Article

John Robinson, Mike Bradley, Peter Busby, Denis Connor, Anne Murray, Bruce Sampson and Wayne Soper

Climate Change and Sustainable Development: Realizing the Opportunity

Manifold linkages exist between climate change and sustainable development. Although these are starting to receive attention in the climate exchange literature, the focus has typically been on examining sustainable development through a climate change lens, rather than vice versa. And there has been little systematic examination of how these linkages may be fostered in practice. This paper examines climate change through a sustainable development lens. To illustrate how this might change the approach to climate change issues, it reports on the findings of a panel of business, local government, and academic representatives in British Columbia, Canada, who were appointed to advise the provincial government on climate change policy. The panel found that sustainable development may offer a significantly more fruitful way to pursue climate policy goals than climate policy itself. The paper discusses subsequent climate change developments in the province and makes suggestions as how best to pursue such a sustainability approach in British Columbia and other jurisdictions.

INTRODUCTION

The climate change issue is characterized by a number of ironies. First, although it is the subject of by far the most extensive process of scientific review ever undertaken, it is commonly argued in the media that much more scientific analysis is required before significant decisions should be taken. Second, just because of this extensive review process, there is probably more consensus on the physical science of climate change in the relevant scientific communities around the world than there is with respect to most high-profile environmental problems. But the degree of consensus within the scientific community seems to be proportional to the degree of perceived scientific uncertainty outside it. Third, although there is ample evidence to suggest that measures that would reduce both emissions and vulnerabilities to future climate impacts are available at low cost and, in some cases even negative costs, the international policy community is in an apparently perpetual state of gridlock on climate change policy. To date at least, research on climate change processes and policy options has not seemed to make it easier to implement climate change policy.

It has been argued elsewhere that part of the difficulty in developing climate change policy lies in the way it has been framed as a scientific problem, and that developing a dialogue between climate change and sustainable development might represent a fruitful way to make a more effective connection to policy (1). It has also been suggested that recent thinking about climate change and sustainable development, as reported in the work of the Intergovernmental Panel on Climate Change (IPCC), both demonstrates the critical importance of the sustainable development connection and offers some specific opportunities for linking the two discourses (2, 3). This paper develops this line of argument further and suggests some specific forms of interconnection related to the engagement of the business community, and society in general, in the examination and achievement of sustainable development scenarios and strategies. It will be argued that shifting the frame of the climate change issue to one of sustainable development is both a logical development of recent work and also provides the opportunity to make specific progress on climate change and other goals.

Climate Change: The Changing Context

One of the distinguishing characteristics of the climate change literature has been a progressive broadening of the debate from a primary focus on the physical science of climate change to a growing interest in the human dimensions of the problem (4, 5). In the Synthesis Report of the Third Assessment Report of the Intergovernmental Panel on Climate Change, the argument is made that an integrated assessment approach to climate change should consider a full cycle from socioeconomic and technological driving forces, through emissions and concentrations of greenhouse gases, physical changes in the climate system, impacts on biological and human systems, and back to underlying socioeconomic and technological development paths (6). A version of the accompanying figure in that report is reproduced here as Figure 1. The critical point for our purposes is that recent work has begun to emphasize the significance of the bottom right-hand corner of that diagram. Although the IPCC's Third Assessment Report did not complete or represent a fully integrated assessment of climate change (7), it did highlight the importance of the underlying socioeconomic and technological development paths in two related ways.

First, it is clear from Figure 1 that impact and adaptation analyses on the one hand, and the construction of greenhouse gas emission scenarios on the other, find a common source in the assumptions of future development paths. The characteristics of these underlying development paths both determine the type and level of greenhouse gas emissions, and also strongly condition the type and level of expected impacts and the adaptive capacity (8) of society. While relatively little work has yet been done on dynamically connecting emission scenarios and impacts and adaptation analysis through underlying development path scenarios, this is clearly an area that needs to be pursued (2, 3, 9–12).

