The Digital Economy and the Green Economy:

Opportunities for strategic synergies

A submission to the Digital Economy Consultation

An IISD Commentary

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Better living for all—sustainably.

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Executive Summary

This submission proposes that Canada's digital economy strategy should be framed in the context of the major economic, social and environmental challenges facing Canada and all other countries in a world where opportunities for sustainable prosperity and threats to human well-being are increasingly complex, interconnected and global in scope.

It outlines the paradigm shifts that have taken place over the past two decades within the sustainable development policy community with respect to the relationship between economy, society and environment. It reviews the emergence of policies to promote the growth of the green economy as key components of national and international responses to the 2008–09 financial and economic crisis, with particular emphasis on the role played by the OECD and other international organizations.

Against this background, the submission identifies opportunities for creating strategic synergies between digital economy and green economy strategies through:

- green ICT products and services;
- smart energy grids, transportation infrastructures, buildings and production processes in all economic sectors;
- smart systems for monitoring the environment and managing natural resources;
- dematerialization of products and services in consumer and business marketplaces, and in government and public services;
- transformation of organizational structures and work practices throughout the economy and society; and
- transformation of values, attitudes and behaviour of individuals, as consumers and citizens.

The submission concludes that the digital economy consultation gives the federal government an opportunity to establish Canadian leadership in the development and implementation of sustainable development policies by creating synergies between its digital economy and green economy strategies.

It recommends the development of an integrated set of actions to maximize the linkages between the digital economy and the green economy by:

- identifying and assessing strategic opportunities arising from technological, economic, social and governance trends and developments;

- developing sectoral strategies for smart grids, transportation systems and buildings that include use of government purchasing power as a driver for innovation;
- developing innovation strategies for green infrastructure, products and services in the areas of cloud computing and the "Internet of Things";
- developing a comprehensive national strategy for achieving universal, affordable access to broadband networks and services, promoting digital literacy and enabling the production of user-generated content; and
- developing indicators for measuring and assessing Canada's performance in creating synergies between the digital economy and the green economy and capitalizing on the resulting economic, social and environmental opportunities.

Introduction

IISD welcomes this opportunity to contribute to the development of a digital economy strategy for Canada. In this submission, we will outline opportunities and recommend actions for promoting the growth of Canada's digital economy by creating synergies with the green economy strategies that are at the centre of the global drive to achieve sustainable development.

The consultation guidelines suggest that submissions respond to the questions posed in the consultation paper with respect to its five themes of innovation using digital technologies, digital infrastructure, growing the information and communication technologies (ICT) sector, creating digital content and building digital skills. Our submission addresses all of these themes. It also touches on a number of the consultation paper's questions. However, it is primarily aimed at a different level of policy dialogue.

Before tackling specific questions of the kind set out in the consultation paper, we believe it is important for policy-makers to consider the relationship between Canada's digital economy and the context in which it is developing—a context marked by unprecedented economic, social and environmental challenges at local, national and international levels.

We believe this context creates very significant opportunities for developing Canada's digital economy. The economic, social and environmental forces that define the global sustainable development challenge will drive innovation not only in the ICT sector, but throughout our economy and society. ICTs will play a critical enabling role in meeting these challenges.

We believe the digital economy strategy that emerges from the consultation process should recognize the benefits of creating synergies between ICTs and the forces driving the growth of the green economy. We also believe it should recognize that innovative policy-making and governance processes are needed to create these synergies.

In preparing this submission, we have taken the view that the consultation paper and the questions it asks should be the beginning of a process that needs to be broadened beyond the bounds of the traditional ICT policy community, and deepened in its appreciation of the linkages between ICTs and the great challenges facing the global community.

We hope that our submission and its recommendations will be considered in this spirit, and look forward to a continuing dialogue about the strategic relationship between the digital economy of today and the green economy of tomorrow.

