomorrowNow's* goal for Manitoba "to be one of the most sustainable places to live on earth" is quite ambitious and invites comparison with leading jurisdictions around the world. **Manitoba needs the ability to scour the globe in search of best practices,** not only to see how we compare but also what we can adapt to our own circumstances. In our energy brief, we noted Manitoba Hydro's strength in long-range power planning but found it deficient in comparison with BC, Vermont and Seattle in obtaining public input for power planning. Seattle is exemplary too in their conservation and affordability pricing of power. Moreover the 2010 census indicates that 41.2% of Seattle residents commute by transit, carpool, biking or walking (http://www.seattle.gov/dpd/Research/Population_Demographics/Overview/default.asp). These are but examples of what we might learn from a more systematic review of best

practices in other jurisdictions.

- Finally, we note that ***TomorrowNow* proposes green branding initiatives** to cast Manitoba as the World's Polar Bear place, the Parks Province, the Eco-Learning Capital of Canada, Leading the Way on Reducing Waste, as well as "one of the most sustainable places to live on earth." We find these branding proposals more attractive than "spirited energy" and express the hope that we can make them all truthful so that they stick. Green Action Centre's and others' briefs in response to the *TomorrowNow* invitation, attempt to identify some of the transformations necessary for this to be the case and we are committed to working with the Province and Manitobans to make it so. **We look forward to the day when *The Manitoba Advantage* can be rewritten to reflect a "green prosperity" perspective** (<http://www.gov.mb.ca/finance/pdf/advantage.pdf>).³

The briefs that follow

Green Action Centre endorses the overall goals of *TomorrowNow* and of each of its five sections. We welcome and wish success to this initiative to refocus, reprioritize, and rebrand Manitoba. This submission is a contribution to that effort. It consists of this introduction with its lessons learned followed by a series of briefs written by members on themes in *TomorrowNow* in which we have some experience. The briefs, which identify challenges and propose solutions, are described below.

Creating a green economy takes stock of where we stand and the challenges we face in creating a green economy, provides a summary critique of measures proposed to address the challenges, and proposes additional measures needed.

On Becoming a Clean and Green Energy Hub takes stock of the value of Manitoba's key asset, hydropower; identifies a number of policies that would help Manitoba make the most of its hydro advantage by strengthening conservation, alternative energy, fairness, affordability, and public input. The discussion then broadens to more comprehensive energy planning, and concludes with remarks on particular topics within that framework.

Reducing Greenhouse Gases (GHG), working from Manitoba's UNFCC GHG inventory, provides detailed analysis of the challenges Manitoba faces to meet its legislated Kyoto target

³ Anders Swanson comments on branding: *If Manitoba's economy is to be underpinned by the skill level, dedication, work ethic, ethics, happiness and wealth of the individuals that live here, how do we plan to get this message out to everyone else? If they aren't here already, we want them to move here. Where is the branding exercise that will drive the point home? How do we envision Winnipeg and Manitoba in 25 years? Is it full of bikes? Are kids happy? Is it safe to be a senior without a car? Do we refrigerate the ice and heat the air of our hockey rinks simultaneously with heat pumps? Are we proud to live here? Are we the Seattle of the North? The Denmark of North America? The Leader in Innovation and Secondary Education that comes with a smarter, more civil society? This messaging could have strong effect on this plan and how people see themselves going forward and have an effect on some of the economic choices we make. (Note that this is more complex than the simple eco-tourism bullet - but runs on the same principles). Basically, how will TomorrowNow seek to capitalize on the idea that Manitoba will become a national leader full of healthy, happy progressive-thinking individuals that thinks green and acts green?*

(albeit belatedly). *TomorrowNow* initiatives are then matched to GHG emissions to assess their adequacy. Finally, additional measures to reduce GHGs are proposed.

Vision for Sustainable Transportation examines strategies to shift towards more sustainable modes of transportation not only to reduce GHG emissions but also to make our communities more liveable and healthy. It references and summarizes a number of recent planning documents, which already provide agendas for action, and makes additional suggestions.

Re-Orienting the Built Environment for Tomorrow describes a model integrating EcoCity, Healthy City, and Age-Friendly City design recommendations – and its potential contributions to the *TomorrowNow* initiative.

Adapting to a Changing Climate identifies several climate change adaptation challenges for Manitoba and proposes an approach to adaptation for each.

Moving towards Zero addresses issues of waste management from a *zero waste, zero harm* perspective, notes recent initiatives of Winnipeg and the province, and makes proposals for improving performance.

Community Education for Sustainability notes how crucial individual decisions are in generating (and thus reducing) Manitoba's ecological footprint and then considers strategies for mobilizing Manitobans to do their part and ideas for meeting the goal of making Manitoba the eco-learning capital of Canada.

Creating a Green Economy*

The Challenge

The *Tomorrow Now* discussion document presents the following goal statement for the Green Plan: “A strong, resilient green economy will be built to reduce environmental risks and ecological scarcities, while improving well-being and social equity for Manitobans.” This is the definition of a green economy as presented by the United Nations Environment Program’s (UNEP) recently released “Towards a Green Economy”. That report goes on to state that such an economy is low-carbon, resource efficient and social inclusive and, that to get there, public and private investments are required to reduce carbon emissions and pollution, enhance energy and resource efficiency and prevent the loss of biodiversity and ecosystem services. We would add that a green economy must be of a scale that does not exceed the carrying capacity of the natural environment to handle the waste products produced by the economy and that does not run down the quality and level of the natural capital – both non-renewable and renewable. A green economy is one that maximizes the quality of life within the limits required to sustain the stock of natural capital and the flow of ecological services it provides.

Compared to this vision, Manitoba’s track record over the last 20 years is mixed. On the one hand, its economy and population have grown – from \$26.4K to \$35.2K of income per capita (2002\$) between 1990 and 2010 and from 1.10 million to 1.23 million people thus providing more Manitobans with more disposable income. As well, the poverty rate has declined, from 13.6 to 9.2 percent, as has the depth of poverty - from 36.3 to 31.3 percent. Offsetting these reductions, the overall level of after-tax income inequality, as measured by the Gini coefficient, has risen slightly from 0.279 to 0.289 but remains the third lowest in Canada.

On the other hand, key aspects of the natural environment of Manitoba have suffered *directly* because of economic growth. For one, Greenhouse gas (GHG) emissions have risen from 18,300 kt of CO₂ equivalent in 1990 to 19,800 kt by 2010, driven mainly by the rise in light and heavy truck use for personal and commercial purposes and because of increases in agricultural production⁴. This is some 2,600 kt more than the target set by the Kyoto protocol and the provincial government’s own Climate Change and Emissions Reduction Act of 6 per cent below 1990 levels. This is not an arbitrary target: It reflects the best scientific judgement of the *minimum* reductions needed to prevent catastrophic climate change.

For another, the quality of water in Lake Winnipeg has deteriorated substantially largely due to the intensification of agriculture production. In a 2011 report commissioned by the Manitoba

* by Harvey Stevens

⁴ See, Table A14-14 1990-2010 GHG Emission Summary for Manitoba of *Canada. National Inventory Report 1990-2010-Part 3*.

government,⁵ the authors conclude that 75 per cent of the historical variation in the lake trophic status is due to increased production of cattle, hogs, chicken and major crop cultivars (canola, potatoes, wheat, etc). They indicate that the ecosystem state change in Lake Winnipeg occurred because of policy decisions made by the provincial government in the 1980's and 1990's that substituted increased production of livestock (cattle and hogs) and potato and canola production for the historical focus on grains. The sudden increases in crop and livestock production increased nutrient runoff in southern Manitoba leading to the worsening of water quality in Lake Winnipeg. The authors note that the level of phosphorous being dumped into the lake has to drop by 50 per cent to avoid a final transition in lake state characterized by toxic algae blooms.

A third negative impact of economic growth has been the rise in the level of waste generated in the province. In 2000, all Manitobans (residential, industrial, commercial and institutional) generated 1.131 million tonnes of waste, in total, representing 966 kg. per person. By 2008, the amount of waste had risen to 1.137 million tonnes (962 kg. per person). However, the amount diverted from landfills actually fell from 19 per cent in 2000 to 15 per cent in 2008, resulting in more waste being landfilled. By 2008, Manitoba had the second lowest waste diversion rate in Canada (15%) and the third highest amount of waste per capita being landfilled.

By way of summarizing these deteriorating environmental conditions and more, the Corporate Knights magazine commissioned a comprehensive state of the natural environment review of each province, based on 35 published and comparable indicators⁶ of environmental health, grouped into the seven areas of air&climate, water, nature, transportation, waste, energy&buildings and innovation. The 2012 report found that Manitoba ranked 11th out of the 13 jurisdictions in Canada on its overall performance across these indicators. Only in the areas of water quality (in spite of the water quality in Lake Winnipeg) and energy and buildings did it rate high (2nd place). For the others, it ranked between 8th and last place, mainly because of high GHG emissions due to transportation, low recycling rates and lack of innovation in green technologies. A number of the indicators were standardized by the size of the provincial economy to provide a measure of the relative efficiency of the economy in producing negative environmental effects.

Thus, the creation of a green economy in Manitoba requires, at the very least, investing in those measures that address the key challenges of growing GHG emissions, the worsening water quality of Lake Winnipeg and the very low waste diversion rates.

⁵ Bunting, L. et. al. *Sudden ecosystem state change in Lake Winnipeg, Canada caused by eutrophication arising from crop and livestock production during the 20th century*. 2011.

⁶ Erin Marchington. *2012 Green Provinces Report*. Corporate Knights Magazine. Summer 2012.

The *Tomorrow Now* Response to Building a Green Economy

The *Tomorrow Now* document presents the following plan:

- **Green Economy Action Plan** – government will partner with stakeholders and private industry to develop a multi-sectoral action plan.
- **Green Research and Development Tax Credit** – government will review all existing supports for R & D and commercialization, bring together local expertise for green business activities, explore opportunities for international investment and leverage local manufacturing expertise to produce clean technology products.
- **Investing in the Green Collar Economy** – stakeholders will have to engage in educational and training efforts to change to sustainable work practices. Government will support the identification, forecasting and provision of skills to support green sectors. Further, the government commits to the development of a “Guide to Green Jobs and Sustainable Careers”.
- **Energy Jobs Fund** – government will create a \$30 Million ‘Energy Opportunities Office and Renewable Energy Jobs Fund’ to attract new investment in the production of equipment for hydro, geothermal, wind, next-generation biofuels, biomass heating, solar or smart-grid technology.
- **Bioproducts Strategy** – government will work with partners to implement the recommendations of *Growing Green: The Manitoba Bio-products Strategy* with a goal to double the amount of revenue generated by the sector by 2020.
- **Leading Clean Water Technology** – government will make legislative and regulatory amendments to encourage investment in innovative water and wastewater technologies.
- **New Bioeconomy Opportunities and Recycling Nutrients** – government will work with local partners to assess pilot projects in cattail harvesting and other initiatives aimed at recovering and recycling nutrients and returning them to the agricultural landscape.
- **National Leader in Energy Efficiency and Green Community Economic Development** – government will stimulate demand for building energy retrofits through Manitoba Hydro’s Power Smart program and support for social enterprises such as BUILD.
- **Ecological Goods and Services Recognition** – government will develop further partnerships with the agricultural industry to encourage the preservation and development of ecological goods and services to benefit Manitoba’s environment.

A Broad Critique of the Green Economy Plan

In light of the above definition of a green economy –low carbon, resource efficient and socially inclusive - and Manitoba’s key environmental deficits, do the proposed measures promote a greener economy and better quality natural environment? The following table provides a high-level assessment of the initiatives in addressing these environmental deficits:

Table 1: Assessment of the Green Economy Initiatives in Addressing Environmental Deficits

A GREEN ECONOMY	
Initiative	Assessment
Green Economy Action Plan	The devil is in the details. The actions need to address the current environmental deficits. There needs to be a stated target date for the plan and the province's role in establishing it. The province does not have a strong record of partnering with stakeholders and private industry. This would be an opportunity for positive change.
Green Research & Development Tax Credit	The green technologies, products and services have to focus on addressing the current environmental deficits facing the province. There is no mention of how a tax credit will work, in the text. There is no commitment for increased support, only to review existing supports. Manitoba is only a marginal participant in the Clean Technology sector. Much work is required to change this situation.
Investing in the Green Collar Economy	The skills to be fostered and supported need to address the environmental deficits facing Manitoba instead of areas where it is already doing well. At present, we have no description of the skill necessary for participating in a Green Economy. This needs to be a priority. There is no target date on this initiative, nor is there an assignment of responsibility.
Energy Jobs Fund	Most of the focus is on further clean energy development which is something Manitoba already does well. The need is for initiatives that reduce our dependency on fossil fuels for transportation and synthetic fertilizers for agriculture.
Bioproducts Strategy	This promotes the use of biomass fibre which will enhance the agriculture sector. But, if in doing so, more greenhouse gases are emitted in producing the fibre and/or polluting the water, then it will worsen Manitoba's environmental performance. A priority should be placed on the use of the biomass we already have available.
Leading Clean Water Technology	This initiative is definitely needed to address the high levels of eutrophication in Lake Winnipeg and other lakes in Manitoba. However, it's not clear the extent to which these technologies will address the root cause of high levels of nutrient run-off from the surrounding watersheds.
New Bioeconomy Opportunities and Recycling Nutrients	This initiative is to assess pilot projects in cattail harvesting and to support other projects. There is no mention of what these other projects are or will be. Much work needs to be done to make the Bioeconomy a viable alternative going forward. There is little to indicate the Province has the desire to actually ensure the work gets done.
National Leader in Energy Efficiency and Green Community Economic Development	This is an area in which Manitoba already scores high. However, more can be done and initiatives like BUILD help achieve social equity and inclusiveness and reducing poverty and inequality. This is a particularly Hydro – centric initiative, ignoring the proven model of community energy projects.
Ecological Goods and Services Recognition	It's not clear exactly what this means or what impact it will have on addressing the environmental deficits facing the province. It seems the authors do not have an appreciation of what ecological goods and services are.

CLEAN AND GREEN ENERGY HUB	
Initiative	Assessment
Manitoba's First Energy Strategy	Is this really the first energy strategy? The commitment to increase renewable energy use is commendable.
The New Generation Hydro Strategy	Partnering with Aboriginal peoples is the appropriate social policy decision for the development of the northern hydro electric projects. However, the notion that the new dams have minimal impacts is disingenuous; the new projects are possible only because of the Churchill River Diversion and Lake Winnipeg Regulation. The flooding has already been done. The new projects should be assigned a proportion of the impacts of previous projects.
An Improved Electrical Grid	We don't understand what is particularly green about the Bi-Pole 3 transmission line.
Stronger Power Smart Program	There is nothing new here except the on-meter financing program.
More Green Heat Through Geothermal	An argument can be made that the installation of geothermal systems in natural gas serviced areas may actually increase regional GHG emission.
Electrical Vehicle Leadership	This will result in minimal reductions in GHGs due to low market penetration of this technology due to high cost.
Increased Biofuel Production and Use	At most, moving to a 10% ethanol and 5% biodiesel blend will lower GHGs by 104 kt., at 2010 levels of fuel consumption.
Green Mining Manitoba	How will mining be 'greened'? The document has to spell out measures to be used to reduce the level of GHGs emitted by the mining and processing operations and to treat tailings to minimize pollution. The notion that sustainable development can apply to extractive industries, mining and petroleum, is not generally accepted.
Manitoba's First Eco-Tourism Strategy	Some analyses have shown that 'eco-tourism' increases GHG emissions based on increased travel and use of resources. The document needs to show how 'eco-tourism' will lower the carbon footprint below that generated by regular tourism.

Further Measures Required to Green Manitoba's Economy

The key focus of the set of initiatives is that of growing the economy in an environmentally friendly manner by producing new products, increasing the energy efficiency of buildings, removing or reducing pollutants. It is hoped that these measures will make the economy more sustainable while continuing to grow it. However, to give the environment its full due by seriously addressing the key environmental deficits facing Manitoba, much more needs to be done both on the demand and supply side.

Achieving the CCER Target of GHG Emissions at 6% Below 1990 Levels

The range of measures required to achieve a 6 per cent reduction in GHG emissions are described in the “Reducing Greenhouse Gas Emissions” section of the Green Action Centre’s response to the Tomorrow Now document.

Reducing the Amount of Phosphorous Entering Lake Winnipeg by 50 Per cent

The 2011 report commissioned by the Provincial Government notes that the vast majority of the nutrient loading into Lake Winnipeg comes from livestock and crop production. Thus, reducing the level of phosphorous flowing into Lake Winnipeg will require additional measures targeting this sector. The 2011 report commissioned by the Provincial Government notes that the vast majority of the nutrient loading into Lake Winnipeg comes from livestock and crop production. Thus, reducing the level of phosphorous flowing into Lake Winnipeg will require measures targeting this sector.

To date, the Manitoba government has taken three steps to reduce nutrient flow from the agriculture sector: (1) Co-funded projects under the Lake Winnipeg Basin Initiative with the federal government; (2) enacted progressively stricter measures governing the handling of manure under the Livestock Manure & Mortality Management Regulation; and, (3) funded ‘Beneficial Management Programs’ under The Environmental Farm Action Program and The Manitoba Sustainable Agriculture Practices Program.

Regarding projects funded under the Lake Winnipeg Basin Initiative, between 2008/9 and 2011/12, the federal government contributed \$1.1 million annually to enhance water quality monitoring in the Red River and the south basin of Lake Winnipeg, as of 2005, followed by a \$17.7 million commitment for fiscal years 2008/09 to 2011/12. The bulk of the federal funds (\$12.1 million) were devoted to scientific research with just \$2.4 million allocated to the Lake Winnipeg Basin Stewardship Fund whose key focus is that of reducing nutrient run-off into Lake Winnipeg. By comparison, Manitoba contributed \$451,000 to this fund and another \$894,000 through its own Water Stewardship fund to address nutrient loading into Lake Winnipeg. According to the federal government’s 2010 progress report (no progress report has been issued by the provincial government), the first three rounds of funding (\$1.75 million) generated an additional \$6.9 million in provincial and project sponsorship funding and resulted in 7 completed projects which achieved the following outcomes by the end of 2009/10:

- 530 head of livestock restricted from surface waters
- 4050 metres of fencing installed to restrict livestock access to surface waters and riparian areas
- 7500 metres of stream/lake bank protected or stabilized
- 7810 native plants, trees and shrubs planted over an area of 8886 m²

- 75 kilometres of land surveyed to identify riparian rehabilitation and pollution sites
- two sampling methodologies designed and implemented.

Given the magnitude of the need for preventive action, this level of response is woefully inadequate.

By the end of 2011/12 a total of 32 projects will have been funded to prevent nutrient run-off at a total federal cost of \$1.22 million and estimated provincial/partner cost of \$4.7 million. Thus, the total impact will be greater than reported above but still far short of what is needed to address the magnitude of the problem.

In addressing the problem of nutrient flow from livestock operations in Manitoba, the provincial government has done a great deal including the commissioning of a Manitoba Phosphorus Expert Committee (MPEC) to examine the issues surrounding phosphorus and livestock manure, enacting phosphorous limits and winter spreading of manure restrictions in its Livestock Manure & Mortality Management (LMMM) regulation in November 2006, and requiring properly constructed holding tanks for liquid manure. In spite of these measures, several concerns remain about the adequacy of the government's response.

