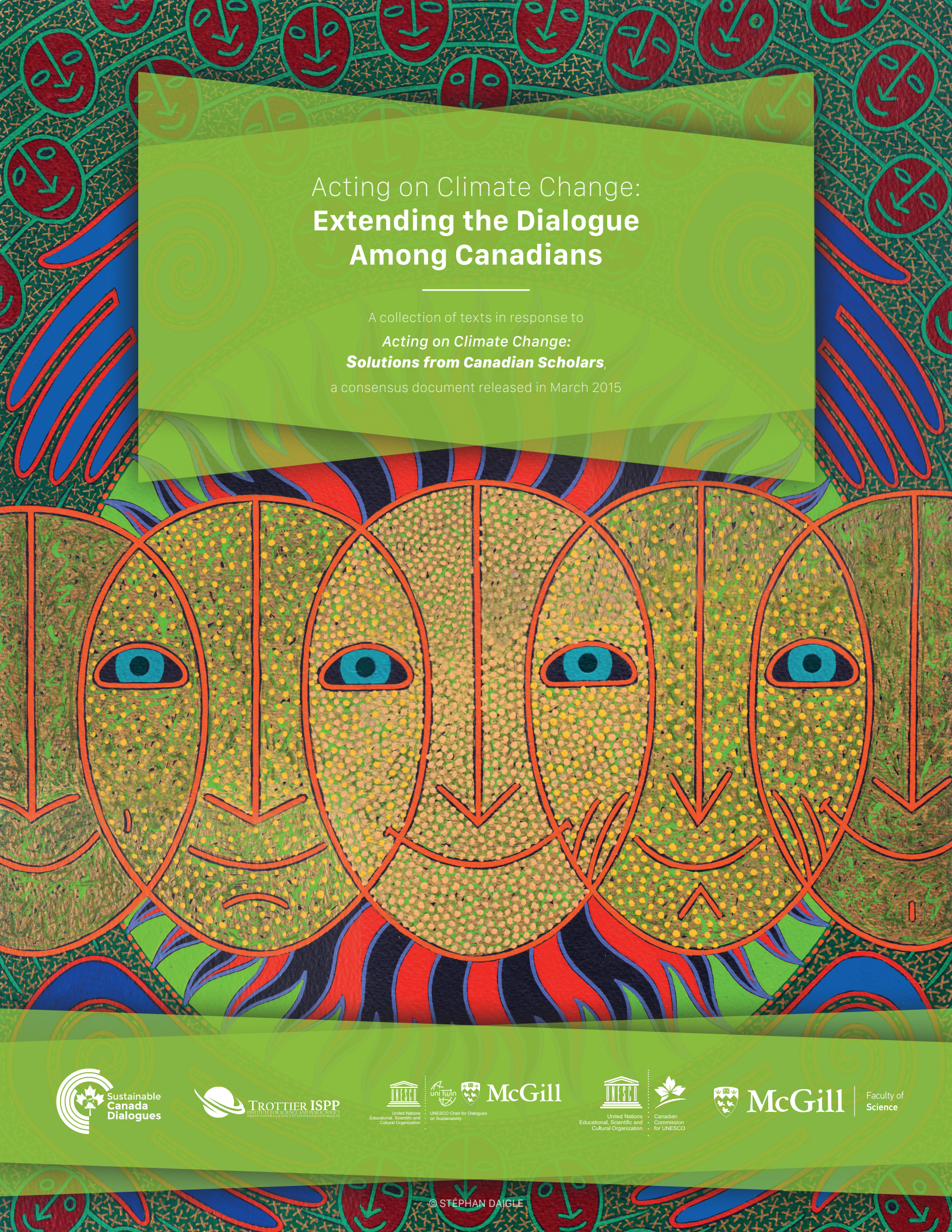


Acting on Climate Change:
Extending the Dialogue Among Canadians

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

TROTTIER ISPP
INSTITUTE FOR SCIENCE AND PUBLIC POLICY

United Nations Educational, Scientific and Cultural Organization · UNESCO Chair for Dialogues on Sustainability · McGill