Background

IISD was founded in 1990 as Canada's response to the report of the World Commission on Development and Environment. The Brundtland Commission, as it is popularly known, put sustainable development on the global agenda. Its work led to the 1992 Earth Summit in Rio de Janeiro, which established international legal frameworks for protecting biodiversity and responding to climate change. In the current decade, the Commission's pioneering work was the precursor to a series of major international conferences on economic and social issues related to sustainable development. These issues included financing, trade, investment, poverty reduction, protection of natural resources and human rights.

The Brundtland Commission report defined sustainable development in the following terms:

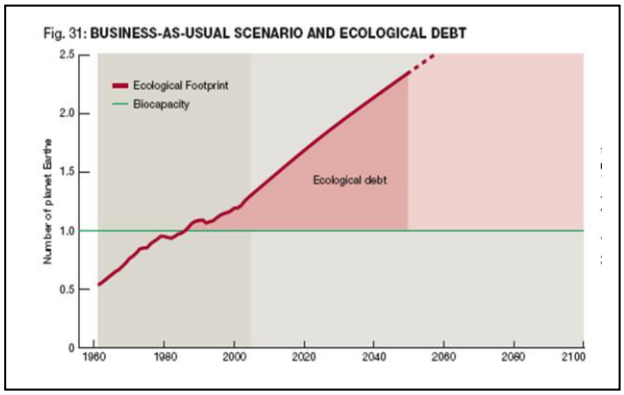
> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs,' in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

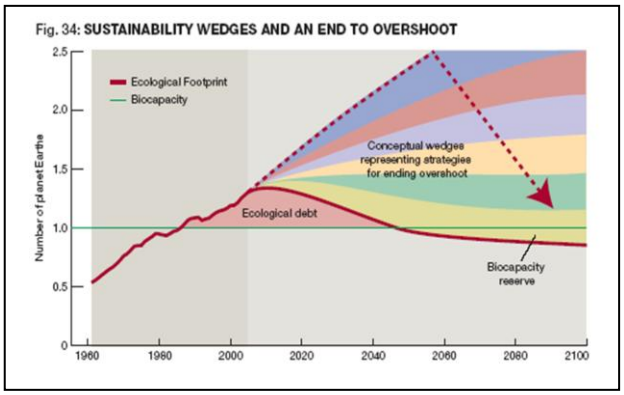
The concept of sustainable development has been elaborated and refined in the years since the Brundtland report. Although there is no single definition of sustainable development—just as there is no single definition of the digital economy—there is general agreement on certain fundamental principles.

- The goal of sustainable development policy is human well-being for people everywhere, measured in terms of factors such as security, satisfaction of material needs, health, social relations and freedom of choice and action.
- To meet this goal, it is necessary to generate and distribute wealth in ways that reduce poverty and provide a decent standard of living to people everywhere.
- This can only be done in the long run through policies and strategies that balance economic growth with social development with environmental sustainability.
- Technology and social organization play critical roles in achieving the long-term balance between human development and the natural environment that is essential for sustainable development.

As illustrated by the following figures from the WWF 2008 Living Planet Report, technological, economic and social innovation will be key factors in reducing our "ecological debt." This debt

results from the fact that the planet's resources are being consumed at a greater rate than they can be replenished. It would take the resources of 1.5 planets to support our current lifestyle, and, under a business-as-usual scenario, two planets by mid-century. Long-term balance can only be achieved if innovative concepts are translated into effective action through policies and strategies that support the development of "green" economies and societies.





Source: WWF, Living Planet Report, copyright 2008

Since its founding, IISD has been centrally involved in the development of sustainability policies and strategies at the international, national and regional levels in Canada, in emerging economies such as China, India and Brazil, and in many developing countries.

IISD's traditional focus has been on how economic, social and environmental policy can be coordinated to support sustainable outcomes in such areas as trade and investment, energy and climate change, and natural resources management. IISD also develops statistical tools to measure progress towards sustainable development and reports on sustainable development negotiations to governments and stakeholders around the world.

