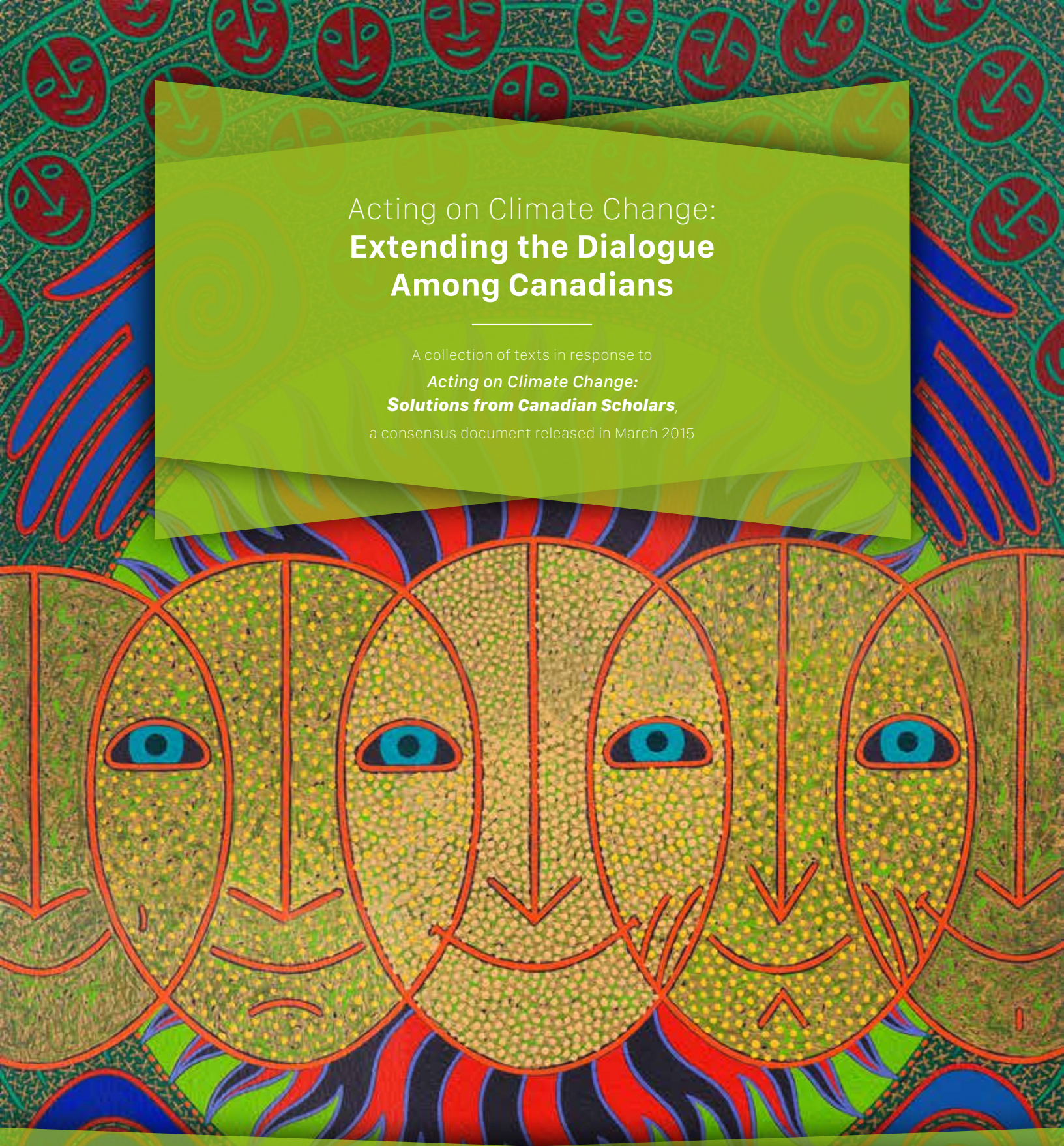
Acting on Climate Change:
Extending the Dialogue Among Canadians

