

## **Climate Change and Rural Issues: Le plus ça change le plus c'est la même chose**

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Concerns about the sustainability of rural Canada are not new, whether they arise from changes in climate and weather conditions, economic forces related to markets and trade, demography, or general environmental stress. Ensuring the viability of water and land resources in rural regions is important for the entire country, not only for supplying raw materials as the basis of production and widespread economic benefits, but also for a number of environmental services, including potable water, clean air, and recreation and leisure opportunities. The advent of climate change and all its associated environmental, economic, and social impacts means rural Canada faces yet more challenges; it is a familiar refrain.

As a topic, climate change can be dense and contested. Most of the discussion surrounding climate change focuses on ways to reduce anthropogenic sources for the greenhouse gas emissions that are warming the atmosphere, inevitably leading to climate change and variability. In this case, the goal is to reduce the carbon footprint and slow down or moderate the pace at which the climate is changing. Such actions are often called *mitigation*. They have fueled fierce debate and conflict between those concerned about the immediate economic costs from reducing greenhouse gases and those concerned about long-term consequences of not doing so. Given the potential to absorb carbon through plant growth, the controversy has serious implications for the forestry and agriculture sectors that dominate rural Canadian landscapes.

While the heavy emphasis on trying to slow down climate change is laudable, it may have stunted attempts to understand and develop adaptation strengths. With each weather-related catastrophe, the need to build adaptive capacity to deal with altered climate and weather conditions, whether direct (as in physical damage from flooding and extreme heat) or indirect (as in increased pests, social disruption, and insurance costs), is becoming more obvious. Even though the United Nations Framework Convention on Climate Change requires signatories such as Canada to formulate, implement, and regularly update programs to facilitate adequate adaptation to climate change impacts, little has been accomplished. In its 2003 report on climate change, the Canadian Standing Senate Committee on Agriculture and Forestry notes that Canadian rural communities face considerable risk from climate change and urges policy makers and researchers to include more work on adaptation (Standing Senate Committee on Agriculture and Forestry, 2003).

By 2008, there appears to be an increasing number of studies aimed at understanding how climate change will affect Canadian society and how the related risks can be managed. Articles in this issue of the *Journal of Rural and Community Development* provide insights into some of the challenges facing rural communities as they adapt to climate change. This introduction offers a brief

overview of climate change and rural Canada. It summarizes climate change assessments, notes possible impacts, and discusses briefly additional factors to consider when examining adaptations to climate change in rural Canada.

### ***Climate Change Assessments***

A 2007 report from the Intergovernmental Panel on Climate Change (IPCC) builds on past assessments. It states, “Observational evidence from all continents and most oceans show that many natural systems are being affected by regional climate changes, particularly temperature increases” (IPCC, 2007, p. 2). Furthermore, “[i]mpacts of climate change will vary regionally. Aggregated and discounted to the present, they are very likely to impose net annual costs, which will increase over time as global temperatures increase” (IPCC, 2007, p. 17).

According to the IPCC, specific projections for North America also indicate wide regional variation. Among other projections, the IPCC report (IPCC, 2007, pp. 14–15) warns:

Warming in western mountains is projected to cause decreased snowpack, more winter flooding, and reduced summer flows, exacerbating competition for over-allocated water resources.

Disturbances from pests, diseases, and fire are projected to have increasing impacts on forests, with an extended period of high fire risk and large increases in areas burned.

Moderate climate change in the early decades of the century is projected to increase aggregate yields of rain-fed agriculture by 5 to 20%, but with important variability among regions. Major challenges are projected for crops that are near the warm end of their suitable range or which depend on highly utilised water resources.

Coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution. Population growth and the rising value of infrastructure in coastal areas increase vulnerability to climate variability and future climate change, with losses projected to increase as the intensity of tropical storms increases.

The IPCC appears cautious compared to other analyses of climate change impacts. For instance, the Stern review (Stern, 2006) on the economic impacts of climate change presents a more stark set of conclusions, noting,

Climate change will affect the basic elements of life for people around the world—access to water, food production, health, and the environment. Hundreds of millions of people could suffer hunger, water shortages and coastal flooding as the world warms. Using the results from formal economic models, the Review estimates that if we don’t act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more.