United Nations Educational, Scientific and Cultural Organization · Canadian Commission for UNESCO

McGill | Faculty of Science

Fondation familiale Trottier Family Foundation

THE CANADIAN ACADEMY OF ENGINEERING
Leadership in Engineering Advice for Canada
L'ACADÉMIE CANADIENNE DU GÉNIE
Chef de file en matière d'expertise-conseil en génie pour le Canada

David Suzuki Foundation

ABOUT THE ORGANIZATION

TROTTIER ENERGY FUTURES PROJECT

ALEX BOSTON

The Trottier Energy Futures Project (TEFP) is a research and modeling effort to determine how Canada can dramatically reduce its emissions of the greenhouse gases (GHG) that are the primary cause of global climate change.

Alex Boston is Principal of Boston Consulting. He advises local and senior governments, utilities and real estate developers on climate and energy. The Trottier Energy Futures Project is dedicated to charting a course for deep emission reductions.

FOR MORE INFORMATION, PLEASE CONTACT
alex@bostonconsulting.co

OFFICIAL WEBSITE
trottierenergyfutures.ca

PASSENGERS BOARD AN URBAN COMMUTER TRAIN

Contributed by

TROTTIER ENERGY FUTURES PROJECT

Local Low-carbon Agenda

for National Prosperity[1]

Dateline: December 31, 2099

At the dawn of the 22nd century, we can gain insight into today's prosperity by exploring major chapters in the history of Canada's deep carbon-reduction path. Almost 100 years ago, Canada's prime minister convened the country's foremost political leadership at a Solutions Summit to guide the way forward. The impetus was a commitment by industrial countries at the historical Paris Climate Summit in 2015 to reduce carbon emissions to zero by 2100.

Local agenda for national prosperity

At the Solutions Summit, leaders shared a sense of urgency to move down the decarbonization path. Obstructing progress, however, were scarce resources and competing priorities.

Municipalities were invited as key contributors, the Prime Minister recognizing that they held significant influence over half of the country's emissions[2]. Transportation and urban form, in particular, held great potential, as emissions from road-based transportation had risen 25% between 1990 and 2012 and freight emissions had surged 65%. Two-thirds of Canadians lived in thinly populated, car-dependent neighbourhoods with few, if any, walkable destinations[3]. Furthermore, the industrial world's think tank had determined that urban policies provided attractive low-carbon options that reduced the transaction costs of mitigation across the entire economy, and the deeper the targets, the greater the benefits of local action[4].

Nationally, the country was confronting hefty deficits. Canadians were accruing mounting financial deficits for municipal infrastructure. Steadily mounting social deficits were borne of congestion, inadequate housing and preventable disease. Environmental deficits were spiralling out of control, notably forest and farmland loss. Although the largest problem was the carbon deficit, these other frustrations could not be forgotten.

At the whiteboard, the Prime Minister outlined a foundation of "Climate Change

1 This article is based on a paper by Alex Boston for the Trottier Energy Futures Project.

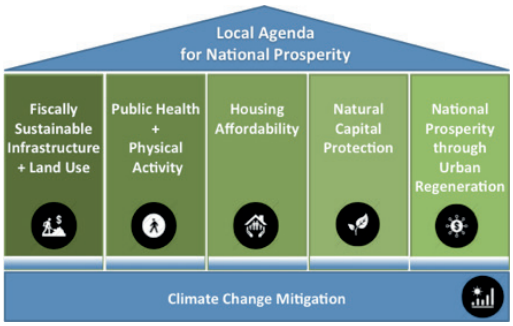
2 Analysis by the author of Canada's latest inventory submission to the United Nations Framework Convention on Climate Change.

3 Population distribution extrapolated on archetyping by Gordon, D. and Shirikoff, I. (2014). Suburban Nation? Population Growth in Canadian Suburbs, 2006-2011. Council for Canadian Urbanism Working Paper I.

4 OECD (2010). Cities and Climate Change. OECD Publishing.

Mitigation" and sketched five pillars supporting a "Local Agenda for National Prosperity." Summit delegates constructed strategies to accentuate synergies, minimize costs and maximize benefits.