A collection of texts in response to

Acting on Climate Change:
Solutions from Canadian Scholars,

a consensus document released in March 2015



Sustainable Canada Dialogues

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Torrie Smith Associates

ABOUT THE AUTHOR

RALPH TORRIE

Torrie Smith Associates (TSA) has been engaged in the global warming issue since 1988 when TSA principal Ralph Torrie organized the energy workshop for the Toronto Conference on the Changing Atmosphere. The firm developed the framework and conventions now used around the world for local government climate change response strategies, produced the first low carbon scenario analysis for Canada, and continues to help public and private sector clients identify and pursue the opportunities being generated by the current global energy transition.

FOR MORE INFORMATION, PLEASE CONTACT
RTORRIE@TORRIESMITH.COM

OFFICIAL WEBSITE
TORRIESMITH.COM

MY GRANDSON WAS BORN IN 2015, AND WILL LIVE OUT HIS LIFE IN THE CENTURY OF CLIMATE CHANGE. WHAT WILL BE OUR LEGACY TO HIM?

Contributed by

RALPH TORRIE

Some Reflections

on Climate Change Response Policy

Critique of Current Climate Change Response Policy Agenda

The current menu of climate change mitigation policies focuses on improving the utilization efficiency and reducing the carbon content of fuel and electricity. Carbon pricing, efficiency regulations, feed-in tariffs, renewable electricity and biofuel mandates, public investment in efficiency and carbon-free alternatives, consumer education and social marketing – these are the elements we find in climate change response policies around the world. They have worked, but not well enough to bend the curve of growing emissions to the extent needed to avoid dangerous climate change. They will give us futures in which emissions are lower than they would otherwise be, but they will not lead to low-carbon futures in the context of avoiding dangerous climate change.

Globally, greenhouse gas (GHG) emissions have *increased* by more than 50% since 1990, the reference year in the Framework Convention on Climate Change. In the rich, industrial countries of the Organisation for Economic Co-operation and Development (OECD) only four countries had emissions in 2013 that were more than 15% below 1990 levels: Germany, the Netherlands, Denmark and the United Kingdom. In the case of Germany and the United Kingdom, a significant portion of the emission reduction resulted from economic structural change that had nothing to do with climate change response policy. Even if this small group of countries could repeat their historical performance *and then repeat it again*, by 2060 their emissions would still be more than twice the levels needed to qualify as low-carbon economies. And these are the world leaders.

In the context of the challenge of achieving truly low-carbon futures, there are two problems with the current policy menu:

- First, it is not politically popular; much of it is not even politically feasible, even when very weakly applied.
- Second, even if and when it can be mounted with some vigour, it is not sufficient to achieve the transformation to the low-carbon future (i.e. emissions at least 80% below current levels).

The current policy menu starts in the world of status quo emissions and political ambivalence, and **efforts to move it to greater**

mitigation efficiency also tend to move it into the realm of political infeasibility (Figure 1). It is the difference between a carbon tax of $15-$30/tonne and a carbon tax of $200-$300/tonne, or the difference between continued harmonization with U.S. fuel efficiency standards vs. banning gas guzzlers or making electric vehicles mandatory.

Even if the current policy menu trended in the direction of increasing political feasibility with increasing intensity, so that political support grew as the carbon taxes went up and the government intervention and/or regulation of fuel and electricity production and consumption grew stronger (accelerating climate change itself may help to do this), our best analysis now suggests that, ***while items from the current menu would be necessary, they would not by themselves be sufficient to achieve the transformative change required for a low-carbon outcome in this century***.