First, only those operations with more than 300 Animal Units have to comply with the winter spreading restrictions and the filing of manure management plans up until Nov. 2013. Depending on the proportion of all animals included in operations of 300+ Animal Units, a significant amount of nutrient could still be added to the land during the winter months which is then subject to run-off during the spring snow melt. At that time, all operations, regardless of size will have to comply with the winter spreading restrictions and file manure management plans.

A second concern is with the definition of 'winter' months during which time manure cannot be spread on fields. According to the LMMMR, 'winter' ends on April 10th of each year. Yet, the report, *State of Lake Winnipeg: 1999 to 2007* (pg. 86), indicates that the greatest load and flow of phosphorous into the lake occurs in April when it is over double that of the months of May June and July and over four times the amount during the remaining months mostly due to the snow melt. Given this startling result, it begs the question of whether the period during which the spreading of manure shouldn't be extended to the end of April.

A third concern is whether the guidelines established by the MPEC, for the application of phosphorous according to the phosphorous levels in the soil, are too high. The concern arises from a study of the comparative effects of conventional vs. minimal vs. zero tillage in the South Tobacco Creek watershed area.⁷ The authors found that zero tillage resulted in much lower

⁷ Tiessen, K.H.D., Elliott, J.A., Yarotski, J., Lobb, D.A., Flaten, D., Glozier, N.E., 2010. Conventional and conservation tillage: influence on seasonal runoff, sediment, and nutrient losses in the Canadian prairies. *Journal of Environmental Quality* 39, 964–980.

levels of nitrogen run-off but higher levels of phosphorous run-off than conventional or minimal tillage. They concluded that,

It is apparent from our results that management practices such as conservation tillage, that are designed to improve water quality by reducing sediment and sediment-bound nutrient export from agricultural fields and watersheds, can be less effective in cold, dry regions where nutrient export is snowmelt driven and primarily in the dissolved form. In these situations, it may be most practical to implement management practices that reduce the accumulation of nutrients in crop residues and surface soil. (pg. 979)

As a complement and/or alternative to setting more restrictive guidelines for the application of manure and synthetic fertilizers to agricultural fields, more needs to be done to construct a system of storing runoff water in rural landscapes and then using that water and the nutrients in it to produce biomass crops. Don Flaten and David Lobb of the University of Manitoba have proposed the testing of such a system in collaboration with other organizations with funding from the provincial government and other sources. Given that excess nutrient loading and discharge into rivers and lakes during spring flooding and summer rains is the key reason for high phosphorous levels in Lake Winnipeg, this kind of research is greatly needed.

For a number of years now, the provincial government has supported the implementation of 'Beneficial Management Practices' by farmers that are aimed at improving the environmental performance and sustainability of agricultural producers. In a recent report entitled, *Environmental Farm Action Program: Beneficial Management Practices Catalogue*, the provincial government states that under the predecessor *Environmental Farm Plan* program, 5,614 producers received a statement of completion making them eligible to apply for cost-shared environmental improvements on their farms. Compared to the average number of farms in Manitoba between 2005 and 2008 of 17,300⁸, this represents a 32 per cent take up of the program. Since 2009, only 830 additional certificates have been issued under the Growing Forward program. Thus, there remains much more work to do to promote environmentally benign agriculture in Manitoba.

Increasing Manitoba's Waste Diversion Rate to At least 50 Per cent

In 1990, the Provincial Government passed the first Waste Reduction and Prevention Act in Canada and promised to increase the waste diversion rate to 50 per cent by the year 2000. As of 2008, the most recent year for which there is comparable national data, Manitoba had a waste diversion rate of 15 per cent. By comparison, the province of Nova Scotia achieved a 45 per cent

⁸ Statistics Canada. CANSIM Table #20044

diversion rate in 2008 and plans on achieving over 50 per cent by 2015. Thus, the 50 per cent target can be achieved. What are required are the right incentives and programs.

The recently introduced product stewardship corporations for electronic and hazardous waste, packaging, tires and used oil will help to increase diversion rates as will the City of Winnipeg's comprehensive household waste reduction program. However, what all of these initiatives ignore is the large amount of waste generated by the Industrial, Commercial and Institutional (IC&I) sectors of the economy. In 2008, more waste was sent to landfills from these sectors than from households and the level of recycling is very low. A key instrument to increasing recycling rates in the IC&I sectors is to increase the cost of sending the material to landfills. It's currently cheaper to landfill than to pay the tipping fees at Material Recovery Facilities (MRFs). To establish a level playing field across the province and particularly in the Capital Region where there are three landfill sites, the provincial government should increase the Waste Reduction and Recycling Support (WRARS) levy from its current \$10/tonne to a level necessary to ensure waste materials are sent to MRFs for processing. The additional revenue raised from the higher WRARS levy could be used to fund infrastructure improvements to the processing of waste materials at the MRFs, encourage the development of local industries for processing waste materials into new products and promote improvements in the shipping of waste materials to distant markets. These developments then could give MRFs the financial room to lower their tipping fees and thus make waste diversion more affordable by the IC&I and Construction and Demolition (C&D) customers.

However, with increased volumes of recyclables in the system, there is a greater need to find ways to cut down on the GHGs produced by shipping most of the materials to distant markets. First, practically none of these materials is reprocessed locally. So, using a green research and development tax credit to stimulate the creation of local reprocessing would help fill that gap. Then, all of the material is shipped by truck which generates 8 times the GHGs on a per tonne kilometer of material than rail. To make rail a more attractive option for the local MRF operators, better infrastructure is needed. The development of Centre Port could be the opportunity to make that happen.

On Becoming a Clean and Green Energy Hub*

Green Action Centre applauds the intention of *TomorrowNow* to make clean and green energy a cornerstone of Manitoba's economy. In general terms, we support the initiatives described, with qualifications that follow in the remarks below. Manitoba needs a well-informed and optimized energy strategy to transition to a more sustainable, fair and prosperous economy.

An energy strategy should include an understanding of the physical, economic and social dimensions of energy systems. Physically, they involve infrastructure and a sequence of energy transformations from sources to end-uses as well as the by-products, emissions and impacts associated with each stage. Economically, the components of energy systems often dominate the marketplace of goods and services, costs and revenues. Socially, they underpin the way we live and are subject to policies and regulation that should, ideally, reduce the harms and enhance the benefits of energy systems.

Creating sustainable energy systems lies at the core of a green economy. Manitoba Hydro obviously has a central role to play, but its full potential can be realized only in conjunction with other green economy players and power smart pricing of energy. Our remarks begin with a valuation of Manitoba's hydropower and how to make the most of it as a contributor to green prosperity in Manitoba. We then extend the analysis to other aspects of building a clean and green energy hub in Manitoba.

1. The value of Manitoba's hydropower

Manitoba Hydro is one of Manitoba's most important assets and a key engine of our prosperity. This asset combines Manitoba's natural endowment of lying at the convergence of multiple watersheds draining the mid-continent with extraordinary engineering achievements that convert water flows to delivered power in a highly controlled system. The historic core of Hydro's business is the supply and sale, at home and abroad, of its premium product – reliable, storable, renewable, dispatchable low-carbon hydroelectric power – and the provision of associated energy services to Manitobans.

This high-value product energizes our homes, institutions, commerce and industry. Moreover it will electrify a growing portion of Manitoba's transportation fleet as electric vehicles are deployed.

Despite a significant environmental footprint from the re-configuration of waterways and the social disruptions created, Manitoba's hydropower is relatively clean per kilowatt hour in comparison with other sources. Its adjustable output and storage capacity can match variable

* by Peter Miller

market demand and prices and make feasible and economic other clean but intermittent sources like wind and solar power. This firming capability serves as a multiplier for Manitoba's capacity to produce clean dependable electricity for domestic consumption or export. Manitoba's new and growing premium export product is a compound of renewables that can displace fossil fuel generation while earning dollars for Manitoba.

The potential to firm and store wind power is reflected in Manitoba Hydro's recently announced contract with Minnesota Power, which has a provision for MH to store power from a wind farm in North Dakota owned by MP's parent company Allete. MH does the same for wind power purchased from Manitoba producers and it has the potential to do much more.

At the same time, wind and solar power diversify Manitoba's generation sources and mitigate hydropower's multi-billion dollar risk -- extended drought. Although intermittent over hours and days, wind and solar are much less variable than hydro in annual energy, since they are not subject to drought cycles. And solar power production is highest during hot summer days when export demand peaks to cool buildings in the central U.S.

Thus, although the historic core of Manitoba Hydro's business is the delivery of hydropower (supplemented by thermal resources), its present and future are interwoven with complementary alternative renewable energy technologies, further diversification of uses, and increasing efficiency.

Finally we should recognize that electricity from all sources, as delivered to consumers, is very high grade energy - instantly available at the flick of a switch, carefully regulated in frequency and voltage, and capable of driving lights, magnets, motors, sophisticated electronics and the global information and communications systems that modern societies utterly depend upon - as well as providing heat through resistance. Lower grades of energy from the combustion of biomass and fossil fuels and from solar thermal and geothermal directly provide only heat, some of which is, however, convertible (inefficiently) into electricity by thermal generation. For this reason, the efficiency guru, Amory Lovins, likens using electricity for heat to chopping up your Chippendale furniture and throwing it into the wood stove. A more efficient matching of energy sources and end-use needs is to serve space and water heating with direct heat energy sources and, *other things being equal*, save electricity for the multiple higher order uses for which it is uniquely qualified.

Summary

- An energy strategy should include an understanding of the physical, economic and social dimensions of energy systems.
- Energy solutions that mitigate harms and enhance benefits lie at the core of a green economy.
- Manitoba Hydro has a central role to play in combination with other green economy players.

- Manitoba's hydropower is one of our most important natural and economic assets, energizing our economy with high quality power and mitigating GHG emissions at home and abroad.
- Manitoba's hydropower falls short of its potential if it is squandered or fails to integrate other complementary renewable energy sources which can multiply clean energy production and reduce drought risk.

2. Making the most of Manitoba's hydropower

It is important to ensure that our Hydro asset and its premium product, hydroelectric power, are properly valued as a high-grade energy source, that the benefits of power are optimized—not squandered, that Manitoba Hydro and its assets and future development are protected from major risks, that Hydro's enabling potential for other renewable energy sources is effectively realized, and that costs and benefits are distributed justly and to maximum advantage to Manitoba and beyond.

In the course of a decade of interventions before the Public Utilities Board on Manitoba Hydro rates, policies and programming, Green Action Centre has developed a number of recommendations to meet the above objectives. We summarize these in the following paragraphs.⁹

Guiding Principles

In addition to other economic and social considerations, Green Action Centre has been guided in its interventions by principles of sustainability and justice.

Sustainability

Manitoba is fortunate to have a Sustainable Development Act, which sets out principles and guidelines for sustainable development. Among them are the following: (1) Integration of environmental and economic decisions; (2) Stewardship - managing for the equal benefit of present and future generations; (3) Global responsibility - think globally when acting locally, recognizing many kinds of interdependence while developing comprehensive and equitable solutions to problems; (4) Efficient use of resources - which means (a) encouraging and facilitating development and application of systems for proper resource pricing, demand management and resource allocation together with incentives to encourage efficient use of resources; and (b) employing full-cost accounting to provide better information for decisionmakers.

⁹ A recent statement of our positions can be found at <http://greenactioncentre.ca/2011/green-and-fair-energy-rates-for-manitoba-hydro>.

Fairness and Justice

Justice is not a singular concept but rather balances a number of principles including (1) the just distribution of benefits and costs across different people and groups, as when hydro customers are asked to pay their fair share of the costs of the utility to serve them, (2) intergenerational equity (the Stewardship principle above), and (3) social justice, i.e. meeting basic human needs and providing equality of opportunity and respect.

The concept of sustainable development (meeting the needs of the present without compromising the ability of future generations to meet their own needs) reflects both intergenerational equity and the societal purpose to meet basic human needs.

These concepts are illustrated by asking what is the fairest distribution of Manitoba Hydro's export profits. Currently the remainder of profits after deductions is used to subsidize domestic energy consumption, so that the largest users get the greatest subsidy (or, more colloquially, the biggest piggy gets the most slop). But the largest users are precisely those who cost Manitoba Hydro the most by reducing the power available for higher value export sales and by hastening the day when more expensive new power from new dams or other sources is required. We have to ask, is it fair that the benefits of export profits should be given unequally to those who consume the most electricity and also thereby cost Manitoba Hydro, and thus all customers, the most? Is there more social equity in subsidizing the plasma TVs, hot tubs and giant homes of high energy consumers by giving them a greater subsidy from exports or is it more equitable to allocate these earnings to low-income customers with a high energy burden (especially those locked into electric heat) and to reducing the basic charge and first block rates of all residential customers equally? Green Action Centre thinks it is obvious, given a robust concept of equity including social justice and a fair distribution of benefits, that the latter allocations are more equitable than the former. They also provide better Power Smart incentives by creating a faster payback on efficiency or alternative energy investments for high consumers who want to reduce their high consumption.

Efficiency and Synergy

The Manitoba Hydro Act mandates “economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power.” On one reading, this is simply the least-cost provision of the benefits of electric power. However the mandate becomes considerably more complicated when it is qualified by multiple technical requirements and alternatives, corporate goals, temporal perspectives, and societal and environmental values. With conjoint objectives at stake, optimal solutions will often be those that synergistically realize multiple objectives at once.

Power Smart programs are often described in these terms. A Power Smart investment lowers the cost of power to consumers, increases power available for export sales (thereby increasing the flow of dollars into Manitoba), and reduces environmental impacts of the electrical system through GHG mitigation from displaced coal generation in export markets and forestalling impacts of new generation and transmission. But the potential synergies don't stop there. By adding Power Smart rates and an affordable energy program for low-income customers

(described below) to complement Power Smart DSM initiatives, Manitoba Hydro can better fulfill its mandate and multiply its social and environmental benefits.

Aggressive Power Smart Efficiency and Conservation Measures

Green Action Centre acknowledges that Manitoba Hydro has done some fine work on DSM in the past, although it has been undercut by historic rates. We are concerned, however, by a precipitous decline in the forecast savings in the immediate future, as shown in the following graph (Figure 1) produced from MH data by Green Action Centre consultant Paul Chernick in the 2010-2012 GRA. Mr. Chernick further compared Manitoba Hydro to other leading programs in North America (Table 1). He noted that most jurisdictions have targeted savings in excess of 1%. Several jurisdictions have targets over 2%. Mr. Chernick noted that Manitoba Hydro's forecasts begin at 0.6% and then decline to 0.2%.

Figure 1: Manitoba Hydro's Planned DSM Savings

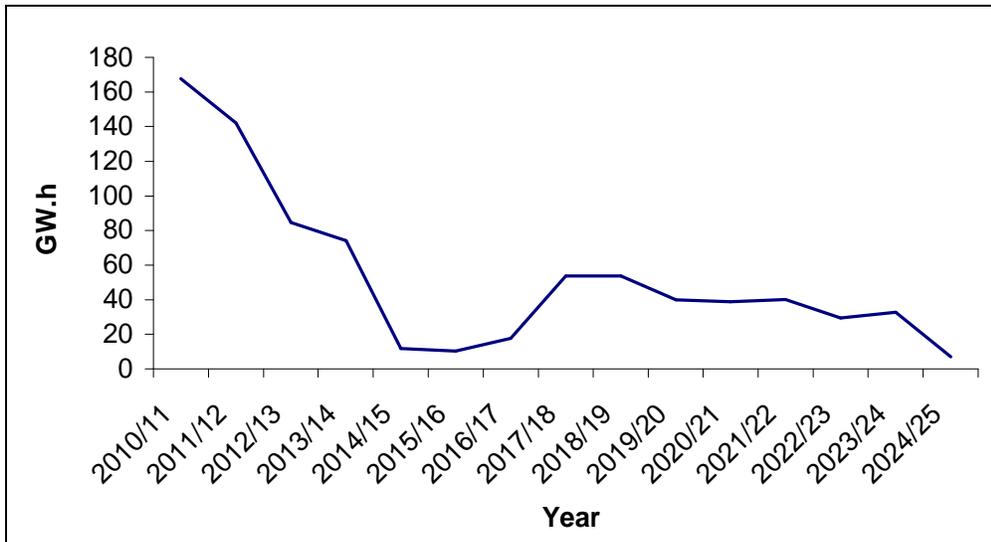


Table 1: Comparison of DSM Target Savings Ratios

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AZ		1.03%	1.02%	1.20%	1.58%	1.56%	1.54%	1.51%	1.49%	1.47%	1.45%	1.43%
CA	1.31%	1.26%	1.27%	1.28%	1.41%	0.92%	0.88%	0.90%	0.90%	0.91%	0.90%	0.89%
CO	0.53%	0.76%	0.80%	0.85%	0.90%	0.95%	1.00%	1.05%	1.10%	1.15%	1.20%	1.20%
CT	1.0%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
DE	0.5%	0.8%	1.3%	2.5%	3.0%	3.0%	4.0%					
HI	0.6%	0.6%	0.8%	0.8%	1.0%	1.0%	1.3%	1.3%	1.5%	1.5%	1.8%	1.8%
IL	0.4%	0.6%	0.8%	1.0%	1.4%	1.8%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
IN		0.3%	0.5%	0.7%	0.9%	1.1%	1.3%	1.5%	1.7%	1.9%	2.0%	2.0%
IA	1.0%	1.2%	1.3%	1.4%	1.4%							
MD	1.0%	1.2%	1.7%	2.2%	2.7%	2.6%	3.1%					
MA	1.0%	1.5%	2.0%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
MI	0.3%	0.5%	0.8%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
MN		1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
NM		0.9%	0.9%	0.8%	0.8%	0.8%	0.6%	0.6%	0.6%	0.6%	0.8%	0.8%
NY	2.1%	2.1%	2.2%	2.2%	2.2%	2.2%	2.3%					
OH	0.3%	0.5%	0.7%	0.8%	0.9%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%
PA			1.0%	1.0%	1.0%							
RI	1.2%	1.2%	1.1%									
TX	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
VT	2.6%	2.6%	2.6%									
WA	0.7%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
MB	0.6%	0.7%	0.6%	0.3%	0.3%	0.0%	0.0%	0.1%	0.2%	0.2%	0.1%	0.1%

Targets have not been set for the years in grey.

Sources: "Advancing Energy Efficiency in Arkansas," M. Neubauer, et al., American Council for an Energy-Efficient Economy, June 2010, Table 14; Manitoba savings from Appendix 9.1, Appendix A.3; Manitoba sales from Appendix 7.1, Table 1.

Green Action Centre commends the province for the creation of several tools in Bill 24 *The Energy Savings Act* that could improve future DSM performance and produce additional social benefits. How well these mechanisms work will depend on how they are exercised. Green Action Centre recommends the convening of a working group of knowledgeable stakeholders and provincial and Hydro officials to advise the Minister on how to achieve best results from the mechanisms introduced by Bill 24.

Power Smart Rates - Sustainable and Affordable Electricity Pricing

Guideline 1 of Manitoba's *Sustainable Development Act*, *Efficient Use of Resources*, calls for "encouraging and facilitating development and application of systems for proper resource pricing, demand management and resource allocation together with incentives to encourage efficient use of resources."

Yet Manitoba Hydro's current rates are at odds with its Power Smart DSM program. On the one hand the virtues of conservation are preached and various incentives offered to persuade customers to implement efficiency measures. On the other hand, because of the volumetric price

subsidies mentioned earlier, Manitoba Hydro continues to offer an increased share of export earnings as a subsidy to customers who increase their consumption.