Second, a major focus of the work of the Third Assessment Report was on connecting climate change to sustainable development. A cross-cutting paper was produced (15), an international conference was held (14), and several of the chapters of both the Working Group II (17) and Working Group III (18) reports focused on this question. This represented a significant broadening of the agenda of the IPCC into issues that are connected in fundamental ways to the question of the development paths underlying the analysis of climate change emissions, impacts, and adaptation (19). Over the period since the publication of the Third Assessment Report, literature has begun to develop on the specific linkages between climate change and sustainable development (e.g. [3, 9, 20–23]). Moreover, the IPCC has identified the relationship between climate change and sustainable development as a cross-cutting theme that will be integrated into and across Working

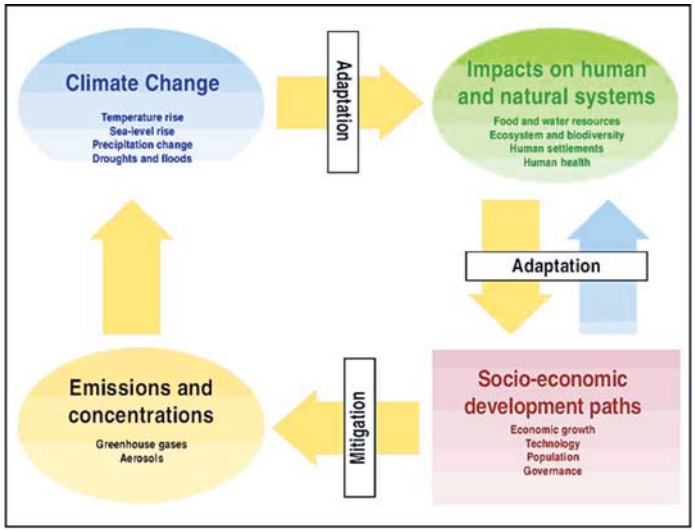

Figure 1. An integrated assessment framework for considering climate change (58, p. 3).

Group reports (particularly those of Working Groups II and III) for the Fourth Assessment Report of the IPCC (to be published in 2007) (24).

Despite this focus, the treatment of linkages between climate change and sustainable development in the IPCC, and in the literature more generally, has tended to be rather one-sided. Much of the literature examines sustainable development through a climate change lens (Fig. 2), leading to a focus on how climate change policies might accomplish more general sustainability goals. This paper goes in the opposite direction, by examining climate change through a sustainable development lens (Fig. 3), leading to a focus on how to achieve climate change goals by following paths to sustainability (*cf.* 25, 26).

The most extensive examination of the question of underlying development paths in recent IPCC activities was contained in the work of the Special Report on Emission Scenarios (SRES) (27) and subsequent analysis (10, 11). Several important conclusions are illustrated by this analysis:

- The choice of underlying development path has a major effect on future baseline emissions.
- It may be possible to achieve a low-emissions world for reasons independent of climate change. In particular, a strong commitment to sustainable development goals gives rise, in the case of the B1 family, to scenarios that result in CO_2 emissions in 2100 that are lower than today.
- The choice of baseline dominates the climate policy effects. As a result, achieving low-emission baseline futures is probably a condition of successful achievement of climate stabilization at 550 ppmv or less.
- Low-emission baseline scenarios embody conditions and outcomes that correspond to high levels of adaptive capacity.

The result is that with regard to all three goals traditionally associated with the climate change question (minimizing climate change impacts, increasing adaptive capacity, and reducing emissions), the successful achievement of sustainable development futures may be a prerequisite of the successful achievement of climate policy goals.

These findings have implications for both research and for policy. On the research front, there is a need to focus research on the intersection of sustainable development and climate change, and of mitigation and adaptation (i.e. to focus on the contents of the development paths quadrant in Fig. 1). In this paper we focus on the practical policy aspects. We begin with recognition that sustainable development is an inherently place-based concept that can best be addressed at a regional scale (28). It also necessarily involves a partnership among the private and public sectors and civil society. In the following section, we will focus on how a climate-friendly version of sustainable development might be achieved in a particular region of Canada, whose economy is based heavily on natural resource extraction.

