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# *Changing our Understanding of Sustainability: The impact of ICTs and the Internet*

***Edited by David Souter and Don MacLean***

## *Introduction and Authorship*

The papers in this report explore the changing relationship between ICTs, the Internet and sustainable development. It is now 25 years since the publication of the Brundtland Report Our Common Future and 20 years since the first Earth Summit was held in Rio de Janeiro. The world has changed dramatically in many ways since then, not least because new media and communications technologies have had profound effects on economy and society, politics and culture. Their impacts will be even greater in the future. The papers in this report ask how and how far we need to change our understanding of sustainability to take account of the impact of the information and communications revolution.

This report is the result of a series of dialogues held by the International Institute for Sustainable Development (IISD) during 2012, led by two senior associates of the Institute, David Souter and Don MacLean. As well as wide-ranging assessments of the relationship between communications and sustainability by the editors, it includes keynote interviews with founding fathers of the Internet and of sustainable development, Vint Cerf and Jim MacNeill, along with other interviews and papers by international experts. The papers were prepared in the run up to, during and shortly after the third Earth Summit (Rio+20), held in Rio de Janeiro in June 2012, and the conclusion of the report also looks ahead at how the international community might address sustainability and ICTs more effectively in the future.

David Souter has been managing director of ict Development Associates ltd—which provides expertise on ICTs, the Internet and their interface with development, environment, governance and rights—since 2003. He is also visiting professor in communications management at the University of Strathclyde, Scotland, and visiting senior fellow in the Department of Media and Communications at the London School of Economics and Political Science. From 1995 to 2003 he was chief executive of the Commonwealth Telecommunications Organisation.

Don MacLean provides senior level advice in Canada and internationally on ICT policy and strategy, where his clients include departments and agencies of the Government of Canada, the United Nations system, the G-8 and the Organisation for Economic Co-operation and Development. Prior to establishing his consulting practice, Don served in a number of senior policy and planning jobs in the Canadian Department of Communications and headed strategic planning and external affairs for the International Telecommunication Union in Geneva.

The papers in this report build on an earlier study for *IISD—ICTs, the Internet and Sustainable Development: Towards a New Paradigm* (2010)—by David Souter, Don MacLean, Ben Akoh and Heather Creech.

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# *Table of Contents*


## Introduction

1. ICTs, the Internet and Sustainability: A discussion paper – David Souter

## Keynote Interviews

2. An interview with Jim MacNeill
3. An interview with Vint Cerf

## Expert Papers

4. ICT Innovation and Sustainable Development – Robin Mansell
5. Using ICT for Adaptation Rather Than Mitigation to Climate Change – Bill St. Arnaud
6. Smarter and Greener? Information Technology and the Environment: Positive or negative impacts? – Graham Vickery

## Rio+20

7. ICTs, the Internet and Sustainability: A discussion guide for Rio+20 – Don MacLean, David Souter and Heather Creech
8. Life After Rio: A commentary by Mark Halle, IISD
9. Moving Beyond the Tool: ICTs in the Sustainable Development Discussion at Rio+20 – Shawna Finnegan and Lisa Cyr

## Interviews

10. An Interview with Angela Cropper
11. An Interview with Anriette Esterhuysen and Alan Finlay
12. An Interview with Caroline Figuères
13. An Interview with Ashok Khosla
14. An Interview with Jay Naidoo
15. An Interview with Luis Neves
16. An Interview with Nii Quaynor

## Conclusions

17. ICTs, the Internet and Sustainability: Where Next? – David Souter and Don MacLean



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DISCUSSION PAPER

# *ICTs, the Internet and Sustainability: A discussion paper*

***David Souter***

***May 2012***

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## *International Institute for Sustainable Development*

The International Institute for Sustainable Development (IISD) contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change and energy, and management of natural and social capital, as well as the enabling role of communication technologies in these areas. We report on international negotiations and disseminate knowledge gained through collaborative projects, resulting in more rigorous research, capacity building in developing countries, better networks spanning the North and the South, and better global connections among researchers, practitioners, citizens and policy-makers.

IISD's vision is better living for all—sustainably; its mission is to champion innovation, enabling societies to live sustainably. IISD is registered as a charitable organization in Canada and has 501(c)(3) status in the United States. IISD receives core operating support from the Government of Canada, provided through the Canadian International Development Agency (CIDA), the International Development Research Centre (IDRC), and from the Province of Manitoba. The Institute receives project funding from numerous governments inside and outside Canada, United Nations agencies, foundations and the private sector.

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**ICTs, the Internet and Sustainability: A discussion paper**

May 2012

Written by David Souter[1]

[1] David Souter is a senior associate of IISD. He is managing director of *ict* Development Associates, visiting professor at the University of Strathclyde, Scotland, and visiting senior fellow in the Department of Media and Communications at the London School of Economics and Political Science.