This last point may not be so obvious, given the hyperbole that often accompanies popular coverage of clean energy technology progress. However, a close reading of the low-carbon scenario literature[1] suggests that while low-carbon futures (emission reductions in the 80% range in this century) are technically possible, there are daunting practical issues facing their implementation on a 2050 time scale, especially given the "business-as-usual" forecasts that are employed. Quoting the Deep Decarbonization Project:

> *"staying within 2°C will require deep transformations of energy and production*

1 See Torrie, R. et. al. (2013). Low Carbon Futures: A Review of National Scenarios. Trottier Energy Futures Project, Vancouver, http://www.trottierenergyfutures.ca.

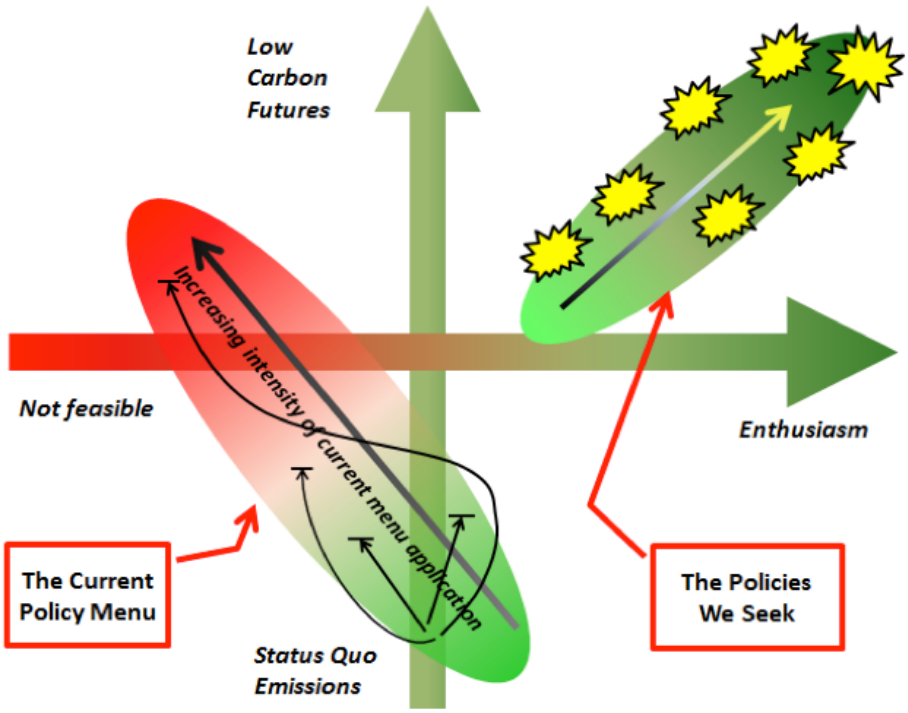


Figure 1. *Individual policies on the current menu may start out in the direction of increasing feasibility but, as intensity of application (e.g. carbon price, regulatory standard) increases, they trend toward political infeasibility before hitting a limit, well short of low-carbon futures. What are the "breakthrough policy strategies" that will allow us to jump over to or tunnel through to the upper quadrant?*

systems, industry, agriculture, land use, and other dimensions of human development. It will require profound changes in the prevailing socio-economic development frameworks. Many of the technologies that will need to underpin these transformations are available, but many others are not"[2].

We are at a political feasibility impasse with versions of the current policy agenda that would not even meet our 2020 targets, let alone put us on a path to deep decarbonization[3,4]. To make the transition to a low-carbon future on a 30 to 50 year time frame, the emissions baseline itself must also curve down, and we must find the policy levers for helping that along.

Low-Carbon Futures — What Might They Look Like?

For Canada, a low-carbon future is defined as one in which GHG emissions are brought to and maintained below 125 Mt CO_2e by 2050, about 80% below their level in 1990 of 600 Mt CO_2e. Emissions haven't been this low in Canada since before World War II. This is not to suggest low-carbon futures will look like the past — they will not — but to underscore that the transition to a future in which fossil fuels play much smaller a role in the economy will be transformative, and that changes in the level and pattern of fossil fuel production and consumption will be much greater than the incremental emission reductions targeted by the current policy menu.