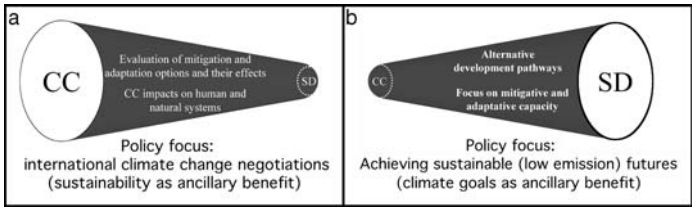

Figure 2a. Sustainable development through a climate change lens. b. Climate change through a sustainable development lens.

From Climate Change to Sustainable Development: The British Columbia Example

Thinking about climate change in a sustainable development framework requires broadening the focus of analysis and examining points of intersection between apparently disparate issues. Making these connections will require moving:

- From environmental/energy policy to tax, budget, trade, and procurement policies
- From focusing on domestic costs to thinking in terms of global investment opportunities and business plans
- From disciplinary and sectoral analysis to integrated assessment of alternative development paths.

One way to approach this challenge is to unpack some of the assumptions underlying low-emission sustainable development scenarios and start to analyze what would be required on the ground to move in the direction described in those futures. Taking the SRES B1 scenario group as one example of such a global scenario (29), we find the following characteristics of this scenario family (10):

- Rapid changes in economic structure toward a service and information economy
- Significant reductions in material intensity
- Introduction of clean and resource-efficient technologies
- Improved equity, as reflected in convergence of incomes across regions.

At a more general level, Toth et al. (32) suggest that sustainable development requires changes in:

- Technological patterns of resource use, production of goods and services, and final production
- Structural changes in productions systems
- Spatial distribution patterns of population and economic activity
- Behavioral patterns that determine the evolutions of lifestyles.

Achieving these kinds of changes will require a shift in focus away from the emphasis on individual behavior and choice that is common in much of the environmental education and environmental economics literatures and toward the question of collective choice and decision making. Key issues become changes in the rules, policies, and laws that govern individual choice. At the urban scale, critical areas of collective choice have to do with decisions on urban form, land use planning, transportation systems, and energy and other infrastructure investments.

Clearly, such approaches imply policies and behavioral changes that go far beyond the purview of climate policy. They also go well beyond the ambit of existing sustainable development policies around the world. In fact, 15 y after the publication of the report of the World Commission on Environment and Development, there is still disagreement on the meaning of the term *sustainable development,* and little evidence of significant progress in achieving it (33).

In fall 2002, the government of British Columbia, a province on the west coast of Canada, appointed a panel (the Climate Change Economic Impacts Panel, CCEIP) to provide advice on provincial climate change policy. The panel consisted of 11 members (8 held senior positions in industry, 2 were from local government, and 1 was from the research sector); 7 of whom are the authors of this paper. The mandate of the panel was to give advice on a greenhouse gas emission reduction target and target date, on proposed actions to reduce emissions or enhance carbon sinks, and on further consultations and analysis required to complete a British Columbia Climate Change Action Plan.

The panel met regularly during the fall and early winter of 2002/2003 and submitted a report to the province in February. Following a presentation to Cabinet and consultation with the British Columbia Business Council and several nongovernmental organizations (NGOs), the report was released in March (35).

A critical component of the CCEIP report is the unanimous stance of the panel members on the linkage between climate change and sustainable development. This position is conveyed in the first paragraph of the Executive Summary of the panel report, which reads: *British Columbia action to address climate change should not be separated from actions in pursuit of important economic, social, and other environmental benefits. A strategy that propels the province along a sustainable development path can achieve these broader goals while, at the same time, reducing the greenhouse gas (GHG) emissions that contribute to global climate change. Such an expanded policy focus is critical to ensuring the long-term prosperity and well-being of all British Columbians*. (36, p. iii).