Electric rates that fail to provide appropriate price signals to conserve energy undermine the performance of Power Smart DSM programs by offering contrary incentives. If incremental use of electricity is underpriced, the true costs of consumption growth imposed on other users, the utility, the province and the global environment are hidden and conservation and self-generation options become less cost effective and suffer a longer pay-back period. It is important to bring incentives contained in rates into accord with the conservation objective of Power Smart programs (and Manitoba Hydro's legislated mandate). A guiding principle of rate design that promotes conservation and reflects the costs of incremental usage is that most customers should face the marginal cost of consumption on their bills (including external environmental costs, we add). We call rates that are so structured Power Smart rates.

This discrepancy has been well-documented before the Public Utilities Board. In a 2005-2006 Cost of Service hearing for Manitoba Hydro, MH cited research indicating that “Short run elasticities based on more current studies show a range of -0.20 to -0.44 for Residential; -0.12 to -0.38 for Commercial and -0.39 to -0.69 for Industrial. Long run elasticities based on more current studies range from -0.35 to -2.23 for Residential; - 0.29 to -1.65 for Commercial and - 0.76 to -2.87 for Industrial.”

Energy consultant Jim Lazar drew the implications of the price elasticity of consumption by showing hypothetically what the conservation and revenue implications might be if Manitoba Hydro's rates were to reflect 100% of the marginal costs plus a \$20/tonne opportunity cost for displacing CO₂ in the export market, assuming a conservative -0.25 arc elasticity.¹⁰ Mr. Lazar calculated that, under these hypothetical conditions, and assuming the then-average export price of 5.5 cents/kW.h, Manitobans would reduce their consumption by a third (which is in the order of magnitude of Conawapa's prospective output) and the province would earn an additional \$388 million annually from export sales. The PUB and MH, in reply, noted that the export interties did not have the capacity to deliver at peak hours all the additional power that would be freed up through conservation, so off-peak pricing would reduce the estimated export revenue (PUB Order 117/06, 62-63). But the example illustrates the opportunity costs to the province of low domestic rates, especially when marginal costs are not reflected in marginal prices through inclined rates. And the intertie constraint will be relieved under the planned new “package” of export contracts plus new transmission and generation.

Because of the importance of pricing to energy conservation and fair allocation of costs, numerous utilities, including sister hydroelectric utilities BC Hydro and Hydro Quebec, have inclined (or “inverted”) rates for their residential customers, in which a second higher-cost tier better represents utility marginal costs. One of the best examples of a publicly-owned hydro utility that takes both its conservation and affordability mandates seriously is Seattle City Light. The tables below compare the SCL rate structure with Manitoba Hydro's.

¹⁰ The example was hypothetical and not recommended for implementation by Mr. Lazar. A presentation of Mr. Lazar's calculations can be found at <http://greenactioncentre.ca/wp-content/uploads/2011/07/Creating-Social-Value-through-Full-Cost-Pricing-of-Electricity-1.pdf>.

Rates Effective January 1, 2012 (http://www.ci.seattle.wa.us/light/Accounts/Rates/ac5_rt2k24.htm)

Seattle City Light Rate Schedules – Effective January 1, 2012

Rate Class	All Months
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Residential: City [RSC]

First Block *	\$ 0.0476	kWh
End Block **	\$ 0.0987	kWh
Base Service Charge per Day	\$ 0.1192	X30 = \$3.576 per month

Residential Elderly/Disabled & Low-Income: City [REC/RLC]

First Block *	\$0 .0200	kWh
End Block **	\$ 0.0366	kWh
Base Service Charge per Day	\$ 0.0597	X30 = \$1.791 per month

*\$/kWh: first 10 kWh/day in Summer (April-September); first 16 kWh/day in Winter (October-March)
 = first 300 kWh/month in Summer; first 480 kWh/month in Winter

**\$/kWh: all additional kWh/day

Compare current Manitoba Hydro residential rates (September 1, 2012)

First Block***	\$0.0694	kWh
Second Block***	\$0.0694	kWh
Basic Service Charge	1/30 = \$0.2283/ day	\$6.85 (\$13.70 over 200 amp)

***Note: MH now has a single energy rate and thus no separate blocks. Formerly MH set the first block size at 900 kWh/month with no difference between summer and winter.

We can see that, for standard residential customers, the basic service charge in Seattle is just over half of MH's per month, the first block is 2/3 of MH's flat rate and the second block is 40% higher than MH's flat rate. Thus electricity for modest consumers in Seattle is significantly cheaper than in Manitoba, while higher consumers in Seattle pay more, reflecting the marginal costs of the system. On top of that, low-income customers pay only 40% of what regular customers do. Thus modest consumers of electricity and low-income customers have far more affordable rates than do Manitobans. Green Action Centre believes that Seattle City Light shows the direction Manitoba Hydro needs to go to have truly sustainable and affordable electricity pricing. Aggressive Power Smart conservation measures should continue to complement rate reform, with a special focus on helping high-consuming and high-energy-burden customers reduce consumption and thus their bills. A further benefit from inclined rates contributing to Manitoba's green prosperity is that green businesses and green jobs will be stimulated when efficiency and renewable energy measures become more cost-effective in comparison to continuing high energy usage at fully priced tail-block rates.

One difference from Seattle is that Manitoba has electric heat customers who lack a ready alternative. On several occasions, Green Action Centre has proposed mitigating any disproportionate extra burden on these customers by adjusting the size of the lower cost first block in winter. Moreover a low-income tariff like Seattle City Light's would alleviate costs for low-income customers. Green Action Centre has proposed a more targeted and thus more cost-

effective low-income rate subsidy program than Seattle's. (See [http://greenactioncentre.ca/2011/busting-myths-on-affordable-and-sustainable-energy/.](http://greenactioncentre.ca/2011/busting-myths-on-affordable-and-sustainable-energy/))

For years, the PUB has been urging Manitoba Hydro to move towards inclined rates and for several years Hydro began to do so. In fact Manitoba Hydro's Corporate Strategic Plan commits the utility to "use rate design and targeted price signals to encourage energy efficiency." However, in the 2010-2012 GRA, Hydro hit a brick wall when they failed to introduce bill mitigation measures for electric heat customers along with their inclined rate proposal and the PUB ordered a reversion to a flat rate. What should have been a workshop exercise to develop an optimal rate scenario that considers conservation, affordability and fuel-switching issues together has been defeated in a cumbersome formal PUB process devoid of negotiated solutions derived from well-researched alternatives. There is something profoundly amiss in a Province that paints itself green when the crown utility and regulator cannot implement conservation pricing, which they have both deemed desirable for years!

Summary - Making the most of Manitoba's hydropower

- Green Action Centre has intervened in Manitoba Hydro PUB reviews for the past decade guided by principles of sustainability (as found in Manitoba's Sustainable Development Act) and robust concepts of fairness and justice, which should also guide the Province, the PUB and Manitoba Hydro.
- Current pricing of electricity, which gives the highest subsidy from export profits to the highest energy users, fails to satisfy either of these standards. The biggest piggy gets the most slop and alternative efficiency and renewable energy initiatives are undercut by subsidized tail-block energy rates.
- Successful rate reform, and other measures, will require more synergistic solutions, i.e. applying Hydro's mandate of efficiency to the realization of multiple objectives simultaneously to achieve the greatest overall benefits.
- Aggressive Power Smart efficiency and conservation measures are one area in which the value of creating multiple benefits synergistically has been recognized, yet even here, as of the last GRA, a sharp fall-off of effort and results was planned. Much more is needed to align Manitoba Hydro with the top North American utilities.
- Bill 24 *The Energy Savings Act* provides tools to address this deficiency and enhance the benefits of Power Smart. An effective advisory group could help insure the tools are well-used.
- Manitoba Hydro's current rates are at odds with its Power Smart DSM program and efficiency mandate because they perversely subsidize increasing energy use rather than distributing export benefits more equitably. A different rate structure could potentially be worth hundreds of millions of dollars to Manitoba as well as fairer to its citizen-customers.
- A Power Smart solution that combines affordability with conservation is found in the inclined or "inverted" rates of BC Hydro, Hydro Quebec and Seattle City Light, among

others. The latter has a special low-income rate as well, which prices electricity at around 40% of the rates for regular residential customers.

- Frustratingly, although both the PUB and Manitoba Hydro have acknowledged the virtues of Power Smart inclined rates for years, Manitoba Hydro has been unable to propose a rate tariff that the PUB would accept. Green Action Centre has repeatedly proposed solutions to this impasse to no avail.
- Green Action Centre has also proposed a problem-solving workshop approach to the development of a solution that addresses conservation, affordability and fuel-switching concerns together. Either the PUB or the Province should facilitate such an approach to break the logjam that has so far confined the parties to what they know to be suboptimal rate structures.

The preceding points cover terrain familiar to participants in Public Utilities Board hearings and students of energy policy, although possibly not to others, including provincial officials.

3. Energy Planning - Manitoba's First Energy Strategy

Green Action Centre welcomes a provincial commitment to engage in Manitoba's first energy strategy. Given the high importance of energy in any developed contemporary society, the centrality and value of Manitoba Hydro as a publicly-owned crown, and the increasingly urgent imperative to respond to climate change, such a planning process is indeed timely (or overdue). Moreover the planning needs to break through the hitherto closed loop of electric power planning that takes place between the provincial government and Manitoba Hydro and eschew the overly simplified stances taken in election campaigns.

We believe that Vermont hit the right note in introducing its backgrounder for public consultation for a comprehensive state energy plan concluded last year.

Energy planning is a complex matter; none of us can deny that. The technology is complex, the operational decisions are complex, the financing is complex, and the environmental effects are complex as well. Thus, energy policy and energy decision making, which try to pull together all of these elements, are inevitably complex as well.

Does this mean that we should throw up our hands and leave the decisions to technocrats and monopolists or, perhaps worse, abandon all efforts to plan and pursue a better energy future? Or can we work together, from all parts of Vermont, to seek reliable, affordable, and sustainable power?

This report presumes that Vermonters can do exactly this.

And so can Manitobans, if they are provided with appropriate background information, research and facilitation.

Green Action Centre proposes that, in planning our energy future, we build on Manitoba achievements and the best practices of others. Some guides are Manitoba Hydro's power resource planning process, Manitoba's Consultation on Sustainable Development Implementation (COSDI) recommendations, BC Hydro's Integrated Resource Planning process, Vermont's Comprehensive Energy Plan and Seattle City Light's citizen advisory committee.

Complex long-range planning that achieves its goals - Manitoba Hydro's *Power Resource Plan*

It is noteworthy that, although *TomorrowNow* is largely devoid of targets and timelines, a rather precise 43% increase in hydro-electricity generation (2,300 MW) is forecast over the next 15 years (i.e. in twice the planning horizon of *TomorrowNow*). Why does the province have this longer view in this one area? The answer lies in Manitoba Hydro's *Power Resource Plan*, whose 20 year horizon includes the completion of Wuskwatim, Keeyask and Conawapa with their planned capacities and schedules. Note that, although the Power Resource Plan crystallizes preferred alternatives for generation and transmission to 20 years out, the internal planning horizon extends much further in its consideration of other potential alternatives.

There are many ingredients to Manitoba Hydro's power resource planning, including economic forecasts for the corporation and the wider economy; domestic demand forecasts that aggregate the demand and trends for various types of end-users; the power needed to meet firm export contract obligations; the opportunities for new export contracts; the potential for curtailing demand through DSM measures; the alternative technologies, fuels and sources available for the supply of electricity; and how the various alternatives satisfy the planning criteria that Manitoba Hydro has chosen.

Remarkably, out of these many considerations reaching far into the future and involving many uncertainties and risks, decisions emerge to build new assets to meet future needs. Extensive resources are committed to the planning process before commitments are made and even greater resources to the building of new dams and transmission lines once decisions are made and subject to public review.

The lesson we draw from Manitoba Hydro's power resource planning process is that one way to insure the achievement of other clean energy objectives is to integrate them with the Hydro's planning process. For example, many jurisdictions with predominantly coal-burning utilities have developed renewable portfolio standards (RPFs) to wean off dependence on coal and develop capabilities for alternative renewable technologies and green jobs. Manitoba is blessed with being largely coal-free (except for our imported power), but there are other reasons for encouraging diversification to the system (e.g. rural economic development, drought risk reduction, multiplying Manitoba's clean energy potential, and developing capabilities for alternative technologies and green jobs). Hence it might make sense to introduce a renewable diversification portfolio standard (DPS) for Manitoba.

Conclusions and recommendations

1. Manitoba Hydro's power resource planning demonstrates the power and possibility of creating a future we want, not just through wishful thinking or pronouncements but through careful analysis of alternatives, anticipating contingencies, methodical research and analysis, and dedication of resources necessary to do the job.
2. Just as we should leverage Manitoba Hydro's firming capabilities to backstop other forms of renewable energy and thereby multiply Manitoba's clean energy potential, so should we leverage Hydro's planning capability to realize the other dimensions of a long-range energy strategy such as renewable energy diversification.
3. A missing element in Manitoba Hydro's planning process, illustrated by contrast with other jurisdictions, is a pre-NFAT consultative exploratory process when both the alternatives and criteria for evaluating alternatives are under consideration.

Adding public consultation to long-range energy planning

COSDI - Consultation on Sustainable Development Implementation

COSDI has influenced many planning processes in the province, including land-use planning on the East Side of Lake Winnipeg, watershed planning, municipal planning, and the new era of consultation and joint ownership with northern First Nations in planning new northern dams. But we are not there yet at the level of developing Manitoba Hydro's overall power resource plan. It is the provincial government and Manitoba Hydro alone who make the major resource development decisions without public input. Manitoba Hydro is then supposed to defend these decisions in a public review process before the Clean Environment Commission or other body in an NFAT proceeding.

It is true that Manitoba Hydro has initiated pre-NFAT meetings with several NGOs for the purpose of exchanging information. The purpose is to make NGOs better informed about Manitoba Hydro's planning process and Manitoba Hydro will have a better understanding of NGO concerns when they make their defense at the NFAT. However the NGOs were explicitly told that the process is in no way collaborative, i.e. that they were to have no influence on the planning process itself, e.g. by serving on a steering committee for relevant research projects, as occurred pre-Wuskwatim. So there has been a regression in consultative practice regarding alternatives from a decade ago.

In contrast, COSDI calls for "*effective/meaningful public participation and consultation processes at all levels of planning, significant resource allocation and effects assessment and review....*" and recommended that "*capacity-building mechanisms be developed to enable the meaningful public participation in sustainable development processes.*" In particular, COSDI called for "*early participation*" before significant resource allocations are decided on. Public

input is to be sought both for particular land use and resource decisions before they become irrevocable and "in establishing all public policies, legislation and strategies affecting air, land and water" [<http://www.gov.mb.ca/conservation/susresmb/cosdireport.html#10>].

First Nations have led the way, through the exercise of their constitutional rights, in having defined through court actions what is effective and meaningful consultation. COSDI says that's the way it should be for all of us.

BC Hydro's Integrated Resource Plan

Green Action Centre submits that if the public consultation principles of COSDI were followed, Manitoba Hydro's planning exercise would more closely resemble BC's Integrated Resource Plan development. BC's process developed two-stages of public engagement, first for ideas for input into their draft plan before it was written and later to review a draft Integrated Resource Plan before finalizing it. All the while, technical advisory groups also provided input [http://www.bchydro.com/energy_in_bc/irp.html.]

Vermont's Comprehensive Energy Plan

BC Hydro's IRP and Manitoba Hydro's PRP are both electric power plans for generation and transmission initiatives. Vermont's Comprehensive Energy Plan, on the other hand, covers all energy uses, in particular adding transportation, heat and industrial processes to the range of energy uses. [See <http://publicservice.vermont.gov/pub/state-plans-compenergy.html>.]

The plan was commissioned by Governor Shumlin when elected as a first-year priority and was completed in the course of 2011. Several noteworthy aspects of the plan are:

- It plans to move Vermont from 25% at present to 90% renewable energy by 2050
- Some of the objectives of the plan are
 - Fostering economic security and independence by creating local jobs in efficiency and renewables and cutting dependence on price-volatile and dirty fossil fuels.
 - Safeguarding their environmental legacy and leading by example
 - Drive in-state innovation and job creation
 - Increase community involvement and investment
- The plan recognizes four drivers of progress: Finance and Funding, Innovation and Expertise, Outreach and Education, and Regulatory Policies and Structures. Each must be addressed in all sectors.

Like BC Hydro's Integrated Resource Plan, Vermont's Comprehensive Energy Plan necessitated educating the public with background material, but also received much technical input from knowledgeable experts.

Seattle City Light's Review Panel

Tackling comprehensive long-range energy planning is a major undertaking. The creation of education and consultation engagements with the public are additional requirements, but necessary in a democracy and beneficial in identifying angles that might otherwise go unremarked and in creating public buy-in when it is evident that the final product is responsive to concerns raised, well-researched, and thoughtfully constructed.

Seattle City Light also provides for continuous citizen review of its policies and operations and participation in strategic planning through a Review Panel of knowledgeable volunteer citizens appointed by Seattle's Mayor and Council [<http://www.seattle.gov/citylightreviewpanel/>]. Said Councilmember Mike O'Brien, chair of the Energy & Technology Committee of the City Council, "The nine-member City Light Review Panel made up of individuals representing all of the utility's customer classes spent two years working with City Light to develop this plan and to talk with customers throughout City Light's service territory about what is in the plan. It's an excellent example of a thorough public process."

A look at the qualifications of the Review Panel's volunteer members shows that Seattle maintains a very cost-effective expert oversight of its electric utility, which has borne fruit in Seattle City Light's very progressive conservation, affordability and pricing policies. It provides a model for Manitoba to examine as we develop and implement a provincial energy strategy.

Conclusions and recommendations

Manitoba's COSDI recommendations on early public input on energy planning have not yet been fulfilled with respect to power resource planning in Manitoba, which still occurs in a closed loop between Manitoba Hydro and the provincial government. BC Hydro's Integrated Resource Plan, Vermont's Comprehensive Energy Plan and Seattle City Light's Review Panel provide three models of how this can be done.

4. Other remarks

The foregoing sections provide a framework for energy planning in Manitoba and observations about optimizing Manitoba Hydro's value and role. Most of the other sections of *TomorrowNow* can be handled within this framework, but we will make a few brief remarks on some of them.

New generation hydro strategy

Two questions about new hydro generation are whether it should be done and, if so, how should it be done?

The answer to the first question should be an output of power resource planning and an NFAT process that assesses power needs and evaluates alternative portfolios by multiple criteria, including costs, risks, and technical, environmental and social considerations. That evaluation

has yet to take place in a satisfactory manner and a previous PUB panel expressed skepticism about the projected costs, returns and rate impacts for Manitoba Hydro's preferred development scenario. Green Action Centre is concerned that new northern generation investments not displace investments in demand reduction, efficiency and alternative renewables. We are concerned that a steady 1.6%/year annual increase in power demand is ultimately unsustainable for a renewable, but finite hydropower resource.

On the other hand, if new northern generation can be justified, Green Action Centre reiterates the conclusion we drew at the Wuskwatim hearing.

Past hydroelectric projects, which benefited southern communities with energy, had disproportionate negative impacts on northern Aboriginal communities and ecosystems located near projects. A partnership that exercises greater care over local ecosystems and promises a share in the dividends is certainly an improvement over the past.