Quantitative scenario analyses[5] of what low-carbon futures might look like in rich, industrial economies like Canada agree on a number of necessary elements:

Efficiency Doubles and Redoubles

Without exception, low-carbon future scenarios include much greater efficiency of fuel and electricity use than currently prevails. In the case of fossil fuel applications (e.g. vehicles, aircraft, furnaces, kilns, boilers, and some power plants), the direct contribution of efficiency gains to emission reductions is obvious, but efficiency gains are also a necessary enabling condition for the displacement of fossil fuels by the emerging carbon-free sources of fuel and electricity. Low-carbon future scenarios typically include per capita levels of fuel and electricity use that are about half the current Canadian average, and energy productivity (GDP/energy) four times higher than current Canadian levels.

Electricity's Market Share Grows

Another universal feature of low-carbon futures is the growing share of electricity in meeting our energy end use needs. Electricity is generally very efficient at the point of end use, and if it can also be manufactured efficiently with a low- or zero- carbon footprint, then a shift to greater use of electricity can play a key role in achieving a

2 Sachs, J. et. al. (2014). Pathways to Deep Decarbonization: Interim 2014 Report. Sustainable Development Solutions Network et Institute for Sustainable Development and International Relations, http://www.deepcarbonization.org, pp. xiii

3 Even if we could get support for the incremental, shallow decarbonization that the current extreme versions of the current policy menu would deliver, successful incremental efforts to "at least get started" could very well make it more difficult and expensive to get on a low-carbon pathway, notwithstanding technological progress, discounting the future and all that. Path dependency matters.

4 Climate change itself will eventually move climate change response policy up the public policy agenda, and we have witnessed the beginning of this in places like New York City in the wake of Tropical Storm Sandy. If this type of motivation can be generated soon enough and acted on in the creative and visionary way led by Mayor Bloomberg in the NYC response, then the accelerating pace of extreme weather can and will improve the political feasibility of a direct response. But it is a razor's edge; extreme weather, climate refugee crises, public health and other consequences will make it increasingly difficult to get and stay on a path to deep carbonization that preserves our traditions of democratic and social rights and freedoms. In those futures climate change will foster a different, darker set of policy responses.

5 See Torrie, R. et. al. (2013). Low Carbon Futures: A Review of National Scenarios. Trottier Energy Futures Project, Vancouver, http://www.trottierenergyfutures.ca

low-carbon future. In Canada, less than 25% of the final demand for energy is provided by electricity, and only 12% of the final demand for energy is *necessarily* electric (e.g. lighting, small motors and appliances, cooling, information processing and telecommunications). Electricity's share of final energy demand varies from province to province in Canada, depending on local circumstances, from 12% in Alberta to more than 40% in Quebec. While most low-carbon scenario analyses envisage electricity providing no more than 50% of total energy use on a 2050 time horizon, this would still represent more than a doubling of the average market share in Canada, and a quadrupling in Alberta.

Carbon-Free Electricity Prevails

Low-carbon futures invariably include a "decarbonization" of the electricity system, with carbon-free energy sources eventually displacing most fossil fuel power generation. Canada's hydroelectric resources give it an advantage in this regard, and the country also has a large surfeit of wind, solar, and other carbon-free primary electricity resources. The acceleration of the deployment of these carbon-free power supplies will depend on the pace with which other aspects of the "new grid" can be developed, including an array of information technologies, energy storage techniques, responsive demand technologies and a transmission and distribution infrastructure that supports a high degree of local, regional and inter-provincial interconnectivity.