Most recently a number of potential threats to rural communities in the United States that depend on land and water resources have been noted (Climate Change

Science Program, 2008). The U.S. Climate Change Science Program reports that climate changes have already had detrimental effects that are compounded by additional stresses and disturbances (e.g., land-use change, pollution, wildfires, and invasive species). For example, the report calls attention to the following effects of climate change:

The marketable yield of many horticultural crops—e.g., tomatoes, onions, fruits—is very likely to be more sensitive to climate change than grain and oilseed crops (p. 6)... Disease pressure on crops and domestic animals will likely increase with earlier springs and warmer winters (p. 6)... Climate change–induced shifts in plant species are already under way in rangelands. Establishment of perennial herbaceous species is reducing soil water availability early in the growing season. Shifts in plant productivity and type will also have significant impact on livestock operations (p. 7)... Climate change has very likely increased the size and number of forest fires, insect outbreaks, and tree mortality in the interior west, the Southwest, and Alaska, and will continue to do so (p. 7)... Higher temperatures, increased drought, and more intense thunderstorms will very likely increase erosion and promote invasion of exotic grass species in arid land (p. 7)... Changes in temperature and precipitation will very likely decrease the cover of vegetation that protects the ground surface from wind and water erosion (p. 8).

The climate change message for rural areas is consistent and compelling: (a) Conditions are altering now and slated to become more pronounced; (b) impacts from those changes will vary according to region and sector; and (c) the capacity to handle the resulting challenges appears to be limited.

### ***Implications from Projected Climate Change Impacts for Rural Canada***

Summarizing the situation for Canada, the latest climate change assessment report issued by the government of Canada notes that “climate change will exacerbate many current climate risks and present new risks and opportunities, with significant implications for communities, industry, infrastructure and ecosystems” (Lemmen, D., Warren, F., Lacroix, J., & Bush, 2008, p. 10). The report’s summary of impacts observed to date includes several with direct relevance for rural Canada. Future projections suggest these effects will continue and intensify in coming years. These effects include:

- Reduced extent of snow cover (Northern Hemisphere decreased 10% from 1972 to 2003)
- Reduction in ice cover season on Great Lakes by 1 to 2 months in the past 150 years
- Changes in water levels for rivers and lakes as well as the timing of peak flows
- Onset of spring in Alberta is earlier by 26 days over the past century
- Greater productivity rates for spruce and poplar in Quebec
- Longer growing season for crops
- Increasing abundance of cool- and warm-water fish species compared to cold-water species

- Accelerated erosion and degradation of dunes and coastlines throughout the Gulf of St. Lawrence and parts of Atlantic Canada

As the national assessment indicates, climate change projections for Canada vary by region. For instance, the current trend in overall warming is projected to continue for Atlantic Canada, especially for the interior. Precipitation is also slated to increase, although seasonal and yearly variations might become more evident, with inland areas having drier summer conditions over those of coastal areas. Already susceptible to a number of seasonal and interannual events, such as winter cyclonic storms, tropical cyclones, summer heat and drought, early- or late-season frost, winter rain and thaw events, and river ice jams and flooding, Atlantic Canada is likely to experience greater extremes and higher frequencies of such events in this century. As well, the effects from sea-level rise and storm surges will continue to present challenges to beaches, terrestrial peat deposits, and saltwater marshes.

Quebec and Ontario will likely face more extreme weather conditions in terms of frequency, intensity, and duration of events. Thus water shortages will likely persist, especially in regions where land use and settlement patterns are already putting stress on supplies. Dropping water levels in the Great Lakes and St. Lawrence River are projected to continue, creating problems for tourism, transportation, water intakes, and coastal erosion. Heat waves and poorer air quality are anticipated, along with conditions that can favour the spread of vectorborne diseases. At the same time, projected increased temperatures could extend growing seasons and allow for production of new varieties in forestry and agriculture.