The Green Economy: An idea whose time has come

Over the past five years, IISD has begun to examine how ICT policies impact sustainable development and the growth of the green economy. Through this work, IISD has engaged with international bodies such as the UN Environment Programme (UNEP), the Organization for Economic Cooperation and Development (OECD), the International Telecommunication Union (ITU) and the UN Internet Governance Forum (IGF). We have been encouraged by the progress made in these and other international forums in linking ICT policy with sustainable development policy. We believe the following developments are noteworthy for the high-level policy linkages they make between ICTs and sustainable development:

- The UNEP Green Economy Initiative (GEI) that was launched in April 2009 and will culminate in the publication of a major *Green economy report* addressed to governments around the world later this year
- The May 2008 OECD Ministerial *Seoul declaration for the future of the Internet economy*
- The June 2008 OECD Council Ministerial *Declaration on green growth*
- The September 2008 report of the ITU Telecommunication Development Bureau on *ICTs for e-Environment*
- The April 2009 report of the ITU Telecommunication Standardization Focus Group on *ICTs and climate change*
- The May 2010 OECD Council *Recommendation on information and communication technologies and the environment*
- The continuing recognition by the IGF that the relationship between the Internet, the environment and sustainable development should be part of the global Internet governance agenda, particularly with respect to the issues identified by IISD in the 2007 report *Internet governance and sustainable development: Towards a common agenda.*

In this submission, we will draw on this work—as well as on work done by IISD and other organizations—to identify opportunities for strategic synergy between Canada's digital economy strategy and the green economy strategies being developed internationally. IISD is heavily involved in the development of these strategies through its work on GEI; the negotiation of international trade and investment agreements through the WTO; the negotiation of international agreements and arrangements to mitigate climate change and adapt to its effects globally and in North America; and the management of water and other critical natural resources in Canada and a number of other countries.

Opportunities for synergy between ICT and sustainable development strategies have been recognized in a number of other countries. The August 2009 OECD report on *The impact of the crisis*

on ICTs and their role in the recovery provides a useful overview of the investments OECD member countries have made in broadband infrastructure, smart electricity grids, buildings and transportation systems, and e-health and e-education applications as part of the stimulus packages they adopted to restore growth in the aftermath of the 2008–09 financial and economic crisis. These investments will help foster the growth of the green economy.

Although Canada escaped the worst of the financial crisis and its economic consequences, we believe our prospects for sustainable growth will be enhanced if we develop strategies for exploiting emerging opportunities for synergy between the digital economy and the green economy. The investments being made by the federal government, as part of its stimulus package, in the development of broadband infrastructure in unserved and underserved areas of the country, is a necessary beginning. However, as the DES consultation paper acknowledges and the example of other countries shows, much more needs to be done to secure Canada's sustainable prosperity.

In the following sections, we will identify opportunities for synergy between Canada's digital economy strategy and the growth of the green economy. We will do this primarily in terms of the economic, social and environmental challenges facing Canadians. However, we must not lose sight of the fact that both the digital economy and the green economy are global phenomena. Their growth is enabled by the borderless nature of both ICTs and the natural environment. In developing synergies between the digital economy and the green economy, Canada should adopt a strategic approach that identifies and addresses opportunities at every level from local to global. This approach should leverage the relationships with our traditional partners, the BRICS, and other emerging economies built up through our leadership in the G8 and G20, and other international forums.

ICTs and the Challenges Facing Canada

We agree with the premise of the consultation paper that "intelligent adoption of digital technologies will play a key role in addressing some current economic, social and environmental challenges" (p. 12). In our view, this is the right place to begin to develop a national strategy for the digital economy, by looking at how the resulting strategy can improve the well-being of Canadians.

Today, Canada faces a number of major sustainable development challenges. These include:

Economic challenges

- Increasing the productivity and competitiveness of firms in all sectors
- Job creation
- Benefitting from globalization in terms of exports and investment
- Enhancing our innovation capacities

Social challenges

- Improving the health of all Canadians and meeting the needs of an aging population
- The social consequences of poverty, particularly on children and youth, in urban cores, rural areas and aboriginal communities
- Integrating an increasingly diverse population
- Transforming our education and other learning systems to equip Canadians with the knowledge and skills they need

Environmental challenges

- Managing waste and controlling pollution
- Managing natural resources
- Mitigating climate change and adapting to its consequences
- Transforming our production and consumption systems so as to lessen environmental impacts

As indicated in the DES consultation document, there is consensus that smart adoption of ICTs can play a key role in addressing all these challenges through investments in technology and complementary investments in organizational change, process re-engineering and skills development.