Bioenergy

Almost all low-carbon scenario analyses include a greatly expanded role for bioenergy, particularly in the provision of carbon-free liquid fuels for those end uses that will be difficult or impossible to electrify, at least in the medium-term (e.g. long haul trucking, aircraft, marine transportation, and some industrial processes). There are serious issues with respect to whether the scale of the necessary bioenergy contribution could be made sustainably, and for this reason some low-carbon scenario analysts opt for an "all-electric" future. However, most analysts do not believe there is a credible "100% electric" scenario in the medium-term (i.e. on a 50 year time scale) and argue that achieving low-carbon futures in this century will require the emergence of a large, global, environmentally sustainable and technologically sophisticated bioenergy industry.

Bending the Baseline

The above elements of low-carbon futures – efficiency gains, electrification of end uses, decarbonization of electricity supply and the growth of the biofuels industry – are largely restricted to changes in energy technologies, energy commodity markets and related policies. ***There is a fifth element that is critical to achieving a low-carbon future – systemic changes in the larger economy that allow human needs for comfort, health, convenience, access, knowledge and happiness to be met in ways that require less energy in the first place***. The economy that generates energy service demands is about 20 times larger than the energy industry itself, and trends and events in that larger economy that are not much influenced by fuel and electricity markets will continue to have profound implications for both the prospect and the economics of a low-carbon future. For example:

- Mobility needs and automobile dependence are largely determined by community design and urban form. The trend to mixed-used, high-density cities in Canada also reduces the carbon footprint of the urban population.

- Energy has become at least a secondary factor in the design of buildings in recent years, but interest in green buildings is being driven more by the improvements they offer in comfort, aesthetics, marketability, and overall technical performance.

- Notwithstanding efforts to improve the efficiency of fuel and electricity utilization, the growth of the service economy and general manufacturing at the expense of primary processing industries, and the drive to increase value added in the primary industries, have done as much to improve the energy productivity of the Canadian economy as all the technological efficiency improvements combined.

- In the other direction, the shift of freight movement from rail to road has trumped any vehicle efficiency gains in the freight sector, making goods movement second only to the fossil fuel industry itself as a source of recent growth in Canada's GHG emissions.

