ICTs, Adaptation to Climate Change, and Sustainable Development at the Edges

An IISD Commentary

Don MacLean

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This paper is based on a presentation to the International Telecommunication Union Symposium on ICTs and Climate Change that took place in London, June 17-18, 2008. The presentation and other symposium proceedings can be accessed at http://www.itu.int/ITU-T/worksem/climatechange/index.html

The original title of this paper was "ICTs, Adaptation to Climate Change, and Sustainable Development at the *Margins.*" However, as I thought more about the main question I want to address—how information and communication technologies (ICTs) can help people adapt to climate change in ways that promote sustainable development—"edges" seemed a better word than "margins."

It is a better word because of its resonance with the idea that the Internet and ICTs are transformative technologies. They are transformative technologies because they put intelligence at the edges of networks, thereby maximizing users' capacity to create and adapt. They are transformative technologies because they enable this creativity to be widely shared at every level, from local to global.

This ICT-enabled creative capacity is one of the keys to adapting to the consequences of climate change, particularly in the most vulnerable regions of the world—areas that are geographically, economically or socially marginal, and therefore tend to lie at the edges of the world's mainstream concerns.

The glossary of the United Nations Framework Convention on Climate Change defines adaptation as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities."[1]

This definition is useful since it reminds us there are two sides to adaptation. Much of the attention of the public and policy-makers is focused on the moderation of harm. This is certainly an appropriate focus, since the negative consequences of climate change are likely to outweigh its positive effects. However, from the broader perspective of sustainable development, it is important not to lose sight of the beneficial opportunities that can result from climate change, even in some of the most vulnerable regions of the world.

From this perspective, it is important to see how ICTs can help people living in these regions realize beneficial opportunities, as well as moderate harm. Apart from their other merits, realization of economically beneficial opportunities would at least partially offset the very significant financial cost of adapting to climate change. The investments needed to adapt to climate change are estimated to run in the hundreds of billions of dollars in developed and developing countries over the next few decades. However, it is also estimated that the cost of not adapting may run in the trillions of dollars in the long run. So we really have no choice but to adapt—and to use ICTs as effectively as possible.

The Arctic is a good example of the two sides of climate change.

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[1] See http://unfccc.int/essential_background/glossary/items/3666.php

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) projects that over the next century, the Arctic will experience a greater increase in surface temperature than any other region of the world. The Panel's report also notes that the effects of climate change are already more visible in Polar regions than anywhere else on earth. It details the potentially devastating consequences of these changes for Arctic ecosystems, wildlife and indigenous peoples.

Recently, attention has begun to be paid to other kinds of threats arising from the economic and political effects of climate change in the Arctic—threats that also contain the seeds of opportunity. If properly managed, they have the potential to promote sustainable development in the changing climate of the Arctic region.

These threats and opportunities arise from the most visible and dramatic effect of climate change in the Arctic—the massive shrinkage of ice cover projected to occur in coming decades. The charts from the fourth assessment report of IPCC Working Group II presented in Exhibit A compare the minimum sea-ice extent in 2002 with the projected situation in about 100 years' time. Among other effects, this shrinkage would open the North-West Passage and the Northern Sea Route to seasonal or even year-round navigation. This in turn would alter trade routes by significantly shortening shipping distances between Europe, North America and Asia.

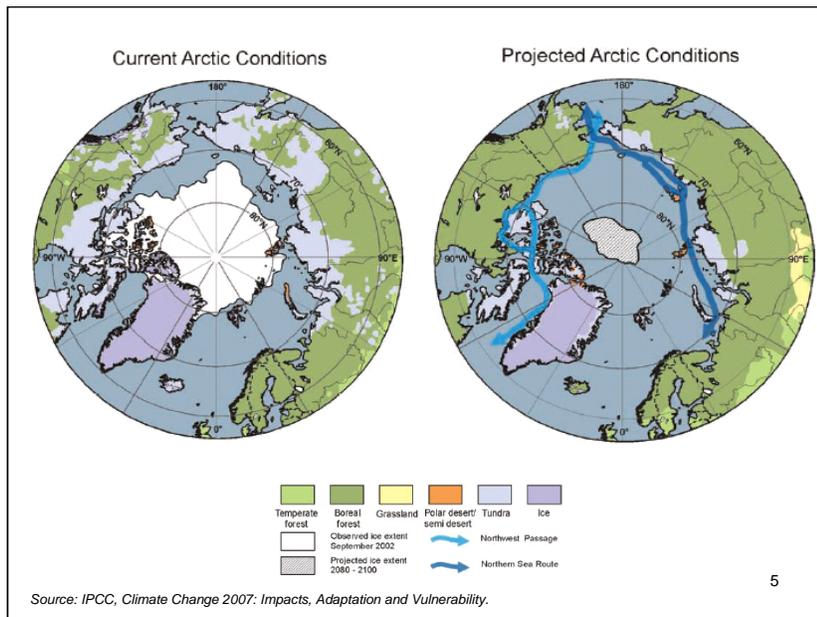Source: IPCC, Climate Change 2007: Impacts, Adaptation and Vulnerability.

Exhibit A

Although these changes would benefit shipping companies and manufacturers, and potentially produce lower costs for consumers in the South, it is not clear whether these developments would benefit people living in the Arctic. In addition, shipping traffic would bring with it the risk

of environmental damage from pollution, a harm to which Arctic ecosystems are particularly sensitive. To transform these threats into opportunity, the peoples of the Arctic will need to reconcile economic growth and social development with environmental sustainability. So far, it has been difficult to achieve this "triple play" anywhere in the world, let alone in areas that lie at its edges.