It is perhaps worth noting that a panel consisting primarily of representatives from the private sector and local government based its analysis on a view of linkage between climate change and sustainable development that is still not typical of either national governments or the international climate change community.

One interesting aspect of the CCEIP report was the way in which the linkage between climate change and sustainable development was expressed. To demonstrate the relevance of taking a sustainable development approach to climate change goals, the panel prepared "word picture" scenarios of what each sector that they represented might look like in British Columbia in 2010, 2020, and 2030 if a sustainable development path were to be successfully implemented. The results of this analysis are briefly summarized in Table 1.

An important aspect of the CCEIP report is that it outlines a picture of sustainability for a political jurisdiction whose economy is based strongly on natural resource extraction. This is in contrast to many sustainability plans for industrialized countries that are primarily *consuming,* rather than *producing* jurisdictions. In this sense, the CCEIP report offers an approach to sustainable development that may have possible relevance to other jurisdictions, such as many of those in developing countries, which are also heavily based on primary resource extraction.

With regard to policy, the CCEIP report proposed a framework for government climate change policy: *Climate change policy should be framed in the context of sustainable development and all government decisions should be screened using a "sustainability lens*." (36, p. 12).

It also suggested an approach to developing an emission reduction target: *The Province should develop an aggregate long-term target for GHG reduction, along with differentiated sectoral and regional targets, that recognize technological innovation and synergies across sectors if a sustainability path is adopted now*. (36, p. 21).

Table 2 outlines the panel's recommendation for the top 10 policy actions for early implementation.

What is noteworthy about this list is not so much the actions themselves, which constitute a fairly typical group of possible GHG mitigation policies. Rather, it is that these measures are framed in terms of an integrated sustainable development strategy that is intended to achieve social and economic, as well as ecological, goals. Such a framework, which goes far beyond the climate change benefits associated with such measures, may make it possible to build public support and alliances across sectors for such measures.

Given the time frame of the CCEIP process, no attempt was made to quantify the overall effects of successful implementation of the sectoral sustainability scenarios on GHG emissions, except in the forestry sector, in which it was estimated that successful implementation of the sustainability scenario would reduce emissions by more than 90%. In some sectors, such as oil and gas, the effect of achieving the sustainability scenario

Table 1: A Sustainable Future for British Columbia

In 2030, many more British Columbians are employed in the service and information economies, which are fully integrated into BC's important resource sectors. People live closer to their workplaces, in denser, quieter communities with more parks and green space. They walk or cycle to work, or take an efficient transit system, and on the weekends some drive fuel cell powered cars out into the countryside. Homes are extremely energy-efficient; many are equipped with photovoltaic panels and other distributed energy technologies that allow them to sell power into the grid. Offices and factories take advantage of shared energy systems, reducing waste and energy costs.

In 2030, the BC economy is more diversified and resilient, and highly cost-competitive in the maturing global sustainability market. Freight and passengers are moved over an effective transportation network that includes zero-emission trucks, trains, and ground support equipment. Resource industries have cut their material and energy intensities significantly. The forest products sector is self-sufficient in biomass energy and provides sustainable building products for local construction. Natural gas continues to be a major energy source, helped by the widespread adoption of geological storage and other sustainable practices. The electricity industry has cut its net GHG emissions to zero through clean energy, energy efficiency, and emission offsets.

The transition to a hydrogen economy is well under way, with fuel cells in use in buildings and vehicles. This is spurring the development of renewable energy sources (e.g., wind, solar), creating opportunities throughout the province. These emerging industries, together with the growth of several key sustainability clusters, have catapulted BC into an international leadership position, exporting technologies and expertise worldwide and boosting job creation.

outlined in Table 1 would be a significant reduction in the growth rate of emissions but not in absolute emissions, given the expected high growth in natural gas production in British Columbia. As a result, while it is clear that the net effect of the combined set of actions suggested by the panel would be to reduce GHG emissions, considerable work is still needed to determine the magnitude of that effect, and its relationship to specific policy measures.