It is also increasingly recognized that the economic, social and environmental challenges facing Canada and other countries are interconnected, and that new governance approaches are needed to deal effectively with these complex challenges in a world marked by globalization of economic opportunities, unprecedented movements of people, looming social and environmental crises, and new forms of conflict fed by these different factors.

What is not yet well understood, in Canada or in other countries facing similar challenges, is how to develop policies and strategies that address economic, social and environmental challenges in a way that optimizes outcomes across these areas. In the face of growing complexity, there has been a tendency to focus policy on one of the three pillars of sustainable development at the expense of the others, with less than optimal results. So, for example, over the past two decades, policy has encouraged economies to grow and wealth to increase at unprecedented rates everywhere in the world. At the same time, however, we have seen longstanding social problems persist, new ones arise and environmental degradation continue.

As a result of the financial and economic crisis, we appear to be at a policy tipping point. The responses of governments to the crisis, the work done by international organizations on sustainability challenges, and the contributions made by stakeholders from the private sector, civil society and research organizations suggest the emergence of a new understanding of what it will take to manage the complexity of sustainable development challenges.

Common to the contributions of these different actors is a growing recognition that business-as-usual approaches will not secure sustainable prosperity, and that innovative approaches are needed across policy domains and governance levels.

- In some areas, international agreements are needed to provide a framework that is fair to all countries, taking account of differences in levels of development. There is consensus that this is the case in such areas as trade and investment, climate change and the management of global ecosystems.
- However, even in these areas, the sustainability challenge is too complex to be solved solely or primarily on a top-down basis. Achieving sustainable development requires economic and social innovation, which, as the experience of recent decades strongly suggests, can most effectively be generated on a bottom-up, decentralized and highly distributed basis—through market mechanisms operating within an enabling environment—as well as through social entrepreneurship among individuals and communities. As the OECD's work on innovation illustrates, economic and social entrepreneurship and innovation, in turn, are enabled through education and training, and by policies that provide affordable access to information

and facilitate communication and knowledge sharing through broadband networks and by other means. The digital economy plays a critical role in supporting these fundamental, bottom-up capabilities.

- National governments are the link between the high-level international governance processes needed to frame sustainable solutions at a global level, and the actions taken within their jurisdictions by private and public sector organizations, individuals and communities in pursuit of sustainable development objectives. In carrying out this role, national governments will need to deploy traditional instruments of public policy, such as regulation, tax incentives, fiscal measures and public procurement to support achievement of these objectives within the framework set by international agreements. They will also need to develop and strengthen the capacity of entrepreneurs, communities and individuals in their dual role as consumers and citizens to innovate and adapt in response to local and regional sustainability challenges. Digital economy policies and strategies are an essential tool for strengthening all these capacities.

Marrying top-down approaches to sustainability challenges using traditional policy instruments with bottom-up capacity-building will require governments at all levels—particularly at the national level—to develop innovative governance approaches and adaptive policy-making processes that effectively engage all stakeholders in the development and implementation of sustainability strategies and policies. In recognition of this requirement, from 2005 to 2009 IISD conducted a major research program on adaptive policy-making in conjunction with The Earth Resources Institute (TERI) and the International Development Research Centre (IDRC). *Creating adaptive policies*, the final report of this project, identified a set of tools policy-makers could use to anticipate change and cope with the uncertainties of complex, adaptive systems of the kind that characterize the digital economy and the green economy.