The Prairies are slated to experience continued water scarcity in many of its regions at the same time that flooding might become more severe. Shifts in the bioclimate are projected to favour fire and insect disturbances and ecosystem health in general. Longer growing seasons mean extended harvests and the potential for enhanced yields. Warming winters have implications for invasive species and insect populations as well as for winter roads into remote communities. Future climate and weather changes projected for British Columbia are similar to the rest of Canada, with water shortages among the top concerns in regions where hydroelectricity, irrigation, recreation, fisheries, and forestry are important. At the same time, warmer conditions may continue to favour diversity in farming opportunities. Extreme weather and natural hazards will likely continue to put stress on human settlements and their infrastructure needs.

What do these changes mean for Canadian rural communities dependent on resource-based industries? Any response must take into account a number of additional considerations.

First, responses will vary according to the type of rural industry implicated. Those related to oil and gas extraction and mining appear not to be affected seriously by climate change (except in terms of pressure to reduce greenhouse gas emissions). The outlook for forestry, however, seems to be highly challenging, particularly if the pine beetle experience in British Columbia is typical of what to expect. Likewise for the fisheries sector, where warming temperatures are changing fish populations and habitat in a manner that threatens future supplies. The case for agriculture is highly varied according to the commodity produced and the specific environment where production takes place. For instance, it may be that new

opportunities for wineries will continue to develop in British Columbia, Ontario, and Atlantic Canada, while grain production in Palliser's Triangle continues to falter because of drought. In some rural regions, tourism could suffer from low lake levels, high sea levels, reduced sports fishing, and poor snow conditions. At the same time, tourism and recreation related to golf, all-terrain vehicles, and camping may benefit from longer warm seasons.

A second consideration regarding how rural communities might be affected by changing climate and weather conditions depends on a number of nonclimatic factors and links directly to sustainability and resilience research. Commonly referred to as *determinants of capacity*, the IPCC identifies economic wealth, technology, information and skills, infrastructure, institutions, and equity as significant features (Smit et al., 2001). A community (or region or country) will be more or less prepared to face challenges from climate change depending on the degree to which these determinants are present. Rural Canadian regions, where residents must deal with job and income losses, limited education opportunities, and reduced service levels, have few resources to mobilize when handling a climate-related risk or opportunity. Their capacity to adapt to any type of stress is more limited than in a community with greater levels of such assets.

The third qualification for appreciating how rural communities might respond to climate change takes into account the broader context for shaping community capacity. Impacts from political and economic forces, such as trade agreements, government subsidies, and regulatory requirements, help to strengthen or weaken resource-based industries in rural Canada. For instance, in the past decade, crises in the Canadian agriculture sector have arisen from low commodity prices, high input costs, food safety issues, and currency values, all factors beyond individual farmers' control. The situation is similar for the forestry sector, where trade barriers related to softwood lumber created major problems for exports to the United States. Fisheries have also suffered from factors beyond the control of local communities. In this case, overfishing and poor resource management have depleted stocks and left rural residents with few choices for employment.

Given the range and variety of conditions in rural Canada, simple answers to basic questions about the capacity to adapt to climate change are not possible. Resource-based studies, such as those presented in this issue of the *Journal of Rural and Community Development*, attest to the need for detailed understanding. First is an article from A. Holly Dolan and Rosemary Ommer, who provide a comprehensive look at community health and climate change issues in east and west coast communities. John R. Parkins' study follows and focuses on institutional capacity in rural communities responding and adapting to the mountain pine beetle epidemic. Moving to the agricultural sector, Margaret Tarleton and Doug Ramsey explore how prairie farmers view climate change impacts and adapt to the risks involved. The final article by Robert Patrick focuses on source water protection in rural British Columbia. His findings concerning the constraints on source water protection are relevant for building future capacity to deal with water issues in an altered climate.

The topic of climate change is heralded by many as *the* issue for the 21st century. Its significance intensifies as news of weather-related disasters and their toll in human life and property damage are reported with growing frequency. Often natural resources and the rural communities linked to them bear the brunt of these adverse climate and weather impacts, at least initially. In Canada, as elsewhere,

such challenges are not new to residents of rural regions; their histories are replete with change and adaptation to environmental, economic, and social conditions. *Le plus ça change, le plus c'est la même chose.*

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