Implementation and Policy: Achieving the British Columbia Scenarios

The report of the British Columbia CCEIP was of course only one input to provincial climate change policymaking. Actual provincial policy and private sector investment strategies are being developed on the basis of a host of considerations, many of which will not be framed in terms of sustainability. What the CCEIP report makes clear is that there exists a *prima facie* case that taking a sustainability approach offers the potential of creating a strategic framework for achieving climate policy goals in a way that is economically and politically appealing. This is in stark contrast to the way in which many governments currently view the climate change issue.

In December 2004, the British Columbia government released its climate change plan (37). The plan makes reference to the report of the CCEIP but frames climate policy in a more traditional climate change manner. Although certain elements of the plan, notably its focus on competitiveness and sustainable energy production, echo the arguments contained in the CCEIP report, the plan as a whole does not propose to locate climate policy in a sustainability framework.

However, in an interesting parallel development, the provincial government separately commissioned a report on the power technology sector for the province (39). Written by the chairman of a major energy technology company in British Columbia, the report proposes a strategy remarkably similar to that proposed in the CCEIP. The Executive Summary of the report concludes: *This report outlines a vision to grow the Power Technology sector through targeted innovation and commercialization—a plan that requires leadership at all levels and collaboration between government, industry, academia and NGOs. This vision will leverage a wide range of existing provincial and federal initiatives that are positioning Canada as a leader in sustainability and power technology* (40, p. 4).

In response to this report, in March 2005, the province created an Alternative Energy and Power Technology Task Force to implement the recommendations made in the power technology report.

Several points emerged from this sequence of events. It seems clear that the framing of climate change as a sustainability issue has had some impact on the evolution of climate change policy in British Columbia. However, this framing has been more successful when expressed as part of a multisector partnership strategy than when applied only to government policy. In particular, considering both the CCEIP and the power technology reports, the role of the private sector has seemed to be critical in British Columbia in championing such a framework. In British Columbia, private sector interest in such an approach is stimulated in large part by the export opportunities associated with what has been called the "urban tsunami" (41): the approximate doubling of population

Table 2: Recommendations for Immediate Action

1. Government leadership. Set aggressive GHG reduction targets for provincial facilities and vehicle fleets, supported by Leadership in Energy Building and Design (LEED) British Columbia Silver standards for major building projects, an employee trip reduction program, and other enabling policies.

2. Urban land use. Use tax shifting to discourage sprawl and favor more compact, transit-oriented communities; develop a policy to promote shared energy systems; and work with municipalities to provide incentives and tools for encouraging GHG reduction targets in official community plans and regional strategies by 2005.

3. Transportation. Implement increased funding of transit and strategic road improvements; California-style vehicle emission standards for cars; higher emission standards for light to heavy-duty trucks; and incentives to purchase more fuel-efficient vehicles and lower-GHG fuels.

4. Buildings. Establish phased-in energy performance standards, with a revolving fund for energy efficiency upgrades, provincial tax relief for the purchase of sustainable products and equipment, and other supporting policies.

5. Electricity. Adopt a GHG emission standard and offset requirement for thermal power generation that is coordinated with the federal government and builds on the province's current energy efficiency and clean energy objectives.

6. Natural gas. Develop an efficient regulatory, fiscal, and land access framework to facilitate expansion of natural gas production consistent with sustainability; and tax or other incentives to reduce fugitive emissions and to promote acid gas reinjection into depleted reservoirs as a strategy for disposing of CO_2 emissions.

7. Fuel cells. Prepare a strategic plan with industry to grow British Columbia's world-leading fuel cell cluster; make a long-term provincial commitment to the hydrogen economy; and ensure active government participation in private and public sector fuel cell demonstrations.