Of course we would welcome partnerships with First Nation communities for home efficiency retrofits, new construction and alternative renewable energy sources as well.

An improved electrical grid

Green Action Centre accepts the need for enhanced grid reliability. The evidence and testimony at the last Manitoba Hydro GRA indicated to us that enhanced interties and transmission into (and from) the U.S. are the most convincing benefit of the proposed package of new generation and export sales because of the great improvement in reliability it offers in case our northern transmission is compromised and because it permits more of Manitoba's surplus energy to be sold on-peak for better returns to Manitoba. We have not had the opportunity sufficiently to research other alternatives for generation and transmission to endorse any one. We are concerned that demand reduction, efficiency improvements and alternative renewable generation will get subordinated to and displaced by new dams.

Green Action Centre believes the grid should be constructed to insure the capability for Manitoba Hydro to perform an enhanced role in support of renewable alternatives, geothermal, district heating, demand management, electrification of transportation, and various smart grid attributes that permit the more efficient, reliable, and cost-effective use of power.

Stronger Power Smart Program

Green Action Centre is a long-time supporter of and advocate for Power Smart improvements for the reasons outlined earlier and in *TomorrowNow*. We also believe that Bill 24 has provided tools for strengthening the Power Smart program, particularly if they are used in combination with Manitoba Hydro incentives and low-income support and extended from residential to commercial customers.

We believe that a more aggressive Power Smart program is possible (a) by operating in resource acquisition, not just customer service mode; (b) by enhanced standards for new construction that correspond to passive house, LEED, or R2000 standards and are zero-net-energy ready; (c) by improving the economic incentives through Power Smart rates; (d) by better targeting of high consumption and high energy burden customers; (e) by improved financing options such as are enabled by Bill 24; (f) by initiating contractor programs for large-scale DSM resource acquisition; and (g) by exploring new configurations of denser housing and district energy systems.

We believe that a semi-expert stakeholder advisory group (on the Seattle City Light model) with research support would be useful for proposing and evaluating demand reduction, efficiency enhancement, and alternative renewable energy programs and delivery channels.

More green heat through geothermal

On the face of it, geothermal has two attractions from an environmental standpoint: (a) it makes more efficient use of electricity for heating than direct electric resistance heat, allowing the saved power to be exported to the US where it will largely displace electricity generated by fossil fuels, thus reducing global GHG emissions, and (b) it displaces GHG emitting natural gas heat in Manitoba. However, since Manitoba power is interconnected to the midwestern U.S. where coal generation dominates, in fact, by Manitoba Hydro's calculations, the extra power consumed by geothermal pumps and supplemental resistance heat requires replacement from coal and gas generation in the US, which emit more GHGs than natural gas heating in Manitoba.¹¹ Hence, with the current composition of generation in the total Midwest Independent System Operator (MISO) market in which Manitoba Hydro participates, geothermal replacing electric resistance heat has a favourable impact on global emissions but no impact on Manitoba's GHGs, whereas geothermal replacing natural gas heat from high efficiency furnaces actually increases global GHG emissions, although reducing those occurring in Manitoba. In addition, each of these switches has economic consequences for Manitoba Hydro, the customer, and the province.

It is clear, then, that geothermal and electric heat policies are far from straightforward in their environmental and economic costs and benefits, although geothermal is clearly superior to electric resistance in most circumstances. Moreover, policy solutions must take a longer range view to consider scenarios and possible trajectories towards a green future. This is an area in which a policy working group should be looking at the research and forecast scenarios to develop sound, robust policies for Manitoba, including those governing the future of natural gas in Manitoba. Climate change mitigation policies must quintessentially take both a local and a global perspective to achieve "glocal" solutions. That is why the issue of preventing "leakage" of GHG emissions from one jurisdiction to another used to be an important topic of climate change

¹¹ See *Economic, Load, and Environmental Impacts of Fuel Switching in Manitoba* at http://www.hydro.mb.ca/regulatory_affairs/electric/gra_2012_2013/Appendix_26.pdf.

policy discussions. We believe that it is still important and needs a thorough investigation. Furthermore we believe that sound environmental policy should be based on the best available knowledge and include long-range and global perspectives. Avoiding "inconvenient truths" should not be an option.

In the meantime, we propose the following rules of thumb.

- Investments in demand management and energy efficiency are unequivocal in their positive GHG mitigative effects and should precede any energy technology and fuel sourcing.
- Other renewables than grid electricity, like solar thermal, solar electric and biomass, can have positive GHG mitigative effect.
- A geothermal deployment policy should ensure that installations to replace electric resistance heat are sufficient to compensate for the extra electric demand created by replacing natural gas heat. In that way, the net results of the province-wide policy need not yield a net increase in global emissions.

Electric vehicle leadership

Transportation is Manitoba's largest GHG emitting sector. Demand reduction, fuel-efficiency and GHG efficiency through natural gas engines, such as those used by Emterra's garbage and recycling trucks, are three ways to address this issue, but ultimately the electrification of transportation while cleaning up the GHGs to produce electricity are on the most compelling path to a cleaner transportation system. Transportation electrification also offers a promising economic opportunity, particularly for Manitoba's bus industry, and a very low-cost fuel for consumers.

Along with range anxiety, vehicle cost still remains a significant barrier to individual retail adoption. In addition to the measures mentioned in *TomorrowNow*, attention should be paid to permitting and promoting lower cost electric vehicle options, such as small commuter vehicles and electric bicycles and scooters.

Increased biofuel production and use

Please see the response to this topic in our Climate Change brief.

Green mining in Manitoba

Classic sustainable development theory contemplates the investment of a portion of income from non-renewable resources into innovation at a sufficient rate to enable a transition into renewable substitutes. Other considerations are to pace the exploitation of non-renewables so as to have a longer term economic base for communities dependent on this source and pollution prevention.

Changing our ways for a changing climate: Reducing Greenhouse Gases (GHG)*

The Challenge

In the *Tomorrow Now* document, the government states its intent to present a strategic plan “. . . to protect the environment while ensuring a prosperous and environmentally-conscious economy.” Given the track record of the provincial economy over the last 20 years, the challenge is to protect the environment in the face of an expanding population and growth in real incomes. Table 1 reveals that, since 1990, the real per capita income of Manitobans has increased as has the population and the total level of greenhouse gas (GHG) emissions. Economic growth has come at the price of rising greenhouse gases and the climate change that results.

Table 1: Trends in Per Capita GDP, Population and Greenhouse Gas Emissions – Manitoba – 1990 to 2010

Year	Per Capita GDP (2002\$)	Total Population	GHG Emissions Intensity (ktCO ₂ e ¹ /\$BGDP)	Total GHGs (ktCO ₂ e)
1990	\$26,425.2	1,105,421	626.5	18,300
2000	\$30,920.9	1,147,313	591.9	21,000
2010	\$35,197.9	1,234,535	455.7	19,800

Source: Statistics Canada, CANSIM Tables 384-0002 & 51-0001; National Inventory Report.

Note: ¹ “ktCO₂e” stands for - kilotonnes of CO₂ equivalent. This measure expresses the various greenhouse gases emitted as a standard unit of carbon dioxide.

Table 1 also reveals that substantial progress occurred between 1990 and 2010 in decoupling economic and population growth from rising GHG emissions. In 1990, every billion dollars of GDP produced 626.5 kilotonnes (kts) of GHGs. By 2010, the GHG emissions intensity of the economy had fallen to 455.7 kts. However, the reductions in emissions intensity were not sufficient to offset the effect of rising incomes and population. By 2010, GHG emissions were 1,500 kts above 1990 levels and 2,600 kts above the Kyoto target of 17,200 kts (6% below 1990 levels). Thus, in order to meet the Kyoto target of 17,200 kts, either the economy will have to shrink or the GHG emissions intensity of the economy will have to fall or both. Given the mathematical relationship between per capita GDP, population, GHG Emissions Intensity and

* by Harvey Stevens with input from Ani Terton

Total GHGs (Total GHGs = Per Capita GDP x Population x GHG Emissions Intensity), any one of the the following single changes would achieve the GHG emissions target of 17,200 kts in 2010:

- Real Per Capita GDP of \$30,579;
- Provincial Population of 1,072,547; or,
- Emissions Intensity of 395.8.

For the provincial government, intentional reductions in the size of the economy or population are not options. Thus, if the province is to achieve the targeted levels of GHG emissions set out in the Climate Change and Emissions Reduction (CCER) Act, the provincial government will have to aggressively pursue programs and policies that reduce the emissions intensity of the economy on an ongoing basis. Just to meet the CCER targets by the end of 2012, it would have to reduce emissions intensity to 396 ktCO₂e per billion dollars of GDP. Furthermore, given that the real economy (GDP) has been growing at an average rate of 2 per cent per year between 2000 and 2010, ongoing annual reductions in the emissions intensity of the economy are required, in the order of 8 ktCO₂e per Billion Dollars of real GDP.

This is a daunting challenge and it is the purpose of this response to assess whether the proposed measures are adequate to meeting that challenge; and, if not, what further measures are required.

A Review and Explanation of the Trends in GHG Emissions

The results of the latest *National Inventory Report* prepared by Canada for the Inter Governmental Panel on Climate Change, released in April 2012, show that Manitoba's level of Greenhouse Gas Emissions (GHG's) were some 2,600 kts of CO₂e, which is 15% above the target set by the province's own Climate Change and Emissions Reduction (CCER) Act in 2010.

Table 2 below reveals the following key points about the production of GHG's in Manitoba since 1990:

- Overall, emissions increased from 18,300 ktCO₂ eq. in 1990 to 21,300 ktCO₂ eq. in 2007 and have since fallen to 19,800 ktCO₂ eq. which may be, in part, a result of the actions taken by Manitoba since the enactment of the CCER Act. Manitoba's *Report on Climate Change For 2010* indicates that its measures resulted in reductions of 882 kts by 2010 which represents half of the decrease recorded in the National Inventory Report.
- Some sectors of the provincial economy have shown declines in GHG emissions while others have demonstrated increases in GHG emissions.
- Individual sectors showing the largest contributions to declines in GHG emissions are:
 - Off-road Gas & Diesel Transportation and Pipelines (-54.3% of Total Gap in GHG Emissions);

- Residential Heating (-19.4% of Total Gap);
 - Electricity and Heat Generation (-14.5% of Total Gap);
 - Light duty Gas Vehicles (-14.0% of Total Gap);
 - Field Burning of Agricultural Residues (-4.2% of Total Gap); and,
 - Mineral, Chemical and Metal Production Processes (-3.9% of Total Gap).
- Individual sectors showing the largest contributions to increases in GHG emissions are:
 - Heavy Duty Diesel Trucks (+45.5% of Total Gap);
 - Agricultural Soils (+42.3% of Total Gap);
 - Light Duty Gasoline Trucks (+32.9%);
 - Enteric Fermentation (+22.2% of Total Gap);
 - Solid Waste Disposal on Land (+12.5% of Total Gap);
 - Stationary Energy Consumption for Manufacturing Industries (+11.3% of Total Gap); and,
 - Fugitive Sources from Oil and Gas Industries (+11.1% of Total Gap).
- With respect to the sectors showing decreases in GHG emissions, the National Inventory Report and our own analyses provide the following reasons:
 - GHGs from residential heating have declined in spite of a 48 per cent increase in floor space which, by itself, would have caused an increase in GHG emissions. Offsetting this increase was the switch to natural gas heating, upgrading to high efficiency furnaces (in part facilitated by Manitoba Hydro's furnace replacement program and the new provincial furnace standard), energy efficiency improvements in house construction and renovation and the warming of the climate, resulting in lower 'heating degree-days'.

**Table 2: GHG Emissions Summary for Manitoba, 1990 to 2010
(kilotonnes of CO₂ Equivalent)**

Source	Emission Levels			CCER Act Target Emission Levels	Gap in Emission Levels (Target – 2010)	
	1990	2007	2010		Absolute Gap	% of Total Gap
Total	18,300	21,300	19,800	17,202	2,598.0	100.0
Stationary Combustion Sources – Total	4,770	4,860	3,990	4,484	-493.8	-19.0
Electricity & Heat Generation	497	486	89	467	-377.8	-14.5
Fossil Fuel Production & Refining	4	0	0	4	-3.3	-0.1
Mining & Oil and Gas Extraction	76	323	175	71	103.9	4.0
Manufacturing Industries	1,060	1,410	1,290	996	293.6	11.3
Construction	63	102	106	59	46.7	1.8
Commercial & Institutional	1,400	1,410	1,230	1,316	-86.0	-3.3
Residential	1,600	1,100	1,000	1,504	-504.0	-19.4
Agriculture & Forestry	42	55	79	40	39.4	1.5
Road Transportation – Total	3,750	5,180	5,160	3,525	1,635.0	62.9
Light Duty Gasoline Vehicles	1,610	1,240	1,150	1,513	-363.4	-14.0
Light Duty Gas Trucks (inc. SUV's & minivans)	847	1,770	1,650	796	853.8	32.9
Heavy Duty Gas Vehicles	341	254	246	321	-74.5	-2.9
Light Duty Diesel Vehicles	15	13	15	14	1.6	0.1
Light Duty Diesel Trucks	40	112	119	38	81.3	3.1
Heavy Duty Diesel Vehicles	828	1,770	1,960	778	1,181.7	45.5

Off-Road Gas & Diesel Vehicles & Pipelines	2,300	1,700	750	2,162	-1,412.0	-54.3
Fugitive Sources – Oil & Natural Gas	386	626	651	363	288.2	11.1
Mineral, Chemical & Metal Production Processes	230	114	114	216	-102.2	-3.9
Production & Consumption of Halocarbons	5	200	260	5	255.3	9.8
Other Production	55	40	270	52	218.3	8.4
Solvent & Other Product Use	7	12	9	7	2.4	0.1
Agriculture – Enteric Fermentation	1,300	2,000	1,800	1,222	578.0	22.2
Agriculture – Manure Management	380	660	610	357	252.8	9.7
Agriculture Soils (Direct, Indirect & pasture use)	3,300	4,200	4,200	3,102	1,098.0	42.3
Agriculture – Field Burning of Ag. Residues	130	16	14	122	-108.2	-4.2
Solid Waste Disposal on Land	560	820	850	526	323.6	12.5

Source: Canada – National Inventory Report 1990-2010 Part 3. Table A14-14

- Detailed unpublished data from Environment Canada on road transportation (see, Appendix 1) show that the dramatic reduction in GHGs from light duty gas vehicles was due entirely to improvements in the fuel efficiency of the fleet and cleaner burning fuels. Between 2000 and 2010, gains in the fuel efficiency of the vehicles resulted in a decline of 102 ktCO₂ eq. and cleaner burning fuels resulted in an additional decline of 156 ktCO₂ eq. Offsetting these declines were increases of 102 ktCO₂ eq. due to the greater number of vehicles and longer distances driven.
- The reductions in GHGs from electricity and heat generation (-408 ktCO₂ eq.) are likely due to the phasing out of the coal burning plant in Brandon. As indicated in Manitoba's report on *Climate Change for 2010* (pg.7), the limited use of the Brandon coal fired facility resulted in a reduction of 350 ktCO₂ eq. by 2010. 2010 was also a high water year for hydro, requiring no backup from natural gas generation. In 2010, fossil fuel thermal units operated only at minimum levels needed to maintain readiness. In future lower flow and drought years we can expect higher emissions from increased thermal generation.

With respect to those sectors showing increases in GHG emissions, the National Inventory Report and our own analyses provide the following reasons:

- Nitrous Oxide emissions from soils and CH₄ from enteric fermentation constitute the largest sources of non-carbon dioxide emissions from agriculture. Nitrous oxide is the major GHG produced from agricultural soils and accounts for more than half of Manitoba agriculture's GHG emissions. These emissions can be further broken down into their specific sources from soil, including direct sources (50%) and indirect sources (42%).
- Enteric fermentation makes up the second largest proportion of GHG emissions in Manitoba agriculture. Methane is released from ruminant livestock as a by-product of digestive fermentation.
- GHG emissions from agriculture soils are due both to the *direct* emission of nitrous oxide from soil after application of synthetic nitrogen fertilizers and animal manure and to the *indirect* emission of nitrous oxide following releases into the environment from fertilizers and manures of ammonia and nitrate. The reduction in summer fallow and intensification of cropping systems is partly responsible for the increase from these sources.
- The dramatic increase in GHGs from enteric fermentation since 1990 is largely due to the increased number of cattle in Manitoba as well as increases in emissions intensity, as the vast majority (93%) of enteric fermentation emissions are from cattle rather than from hogs (4.5%). Cattle populations in Manitoba increased between 1990 and 2005 and have declined to about 2000 levels in 2010. The following table shows the numbers of cattle and the GHG emissions intensity of cattle operations in Manitoba between 1990 and 2010.

Table 3: GHG Emissions from Cattle and Calves – Manitoba 1990 to 2010

Year	Total Cattle & Calves (millions)	GHG's from Cattle Enteric Fermentation	Tonnes GHG per Livestock
1990	0.9835	1,249 kt	1.27
2000	1.2800	1,694 kt	1.32
2005	1.6125	2,064 kt	1.28
2010	1.2850	1,678 kt	1.31

Source: Environment Canada

- The table shows that there has been an increase in the emissions intensity from cattle operations in Manitoba between 1990 and 2010 from 1.27 tonnes per head of livestock in 1990 to 1.31 tonnes in 2010. The National Inventory Report indicates

that for all types of cattle increased emissions per head per year since 1990 are due to increases in the live weight of animals resulting in more consumption and higher GHG emissions

- The increase in GHGs from fugitive sources is entirely due the growth in the oil and gas industry in Manitoba. The fugitive sources include the intentional or unintentional releases of GHGs from the production, processing, transmission, storage and delivery of fossil fuels. Released gases that are combusted before disposal; e.g. flaring of natural gases at oil and gas production and processing facilities are also considered fugitive emissions. Between 2004 and 2010, the number of producing oil wells in Manitoba doubled and the amount of oil extracted almost tripled from 1,710 (11, 020 barrels per day) to 3,300 (29,000 barrels per day).
- Detailed unpublished data from Environment Canada on road transportation (see, Appendix 1) show that the dramatic increase in GHGs from light duty gas trucks was due entirely to the dramatic increase in the number of such vehicles. Of the total increase in GHGs from this class of vehicle between 2000 and 2010 (+162 ktCO₂ eq.), the increase in the number of vehicles alone accounted for an increase of +441 ktCO₂ eq. Offsetting this increase were reductions in GHG emissions due to more fuel efficient vehicles (-78 ktCO₂ eq.) and cleaner burning fuels (-183 ktCO₂ eq.)
- Similarly, the dramatic increase in GHGs from heavy duty diesel vehicles was due entirely to the increase in the number of such vehicles and in the average distance driven. Of the total increase in GHGs from these vehicles between 2000 and 2010 (+700 ktCO₂ eq.), the increase in the number of vehicles accounted for +499 ktCO₂ eq. while the increase in the distance driven added another +206 ktCO₂ eq. Offsetting these increases were small reductions due to greater fuel efficiency of the vehicles (-41 ktCO₂ eq.) and cleaner burning fuels (-15 ktCO₂ eq.).

Manitoba's Response to the Challenge of Rising GHG Levels

Table 4 shows how the GHG reduction measures set out in the *Tomorrow Now* align with these sources of emissions.