The development of the Internet and other ICTs has created a platform and tools for information processing, communications, knowledge sharing, consensus-building and decision-making that enable Canadians to progress toward the goal of sustainable development in a world where constraints of space and time have shrunk, interconnection has increased and the pace of change has accelerated. These changes have been largely enabled by ICTs. The time has come to use these technologies much more effectively to manage the consequences of the economic and social change, and its impact on the environment.

Digital Opportunities in the Green Economy

Although their emergence on the international agenda was triggered by the financial and economic crisis of 2008–09, the concepts of green growth and the green economy are products of paradigm shifts that have taken place in recent decades as economic, social and environmental issues have begun to converge in the context of globalization.

The impacts of economic and social development on the environment and the consequent need to conserve and protect its resources have long been recognized. Traditionally, environment policy was seen as largely separate from—and sometimes in opposition to—mainstream economic and social development policy. Over the past 10–20 years, the perspective of sustainable development policy-makers on environmental issues has significantly broadened.

- Major shifts have taken place in thinking about the relationship between economic and social policy. The traditional view that saw economic and social policy as essentially different domains—one concerned with creating wealth and the other with distributing it—is giving way to a view that sees them as two sides of the same human development coin. For example, in addition to addressing basic human needs, education and health care policies increasingly are seen as essential components of policies aimed at increasing national productivity and competitiveness, and as opportunities for product, service and innovation in the global marketplace.
- The environmental and resource management sector is making growing contributions to national economies. It is becoming increasingly recognized that economic and social policy instruments such as market mechanisms, public education and support for social networks, open source development communities, crowd sourcing for solutions and user-generated content need to be integrated into environmental policy in order to support the emergence of this sector as a major contributor to the creation of jobs and trade in knowledge, technology and services.
- Sustainable development policy-makers recognize that it will be impossible to achieve economic and social objectives of the kind set out in the Millennium Development Goals (MDGs) and at the same time maintain a healthy, sustainable environment without significant technological innovation—not only in the production and consumption of energy and raw materials and in the management of the earth's major ecosystems, but also in the way economies function, societies are organized and individuals live.
- Sustainable development policy-makers also recognize that all countries, from the poorest to the richest, face the challenge of achieving a healthy balance between the economic, social and environmental pillars of sustainable development through sound policy, technology-enabled innovation and socioeconomic transformation. This challenge is particularly

> daunting in the major emerging economies, where policy-makers must deal with the rising expectations of a rapidly growing middle class, as well as in developing countries where large proportions of the population are still mired in poverty. The challenges facing all countries will become even more difficult if, as forecast, the world's population grows from 6–7 billion to 9–10 billion over the next 40 years, putting additional pressure on environmental resources, economic relationships and social structures.

Just as sustainable development policy-makers have begun to focus on the role of innovation, market mechanisms and social entrepreneurship in the achievement of environmental and other objectives, the ICT sector and ICT policy-makers have begun to recognize the opportunities emerging from the critical role ICTs can play as a key enabling technology supporting green growth and the development of the green economy.

Over the past 5–10 years a consensus has emerged that ICTs can support the development of the green economy in three principal ways:

- by decreasing **direct effects** on the environment of the production, distribution, operation and disposal of ICTs through improved energy and materials efficiency, increased use of renewable energy sources, reduced use of toxic materials and improved recycling and end-of life disposal of ICTs;
- by increasing the **enabling effects** of ICTs on the development of the green economy through improvements in the efficiency of production, distribution and consumption of goods and services throughout the economy and society; by reducing demand for energy and materials through the whole or partial substitution of virtual products and services for their physical equivalents; and through the dematerialization of human activities and interactions; and
- by supporting **systemic effects** that result in the transformation of behaviour, attitudes and values of individuals as citizens and consumers; economic and social structures; and governance processes.

In its April 8, 2010 *Recommendation of the Council on information and communication technologies and the environment*, the OECD drew together the results of work on these issues to recommend that:

> Members should coordinate ICT policies and climate, environment and energy policies to improve environmental performance, tackle climate change, enhance energy efficiency and improve sustainable resource management. They should aim to bridge the gap between ICT, climate, environment and energy experts, policy-makers and stakeholders and extend understanding among these groups of: i) the direct

effects of ICTs themselves on the environment, ii) the enabling effects of ICT applications in other sectors, and iii) the systemic effects to change social and cultural behaviour through the use of ICTs.