8. Forest products. Establish incentives to encourage energy from biomass; targets and support for afforestation and reforestation projects; and policies to prevent deforestation (all consistent with international carbon accounting protocols).

9. Aluminum (and other sectors). Negotiate voluntary binding agreements for GHG emission reduction with the aluminum smelting and other industry sectors that are harmonized with federal initiatives.

10. Cross-cutting actions. Implement a revenue-generation device to pay for the above measures consistent with the budget neutrality principle; an aggressive strategy for research, development, and demonstration of new technologies, and the fostering of sustainability clusters in British Columbia; tax or other incentives to encourage energy efficiency, recycling, and the accelerated replacement of old buildings and equipment; and cooperation with universities and other organizations on climate change education and public engagement in sustainability decision making.

expected by most cities outside Europe and North America over the next few decades, and the trillions of dollars of new urban infrastructure that will be required to accommodate that growth (11). That infrastructure needs to be more sustainable than in the past if cities are to accommodate expected population growth, giving rise to a huge potential market for technologies and services that enhance urban sustainability (12).

All this suggests the critical importance of multisector partnerships both in building support for a sustainability approach, and for providing the context within which such an approach can be implemented. As both the CEIP and power sector technology reports indicate, such partnerships also need to involve the NGO and research sectors. Increasingly, the NGO sector is an indispensable critic, generator of new ideas, and public watchdog. And given the critical role of science, technology, policy, and behavior, the research sector has much to contribute to our understanding of the potentials for and barriers to change.

These considerations underlie the development of an approach to achieving sustainable futures in British Columbia that is currently under development. A group of research, private, public, and NGO sector partners is proposing to build the Centre for Interactive Research on Sustainability (CIRS) to promote the development of a more sustainable economy and society in British Columbia (13).

In response to the global challenge of creating a more sustainable society, CIRS will be the most innovative and high-performance building in North America, demonstrating leading-edge research and sustainable design, products, systems, and decision making, in three ways:

- A state-of-the-art "living laboratory" will allow researchers and building industry partners to undertake research on, and assessment of, current and future sustainable building systems and technologies.
- Advanced visualization, simulation, and community engagement technologies and processes will support research on new approaches to interacting with citizens in exploring sustainable lifestyles.
- Partners from the private, public, and NGO sectors will share the research facility, working with CIRS researchers to identify areas in which this region has a competitive edge in sustainable technologies and services and helping to implement these on the ground, as a springboard to the export market in urban infrastructure.

The CIRS project represents one example of a real-world attempt to apply the approach to climate change argued for in this paper. The building itself will be greenhouse gas–neutral (14), but even more importantly, it will serve as a test bed and incubator for the evaluation and commercialization of sustainable building and urban development practices. Such an approach offers the potential for going far beyond the confines of climate policy and for developing policy, investment, and research strategies that can begin to create broader and deeper changes in mitigation and adaptation than climate policies, even at their best, will be able to accomplish.

The approach to climate change represented by the CIRS project can be generalized to any jurisdiction. In fact, a key goal of the CIRS partners is to replicate the CIRS models in other cities and regions around the world once it has been proven to work in British Columbia. While the bases for comparative advantage in sustainability services and technologies, and the specific microclimatic and site-specific characteristics will differ among regions, the principles are applicable anywhere. And a network of CIRS-like projects would provide a powerful basis for comparative and collaborative work on sustainability and climate change around the world.

CONCLUSIONS

This paper has argued that sustainable development may offer a significantly more fruitful way to pursue climate policy goals than climate policy itself. In the first place, recent work performed for the IPCC suggests that the choice of the underlying technological and socioeconomic development path can swamp the effects of the choice of climate policy, and that achieving climate stabilization in high-emission-baseline scenarios will be prohibitively difficult and expensive. In the second place, recent developments in British Columbia suggest that framing climate goals in a sustainable development context offers major opportunities for emission reduction in a framework that is attractive to business, government, and civil society interests.