Table 4: “Tomorrow Now” Responses to Reducing Greenhouse Gases by Source

Source	% of Total Gap	“Tomorrow Now” Responses
Electricity & Heat Generation	-14.5	Building a Coal-Free Manitoba
Fossil Fuel Production & Refining	-0.1	
Mining & Oil and Gas Extraction	4.0	
Manufacturing Industries	11.3	
Construction	1.8	
Commercial & Institutional	-3.3	National Leader in Energy Efficiency, Stronger Power Smart Program, More Geothermal
Residential	-19.4	
Agriculture & Forestry	1.5	
Light Duty Gasoline Vehicles	-14.0	Electric Vehicle Leadership, Increased Biofuel Production & Use, Mb. Emissions Reduction Challenge, Reduced Tailpipe Emissions, Active Transportation Strategy, Capital Region Transportation Master Plan
Light Duty Gas Trucks (inc. SUV’s &	32.9	
Heavy Duty Gas Vehicles	-2.9	
Light Duty Diesel Vehicles	0.1	Increased Biofuel Production & Use
Light Duty Diesel Trucks	3.1	
Heavy Duty Diesel Vehicles	45.5	
Off-Road Gas & Diesel Vehicles & Pipelines	-54.3	
Fugitive Sources – Oil & Natural Gas	11.1	
Mineral, Chemical & Metal Production Processes	-3.9	
Production & Consumption of Halocarbons	9.8	
Other Production	8.4	
Solvent & Other Product Use	0.1	
Agriculture – Enteric Fermentation	22.2	
Agriculture – Manure Management	9.7	Incenting the acquisition of new technologies to manage manure responsibly through the new Nutrient Management Tax Credit

Agriculture Soils (Direct, Indirect & pasture use)	42.3	
Agriculture – Field Burning of Ag. Residues	-4.2	Better stubble burning mitigation (stronger enforcement regulation), alternatives will be explored and promoted
Solid Waste Disposal on Land	12.5	Reduced Landfill Gas Emissions

This comparison reveals several things:

- First, the government's response is targeted to only a few of the many sources of GHG emission. There are no measures for addressing GHG emissions from the manufacturing and the oil producing sectors of the economy or the production and consumption of halocarbons.
- Second, it fails to effectively address big increases in GHG emissions from the agriculture¹² and the road transportation sectors.
- Third, a number of its initiatives are targeted to areas where there are already reductions in GHG emissions. These reductions could be due, in part, to these initiatives having been in place for a number of years now. And, a further expansion or intensification of these initiatives should lead to further GHG reductions.

Additional Measures Required to Achieve the CCER Target Level of GHG Emissions

Broad/Economy-Wide Measures

A number of European and Canadian jurisdictions have implemented **carbon taxes** either as a way of reducing GHG emissions and/or of raising revenues to fund carbon mitigation programs and create market signals for consumers. The programs implemented by these jurisdictions differ in terms of the types of carbon sources taxed, the tax rate applied to them and the use of the resulting revenues. Sumner et al. (2011)¹³ provide an overview of the experience with and policy design issues involved in implementing carbon taxes. Both Quebec in 2007 and British Columbia in 2008 implemented quite different carbon tax systems which offer options for designing a carbon tax for Manitoba.

¹² It should be noted that Manitoba Agriculture, Food and Rural Initiatives (MAFRI) has in place a program for promoting sustainable agriculture practices such as improved manure storage methods, reduced fertilizer use and zero or minimal tillage practices. However, the program is voluntary, does not have sufficient funds to meet demand and has no reporting mechanisms to track performance. A second program is in partnership with Manitoba Water Stewardship, Ducks Unlimited Canada and the Manitoba Habitat Heritage Corporation to work with farmers to permanently restore drained wetlands.

¹³ See, J. Sumner, L. Bird & H. Dobos. 2011. *Carbon taxes: a review of experience and policy design considerations*. *Climate Policy*, 11:2, 922-943. <http://dx.doi.org/10.3763/cpol.2010.0093>

Quebec's carbon tax is imposed on fossil fuel distributors at the low rate of \$3.50 per metric tonne of CO₂ on gas, diesel fuel, light heating oil and coal. This translates into a tax of 0.8 cents per litre of gasoline, 0.9 cents per litre of diesel fuel, 0.96 cents per litre of heating oil and \$8.00 per tonne of coal. The tax generates about \$200 million per year for the province's "Green Fund" and is used to fund Quebec's greenhouse gas reduction programs including heavy investments in public transit, intermodal transport and use of rail and marine for transporting goods, heavy oil consumption reduction measures, capture and use of biogas and others.

By comparison, B.C.'s carbon tax features a much higher rate of initially \$10 per tonne of CO₂ in 2008, rising in equal steps to \$30 per tonne in 2012 which translates into the following 2012 prices for fuel: 6.67 cents per litre of gasoline, 8.07 cents per litre of diesel fuel, 4.62 cents per litre of propane, 5.70 cents per cubic metre of natural gas and substantially higher prices for coal, coke, tires and peat fuel. The tax is paid by the individual purchaser and remitted to government by the vendor. In 2010/11, it raised \$741 million. This income was then redistributed in the form of a tax credit to low income households and reductions in both personal corporate tax rates which amounted to some \$124 million more than was collected in 2010/11. Separately, the B.C. government funded a broad range of greenhouse gas reduction measures from its general revenues. Thus, the B.C. carbon tax serves the purpose of discouraging consumers from using fossil fuels by raising their price while encouraging employment by lowering the cost of creating jobs and raising after-tax wage rates.

Based on volumes of gasoline, diesel fuel and natural gas consumed by Manitobans in 2010, a \$30 per tonne carbon tax would generate about \$158.2 million in gas and diesel taxes and \$114.2 million in natural gas taxes for a total of \$272.4 million. This represents 11 per cent of total individual taxes paid by Manitobans. Based on our analysis of the price elasticity of fuel taxes (see Appendix 3), the 6.67 cent tax on gasoline would lead to a 2.6 per cent reduction in fuel consumption and 78 ktCO₂e fewer GHGs. The total reduction in GHGs would be higher, given the impact on diesel fuel and natural gas consumption. Thus, from the standpoint of reducing GHG emissions, a carbon tax of the type implemented by B.C. represents a powerful tool, particularly if part of the revenue were directed to the kind of green investments made by Quebec.

Measures Aimed at Reducing GHGs from Road Transportation

The formula presented in Appendix 1 for calculating the total GHGs emitted from vehicles provides the list of the types of measures that can be used to reduce GHGs, including those aimed at,

- Reducing the vehicle kilometers driven either by reducing the number of vehicles and/or the distance driven by each vehicle;
- Increasing the fuel economy of the fleet; and,
- Improving the type of fuel to that emitting fewer GHGs per litre.

Litman¹⁴ provides a useful list of transportation emission reduction strategies aimed at these three approaches to reducing GHG emissions:

Cleaner Vehicles	Mobility Management		
<i>More Efficient and Alternative Fuel Vehicles</i>	<i>Improved Transport Options</i>	<i>Incentives to Choose Efficient Options</i>	<i>Land Use Management</i>
Efficient vehicle technology development	Transit improvements	Congestion pricing	Smart growth policies
Fuel efficiency standards (such as CAFÉ)	Walking & cycling improvements	Distance-based fees	Transit oriented development
Alternative fuel requirements and incentives	Rideshare programs	Commuter financial incentives	Location-efficient development
Feebates(financial rewards for purchasing efficient and alternative fuel vehicles)	HOV priority	Parking pricing	Parking management
Fuel tax increases	Carsharing	Parking regulations	Carfree planning
	Telework & flextime	Fuel tax increases	Traffic calming
	Taxi service improvements	Transit encouragement	

More Efficient and Alternative Fuel Vehicles

Regarding the promotion of more efficient and alternative fuel vehicles, the *Tomorrow Now* document cites two initiatives aimed at doing so: Electric vehicle leadership and increased biofuel production and use. These are both aimed at reducing the GHG emissions from the motive fuel. They have the advantage of not suffering from the ‘rebound effect’ which occurs with measures aimed at increasing the fuel consumption ratio of vehicles: People tend to drive longer distances when they purchase more fuel efficient vehicles which reduces the impact of the measure on curbing GHG emissions. Litman indicates that the rebound effect can be as high as 30 per cent.

Based on a recent Canadian life cycle analysis of the GHG emissions from biofuels¹⁵ we estimate that the current levels of production of ethanol (8.5% blend) and biodiesel (2% blend) are reducing GHG

¹⁴ See, Todd Litman, *Smart Transportation Emission Reduction Strategies*. Victoria Transport Institute. Nov. 24, 2011. Page 3.

¹⁵ See, Canadian Renewable Fuels Association, 2009. *Life Cycle Assessment of Renewable Fuel Production from Canadian Biofuel Plants for 2008-2009*. Tables 4 and 5.

emissions in Manitoba by a total of 202.5 ktCO₂ eq. (see, Appendix 2 for details). This is considerably lower than the estimate provided by Manitoba in its 2010 progress report of 393 ktCO₂ eq. The main difference is the much lower estimates of GHG reductions due to ethanol.

Were the current mandates of 8.5% ethanol and 2% biodiesel raised to 10% and 5%, respectively, Manitoba could achieve a further total reduction of 104 ktCO₂ eq. based on 2010 levels of fuel consumption. These targets are within the currently acceptable levels of vehicle manufacturers. Were Manitoba to mandate a 20 per cent concentration of biodiesel fuel, which is a currently acceptable level in the United States, it would further reduce GHG emissions by 464 ktCO₂ eq. However, that would require the production of close to 154 million litres of biodiesel which far exceeds the current capacity of 30 million litres. Thus, a 5 per cent blend of biodiesel is a more realistic target for Manitoba to aim for.

In addition to promoting electric cars and higher levels of biofuel production and consumption, Manitoba could look at instituting either a registration/circulation fee that is based, in part, on the fuel economy of the vehicle or a feebate system which offers rebates on fuel efficient new vehicles and fees on fuel inefficient new vehicles. The trends presented in Table 1 and Appendix 1 make a compelling case to implement these programs to induce vehicle owners to switch to more fuel efficient vehicles. The number of light duty gas trucks rose substantially between 2000 and 2010 and their share of the total light duty gas vehicle market rose from 42 to 47 per cent. As a result, by 2010, they represented 33 per cent of the total gap in GHG emissions.

In 2000, the United Kingdom introduced an annual ‘vehicle excise duty’ (VED) on all cars registered after March 1, 2001 based on their average CO₂ emissions (grams per kilometer). Currently, there are seven levels of fees which are progressively higher, the higher the CO₂ emissions. A key advantage of such a system of fees is that it encourages people to buy more fuel efficient second-hand vehicles which comprise the bulk of vehicles on the road. Such a system could be implemented in Manitoba via changes to the *Automobile Insurance Certificates and Rates Regulation*. That regulation sets out a detailed schedule (B) which shows the insurance rating for every type of vehicle on the road by manufacturer, fuel type, number of cylinders and year of make. A parallel table showing the rated fuel efficiency for each model would provide the basis for setting a supplementary rate schedule based on the fuel efficiency of the vehicle.

Alternatively, Manitoba could introduce a ‘feebate’ for the purchase of *new* vehicles: Purchasers of new vehicles with a rated fuel efficiency (grams of CO₂/km) below a threshold level would receive a rebate proportional to the amount by which the fuel efficiency was below the threshold level. Conversely, those buying vehicles with fuel efficiencies above the threshold level would pay a fee, again proportional to the amount by which the fuel efficiency was above the threshold level. The design of such a program is crucial to achieve the objective of reducing GHG levels.

A recent analysis of the feebate program introduced in France in late 2007¹⁶ found that a feebate program can create five different types of effects. In the short run, it changes the *composition* of the fleet in favour of more fuel efficient vehicles. However, offsetting this positive increase, it can create a rebound effect where the drivers of the more fuel efficient vehicles drive farther distances. As well, if the set of rebates are too generous, it can induce people to buy more vehicles than they normally would, leading to higher GHG emissions from the production of the extra vehicles and greater distances driven. In the French example, these offsetting effects were greater than the composition effect, with the result that GHG emissions actually rose. However, the analysis found that a more modestly scaled feebate program would have achieved reductions in GHGs. A recent report from California provides detailed guidance on the design of an optimal feebate system.¹⁷ It finds,

Quantitative models suggest that a single benchmark system (i.e. one that is not indexed to vehicle size or class) would yield the largest reduction in greenhouse gas emissions, but also the largest reduction in consumer welfare (measured by Consumer Surplus). However, when future fuel savings are taken into account, a single benchmark system would yield the largest net social benefit. (pg. 38)

Increases in the excise tax on gas and diesel fuel are another method of raising the cost of operating a vehicle and thus discouraging its use. A recent report¹⁸ suggests that gas tax increases are an effective tool in promoting reduced use of vehicles. Particularly if the revenues from those taxes are used to make greener transportation options more available such as investments in public transit and active transportation measures, there are greater reductions in vehicle use. Appendix 3 presents an estimate of the impact of the recent 2.5 cent per litre increase in the gas and diesel excise tax in Manitoba on GHG emissions. It shows that the reductions amount to 29.2 ktCO₂ eq. in the short-run. Longer-run impacts would be even higher, as people switch to more fuel efficient vehicles, move closer to work and use alternative transportation modes more frequently. In addition, the 2.5 cent increase is expected to raise \$50 million. Thus, the justification for further increases in the excise tax on fuel are both further reductions in GHG emissions and the additional revenue required for investments in GHG reduction measures such as public transit, as Quebec and British Columbia have done. In addition, equity would be served by having gas taxes better reflect the cost of maintaining Manitoba's roads and bridges. At present, they cover less than half of the cost.

¹⁶ Xavier D'Haultfoeuille, P. Givord, X. Boutin. *The Environmental Effect of Green Taxation: The Case of the French "Bonus/Malus"*. Institut National de la Statistique et des Etudes Economiques. Sept. 2011.

¹⁷ See, D.S. Bunch et al. *Final Report: Potential Design, Implementation, and Benefits of a Feebate Program for New Passenger Vehicles in California*. Feb. 2011

¹⁸ Todd Litman, *Comprehensive Evaluation of Transport Energy Conservation and Emission Reduction Policies*. Victoria Transport Institute. March 8, 2012.

The increasing use of heavy duty diesel vehicles for freight transportation is responsible for 45 per cent of the total gap in GHG emissions. Thus, measures are required to address this source of high GHG emissions. The promotion of higher concentrations of biodiesel and higher taxes on diesel fuel are two such measures. A third is the encouragement of the use of rail as the transportation mode as is being done by the Quebec government. Appendix 4 shows that rail produces 8 times less GHGs per tonne-kilometer of freight (0.041 vs. 0.411 lbs).

Mobility Management Policies

Litman notes that there are three types of policies aimed at managing mobility: improved transport options in favour of sustainable transportation such as public transit, walking and cycling, financial incentives for choosing such options and land use management practices. A number of these fall within municipal responsibilities such as transit improvements, active transportation infrastructure, HOV lanes, congestion and parking pricing, smart growth policies and transit oriented development, parking management. The City of Winnipeg's recently adopted *Transportation Master Plan* emphasizes the importance of an active transportation infrastructure, a rapid transit system that features four corridors and land use planning that favours more intensive development of existing built-up areas of the city to support rapid transit and for designing and building new communities with compact urban form and road and transportation networks that are more conducive to public transit, walking and cycling.

However, the provincial government can support the greater development of sustainable transportation by encouraging the Manitoba Public Insurance Corporation to look at implementing a distance-based auto insurance system and by providing dedicated funding for the construction of an adequate rapid transit system for Winnipeg.

Regarding distance-based vehicle insurance, Litman¹⁹ shows that the number of vehicle crashes increases with distance driven and that a properly designed distance-based vehicle insurance system can reflect these risks. Of the options in place in various jurisdictions, Litman's analysis shows that a mandatory per-mile premium system offers the greatest positive impacts on a range of performance criteria, with an optional per-mile premium system performing second-best. The benefits include improvement in road safety, lower emissions, reduced congestion, consumer savings, equity and affordability.

Regarding provincial financial support for public transit, there are a number of reasons for advocating this measure. First, compared to Single Occupancy Vehicle (SOV) commuting, the current level of public transit use results in lower GHG emissions per passenger kilometer travelled. The average light duty gas vehicle and truck emits about 0.535 lbs. of CO₂e per

¹⁹ See, Todd Litman, *Distance-based Vehicle Insurance as a TDM Strategy*. Victoria Transport Institute. 8 June 2011.

vehicle kilometer compared to only 0.25 lbs of CO₂e per passenger kilometre, at a current low utilization level of public transit (see, Appendix 5 for details). This difference in GHG emissions means that for every 3,200 commuters who switch from using their car to public transit on a full-time, full-year basis (12 km per day x 200 days), there would be a reduction of 1 kilotonne of GHG emissions. Second, increasing the utilization levels of public transit requires that commute times are reduced, as a recent Statistics Canada analysis revealed.²⁰ A fully developed rapid transit system is required to achieve shorter commute times. Third, the schedule for the development of the rapid transit network set out in City of Winnipeg's *Transportation Master Plan* features the completion of the Southwest corridor to the U of M by 2016 and the other three corridors (West, East and North) by 2031 at a cost of \$275 million for the first and a combined cost of \$396 million for the other three. Given the anticipated growth of the city over the next 20 years, this is far too long a time to wait for the completion of the rapid transit network. As noted above, were the province to implement an additional 2.5 cents per litre excise tax on gas and diesel fuel, it would both reduce GHG emissions by at least 29 kt per year and provide \$50 million for investment in a rapid transit system for Winnipeg.

Measures Aimed at Reducing GHGs from the Agriculture Sector

Implementation of a Comprehensive 4R Consistent Nitrogen Stewardship Plan

Implementing a comprehensive *4R Consistent Nitrogen Stewardship Plan* (Right Source at the Right Rate, the Right Time and the Right Place) results in applied nitrogen being used more effectively to grow agricultural crops. Nitrogen applied in fertilizers is not always used efficiently by crops. Consequently, improving N use efficiency can reduce N₂O emissions and indirectly reduce GHG emissions from N fertilizers manufacture.

Practices that improve N use efficiency include:

- identifying different soil management zones and corresponding yields (applying variable rates of fertilizer makes economic sense),
- adjusting application rates based on precise estimation of crop needs, using slow or controlled-release fertilizer forms or nitrification inhibitors,
- applying N when least susceptible to loss, often just prior to plant uptake, placing the N more precisely into the soil to make it more accessible to crops' roots, or avoiding N applications in excess of immediate plant requirement.
- "Banding" has a high potential of reduction in Nitrous Oxide emissions from fertilizer application. This practice is already preformed on some crops in Manitoba, with the potential for further expansion.

²⁰ See, Martin Turcotte, *Commuting to Work: Results of the 2010 General Social Survey*. Canadian Social Trends. Aug. 24, 2011.

- Of these practices, the Government of Manitoba should support uptake through incentives to obtain specialized equipment to band fertilizer.

According to recent surveys done in Alberta, 30% of Alberta farms do not perform annual soil nutrient testing at all, with 44% of farms performing the test every 2 to 5+ years; only 11% of Alberta's farms develop and implement nutrient management plans. A survey by IPSOS indicated the majority of plans were prepared by growers without support of trained advisors. If we assume the numbers are similar for Manitoba farms there is potential for reduction in Nitrous Oxide emissions from fertilizer application through so called Nitrogen Stewardship Plans. The Manitoba Government could provide training to professionals who will be assisting farmers implementing a 4R Nitrogen Stewardship Plan.