The five pillars



1. Fiscally Sustainable Infrastructure + Land Use

In the early 21st century, municipalities were bowed under mounting costs for delivering municipal services across thinly populated residential neighbourhoods. Municipalities discovered servicing costs to support this form of development were as much as threefold those of complete, compact areas[5]. This development model was contributing to rising municipal infrastructure deficits, then pegged at $125 billion[6].

Transportation spending was fuelling the auto-oriented model. Collectively, governments spent $29 billion annually on roads — quadruple transit budgets[7]. That total excluded the land value of roads, let alone parking spaces, the single largest land use in many communities. Nor did it include social and environmental costs, estimated at $27 billion annually[8].

This growth model was eventually overturned due to two competing principles: **1.** Segregation of activities in people's lives (working, shopping and living) and; **2.** Connecting people to these dispersed activities by personal automobile.

The costs of state-financed roads, bridges, parking, sewage and water infrastructure, accidents, pollution and environmental damages were internalized into the costs of transportation and land-use activities. Sound fiscal policy was supplemented by supportive municipal zoning. Within two decades, greenfield development tapered off, and suburban areas modernized.

Suburban superblocks were opened up with cross streets and greenways, linking homes and shops. Cul-de-sacs were connected. Mega-multi-lane arterials from century-old residential areas acquired sidewalks, bike lanes and bus stops along mixed-use frontages.

Cycling rates swelled in suburban areas. Suburban town centres became important employment hubs connected across urban regions by rapid transit. Transit investments were conditional on municipalities meeting growth-intensification targets. As a result municipal service and utility costs were cut 30%. Household transportation costs dropped 50%[9].

Focused growth laid the groundwork for district energy. By increasing the density of hot-water

5 Based on a literature review of municipal infrastructure spending in a half dozen municipalities by Thompson, D. (2013). Suburban Sprawl: Exposing the Hidden Costs, Identifying Innovations. Sustainable Prosperity.

6 Mirza, S. (2007). Danger Ahead: The Coming Collapse of Canada's Municipal Infrastructure. Federation of Canadian Municipalities.

7 Transport Canada (2011). Transportation in Canada, Appendix A.

8 Thompson, D. (2013). Suburban Sprawl: Exposing the Hidden Costs, Identifying Innovations. Sustainable Prosperity.

9 Based on a U.S. study by Todd Litman for the Global Commission on Economy and Climate: Litman, T. (2014). Better Growth, Better Climate: The New Climate Economy. Global Commission on Economy and Climate.

and space-heating services (70% of building energy demand at the time) in nodes and corridors, district energy was made possible. Thousands of high-efficiency mini energy plants driven by renewables propagated in neighbourhoods across the country, displacing millions of inefficient furnaces and boilers. Renewable heat cut building power demand by 50% in parts of Canada.

2. Public Health + Physical Activity

In the mid-20th century, Canadians learned the average 60-year-old Swede was fitter than a 30-year-old Canadian because of his regular walks to work and cycling trips to the bakery[10]. More than 40% of trips in Sweden were by foot or bike, one-third by car. In Canada, only 8% of trips were by active transportation, and more than three-quarters by car.

Higher rates of inactivity, obesity and diabetes were correlated with lower-density neighbourhoods[11]. Physicians began writing prescriptions to citizens, cities and senior governments for better land use and urban design — top determinants of physical activity levels[12].

At the time, obesity cost $6.4 billion in annual economic output losses due to disability and premature death[13]. Young Canadians' life expectancies were shorter than their parents'.

Under a Neighbourhood ParticipACTION Infrastructure Plan, senior governments invested in retrofitting existing residential areas with cycling and walking infrastructure conditional on municipalities hardwiring this infrastructure into transit corridors, financed by new development. Today, most doorsteps are within a five-minute walk of key destinations — corner stores, transit stops, car shares, cafés and parks.

3. Housing Affordability

In the early 21st century, housing affordability was in a crisis. One in four Canadians spent more than 30% of their income on housing, the country's affordability threshold. Among people under 25, the figure was one in two.