These two arguments come together around the issues of development paths, scenarios, and public acceptance. They suggest two prongs of a strategy to capitalize on this opportunity.

First, new forms of partnership among the private, public, NGO, and research sectors are required to begin to articulate the business plans, policies, and visions required to implement sustainable urban strategies in each region. In such endeavors, the private sector will necessarily be the primary engine of technology development and implementation. The incentive for them to participate is the trillions of dollars of urban infrastructure investment that must be put in place in cities around the world over the next several decades (15).

However, the private sector cannot achieve sustainability on its own. Nor will such approaches succeed if they are presented to a populace and political process that is not sensitized to the need for new ways to address problems such as climate change. No political constituency for change can be created if alternatives are not recognized or believed to be possible. And choices about which futures and which policy tradeoffs are acceptable, are not in the end, technical or scientific ones. They are fundamentally questions of value and political choice, which should not be made by experts but through processes of public engagement in which those affected are provided with as much information as possible about the consequences of such choices.

Therefore, a second prong of the strategy is to develop new forms of engaging the public and interested stakeholders in thinking through the consequences and characteristics of alternative development paths. This will help to build both political constituencies and market acceptance for the kinds of collective policy and investment decisions required to achieve urban sustainability. These approaches could build on the significant amount of work currently being undertaken on scenario analysis, on sustainable futures and on new approaches for interactive public engagement (16).

This paper has suggested the adoption of a regional approach, whereby formal partnerships are established among the four sectors discussed above within the region; areas of comparative advantage in sustainability services and technologies are identified; and work focused on the implementation of those services and technologies in the region, with a view to using this as a springboard to go after the global market in urban sustainability. The premise here is that it is much easier to market technologies and services abroad if they have been shown to work at home. This would simultaneously contribute to sustainability locally and globally, and offer the potential for wealth creation at both scales as well. Because of its focus on local or regional comparative advantage in sustainability, such an approach can be widely adopted in regions around the world.

The ideas suggested here certainly do not exhaust the list of possible responses to the arguments made in an earlier section of this paper. They are offered to illustrate the kinds of

strategies and approaches that are suggested by the idea of linking climate change and sustainable development in new ways. Such strategies and approaches have in common a recognition that we need to think differently and more broadly about complex public policy problems such as climate change, capitalize on substantial existing opportunities for change, and actively involve new actors and interests, if we are to have any chance of transcending the ironies outlined at the beginning of this paper and avoiding the deadlock of current climate policy negotiations.

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44. For more information on the CIRS project, see www.sdri.ubc.ca/cirs.
45. Current energy modeling of the CIRS design suggests a total secondary energy use of 47 kWh/m^2, about 82% below the Model National Energy Code for an electrically heated building in Vancouver.
46. A focus on the urban infrastructure opportunity provides another advantage with respect to climate change goals. A major barrier to achieving political acceptability for climate change mitigation is the long time frame before effects will be strongly felt in many regions. Urban infrastructure needs on the other hand are urgent and pressing.
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60. First submitted 25 January 2004. Accepted for publication 10 Nov. 2005.

John Robinson is Professor in the Institute of Resources, Environment and Sustainability, and the Department of Geography, at the University of British Columbia. He currently directs several research programs in the areas of climate change and sustainability, visualization, and citizen engagement around sustainable futures, the development of modeling and scenario analysis tools, sustainable buildings, and creating private/public/NGO and research sector partnerships for sustainability. Dr. Robinson is a member of the Advisory Council of the David Suzuki Foundation, on the Board of the Sustainable Cities Foundation, a member of the Steering Group of HELIO International. His address: Institute of Resources, Environment and Sustainability, University of British Columbia, 2202 Main Mall, Vancouver, BC V6T 1Z4 Canada.