Promotion of high quality forages in ruminant feeding and grazing systems

A Manitoba study showed that CH₄ emissions from grazing steers that had access to high quality pastures declined by 50% compared to emissions from matured pastures.²¹ Feed and animal management is very effective way of reducing GHG from animals and economically profitable for adoption by producers. In general, when the productivity of animals is improved, CH₄ emission per unit of product is reduced because feed energy associated with maintaining the animal is reduced. Modification of diets in terms of its nitrogen and carbon content seem to have a dual impact on both enteric and manure GHG emissions and is cost effective.

Promotion of Dry Manure Management Systems

More CH₄ emissions have been observed with liquid or slurry handling systems, which support anaerobic conditions. In solid manure management, such as poultry systems where broilers are kept on dry bedded manure packs lower CH₄ emissions have been reported.²²

Changes to the type and time of land application of manure

It has been observed that fall application of manure may lead to high levels of denitrification prior to winter and in early spring. Also, it has been shown that liquid manure applied through banding may produce more Nitrous Oxide than manure applied uniformly on the soil surface. Injecting the manure directly into the soil or cultivation of land immediately after application can reduce N-volatilization by about 90% compared to normal surface spreading.

More Research and Promotion of Organic Farming

Many organic farming methods have good potential to mitigate climate change by reducing greenhouse gas emissions as well as sequestering CO₂. While there are numerous variables that

²¹ IISD (2001): Reducing Greenhouse gas emissions from Livestock Agriculture in Manitoba for Manitoba Climate Change Task Force.

²² IISD (2001): Reducing Greenhouse gas emissions from Livestock Agriculture in Manitoba for Manitoba Climate Change Task Force.

make it difficult to compare the global warming potential of organic and conventional systems there are some key practices that favour organic agriculture. Little effort is going into organic farming research in Manitoba. More research needs to be done in conjunction with farmers to develop innovative and cost-effective solutions to boost agricultural productivity while not losing sight of environmental, health and socio-economic impacts.

Wetland Protection Incentive Program

The Manitoba Government Wetland Restoration Incentive Programs has to go beyond simply restoring and include protection of wetlands. Green Action Centre supports an ecological goods and service program that provides financial incentives to farmers and landowners to conserve wetlands on their land. The economic costs of wetland loss in south-west Manitoba in 2005 was valued at \$15 million per year and is increasing annually.²³

Renewable energy and bio-fuels

Manitoba farms can produce fuels on-farm, including harvesting biomass and wind and solar installations. Research institutes like IISD are providing leadership on the viability of these initiatives. The Government of Manitoba should invest in the work being done to test and prove these technologies and practices for wider application.

A long-term strategy for carbon-neutral farming

As fuel and inputs become more expensive for farmers and the environmental costs become more apparent, these proposed initiatives support our transition to carbon-neutral farming. Manitoba can be a leader in transitioning agriculture to renewal, sustainable energy and fertilizer solutions.

Summary and Recommendations for Manitoba's Plan to Reduce GHG Emissions

The measures taken to date will not meet the CCER target of 17,200 ktCO₂e by the end of 2012. As of 2010, there was a gap of +2,600 ktCO₂e between actual and target emissions. Manitoba's progress update report on emission reductions projects additional reductions of 938 and 959 ktCO₂e emissions for 2011 and 2012, leaving a projected gap of 703 ktCO₂e by the end of 2012. However, the growing economy may have added GHG emissions in 2011 and 2012 and the estimated reductions from ethanol may be 185 ktCO₂e too high. Accordingly, the GHG emissions gap by the end of 2012 could well be in the order of 900 ktCO₂e.

Measures proposed in the Tomorrow Now document will not likely succeed in closing this gap. Our estimates indicate that meeting a 10 per cent ethanol and 5 per cent biodiesel mandate will reduce GHG emissions by 104 ktCO₂e annually. Completely eliminating the use of the coal

²³ Ducks Unlimited: http://www.ducks.ca/conservation/wetland_values/conservation.html

fired hydro facility in Brandon would remove 270 ktCO₂e, leaving a gap of about 530 ktCO₂e. It is doubtful that the remaining measures presented in Table 3 above would eliminate this gap because the annual *additional* GHG reductions from the other measures listed in the progress update report amount to only 64 ktCO₂e.

Thus, additional measures are needed to reduce the GHG emissions intensity of the economy to achieve the target, such as,

- Carbon taxes of the sort B.C. has introduced but with a key difference that some of the revenues raised are dedicated for use in building the infrastructure needed to green the economy;
- Increased production and use of biofuels;
- Introduction of vehicle excise duties and feebates to discourage the purchase of light duty trucks (SUVs, minivans and pick-up trucks);
- As an alternative to carbon taxes, raising of the fuel excise tax to promote reductions in use of vehicles and to finance improvements to green infrastructure such as public transit and active transportation routes and amenities. Our estimates indicate that a 2.5 cent excise tax on gasoline would lead to GHG reductions in the order of 29 ktCO₂e annually and raise about \$50 million;
- Matched funding of public transit infrastructure for Winnipeg on an annual basis until the full Rapid Transit system proposed in Winnipeg's Master Transportation Plan has been built;
- Introduction of distance-based automobile insurance;
- Implementation of a comprehensive 4R consistent nitrogen stewardship plan, promotion of high quality forages in ruminant feeding and grazing system, improved manure management and application, promotion of wetland restoration and conservation and promotion of biofuel generation at the farm level.

It will likely be very difficult for the provincial government to muster the political will to implement such measures as carbon or fuel taxes, feebates and vehicle excise duties and distance based automobile insurance as well as make green farm management practices more mandatory. If that will is lacking, then the provincial government must look to implementing more aggressive carbon sequestration programs such as tree planting and zero tillage.

An aggressive tree planting program has significant potential to reduce GHG emissions. Provincial government staff have estimated that the 'Trees for Tomorrow' program resulted in 38 ktCO₂e being sequestered between 2008 and 2012, as a result of 5.9 million seedlings being planted of mixed species on 2,536 hectares of largely agricultural land²⁴. Over the next 30 years,

²⁴ Provincial staff used the Natural Resources Canada "CBM-CFS3" model for estimating the amount of GHGs sequestered by the Trees for Tomorrow program and assumed a 25 per cent loss rate.

staff estimate that an additional 942.7 ktCO₂e can be sequestered which would require an average of 3.6 million trees planted per year. This is 3 times the number of trees planted under the current program. However, these estimates do not take into account the carbon release impact of forest fires which are counted in establishing Canada's GHG emissions for reporting to the Inter Governmental Panel on Climate Change. Thus, the net carbon balance for the entire province will be less. As the Trees for Tomorrow program ends this year, the provincial government should make an expanded program a high priority for meeting its CCER target.

Appendix 1: Sources of Changing Levels of GHG Emissions from Road Transportation 2000 to 2010 – Manitoba

Year: 2000

Vehicle Type	Total Number	Average Vkt ¹	Average FCR ² (L/100 kms)	Lbs. GHGs/ litre of fuel. ³	Total GHGs (ktCO ₂ eq.)
Light Duty Gas Vehicle	368,703	14,604	10.03	5.3486	1,313
Light Duty Gas Truck ⁴	264,630	16,142	14.20	5.3823	1,484
Heavy Duty Gas Vehicle	18,829	13,991	34.66	5.1080	212
Light Duty Diesel Vehicle	3,012	19,335	6.68	6.2207	11
Light Duty Diesel Truck	12,843	19,648	13.09	5.9943	90
Heavy Duty Diesel Vehicle	31,528	39,074	37.84	5.9417	1,259

Source: Scott McKibbin, Environment Canada. *Mb. Transport Summary Sheets.*

Notes: ¹ Vkt = Vehicle Kilometres travelled; ² FCR = fuel consumption ratio; ³ Calculated from the following formula: $(\text{Total GHGs} \times 2,200 \times 1,000) / (((\text{Total Number} \times \text{Average Vkt}) / 100) \times \text{FCR})$.

⁴ Includes Minivans, SUVs and pick-up trucks.

Year: 2010

Vehicle Type	Total Number	Average Vkt ¹	Average FCR ² (L/100 kms)	Lbs. GHGs/ litre of fuel ³	Total GHGs (ktCO ₂ eq.)
Light Duty Gas Vehicle	390,324	14,879	9.25	4.7136	1,151
Light Duty Gas Truck ⁴	343,344	16,557	13.50	4.7185	1,646
Heavy Duty Gas Vehicle	22,294	15,344	33.75	4.6877	246
Light Duty Diesel Vehicle	4,049	20,347	6.86	5.8390	15
Light Duty Diesel Truck ⁴	18,220	19,670	12.34	5.9197	119
Heavy Duty Diesel Vehicle	44,025	45,466	36.62	5.8737	1,957

Source: Scott McKibbin, Environment Canada. *Mb. Transport Summary Sheets.*

Notes: ¹ Vkt = Vehicle Kilometres travelled; ² FCR = fuel consumption ratio; ³ Calculated from the following formula: (Total GHGs x 2,200 x 1,000) / (((Total Number x Average Vkt) / 100) x FCR).

⁴ Includes Minivans, SUVs and pick-up trucks.

Decomposition of Total Change in GHGs Into Component Elements

The general approach is to calculate the total GHGs, using the following formula, by substituting the 2010 values for each component, in turn, while leaving the other values at their 2000 level.

This shows the unique effect of the change in each component.

Formula: Total GHGs = ((Ttl Vehicles x Average Vkt) / 100) x FCR x Lbs. GHG.

Example: Light Duty Gas Vehicle: Effect of Increase in Total Number of Vehicles:

$$((390,324 \times 14,604) / 100) \times 10.03 \times 5.3486 = 1,390; (1,390 - 1,313) = +77 \text{ ktCO}_2 \text{ eq.}$$

Appendix 2: Calculation of Biofuel Concentrations Needed to Meet CCER Targets for the Road Transportation Sector

Table A.1 above shows that for gas-powered vehicles, +415.9 more kilotonnes of CO₂ equivalent greenhouse gases were being emitted in 2010 than the CCER target of 6 per cent below 1990 levels. For diesel-powered vehicles, the gap is +1,264.6 kilotonnes of CO₂ equivalent.

One way of reducing the GHGs emitted by gas- and diesel-powered vehicles is to switch to biofuels. Various studies have been commissioned on a ‘life-cycle analysis’ basis and a recent one done on operations in Alberta, Saskatchewan, Ontario and Quebec²⁵ show that an E10 blend of ethanol reduces GHG emissions by 125 grams (0.27533 lbs.) per litre of blended fuel while a 5 per cent blend of tallow-produced biodiesel fuel reduces GHG emissions by 164 grams (0.361233 lbs.) per litre of blended fuel. These estimates include both the production and distribution of the biofuels and the tailpipe emissions.

In 2010, the following volumes of blended gas and diesel fuel were consumed in Manitoba²⁶:

Gasoline = 1,422,310,000 litres

Diesel = 784,956,000 litres.

Manitoba’s ethanol mandate specifies an 8.5 per cent blend while its biodiesel mandate specifies a 2 per cent blend. Accordingly, in 2010, the amount by which these blends reduced greenhouse gases in Manitoba were:

Gasoline Blend Reductions = $(1,422,310,000 \times (0.27533 \times (8.5/10)))/2,200,000 = 151 \text{ ktCO}_2 \text{ eq.}$;

Biodiesel Blend Reductions = $(784,956,000 \times (0.361233 \times (2/5)))/2,200,000 = 51.5 \text{ ktCO}_2 \text{ eq.}$

These estimates are lower than those contained in *Manitoba’s Report on Climate Change for 2010* which indicate that the ethanol mandate reduced GHGs by 336 ktCO₂ eq. and the biodiesel mandate reduced them by 57 ktCO₂ eq. While the biodiesel estimates are close, the province’s estimates of reductions from ethanol are substantially higher than the life cycle analysis would indicate.

For the purposes of this analysis, we are using the more conservative estimates of GHG reductions. In order to close the gap on GHG emissions from gasoline, the blends for the two types of biofuels would have to be:

Ethanol = 23.4 per cent blend

Biodiesel = 49.0 per cent blend.

²⁵ See, Canadian Renewable Fuels Association, 2009. *Life Cycle Assessment of Renewable Fuel Production from Canadian Biofuel Plants for 2008-2009*. Tables 4 and 5.

²⁶ See, Statistics Canada, CANSIM Table 405-0002.

In order to meet these blend requirements, the province would have to produce the following amounts of biofuels:

Total Ethanol = 332.8 million litres vs. the current 140 million litres;

Total Biodiesel = 384.6 million litres vs. current capacity of 30 million litres.

In addition, most gasoline vehicles are not suited to burn a 23 per cent blend of ethanol; and, while diesel vehicles can burn 100 per cent biodiesel without modifications, manufacturers warranties are the biggest stumbling block to raising the current 2 per cent blend amount to higher levels. As well, high levels of biodiesel fuel mixes pose problems in cold weather due to a higher freezing point.

Thus, both production limits and vehicle design barriers prevent the reduction of GHG levels from cleaner fuels.

Appendix 3: Calculation of GHG Emission Reductions Due to a 2.5 cent/litre Increase in the Excise Tax on Gas and Diesel Fuel

Estimates of Vehicle Travel Elasticities

Davis and Kilean's²⁷ recent assessment of the responsiveness of gasoline consumption to price increases in the cost of gasoline indicates that for every 10 per cent increase in the cost of gasoline, gasoline consumption will decrease by 4.6 per cent in the short-run. Using this estimate, we calculate the reduction in GHG emissions due to the recent 2.5 cent increase in the excise tax in the following manner, assuming the price of gasoline is \$1.20 per litre.

A. Impact on Litres of Fuel Consumed

$$= 1,422,310,000 \text{ litres} \times -0.46 \times (0.025/1.20) = -13.63 \text{ million litres}$$

B. Impact on GHG's Emitted

$$= (-13,630,471 \text{ litres} \times 4.7165 \text{ lbs})/2,200,000 = -29.2 \text{ ktCO}_2 \text{ equivalent.}$$

²⁷ L.A. Davis & L. Kilian. 2011. *Estimating the Effect of a Gasoline tax on Carbon Emissions*. Journal of Applied Econometrics. 26: 1187-1214.

Appendix 4: GHG Emissions Intensity of Freight-Hauling Modes of Transportation

Transport Mode	Tonne-Kilometres Transported (Tkm) (Millions)	Megatonnes of CO₂ e Emitted	Lbs. of CO₂ e per Tkm¹	GHG Intensity (tonnes per Terajoule)
Rail	299,646	6.7	0.049	78.5
Marine	208,000	6.7	0.071	75.7
Air	1,626	0.3	0.406	68.4
Heavy Truck	212,689	39.7	0.411	70.8
Medium Truck	21,004	10.5	1.100	69.1
Light Truck	25,215	12.7	1.108	67.6

Source: Natural Resources Canada. Office of Energy Efficiency Comprehensive Energy Use Data Base Tables 24,27,29,53,57,59.

http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_tran_ca.cfm

Notes: ¹ Calculations by author: (1 MtCO₂e=2,200,000,000 lbs.)

Appendix 5: Calculation of GHG emissions per Kilometre Travelled**A. Cars and Light Trucks (Gasoline)**

Type	Vehicle kt (millions)	Litres (millions)	Litres/Vkt	Lbs CO₂e/Vkt
Light Duty Cars	5,807.631	537.2058	0.0925	0.436
Light Duty Trucks	5,684.747	767.4408	0.1350	0.637
Total	11,492.378	1,304.6466	0.1135	0.535

Source: Scott McKibbin, Environment Canada. *Mb. Transport Summary Sheet*

B. Urban Transit (2009 Manitoba)

Type	Passenge kt (millions)	GHG emissions (ktCO₂e)	Lbs CO₂e/Pkt
Total Urban Transit	948.870374	107.933	0.250

Source: Natural Resources Canada, Office of Energy Efficiency, Comprehensive Energy Use Database.

http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tablestrends2/tran_mb_29_e_4.cfm?attr=0

TomorrowNow* – Reducing GHG Emissions: Vision for Sustainable Transportation

A transportation system that prioritizes pedestrians, cyclists and transit users at the top of the transportation hierarchy, and creates a preference for sustainable commuting options over driving alone in terms of cost, convenience and comfort. One that ensures Manitobans have sustainable options for travel within their community and between communities that are practical, convenient and well known.

This vision requires transportation and land use planning that supports density and multi-modal connections; financial incentives and disincentives that reward sustainable modes over driving alone and encourage the use of energy efficient vehicles; and a willingness to demonstrate preference to non-driving modes of travel.

But achieving the vision will reduce GHG emissions, expand our green economy, help Manitobans adapt to lifestyles that are less reliant on fossil fuels, build eco-tourism in the province, and improve the health and safety of our most vulnerable residents through:

- a switch to sustainable modes for personal travel;
- electric vehicle leadership;
- AT routes that connect communities and provide tourism opportunities;
- ‘complete streets’ that are safe, accessible and comfortable for users of all modes and ages;
- more children safely biking and walking to school, thereby improving their health and spending more time outdoors;
- inter-provincial transit that provides a sustainable transportation option for residents in small and rural communities;
- a complete rapid transit network in Winnipeg; and
- financial mechanisms, like the excise tax on gas and diesel fuel and distance-based insurance, that encourage driving less and driving more fuel efficient vehicles.

There exists a wealth of guidance for achieving this vision and the goals outlined in *TomorrowNow*. Key documents include:

- **City of Winnipeg Transportation Master Plan**

(<http://transportation.speakupwinnipeg.com/files/2011/11/2011-11-01-TTRWinnipegTMP-Final-Report.pdf>)

Winnipeg’s Transportation Master Plan (TMP) is based on the concept of Complete Communities and recognizes the importance of improving multi-modal travel choices, with particular recognition given to the important role of rapid transit. As noted in the final report, “Complete communities are places that offer and support a variety of lifestyle choices, providing opportunities for people of all ages and abilities to live, work, shop, learn and play in close proximity to one another.” (p 3)

While Winnipeg’s TMP falls short of placing a higher emphasis on sustainable modes of travel, the six key strategic goals (p 9-11) support several aspects of the *TomorrowNow* plan:

- A transportation system that is dynamically integrated with land use
- A transportation system that supports active, accessible and healthy lifestyle options

* by Beth McKechnie

- A safe, efficient and equitable transportation system for people, goods and services
- Transportation infrastructure that is well maintained
- A transportation system that is financially sustainable
- A transportation system that reduces its greenhouse gas emissions footprint and meets or surpasses climate change and emissions reduction goals set by the City and the Province

However, the need for rapid transit is not adequately reflected in the phasing of construction, with timelines stretching decades into the future (p 53). The provincial government can address this gap by providing dedicated funding for the construction of a rapid transit system for Winnipeg.

Also, cohesive transportation and land use planning for the Winnipeg Capital Region will be critical given that approximately 64% of Manitoba's population lives in Winnipeg and surrounding region. This could be accomplished through a Regional Transportation Authority with a sustainability mandate. Similar to Metrolinx in the GTA (and TransLink in Metro Vancouver), the mandate of this authority would be "...to improve the coordination and integration of all modes of transportation in the region."