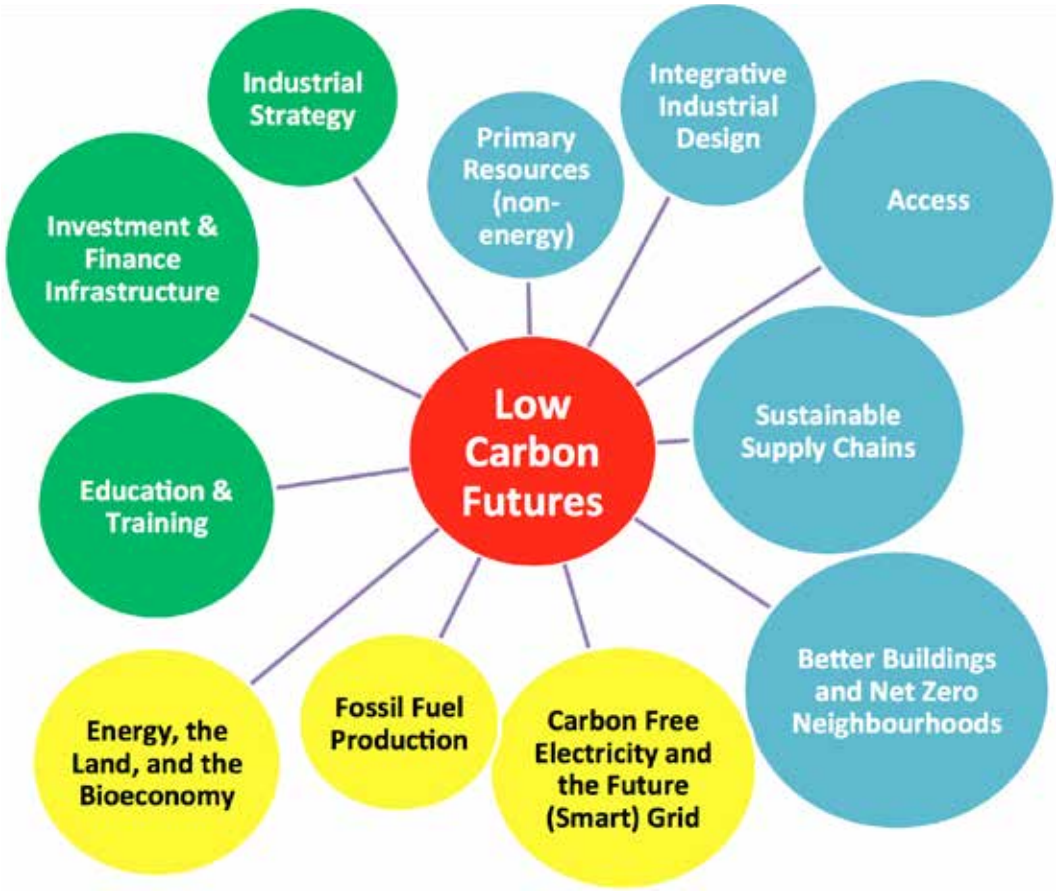
Reframing the Low-Carbon Challenge

Breakthrough strategies for achieving low-carbon outcomes and political feasibility will emerge from those areas where the social and economic goals and aspirations of Canadians align with the objective of a low-carbon future. Achieving that goal will also require the pursuit of policies that encourage trends outside of the energy sector that have the "side effect" of improving energy productivity. The challenge is to identify solutions that appeal to decision-makers while at the same time resulting in low-carbon outcomes in the energy demand sectors. Breakthrough business strategies and public policies for achieving low-carbon futures will occur when and where this type of alignment can be achieved.

Reframing the area of mitigation actions will help identify such solutions. For example, "personal transportation" is seen as an important focus of mitigation actions in traditional energy analysis, and the corresponding solutions are defined in terms of transportation modes (automobiles, public transit) and fuels. Reframing personal transportation as "Access" (see Figure 2) widens the system to include all the decisions and behaviours that give rise to the demand for personal mobility, including urban form and spatial structure, the substitution of telecommunications for mobility, etc. This widening of the system boundary expands the solution set to include technologies and techniques that can provide the fundamental amenity – access – without necessarily requiring the degree of personal mobility that characterizes modern urban life. Telecommuting, teleshopping, multi-use zoning of suburban developments and many other solutions are now included alongside vehicle technologies and carbon-free fuel options as ways of achieving carbon-free outcomes to the fundamental demand for access. When these novel low-carbon solutions align with the motivations of the decision-makers then "game changing" strategies emerge. For example, urban managers and policy-makers seeking ways to lower infrastructure capital spending will be attracted to the urban densification proposals that also have the side effect or collateral benefit of lowering GHG emissions.

Similarly, what would have been characterized as the "freight transportation" sector in traditional energy analysis, with a corresponding focus on vehicles (mostly trucks and trains) and their fuels, can be recast as "Sustainable Supply Chains", thus expanding the potential solution set to include techniques and technologies that address the underlying demand for "tonne-kilometres" of goods movement.

Figure 2. Reframing Climate Change Mitigation Strategies



New frameworks including broader potential strategies and solutions for achieving low-carbon outcomes need to expand beyond the traditional focus on energy commodities, as illustrated in Figure 2. Most importantly, rapid and transformational change can take place when that expanded solution set contains policies and strategies that respond to the needs and motivations of the key decision-makers who are outside the energy economy *per se*, but whose decisions and behaviours are nevertheless instrumental in setting the level and pattern of energy service demand in the society. Indeed, one could argue that given the inherent limitations of the current climate change response agenda, with its relatively narrow focus on fuel and electricity, that our best hope for achieving a transition to a low-carbon future on a time scale that is relevant to the pace of climate change itself, is the identification and acceleration of opportunities for just such disruptive and transformation change.