We urge the federal government to use the process for developing a digital economy strategy as an opportunity to respond to this recommendation and others on the role of ICTs in the green economy made by the OECD and other organizations of which Canada is a member.

In formulating its response, and in seeking to create strategic synergies between the digital economy and the green economy, we believe the government should consider the following opportunities for innovation.

Direct effects

It is generally agreed that to fully support the transition to a green economy, the ICT sector has to clean up its own act. The problems associated with e-waste have been recognized for some time, and have begun to be addressed through improvements to product design and industry codes of practice as well as through recycling programs and regulatory action at local, national and international levels.

More recently, attention has shifted to the greenhouse gas (GHG) emissions generated by the ICT sector in the production and distribution of its products and services. It has been estimated that the ICT sector currently generates around 2 to 3 per cent of global CO_2 emissions—an amount larger than the emissions of the airline industry and roughly equivalent to those of Canada. Smart 2020, a 2008 report of the Global e-Sustainability Initiative (GeSI), projected that ICT sector emissions are likely to almost triple by 2020 under a business-as-usual scenario.

Although Canada has not yet played a leading role in international efforts to promote the development of "green ICTs," a current IISD research project undertaken for CANARIE found that there may be opportunities for Canada to lead in the development of cloud computing facilities at sources of renewable energy, such as hydroelectric sites, particularly in remote locations that could offer other environmental advantages, such as natural cooling. The development of "green clouds" could provide advantages to government departments and public service providers, as well as to research and educational institutions. They could also help position Canadian companies as leading suppliers of virtualization services to regional, national and global markets.

Enabling effects

As a result of work done over the past 5–10 years by international organizations, such as the European Commission, OECD and the ITU; leading environmental organizations such as the

WWF; and industry stakeholder organizations such as GeSI, there is substantial international agreement on the main ways ICTs can support green growth throughout the economy and society.

- ICTs can have a major impact on the reduction of GHG emissions by increasing energy efficiency and enabling greater use of innovative sources of renewable energy through the development of "smart" energy grids, transportation systems, buildings and production/distribution processes in the agricultural, resource and manufacturing sectors. GeSI's Smart 2020 study estimated that the deployment of smart systems in these sectors could reduce GHG emissions by 15 per cent by 2020 under a BAU scenario and result in an economic benefit of $950 billion.
- ICTs can reduce the demand for energy and materials throughout the economy as well as in government and the public sector through "dematerialization"—the whole or partial substitution of virtual products, services and processes for their physical equivalents through e-commerce, digital media, tele-work, e-government, e-education, e-heath, etc.
- ICTs can play an important role in monitoring, measuring and managing the natural, human and built systems of the physical environment through the remote sensing systems, embedded sensor networks, RFID and ubiquitous networking technologies that together make up the "Internet of Things."
- The Internet and other ICTs can provide individuals and communities everywhere with access to the information, communication and knowledge resources they need to respond to sustainability challenges through action at local, regional, national and global levels—for example, by reducing household energy consumption, substituting virtual products and services for their physical equivalents, improving reuse and recycling, adapting to the effects of climate change, and contributing to the development and implementation of sustainable development policies and practices through engagement in governance processes.

These opportunities were confirmed in the Canadian context by WWF Canada's 2008 study *Innovating toward a low-carbon Canada: Using technology to transform tomorrow*. This study estimated that the enabling effects of ICTs could reduce Canada's CO_2 equivalent emissions between 19 and 36 megatons and generate financial benefits between $7.5 and $12.9 billion, by enabling tele-work, smarter automobile transportation, electronic billing and building efficiencies.