Mike Bradley has been with the Pulp and Paper group at Canfor for the past 17 years. Canfor is an integrated producer of forest products with operations located primarily in western Canada, selling its products to markets worldwide. In recent years, he has participated in a two-continent, three-country, life cycle assessment of paper products, and is currently adding to this body of work a more detailed understanding of the carbon fluxes and flows across the forest products chain. He is a participant in the Joint Solutions Project, an innovative, solutions-oriented, multi-stakeholder process striving to resolve land use conflicts on the coast of British Columbia. His address: Canadian Forest Products (Canfor), 1500-550 Burrard St., Vancouver, BC V6C 2C1 Canada. mbradley@mail.canfor.ca

Peter Busby, C.M., AIA, FRAIC, MAIBC, MAAA, MOAA, BCID, LEED A.P. is Managing Director of Busby Perkins+Will, and as such, is involved in the design and sustainable direction of each project the firm engages. Overseeing offices in Vancouver and Victoria, BC, and Calgary, AB, Peter directs more than 60 employees working on projects across Canada, the United States, Europe, and the Middle East. Peter was admitted to the College of Fellows of the Royal Architectural Institute of Canada in 1997. In 2005, Peter was nominated for the Governor General's Order of Canada, the highest civilian award in Canada, which recognizes a lifetime of outstanding achievement, dedication to the community, and service to the nation. His address: Busby and Associates, 1220 Homer St., Vancouver, BC V6B 2Y5 Canada. pbusby@busby.ca

Denis Connor is Chairman of QuestAir Technologies, a hydrogen equipment supplier. During 2003–2004 he was the part-time Chief Executive Officer (CEO) of Angstrom Power, a microfuel cell company. He is a member of the Sustainable Energy Science and Technology panel which advises the Government of Canada. Dr. Connor is a professional engineer and holds a PhD in Electrical Engineering from the University of British Columbia. His address: QuestAir Technologies Inc., 6961 Russell Ave., Burnaby, BC V5J 4R8 Canada.
connor@questairinc.com

Anne Murray is Vice-President, Community and Environmental Affairs for the Vancouver International Airport Authority, a position she has held since 1998. Ms. Murray is responsible for communications, media relations, environmental management and community relations. From 1992 through 1998, she managed the Airport's environmental and noise issues. She is also an Adjunct Professor, School of Resource and Environmental Management, Simon Fraser University, Vancouver. Ms. Murray has a MSc in Resource Management from the University of Canterbury in Christchurch, New Zealand, and a BA in Environmental Studies from the University of Waterloo. Her address: Community and Environmental Affairs, Vancouver International Airport Authority, 3800 Grant McConachie Way, Richmond, BC V7B 1Y7 Canada. anne_murray@yvr.ca

Bruce Sampson is an alumni of the University of Victoria where he earned his bachelor's degree in Economics in 1976. He also completed a graduate diploma program in mathematical economics at the University of Essex, in England, in 1979. Bruce spent many years in various positions with the provincial government and ended up heading the Provincial Treasury Division at the Ministry of Finance and Corporate Relations. He has been with BC Hydro since 1997, when he joined as Director, Strategic Issues and Planning, and is currently the Vice President of Sustainability. His address: Sustainability, BC Hydro, 333 Dunsmuir St., Vancouver, BC V6B 5R3 Canada. bruce.Sampson@bchydro.com

Wayne Soper has more than 30 years of professional experience in British Columbia in environmental engineering, education, marketing, external relations, and government. Mr. Soper, who retired from Duke Energy in January 2004, has continued to be actively engaged in Canadian and international sustainability initiatives in various business, industry, and civil society capacities, including sustainability consulting services to government and corporate clients. Mr. Soper also serves as a Director and Pacific Council Member for World Wildlife Fund (Canada), as Chair of the International Centre for Sustainable Cities, and as Chair of the Britannia Development Corporation. Mr. Soper is a graduate of the University of British Columbia and is a registered Professional Engineer in British Columbia. His address: International Centre for Sustainable Cities, 415-1788 West 5th Avenue, Vancouver, BC Canada V6J 1P2. pwsoper@shaw.ca