- **Greater Strides: Taking Action on Active Transportation**

(http://www.gov.mb.ca/conservation/pdf/atag_report6.pdf)

The five objectives outlined by the provincial Active Transportation Advisory Group in their report, *Greater Strides*, and fleshed out in a series of 25 recommendations, provide a blueprint for the provincial government, namely to:

- Develop a provincial policy and coordinated approach to Active Transportation.
- Create a benchmark and measurable targets to guide the development of a safe, sustainable and cohesive active transportation network.
- Build safe and connected active transportation networks.
- Explore opportunities to raise awareness and provide training and incentives to motivate Manitobans to choose safe active transportation options more often.
- Establish a platform for building a sustainable future for active transportation.

The provincial government has already taken initial steps, including appointing a provincial AT coordinator, committing to develop a provincial policy and establishing a ministerial steering committee and public stakeholder advisory committee

(<http://news.gov.mb.ca/news/index.html?archive=2012-06-01&item=14672>). These initial steps are recognized in *TomorrowNow* under the Active Transportation Strategy.

- **Complete Streets** (<http://greenactioncentre.ca/content/complete-streets/>)

The National Coalition on Complete Streets provides the following definition: "Complete Streets are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists, and public transportation users of all ages and abilities are able to safely move along and across a complete street."

Complete Streets policies or language have been adopted or committed to in 379 regional and local jurisdictions and 26 states in the U.S. In 2009, the City of Calgary was the first to adopt a Complete Streets policy in Canada, followed by the Region of Waterloo in 2011.

Winnipeg's Transportation Master Plan includes a recommendation to develop a Complete Streets strategy and "Move to a road classification system that recognizes multi-modal travel needs and the concept of 'complete streets' ". (ii and p 37)

Similar to regional jurisdictions and states adopting Complete Streets strategies, Manitoba's adoption of a Complete Streets policy would support and encourage municipalities to do the same.

- **Child- and Youth-Friendly Land-Use and Transport Planning Guidelines for Manitoba** (<http://greenactioncentre.ca/content/kids-on-the-move/>)

These guidelines were developed as tools for municipal transportation and land use planners to achieve transportation and land use arrangements that meet the needs of children and youth — and everyone else. They mesh with the Age Friendly Communities concept adopted by the provincial government (<http://www.gov.mb.ca/shas/agefriendly/>) and underscore the importance of community sustainability plans that provide for our most vulnerable citizens.

- **School Travel Planning** (<http://greenactioncentre.ca/program/asrts/school-travel-planning/>)

With School Travel Planning, walking or biking to school becomes a realistic choice for a greater number of families. It increases daily physical activity, reduces traffic dangers on school routes and in school zones, and decreases local air pollution and greenhouse gas emissions. The process highlights the importance of supporting active school travel through the creation of local school district and municipal plans and policies.

Just as schools are responsible for student travel if they live beyond 1.6 km of the school, they should be responsible for assisting students who live closer to walk or bike to school.

School Travel Planning, and the financial means to address infrastructure needs that will support students to walk or bike to school safely, is an important part of green schools and school sustainability plans. It also enables more children to spend time outdoors and ties into the need to ensure new schools are sited to accommodate active travel and built to standards that encourage walking and cycling.

- **Community-Based Travel Marketing** (<http://greenactioncentre.ca/content/cbtml/>)

Community-Based Travel Marketing (CBTM) uses an Individualized Marketing approach to help households drive less by switching to transit, walking, cycling and carpooling, with the goal of reducing personal transportation emissions. A 2007-2009 pilot project delivered by Green Action Centre in Winnipeg, funded in part by the Province, resulted in a 11.7% reduction in drive-alone mode share and an 18.2% reduction in trip-related CO₂ emissions for participating households.

This social marketing approach directly supports the provincial government's plan to reduce GHG emissions and help Manitobans make simple personal choices that will lead to big results.

Guiding Principles

Green Action Centre's response to the City of Winnipeg's development of a Transportation Master Plan included a number of guiding principles, which also apply here:

- Ensure decision-making favours pedestrians, cyclists and transit riders over single occupant vehicles. This would ensure our transportation system safely and conveniently accommodates even the most vulnerable road users – seniors, children, persons with disabilities.

- Integrate the various modes to make it easy to combine walking, cycling, transit or driving for a given trip.
- Recognize and celebrate Manitoba as a northern climate with facility design and maintenance plans that accommodate four season use.
- Embed education and communication in transportation projects and plans.
- Encourage separated facilities for users, e.g. pedestrians and cyclists, buses and cyclists, through reduced vehicle lane widths rather than road widening.

Small or Rural Communities and Inter-provincial Travel

- Connections between communities for small and rural centres are critical, including Active Transportation pathways, paved shoulders, and inter-provincial transit.
- AT pathways between communities across the province also support eco-tourism.

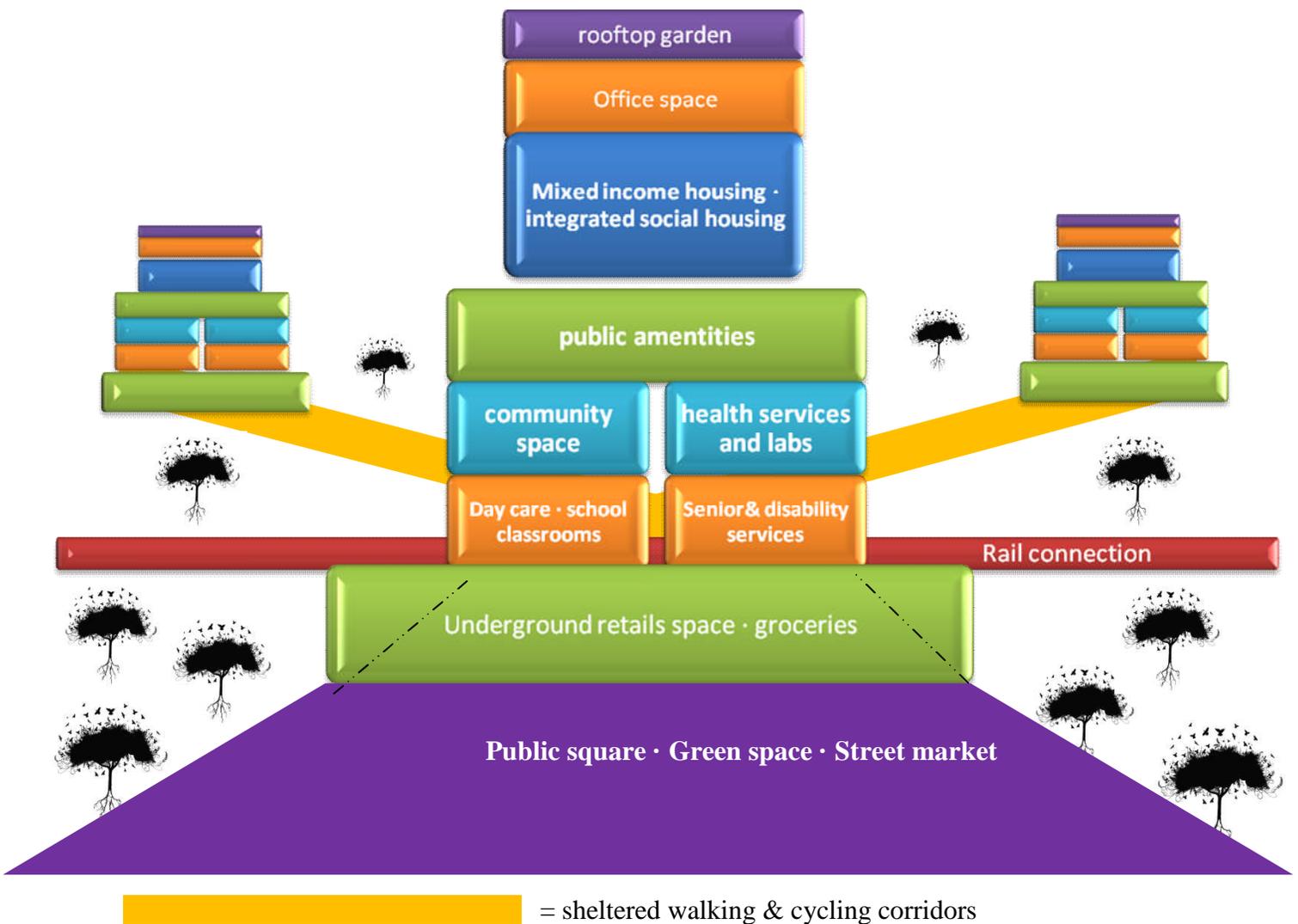
Additional Comments on *TomorrowNow*:

- Include employee commuting as one of the internal programs to reduce the provincial government's environmental footprint (Demonstrating Green Leadership in Government).
- Adopt existing AT design guidelines that are based on best practices rather than creating from scratch, e.g. NACTO's Urban Bikeway Design Guide (<http://nacto.org/cities-for-cycling/design-guide/>).
- Partner with municipalities and businesses in the Winnipeg Capital Region to purchase a regional carpooling subscription.
- Support lower speeds and corresponding street design for all residential streets, beyond school zones.

Re-Orienting the Built Environment for Tomorrow*

Objective: To review an urban model integrating EcoCity, Healthy City, and Age-Friendly City design recommendations – and its potential contributions to the *TomorrowNow* initiative in considering the building of new communities or rebuilding of old ones.

Summary of Model: the model features mixed-use buildings, with public services, amenities, and groceries occupying the ground- and lower-levels to ensure access to basic resources through elevator travel. Buildings are linked in clusters through sheltered walking and cycling paths; clusters are then linked through (rapid) transit.



* by John Hu

Desired Outcomes: 1) minimized land use through vertical densification; 2) increase connectedness to allow elevator travel, walking, cycling, and transit to replace car-dependency; 3) minimize reliance and use of personal vehicles – to reduce car-related air pollution and greenhouse-gas emissions; 4) minimize the need to establish expansive road networks to support transportation needs of the community

Impacts:

GOOD FOR OUR ECONOMY – GOOD FOR OUR ENVIRONMENT

Facilitate green energy systems: Increasing population density helps create a critical-mass at which implementation of large-scale energy systems (eg. solar, geothermal) become economically feasible.¹

Build resiliency against rising oil prices: Rising oil prices affect movement and trade of all physical goods and thus negatively impact the economy. By increasing connectivity and reducing car-dependency, this urban model reduces the transportation-reliance on oil on a large scale.²

Reduce public service costs: Through decreasing land use and the area of coverage, this model reduces logistical costs of providing water and sewage infrastructure, electrical gridlines, public transportation, education services, health services, police and fire services, road construction, and road maintenance.³

CHANGING OUR WAYS FOR A CHANGING CLIMATE

Reducing Greenhouse Gases: Car-dependency and vehicle-miles travelled is minimized, which reduces transport-related emissions.

Adapting to a Changing Climate: For urban residents with mobility challenges, the model's mixed-use design can help guarantee access to a basic level of amenities and services – protecting them against travel barriers associated with extreme weather events, cold weathers, and floods.

SAFEGUARDING OUR WATER, AIR AND LAND

Protecting water, air, and land: Through reducing car-dependency, vehicular air-pollution can be reduced; furthermore, through reducing the urbanized land area (by buildings and/or road networks), expansion into arable land, green space, and freshwater sources is reduced.

Reducing construction-related waste: Through sharing of walls and common spaces, the vertical-densification and mixed-use design requires less *per-unit* construction resources, thus producing less construction related waste.¹

NURTURING OUR LIVING WORLD

Protecting ecosystems and biodiversity: By drastically reducing urbanized land, sprawl into ecosystems can be ameliorated, or reduced

Additional Impacts:

POPULATION HEALTH BENEFITS⁴:

Encouraging active transportation: Through re-design of the built environment, walking and cycling can become more convenient and feasible modes of transport. This encourages daily physical activity, which is linked to reduced obesity, diabetes, heart diseases, and cancer.

Improving air quality: Reduced car-dependency leads to lower vehicular air pollution – which is linked to lung diseases, heart diseases, and higher overall mortality rates.⁵

Minimizing traffic-related injuries, deaths, and disabilities: Reduced car dependency also helps reduce this leading cause of injury and lifelong disability at the population level.

Reducing climate-change related health-risks: By reducing vehicular GHG emissions, climate-change risks such as heat-stroke events may be lowered.

Protecting food and water-security: Minimizing urban land-use reduces risks of expansion into arable land and freshwater resources. As well, it reduces reliance on expensive road networks and reduces concrete coverage – which negatively impacts both storm sewer systems and groundwater recharge rates.⁴

Reducing health care financing and delivery costs: This model was previously published by the Health Council of Canada because of its potential to reduce health care delivery costs – through improving economies of scale and consolidating information, and minimizing transportation costs of all goods, equipment, and personnel related to health care centres.⁶

IMPACTS ON SOCIAL EQUITY

Create Age-Friendly communities: This design aligns with the World Health Organization's Age-Friendly Cities initiative⁷, particularly in ensuring mobility and basic access to resources for frail seniors; seniors living with disability; and seniors without the financial or physical capacity to operate a car in car-dependent neighbourhoods

Improves access to services, resources, and life opportunities: Through maximizing connectedness, the model helps reduce everyday travel time, costs, and risks – which are noted barriers to equitable access to health care, social services, education, employment opportunities, community participation, participatory governance, and even food.⁸ This is particularly important for people with physical disabilities, which affect 1 in 3 Aboriginal persons, for 36.7% of all Canadian households living in poverty,⁹ as well as the growing number of seniors.

BUILDING RESILIENCY IN SUBURBAN NEIGHBOURHOODS

Minimizing risk associated with the Suburban Slum: Due to continually-rising oil prices, suburban communities may find increasing costs associated with getting to work, getting to school, grocery shopping, and general community participation. There are a growing number of suburban communities experiencing decline, vacancy, and even complete abandonment – including newly-constructed suburbs¹⁰. The model works well to serve as a “hub” of services and resources to service existing suburban communities, which helps ensure basic access and mobility in an era of uncertainty.

REDUCING LONG-TERM COSTS

While seemingly a large investment, it all starts with one building. A number of economic benefits exist for both the public and private sectors such as: 1) reduction of per-unit construction costs and land-costs, 2) reduction of road construction and maintenance costs, 3) reduction of aforementioned public service costs through reducing service area coverage to serve the same-size population; 4) reduction of long-term health care costs by addressing public health concerns; 5) reduction of economic loss due to oil-dependency and climate change¹¹. Overall, the model does not rely on an excess of resources – but rather a transfer of existing resources.

REFERENCES

1. Yeang K. 1999. *The Green Skyscraper: The Basis for Designing Sustainable Intensive Buildings*, New York: Prestel Publishing.
2. Hirsch R. 2005. *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*. US Department of Energy.
3. Transit Cooperative Research Program. 2004. *Costs of Sprawl*. Available at: http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_74-a.pdf
4. Frumkin H. 2006. Urban sprawl and public health. *Public Health Rep.* 117(3):201-17
5. Dockery DW, Pope CA, Xu X et al. 1993. An Association between Air Pollution and Mortality in Six U.S. Cities. *N Engl J Med.* 329:1753-1759.
6. Hu J. 2010. *Re-orienting the Built Environment: Contributions of “Mixed-Use Skyscraper Systems” to Sustainable Healthcare*. Health Council of Canada.
7. World Health Organization. *Global Age-Friendly Cities: A Guide*. 2007. Available at: http://www.who.int/ageing/publications/Global_age_friendly_cities_Guide_English.pdf
8. Hu J. 2012. Built Environment Impacts on Health Inequities: Impacts Through Travel Barriers. 2012 Canadian Public Health Association Conference. Edmonton, Alberta. Paper presentation published online at: <http://resources.cpha.ca/CPHA/Conf/Code/PresentationsSessions.php?r=0&y=2012&l=E&Session=220&Order=Time&f=1&p=1>
9. Hu, J. 2009. The Existing Leverage Point: Addressing the Social Gradient in Health through Disability Support. Paper presentation published online by the Canadian Public Health Association. Available at: <http://resources.cpha.ca/CPHA/Conf/Data/2009/A09-623e.pdf>
10. Karlenzig W. 2010. *The Death of Sprawl: Designing Urban Resilience for the Twenty-First-Century Resource and Climate Crises*. Post Carbon Institute.
11. National Roundtable on the Environment and the Economy. 2011. *Paying the Price: The Economic Costs of Climate Change for Canada*. Available at: <http://nrtee-trnee.ca/climate/climate-prosperity/the-economic-impacts-of-climate-change-for-canada/paying-the-price>.

Changing Our Ways for a Changing Climate: Adapting to a Changing Climate*

Adaptation Goal: Manitoba's adaptation strategy needs to evolve around the goal to be prepared for and resilient to the impacts of climate change.

The issue whether Manitoba should focus on climate adaptation is no longer a question. The answer is yes. The imperative now is to prioritize the key adaptation challenges and to execute solutions to these challenges in the best possible manner.

Manitoba's key adaptation challenges:

(1) City and Rural Infrastructure

- There is uncertainty about the nature and rate of local climate change and about which climate parameters pose the greatest risk to the continued safe and cost-effective operation of existing and proposed infrastructure. The uncertainty extends to the design of new infrastructure, where current design values may not take into account future climate change or extreme weather events.

Adaptation Approach:

1. Existing estimations about the service life of infrastructure do not factor in future climate scenarios. Communities, and their municipal governments should first screen all proposed infrastructure to identify high-risk areas (e.g. flood-prone areas) This should be followed by a more detailed climate risk assessment to identify risks to specific pieces of critical infrastructure.
2. Incorporate adaptation into city planning. Addressing the changing climate with respect to city infrastructure requires a multi-disciplinary approach that includes engineers, planners, managers, operators, climate scientists and other professionals working towards a common goal. Incorporating adaptation means to identify actions that improve infrastructure resiliency and generate community benefits. This also requires a dedicated and focused awareness campaign geared to ensuring acceptance of this issue and implementation of cost-effective measures that will enable infrastructure to withstand climate impacts.

* by Ani Terton

(2) Freshwater Resources

- Warming atmospheric temperatures have already begun to accelerate the global hydrological cycle that is expected to result in more frequent and severe floods and droughts.
- Water availability and water pollution are the two most significant challenges that Manitoba must deal with as the climate changes.

Adaptation approach:

1. Protect and restore wetlands and natural drainage systems. The restoration of wetlands is an effective means to adapt to the impacts of climate change on water quality and quantity. Wetlands function as the kidneys of watersheds. A provincial initiative to identify, preserve and restore wetlands within our watersheds should be set as a major priority. Wetlands are taxed as part of the overall land holding and many producers feel they need to gain revenue from wetlands by draining and cropping them. The current regulatory instruments and other non-regulatory programs do not appear to adequately protect wetland areas. The cost of preserving these wetlands needs to be shared more broadly throughout society as a whole. The economic costs of wetland loss in southwest Manitoba in 2005 was valued at \$15 million per year and is increasing annually.
2. Water conservation and waste water treatment should be encouraged by employing the principles of user-pay and true-cost accounting. In this manner, the actual cost of providing water and wastewater treatment services may be recovered. The Province of Manitoba should ensure that all Manitobans are served by wastewater treatment that safeguards human health and water quality. Manitobans should pay the true cost of the operation and maintenance of the systems required to provide the water they consume, and the true cost of the services required to adequately treat wastewater. The Province of Manitoba should negotiate predictable funding agreements with municipal and federal governments for wastewater treatment infrastructure to ensure that municipalities adequately remove nutrients. Over the long-term, utilities need to implement full-cost recovery funding models that cover complete life cycle costs.
3. Municipal, agricultural and industrial operations should be required to create and implement comprehensive water efficiency plans that include hard targets, reflect best practices for their sector, and provide clear timelines for implementation. The provincial government should enforce such requirements by making infrastructure grants and applications for water licenses contingent on the preparation and implementation of these plans.