In addition to general agreement on the kinds of opportunities that exist in these areas for creating synergies between the digital economy and the green economy, there is a shared view among those who have studied the linkages between ICTs and sustainable development that a number of key policy issues must be addressed to facilitate these linkages. These issues include:

- achieving universal, affordable access to open broadband networks and services;

- promoting digital literacy and building the capacities people need to use ICTs to access information, communicate, share knowledge and experience, generate content, adapt and innovate in the digitally-based green economy;
- deploying the new addressing and object-identifying resources, such as IPv6, that are critical for the development of the Internet of Things and its application to smart energy grids, transportation systems, buildings and production processes, as well as to environmental monitoring and the management of natural resources;
- standards and protocols for seamlessly networking the Internet, Next Generation Networks and the Internet of Things as platforms for developing and implementing "green ICT" and "smart solutions" throughout the economy and society;
- the role of regulation, incentives, partnership programs and public procurement in supporting ICT-enabled green innovation;
- public policy with respect to issues such as identity, privacy, child and consumer protection, cybercrime, information and network security, digital media and intellectual property—including new issues that will arise in connection with the Internet of Things

To address these issues, there is growing awareness that innovative governance approaches are needed to develop, implement and adapt policies and strategies in the fast-moving context of the digital economy, in ways that respect fundamental democratic principles of representation, responsibility, transparency and accountability. These innovative approaches could include such mechanisms as:

- self-regulatory and co-regulatory processes of the kind originally developed by the Internet community and subsequently adopted and adapted by governments to deal with Internet-related public policy issues—for example, to combat spam and cybercrime
- adaptive policy-making processes based on the types of principles, tools and practices identified by IISD through its comparative analysis of policy-making in the fields of climate change mitigation, water resources management, healthcare, energy, transportation, ICTs and development
- multi-stakeholder governance processes of the kind pioneered internationally by the IGF, a model that has already been adopted in a number of countries and regions in both the developed and developing worlds

Systemic effects

In addition to the areas of opportunity for synergy between the digital economy and the green economy outlined in the previous sections, there is general agreement that, in the longer term, ICTs can play a critical role in achieving the goals of sustainable development by enabling the

transformation of economic, social and governance structures, and supporting fundamental changes in the values, attitudes and behaviour of individuals, as citizens and consumers. However, very little research has been conducted on the systemic effects of ICTs on the economy, society and environment, or on the policies and strategies needed to ensure that the systemic effects of the digital economy support the transition to a green economy in the longer term.

The policy research questions identified in the literature on the relationship between ICTs and sustainable development include such issues as:

- **Rebound effects:** Will the increased energy and material efficiencies enabled by the Internet result in increased consumption? Economic theory and practical experience suggest that this is likely to happen in the absence of measures to suppress demand and/or supply. If so, what are the relative merits of different policy options for dealing with rebound effects?
- **Unintended consequences:** What is the human impact of the openness and dematerialization enabled by the Internet? How and to what extent could unintended consequences for individuals, social relationships, communities, organizations and countries limit the capacity of the digital economy to support the transition to a green economy? What policies, strategies and governance mechanisms are needed to deal efficiently and effectively with unintended consequences?
- **Uncertainties and unforeseen events:** What new kinds of threats and vulnerabilities arise in a world where human, material and natural systems are interconnected and hyperlinked in real time, particularly when artificial intelligences of one kind or another make decisions? What policies and strategies are needed to anticipate uncertainties and respond to the impact of unforeseen events? How can these policies and strategies be shaped so as to avoid creating barriers to the synergistic growth of the digital economy and the green economy?

The need for policy research

The 2006 report of the Telecommunications Policy Review Panel (TPRP) drew attention to the fact that Canada's ICT policy research capabilities had declined in parallel to our digital economy performance, as measured by international comparative indices. The TPRP recommended that the federal government take steps to begin rebuilding this capacity.

We suggest that this recommendation be reconsidered as part of Canada's digital economy strategy, and that issues related to the direct, indirect and systemic effects of ICTs on the economy, society and environment be part of the digital economy research agenda going forward.