New trade routes will not be the only consequence of climate change in the Arctic. The shrinkage of ice cover will trigger a cascading series of economic and political issues at international, national and local levels. For example:

- the prospect that the resources lying under the floor of the Arctic Ocean will become available for exploitation has already begun to trigger competing ownership claims among Arctic nations;
- the opening of the North-West Passage as a part- or full-time international shipping lane has begun to raise issues of national sovereignty and control;
- increased economic activity in the resource and shipping sectors will provide opportunities to diversify the Arctic economy—providing communication, transportation, energy and social infrastructures are upgraded and enhanced;
- at the same time, however, these activities will put fragile Arctic ecosystems at greater risk; and
- economic development will help provide the financial resources necessary to adapt to climate change at the local level—but will raise significant social, cultural and political issues concerning the role of indigenous peoples and traditional knowledge.

As the Arctic example shows, adaptation to climate change is a complex, multi-dimensional challenge. How can ICTs help? To answer this question, it is helpful to understand how experts in adaptation see the problem.

Policy research conducted by IISD's Climate Change and Energy team suggests that successful adaptation requires both top-down and bottom-up approaches. Top-down approaches tend to emphasize global climate change scenarios, of the kind developed by the IPCC, as a planning tool. Technological innovation and infrastructure investment are typical response strategies from this perspective. Bottom-up approaches, on the other hand, tend to emphasize vulnerability assessments of specific ecological, economic and social systems as a planning tool. Adaptive capacity-building at the local level is a typical response strategy. IISD's research also suggests that environmental governance arrangements need to be reformed, since current arrangements have been relatively ineffective in meeting climate change goals.[2]

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[2] See Jo-Ellen Parry, John Drexhage and Frédéric Gagnon-Lebrun, "Adaptation in a Post-2012 Climate Regime," in John Drexhage, Deborah Murphy and Jenny Gleeson (eds), *A Way Forward: Canadian perspectives on post-2012 climate policy*, IISD, 2008. Available at http://www.iisd.org/pdf/2007/a_way_forward.pdf

To analyze the role ICTs can play in supporting top-down and bottom-up approaches to adaptation, as well as the development of new arrangements for governing global, national and local responses to climate change, it is helpful to use a framework found in much of the current literature on the relationship between ICTs and the environment. This framework distinguishes between three different kinds of effects:

- *First order or direct effects* – e.g., the use of ICTs as a tool for monitoring and measuring climate change, assessing its effects, and controlling interactions with the environment (e.g., the Internet of Things).
- *Second order or indirect effects* – e.g., the use of ICTs as a medium for increasing awareness and facilitating dialogue about the effects of climate change (e.g., Web 2.0 and social networking applications).
- *Third order or systemic effects* – e.g., the use of ICTs as an enabler for "networked governance"— the new forms of economic and social organization and decision-making that will likely be needed not only to adapt to climate change, but to achieve sustainable development (e.g., the kinds of Internet-based, open organizations and decision-making processes described by Don Tapscott in *Wikinomics*).

Using this framework and applying it to the challenge of adapting to climate change in the Arctic, it is relatively easy to identify the potential first- and second- order effects of ICTs at different levels. Examples of the effects are presented in Exhibit B.

Adaptation and ICTs: Arctic Examples

Adaptation Issues

- International
  - Melting of ice cover and permafrost
  - Resource ownership and exploitation
  - Territorial boundaries
- National
  - Economic diversification
  - Infrastructure development
  - Security and inclusion of northern peoples
- Local
  - Social adaptation
  - Preservation and application of traditional knowledge

ICT Linkages

- Scientific research and modelling
- Emergency warning and relief
- Monitoring and control

- Deployment of broadband networks
- Intelligent infrastructure
- E-government and e-services

- Affordable access to ICT networks and knowledge resources
- Local content

10 June 08 - handout version with talking points   8

Exhibit B.

While clearly important, these kinds of effects are largely known quantities that are already subjects of national policy and international coordination in Arctic countries. What is more difficult to see, with our present state of knowledge and existing policy mechanisms, is how ICTs can be used to enable new forms of "networked governance" in the Arctic region that will:

- join up top-down and bottom-up approaches to climate change adaptation;
- take maximum advantage of the direct, indirect and systemic effects of ICTs;
- engage all stakeholders—international organizations, national governments, businesses and indigenous peoples—in a common, coherent effort to adapt to the challenges of climate change; and
- increase responsiveness and flexibility, thereby enabling people to adapt more quickly to both anticipated and unanticipated events.

For ICTs to be used to facilitate networked governance across the Arctic, a better picture is needed of the penetration and use of ICTs in the region.

To help fill this void, the Arctic Council has decided to undertake an Arctic ICT Assessment study. The Arctic Council is a multi-stakeholder forum that brings together representatives of Arctic governments, indigenous peoples and other residents to cooperatively address common challenges. The aim of this study is to develop a knowledge base about the current state of ICTs in the Arctic, as well as their potential to support sustainable development. As part of this project, IISD will be doing case studies of how ICTs are currently being used by Arctic residents, particularly young people, and what obstacles they face.

The Arctic example suggest that successful adaptation to climate change, particularly in the world's most vulnerable regions, requires us to move beyond the first- and second-order effects of ICTs towards systemic transformation of economic and social structures through networked governance. Learning how to do this is one of the major challenges facing both the ICT sector and the sustainable development community. This challenge is likely to be more swiftly and successfully surmounted if these two communities can begin to tackle it together, by developing and practicing principles of networked governance that draw on the unprecedented power of ICTs to make connections and enable creativity, even at the edges of the world.