Paradoxically, the most costly housing to build – single detached homes and high-rise condominiums – dominated new construction. These housing types were also the most greenhouse gas (GHG) intensive, the latter in part because of concrete construction, but also because of inefficient glass walls and other cost-cutting measures.

All levels of government modernized housing and development policy, updating regulations and fiscal tools, and reforming subsidies that constrained housing choice. Multiplexes, row and townhouses and, wood-frame low-rises flourished in this fertile policy environment. The latter was the least carbon-intensive form of housing and 25% less expensive per square foot to build than concrete buildings[14].

10 ParticipACTION (2004). The Mouse That Roared: A Marketing and Health Communications Success Story. http://scaa.sk.ca/gallery/participaction/english/media/PDF/CJPH_95_Suppl_2_e.pdf

11 Glazier, R. et al. (2014). Density, Destinations or Both? A Comparison of Measures of Walkability in Relation to Transportation Behaviors, Obesity and Diabetes in Toronto, Canada. PLOS ONE, 9(3).

12 "Lifestyle" interventions that require physical activity as a course of daily routine are more likely to produce longer-term increases in activity levels relative to "facility-dependent" ones; e.g., gym, pool. Dunn, A.L., Andersen, R.E. and Jakicic, J.M. (1998). Lifestyle physical activity interventions: History, short and long-term effects, and recommendations. American Journal of Preventive Medicine, 5(4): 398-412.

13 Katzmarzyk, P. and Janssen, I. (2004). The economic costs associated with physical inactivity and obesity in Canada update. Canadian Journal of Applied Physiology, 29(1): 90-115.

14 http://www.woodbywy.com/2014/01/07/wood-fra-

Canada became the single greatest hewer of high performance, pre-fabricated, wood-frame housing in the world. Production costs fell and construction rates soared, further increasing affordability. Energy performance rose, establishing Canada as the pre-eminent home for net-zero buildings.

Governments realized some of the affordability potential of existing housing. More than half of homes were single detached. Most were occupied by one- to two-person households. The largest share was empty nesters and seniors. Responding to tax incentives, many elected to downsize their own homes, establishing secondary suites and stratifying separate units, creating liquid retirement assets.

4. Protecting Natural Capital

The turn of the last millennium marked a period of unprecedented global volatility in renewable and non-renewable natural resource prices[15]. The World Economic Forum tabled a report concluding this volatility would continue if dominant expressions of urbanization, resource demand and supply constraints continued[16].

In Canada, 2% of agricultural land disappeared in the first decade of the 21st century[17]. Canada faced growing disruptions from U.S. food production — the U.S. being Canada's chief food-export destination. Water scarcity, drought, extreme weather and sea-level rise were among the factors reducing arable U.S. land, precipitating food price volatility. Canada and the world would benefit, because agricultural land in Canada was protected.

Canada's political leadership began to see what needed to be done. They focused growth in nodes and corridors and restored green space in cities. This sowed the seeds for today's extensive riparian forests alongside waterways that spread out across our cities. Not only has this reduced hard infrastructure costs, it has also provided today's extensive network of multi-use paths for pedestrians and cyclists.

Canada's reputation as the "Sharing Country" also has its origins in the early 21st century eco-industrial renaissance. At the time, most households possessed a private car, costing $10 000 a year to own and operate, despite sitting idle 95% of the time[18].

A shared car displaced four to 13 vehicles[19]. The federal government provided tax credits for car-sharing expenses, accelerating the car-share economy.

The government also saw car-sharing as the delivery model for the autonomous car. Autonomous vehicles were projected to displace car ownership rates by as much as 98%, according to PricewaterhouseCoopers. Canada opened its borders and Google, Apple, Tesla and Uber rolled in. There are fewer cars on the road in 2100 than in 2000, despite a doubling of the population.

med-six-story-condominium-saves-cost-boosts-sustainability-vancouver/

15 The McKinsey Commodity Index covers food and non-food agricultural items, metals + energy. McKinsey Global Institute (2011). Resource Revolution: Meeting the World's Energy, Material, Food, + Water Needs.