Conclusions

As the consultation paper and other reports have acknowledged, Canada has lagged behind a number of other countries in the development of digital economy strategies. We have similarly lagged behind some other countries in the development of green economy strategies. The digital economy consultation process provides an opportunity to regain leadership in both these areas, by capitalizing on the strategic synergies between the digital economy and the green economy outlined in this submission. To do this, we need to seize opportunities and overcome barriers.

At the North American and global level, we need to capitalize on our current strong economic position and the effective relationship we have built up with the emerging powers of the G20 to engage more actively in the development of policy frameworks and legal agreements that will provide the foundation for green growth and the transition to a green economy.

At the local level, we need ensure that SMEs, communities and individual Canadians have affordable access to the Internet and ICT-enabled tools they need to participate in and benefit from the transition to a green economy, as well as the digital literacy required to use these tools effectively as producers and consumers of products and services, and as stakeholders in governance processes in the green economy.

At the national level, we need to develop green economy strategies that overcome the jurisdictional barriers and other sources of fragmentation that currently exist in sectors fundamental to the growth of the green economy, such as energy, resource management, education, internal trade and investment. This is vitally important to position us to engage effectively with the United States and Mexico in the development of North American solutions to sustainability challenges such as climate change mitigation and adaptation, and the management of water and other resources that are shared across borders. It is also important to overcome these barriers so that Canada can participate more effectively in international policy dialogue and the negotiation of international agreements on climate change, energy, and the management of natural resources, particularly those agreements involving trade and investment, the governance of the Arctic, and the management of its resources.

Recommendations

The following recommendations follow the thematic structure of the consultation document and are intended to address the issues it raises and the questions it asks with respect to innovation, infrastructure, the ICT and content industries, skills development and target setting.

We recommend that Industry Canada, in consultation and coordination with appropriate stakeholders, develop an integrated set of strategies to maximize the linkages between the digital economy and the emerging green economy.

This strategy suite should include the following elements:

Planning framework

1. **A plan for implementing the recommendations of international organizations** of which Canada is a member with respect to ICTs, the environment and other aspects of sustainable development, including:
    - the April 8, 2010 Recommendation of the OECD Council on Information and Communication Technologies and the Environment
    - the Recommendations of the ITU and other relevant standardization bodies on green ICTs

2. **A process for tracking the evolution of the global green economy framework** in order to anticipate the emergence of new drivers for ICT-enabled innovation in the green economy and develop strategies for product and service innovation resulting from potential game-changers such as:
    - the introduction of market-based systems to value natural capital and manage the provision of ecological services
    - the introduction of sustainable development requirements and safeguards into global trade and investment agreements
    - the introduction of carbon pricing mechanisms in the North American and global energy markets

3. **A policy research program on the direct, enabling and systemic impacts of ICTs on Canada's economy and society**, focused on issues related to:
    - changes in consumer behaviour, attitudes and values
    - opportunities for economic and social innovation and entrepreneurship
    - changes in organizational structures, production processes and work practice in the private and public sectors

Innovative applications

4. **Sectoral strategies for smart grids, transportation systems and building infrastructures** that include use of the purchasing power of the federal and other governments as a driver for ICT-enabled innovation

Infrastructure, product and service innovation

5. **National strategies for green ICT in emerging areas where Canada may have a competitive advantage** because of its sources of renewable energy and other environmental advantages, such as cloud computing

6. **Integrated strategies to address the technical, economic, social and environmental aspects of key technologies underlying the Internet of Things**, including strategies for promoting the deployment of IPv6 through public procurement and by other means

Capacity-building, skills development and content generation

7. **A comprehensive, integrated national access and digital literacy strategy** for
    - achieving universal affordable access to broadband networks and the applications, content and services they enable
    - promoting digital literacy through K–12 and post-secondary education, occupational training, skills development and lifelong learning
    - ensuring that the Internet remains an open platform on which users are free to access, create and communicate information of their choosing, subject only to generally applicable laws and regulations

Measurement and assessment

8. **A framework for developing key indicators** of the linkages between the digital economy and the green economy, as well as indices for measuring and assessing Canada's performance.

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