(3) Aboriginal Communities

- Climate change will lead to damage and destruction of residences and community facilities, infrastructure and basic services
- Climate change impacts on ecological and wildlife systems will jeopardize harvesting, hunting, fishing, trapping and food security which in turn, will affect the health of Aboriginal Peoples
- Climate change will disrupt transportation infrastructure, harbours, airports, roads, winter roads, bridges and communication systems. These effects will constrain and jeopardize the integrity of community energy systems. A high portion of these costs are not insured by private commercial and resident property insurance. For this reason, climate change represents a huge potential cost for the Manitoba government.

Adaptation approach:

1. Manitoba Conservation and Water Stewardship must design climate vulnerability assessments with aboriginal communities and Aboriginal Affairs and Northern Development Canada (AANDC). These assessments should determine whether communities are affected by ongoing spring flooding, require the redesign or potential relocation of key facilities.
2. Work with aboriginal communities to ensure that adaptation policy integrates local and cultural specific knowledge about climate change. There is a need to ensure current and long-term planning for food.
3. From the perspective of transportation, climate change will cut the physical link between aboriginal communities and the rest of Canada. Suggested strategies include installing bridges across open bodies of water in warm seasons that can be used in winter; moving winter roads off-ice where possible; commissioning construction crews to strengthen thin ice by repeated flooding and freezing; increasing the consumption of local foods; enhancing safety measures; and considering alternative transportation means, such as ferries and rail, or airships that can land on any flat surface and so compete with surface transportation. While cost-sharing plans among stakeholders might solve significant transportation and construction problems, the truth is that short- and long-term plans for winter road networks are unclear at this point. This is a serious issue and discussions among the province, AANDC, other government departments, and First Nations need to establish priorities, and develop detailed plans.
4. It is critical to catalyze all commercially viable sources of renewable energy on aboriginal lands. It is particularly important to try and convert diesel-reliant communities to renewable sources of power.

(4) Agriculture

- A large portion of the agricultural community, like much of the population in general, does not appreciate the urgency of climate change or accept that they have any personal responsibility to act. Obviously, this acts as a serious constraint on adaptation to climate change.
- Decision-makers in agriculture continually adapt to a suite of changing conditions relating to costs, markets, technologies, policies, weather forecasts and personal circumstances. Climate change is considered almost inconsequential when making strategic decisions about crops, livestock, resource use, enterprises etc.

Adaptation approach:

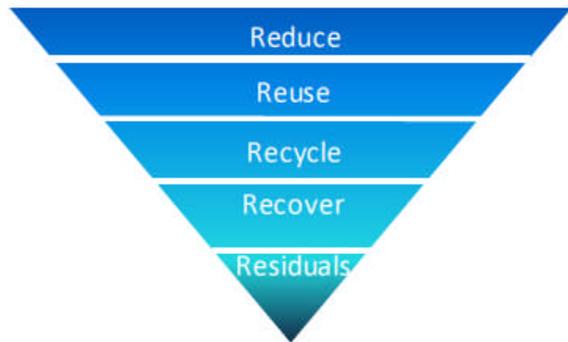
1. Identify attributes of climate change that are relevant to agricultural operations and decisions; illustrate the significance of these attributes in terms used by agriculturalists and farmers. Then indicate the expected changes in weather patterns due to climate change. These are likely to relate to the frequency, magnitude and timing of extremes in droughts, storms, frosts, and other weather events.
2. Engage representatives from agricultural producers, business, government agencies and the research community to explore adaptation options relating to climate in the context of the decisions producers and others make base on a range of forces. Adapting to climate needs to become a factor incorporated into the regular decision-making process. Support the renewal of agricultural systems that are more resilient to extreme weather events. Nature can work for us instead of against us.
3. A long-term strategy for carbon-neutral farming. As fuel and inputs become more expensive for farmers and the environmental costs become more apparent, these proposed initiatives support our transition to carbon-neutral farming. Manitoba can be a leader in transitioning agriculture to renewal, sustainable energy and fertilizer solutions. More research needs to be done in conjunction with farmers to develop innovative and cost-effective solutions to boost agricultural productivity while not losing sight of environmental, health and socio-economic impacts.

Preparing effectively for climate change will require decisions based on an understanding of future climate, not just the climate for the past. Smart investments that consider current climatic hazards and future climate risks will reduce long-term costs for infrastructure, and contribute to the maintenance and protection of societal goods and services.

Leading the Way on Reducing Waste: Moving Towards Zero*

The goal of achieving *zero-waste, zero-harm* may seem to lie beyond us as a faint glow on the horizon, but we need to keep that goal in sight as a beacon. Green Action Centre supports *Zero Waste, Zero Harm* as guiding principles for addressing waste. More comprehensively, "*Zero Waste is a design principle for the 21st Century that seeks to redesign the way resources and materials flow through society. Zero Waste requires eliminating subsidies for raw material extraction and waste disposal, and holding producers responsible for their products and packaging 'from cradle to cradle.'* The goal is to promote clean production, prevent pollution, and create communities in which all products are designed to be cycled safely back into the economy or environment" (<http://www.grn.org/page/zero-waste>).

Looking only at the waste stream itself, we have this familiar hierarchy, with the objective of reducing residuals ideally to zero by implementing strategies at the highest rungs possible. It is not enough to divert material that has entered the waste stream. We need to reduce the flow and to ensure that the remainder flows in channels that lead to the highest possible uses.



Both traditional waste management and waste reduction focus on the management of solid and liquid wastes. However, the most harmful waste product is the invisible waste, the greenhouse gas emissions from fertilizers and the burning of fossil fuel. In 2010, the 1,234,535 residents of Manitoba (and their businesses and institutions) released the equivalent of 19,800,000 tonnes of CO₂ or 16 tonnes for each of us, while we sent approximately one tonne of solid waste per capita to landfill sites. Hence, Green Action Centre believes that waste and waste reduction management planning requires GHG accounting as well and the design of efficient, low-carbon systems for handling waste. The emission of methane from landfilled organics and the value of compost have become major drivers for developing better recovery alternatives.

Green Action Centre believes that recent initiatives by the provincial government and City of Winnipeg are decisive moves in the right direction. The Province has introduced an Extended Producer Responsibility (EPR) regime to cover a range of household waste streams, and the City has begun to implement its Garbage and Recycling Management Plan aimed at better recovery of materials including organics. We commend provincial and city officials for taking these steps.

* by Carolyn Garlich

Although the province has rightly shifted the cost of these programs to the producers and consumers of products that end up in the waste stream, the responsibility for monitoring and regulating these programs remains with the province. The province needs to ensure that the goals set out in these programs are met and that from time to time the goal posts are moved closer to the zero-waste horizon.

In addition, we have the following observations for improving performance

Reducing Garbage

Low Tipping Fees: Provincial Responsibility and Potential Solutions

The City of Winnipeg, with expert advice, has adopted a waste reduction plan that deals largely with residential waste. The role of the province is to ensure that some of the same practices, or better, are adopted, where feasible, in the rest of the province. The gaping hole for Winnipeg, and the province as a whole, is the lack of an effective strategy for construction, demolition, industrial, commercial and institutional waste. The provincial government needs to acknowledge its culpability for the downward spiral of tipping fees that has landed Manitoba near, if not at, the bottom of the provinces in waste diversion. Large landfill sites in the Capital Region (Rosser, Richot and Libau) approved and licensed in the late 1990s and early 2000s, created excess landfill capacity, leading to intense competition for ICI and C&D waste. The consequences, as the City of Winnipeg and environmental organizations predicted, were dire. The amount of ICI and C&D waste going to Brady landfill dropped dramatically and with it revenue needed for waste reduction initiatives. Currently only about a fifth of the non-residential waste generated in the City of Winnipeg, goes to Brady. The other consequence is that businesses recycle less. Businesses are very sensitive to prices. When tipping fees are high and there is revenue to be made from recycling, businesses and institutions will recycle. When both fees and prices for recyclables fall below the cost of isolating, handling and shipping the material, the material will be sent to the landfill. There is little that the city can do to send a price signal without losing business to other facilities in the capital region.

There are steps that the Province can take to rectify, or at least ameliorate, the problem. The Province should raise the WRARS (Waste Reduction and Recycling Strategy) levy and make it higher for unsorted loads, exempting, as much as possible, materials that can be reused, recycled or composted. Since the WRARS levy is only a small part of the cost of disposal, the province could also pass a regulation that would require landfill operators to establish a price differential in tipping fees for sorted and unsorted loads.

Landfill bans are another means of getting businesses to recycle.

Regulating and Licensing Landfill Sites

No new landfills sites should be approved unless they have differential fees and onsite recycling and composting facilities as well as a place to leave items for reuse. No new landfill sites should be licensed in areas where there is an excess capacity.

Recycling Less

People who should know better often boast about the amount of recycling they put out. Recycling is only the third R. As we move toward zero waste, recycling too will have to be reduced. Reusing the material produces waste in itself. Some of this is the invisible waste in the form of greenhouse gases emitted by the transportation and remanufacturing of the product. There is also leakage. From every five aluminum cans that are recycled only four can be produced. Achieving the objective of reducing recycled material as well as garbage will require a threefold approach: consumer education, increased opportunities for reuse, and pressure on manufacturers to reduce packaging. Extended producer responsibility puts some pressure on manufacturers to do the latter. The City of Winnipeg is to be commended for its Give Away Weekends and its plans to develop a centre for reusable products at Brady. The provincial government could promote something similar in other areas of the province by requiring all landfill sites to have drop-off areas for reusable items. Give Away days should be promoted at all of the sites.

Recycling Better

Although the overall objective should be to get less material put into blue boxes or carts, there are items, not currently included in the program that should be. The most obvious omission is metals: aluminum pie plates and small metal objects such as bent nails, stripped screws and broken appliances. These things will continue to be thrown into the general garbage unless convenient pickup is available. The problem may be that there are no stewards for these products. This is where the province could step in. The up-front cost would be offset by the value of the resource. Metals should not be going into the landfill. Another possible alternative would be to have the materials first dumped and spread out so that a powerful magnet would pull up the metal objects.

Co-mingled collection has been effective in increasing the volume of recyclable material, but it has lowered the quality of some products, particularly paper. People are shocked when they hear for the first time that the paper we put into our recycling boxes or carts is shipped to China where it is turned into roofing tiles, some of which might be shipped back and put on roofs in Canada. Certainly something better could, and should be, done. What we need is a separate system for the

collection of newsprint and high quality office paper in addition to the collection of paper through the blue box or cart system. The stewards should be required to set up bins in public areas like parking lots at shopping centres for people to leave newspaper and office type paper. The stewards should also be required to collect directly from schools, universities and other businesses that produce significant amounts of used paper. The higher value product might go some distance to covering the cost of the program.

Getting the Gas Out of Glass: Tomorrow Not Yet Now

The title of this section may seem absurd because glass is an inert material that does not give off gas in a landfill, but we often forget the unseen waste, the gases that go into the environment through transport. Glass is an excellent material for packaging food. It is made from material that is abundant, and, if treated well, it is reusable. The problem is that it is a heavy material, and more energy is required in transporting it. There is already a deposit system on beer bottles and some pop bottles, which are then reused. A similar system needs to be put into effect for other foods and beverages that are sold in glass, or could be sold in glass. This would require standardized sizes and local bottling. Of course this is well beyond the capacity of the Province of Manitoba to implement, but it is an idea that could be discussed with other provinces. Local processing would be good both for the economy and the environment. It is not enough to reduce waste. We also need to preserve non-renewable resources like metals for the future.

Summary of Recommendations on Waste

1. Adopt Zero Waste, Zero Harm and highest use design principles for waste management.
2. Engage in full-cost accounting that includes energy use and GHG impacts to design efficient, low-carbon systems.
3. Extend and improve an Extended Producer Responsibility regime, in which producers and consumers of the materials that are wasted are held responsible for waste reduction systems and their costs.
4. Encourage and support the City of Winnipeg and other municipalities in their efforts to implement more effective waste reduction and waste collection systems with a wider range of waste streams included. Metals are an obvious example of a valuable resource that is missed by residential collection.
5. Reduce landfilled construction, demolition, industrial, commercial and institutional waste by imposing bans on some materials and using financial incentives to discourage unsorted loads.

6. Through regulation require all landfill sites to provide facilities for recycling and composting.
7. Require the stewards of paper products to provide for separate collection of newsprint and office paper at shopping centres to recover a higher quality product.
8. Support the development of local processing, reuse and remanufacturing enterprises to enhance local economic initiatives that improve system efficiencies and highest use of materials.
9. Exercise responsibility and initiative, working with municipalities, to deploy the tools at its disposal to regulate, monitor, incent and license waste management to promote the zero waste, zero harm design principles and achieve the above objectives.

Community Education for Sustainability*

“Simple Personal Choices – Big Results”

I. Mobilizing Manitobans So We All Do Our Part

TomorrowNow rightly notes that everyone has a role to play “to reduce our consumption of water, energy and material resources to sustainable levels.” Individual citizens indeed have a huge opportunity to help Manitoba in its ambitious goal to become "one of the most sustainable places to live on earth." Households use about 40% of electricity consumed in the province. Light duty trucks and vehicles use half the province's transportation fuel. In the City of Winnipeg alone, over 200 000 tonnes of residential garbage, much of which could be recycled as valuable resources, is wasted every year. The choices households make on how and what they consume are central for determining our environmental footprint.

Green Action Centre agrees that supporting individual behaviour change is a critical step in our progress toward sustainability. It is also one of the most challenging steps. Green Action Centre has been doing environmental change work for more than 25 years – initially promoting the practice of recycling and then composting, and in more recent years also working to reduce greenhouse gas emissions in the transportation sector through programs such as Active and Safe Routes to School, Workplace Commuter Options, and the annual Commuter Challenge. Our newest program, Living Green, Living Well, works to support greener living in everyday life. Green Action Centre’s efforts are directed to workplaces, schools, neighbourhoods, businesses and communities to encourage all Manitobans to do our part.

Prioritizing general public education to complement sustainability programs in schools is an essential step in building a culture that understands and values the environment. Manitoba’s environment in the twenty-first century faces stresses that were little understood a generation ago, including climate change, resource depletion, and nutrient pollution that can cause toxic algae blooms in our waters. Manitobans want to live sustainably, but all generations must learn new skills and habits if we are to adapt to challenges of a changing planet. Government leadership in this area is vital, to model the desired practices and to move them into the mainstream. Beyond that, community understanding, commitment and participation are absolutely essential.

* by Randall McQuaker with input from Josh Brandon

Manitobans, like other Canadians, want to live greener lives. We care about the world our children will inherit. To be sure, people need support in understanding environmental issues, setting priorities and overcoming obstacles to more sustainable habits of living. But we know that people are willing to embrace changes that are part of solutions.

Education is critical to prepare the community for the scale of change that will be needed. Such change is best achieved through respectful engagement that acknowledges the multi-dimensional nature of people's lives. At the same time, people need to appreciate the ecological consequences of their everyday decisions. We also need models and champions to help build and express a social consensus around environmental action and around the associated policies, regulations and public investment priorities. By no coincidence, sustainable behaviours often reflect a "triple bottom line" that results in economic, social and environmental benefits.

At the same time, we must be wary about loading too much onto individual actions. The responsibility to adopt sustainable practices is a shared responsibility that includes all sectors of society. A co-ordinated and integrated approach is needed, including infrastructure as necessary to make sustainable choices possible along with price signals and incentives to encourage sustainable choices. Individuals are more likely to make the right choices if those options are practical, safe, affordable and efficient.

We note that social media and community based social marketing can be key tools in leading campaigns for social change. Too often, though, these tools are add-ons to traditionally developed marketing campaigns. The most effective social media campaigns are interactive conversations, not one-way broadcasts. We believe that community-based social marketing can best succeed if it makes use of organizations that are already well experienced and respected within communities. Sometimes, a constructive role for government is to lead by listening.

Green Action Centre recommends:

- Provide adequate, stable, multi-year support for organizations that actively engage communities, workplaces, households, schools, businesses, municipalities, organizations, institutions and individuals in programs of education and behaviour change in the priority areas identified in *TomorrowNow* – waste reduction and climate change.
- The goal must be to reduce the ecological footprint of Manitobans. Programs and strategies of demonstrated value must be scaled up to achieve not just incremental, but transformative change.
- Use appropriate ecological fiscal measures to direct resources into supportive infrastructure and community education and mobilization on sustainability.

- Understand that environmental change must occur in the community if school-based sustainability curriculum is to be effective. Otherwise, the message in schools rings hollow. It is no surprise that kids are quick to spot contradictions between what grownups say and what they actually do. In the end, schools do not set, but reflect, community values.

II. Manitoba as the Eco-Learning Capital of Canada

Green Action Centre has been delivering environmental presentations in schools since 1998. We have given more than 3,800 curriculum-linked presentations to more than 100,000 students over that period. Through school-based environmental education, children learn how interdependent we are and how we rely on natural processes and on the ecological services they provide for human communities (and other species with whom we share the earth). They learn that we have responsibilities for the ecological impact of our resource consumption decisions. Such learning needs not just to inform, but also to empower children to make change.

Green Action Centre recommends:

- Within the formal education system, include community partners and draw on community resources in curriculum-based education for sustainable development, to underscore the real-world relevance of sustainability issues and to focus the discussion on solutions.
- Schools should have sustainability co-ordinators to support and identify opportunities to reduce their ecological footprint.
- School sustainability plans should be not just encouraged, but required.
- Programs like Green Action Centre's Active and Safe Routes to School need to be maintained and expanded. Such programs actively involve children in practical environmental solutions. As well as school travel, Green Action Centre supports school sustainability through curriculum-linked environmental education as well as waste reduction (e.g. litterless lunches) and composting. We recommend expanding program capacity to make these resources available to more schools.

Concerning green leadership in government, Green Action Centre recommends:

- As Government, model what you urge on others. Demonstrate a commitment to sustainability not only in government operations, but also in government policy and in budgets. Suggested policies and budget measures appear throughout Green Action Centre's submission.
- Measuring corporate GHG emissions is a positive first step, but it should be followed up with constructive action. Last year, the government of British Columbia announced that its

public sector had succeeded in reaching its target of becoming carbon neutral, with all emissions by public facilities being offset by clean energy and other projects to reduce carbon emissions.²⁸ Such a step in Manitoba would go a long way toward inspiring Manitobans and convincing them that the Province is practising what it is asking of others.

- The Legislature is one of Manitoba's most striking and high-profile buildings. Any improvements there would be noticed and welcome. However, if these changes are to be meaningful, they should be complemented by improvements in all government buildings. Investments in energy and water efficiency in schools, hospitals and public administration buildings across the province would quickly show benefits by reducing emissions, impacts and costs. We appreciate that different branches of government (e.g. school boards or Regional Health Authorities) are responsible for operating budgets while capital improvements are provincially funded. In the big picture, efficiency improvements offer public and environmental benefits.
- Overall there needs to be a clear plan of action to reduce government's environmental footprint. Measurement is a useful and necessary first step but unless it is followed up with targets and practical implementation, we will fall short of making Manitoba a leader in sustainability and will be unsuccessful in encouraging businesses, institutions and households to follow suit.

²⁸ http://www2.news.gov.bc.ca/news_releases_2009-2013/2011ENV0032-000805.htm