16 World Economic Forum and Ellen MacArthur Foundation (2014). Towards the Circular Economy: Accelerating the scale-up across global supply chains.

17 Statistics Canada (2014). Agriculture in Canada in Human Activity and the Environment. Government of Canada.

18 Shoup, D. (2005). The High Cost of Free Parking. Chicago: American Planning Association.

19 Metro Vancouver found each shared car displaced up to four personal ones. In Philadelphia 13 cars were displaced.

5. National Prosperity Through Urban Regeneration

In the 20th century, policymakers began to realize that major urban regions were the key social and economic organizing units for a country. They were the nexus where goods, people and ideas came together to connect with the rest of the country and the world. Economic growth in major urban regions resounded across the country, determining national prosperity.

PricewaterhouseCoopers and the Toronto Board of Trade found Canada's major urban centres scored low on transportation measures such as congestion, commute times and transit-fare prices. Transport Canada estimated that *personal* social, economic and environmental costs of congestion across Canada's nine largest urban centres were $12 billion annually. That total jumped to $20 billion when freight-hauling delays and other business-related costs were included[20].

Leading countries began focusing on energy productivity as a central competitive advantage. Energy had become a strategic factor for 40% of global revenue, meaning it was crucial for management to know the type, quantity and cost as key decision-making variables[21]. At the time, Canada was the industrial world's largest per capita energy consumer. Canada's low-density residential neighbourhoods made it difficult to make progress in energy productivity.

Canada's political leadership was determined not to be left behind and laid out the world's most ambitious electrified transportation agenda. Inspired by Montreal Transit's unprecedented 100% electrified transit commitment, Canada became the world's first fully electrified transit country. Provinces were North America's first jurisdictions to require electric vehicle (EV) charging infrastructure in new buildings.

Canada overtook its industrial rivals in energy productivity primarily because EVs were more than four times as efficient at converting energy to momentum as internal combustion engines.

Good governments to good governance

The magnitude of Canada's financial, social and environmental deficits 100 years ago may suggest a federation administered by bad governments. Canada's governments, however, scored good grades on most tests. Good was not good enough.

Early 21st century challenges were more complex than the challenges of the 19th and 20th centuries when governments' essential institutions were conceived. A growing number of foresighted countries — Denmark, Sweden, South Korea, the U.K., Netherlands and China — had national urban agendas.

To support the pillars and lay the foundation of the Local Agenda for National Prosperity, Canada created a national-subnational-local governance institution that strengthened horizontal and vertical stickhandling.

Canada, the Sharing Country, imparted technical and institutional innovations to the rest of the world that have contributed to the relative climatic stability we all enjoy today.

20 This additional $8 billion is an extrapolation of a 2008 Metrolinx study calculating business-related congestion costs in Greater Toronto-Hamilton.

21 McKinsey + Company (2009). Energy - A Key to Competitive Advantage: New sources of growth and productivity.

ABOUT THE INITIATIVE

SUSTAINABLE CANADA DIALOGUES

This contribution is part of a collection of texts, *Acting on Climate Change: Extending the Dialogue Among Canadians*, stemming from interactions between Sustainable Canada Dialogues, an initiative of the UNESCO-McGill Chair for Dialogues on Sustainability, and business associations, First Nations, non-governmental organizations, labour groups, institutions, organizations and private citizens.

Sustainable Canada Dialogues is a voluntary initiative that mobilizes over 60 researchers from every province in Canada, representing disciplines across engineering, sciences and social sciences. We are motivated by a shared view that putting options on the table will stimulate action and is long overdue in Canada.

Together, the contributions enrich the scope of possible solutions and show that Canada is brimming with ideas, possibilities and the will to act. The views expressed in *Acting on Climate Change: Extending the Dialogue Among Canadians* are those of the contributors, and are not necessarily endorsed by Sustainable Canada Dialogues.

We thank all contributors for engaging in this dialogue with us to help reach a collective vision of desired pathways to our futures.

FOR MORE INFORMATION, VISIT OUR WEBSITE

sustainablecanadadialogues.ca/en/scd/acting-on-climate-change