## *Table of Contents*

1.0 Introduction ..... 1
2.0 The Meaning of Sustainability ..... 2
3.0 Transition in the ICT Environment ..... 4
3.1 Reach ..... 5
3.2 Adoption and Usage ..... 5
3.3 Quality ..... 5
3.4 Variety of Services ..... 5
4.0 An Information Society? ..... 6
5.0 The Impact of Information Technologies and the Internet on Sustainability ..... 7
6.0 Societal Impacts of the Internet: Some Current Trends ..... 9
6.1 Economic Development ..... 9
6.2 Social Development ..... 12
6.3 Environmental Protection ..... 14
6.4 Cultural Diversity ..... 15
6.5 Governance ..... 16
7.0 ICTs, the Internet and Sustainable Development: Questions for Discussion ..... 18
8.0 Reference List ..... 19

## 1.0 Introduction

This discussion paper addresses two issues of critical importance for today's world and future generations:

- The challenge of sustainability in the world economy, society and environment
- The transformations in economy, society, politics and culture that are resulting from the spread of information and communications technologies (ICTs) and especially the Internet

A central question arises from the juxtaposition of these issues:

**How far and in what ways do we need to change our understanding of sustainability in the light of the information and communications revolution?**

The International Institute for Sustainable Development (IISD) has been concerned about the challenge of sustainability and its relationship with global economic, social and technological trends since it was formed in 1990, in response to the Brundtland Commission report *Our Common Future*, whose work defined "sustainable development" for the subsequent generation. IISD's concern reaches far beyond the environmental preoccupations with which many people associate sustainability, to include economic prosperity and social order. It encompasses a complex matrix of sustainability that is reflected in its work on sustainable markets and international trade; on political leadership and the causes and control of conflict; as well as on more obviously "environmental" issues such as climate change and natural resource management. IISD's Global Connectivity program has focused for more than a decade on the impact of ICTs, and especially the Internet, in changing the underlying parameters of economic, social and environmental policy.[2]

The need for "adaptiveness" in thinking about the future has become a cornerstone of IISD's approach to the political and economic challenges of sustainability, as well as to the practice of environmental management.[3] This is particularly true today. The world economy faces the greatest challenge in sustaining growth and prosperity that it has seen in half a century, one that is accelerating transitions in economic power towards emerging markets in new world regions. Long-standing preconceptions about political order and stability have been undermined by the Arab Spring and the complex, difficult, uncertain but hopeful process of transforming political structures emerging from it. The capability of global institutions to handle complex transitions, such as mitigating climate change, is under question. The impact of ICTs and the Internet in all these areas has been or could be profound. These are the underlying circumstances facing the world community as it holds the third of its decadal summits to address the challenge of sustainable development in Rio de Janeiro in 2012.

This discussion paper is designed to raise questions and provoke debate about the relationships among ICTs, the Internet and sustainable development. It summarizes the meaning and context of sustainability today, the changes that have taken place in information and communications since the first Earth Summit in 1992, and the impact that these have had on the economic, social and environmental dimensions of sustainability.

[2] See, especially, Souter, MacLean, Creech & Akoh (2010).
[3] See Swanson & Bhadwal (2006), and related papers on adaptiveness at www.iisd.org.

As companion pieces to this discussion paper, IISD is publishing separate keynote interviews with two global experts who have been involved in these parallel fields for more than 25 years—Jim MacNeill, who was secretary-general of the Brundtland Commission and lead author of *Our Common Future* and Vint Cerf, one of the founders of the Internet and currently Google's Chief Internet Evangelist.

This discussion paper, together with the views of Mr. MacNeill and Mr. Cerf, set the stage for a global discussion in June 2012, in parallel with the events taking place as part of Rio+20, the 20th anniversary the Earth Summit. A separate discussion guide has been prepared for all those wishing to take part in the debate. A series of short, provocative contributions in the form of essays and interviews with other leading thinkers about sustainability and the Internet will inform the debate during June and July. All documents will be available at www.iisd.org/infosoc as they are released.

## 2.0 The Meaning of Sustainability[4]

The Brundtland Commission defined sustainable development in 1987 in several ways. One of these definitions—the statement of intergenerational equity summarized as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"—has received most attention (World Commission on Environment and Development, 1987, ch. 2, para. 1). However, that was only one dimension of sustainability as understood by the Commission. It also emphasized that sustainable development "at a minimum … must not endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils and the living beings" (para. 9). It related these natural systems to human behaviour and experience by emphasizing that sustainable development must be based on "consumption standards that are within the bounds of the ecological possible and to which all can reasonably aspire" (para. 5).

The Brundtland Commission also identified a number of "strategic imperatives," which it saw as necessary if development were to move toward greater sustainability. These included efforts to advance international equity; reduce poverty, energy consumption and resource depletion; achieve sustainable demographic levels; reorient technology; and bring together decision-making concerned with the environment and the economy.

The sustainability framework that emerged from subsequent discussions, and that influenced thinking about sustainability within and beyond the Earth Summits of 1992 and 2002, is made up of three elements, which are considered to be of equal significance:

- *Economic development* – reducing and seeking to eradicate income poverty, achieving higher levels of prosperity and enabling continued gains in economic welfare
- *Social development* – reducing and seeking to eradicate other dimensions of poverty; improving the quality of education, health, housing and other aspects of the welfare of individuals and communities; and enhancing the quality of social interaction, engagement and empowerment
- *Environmental protection* – reducing pollution and other negative impacts on the environment, mitigating the effects of industrialization and human activity, and seeking to achieve sustainable use of resources in the interest of future generations.

[4] This section is based on Chapter 2 of Souter et al. (2010).

Sustainable development seeks to achieve these multiple objectives, not by trading them off one against another, but holistically, through government policies, business strategies and lifestyle approaches that reinforce the mutuality of economic, social and environmental goals. Two further elements might be added to these dimensions of sustainability:

- *Cultural diversity* – the continuance of diverse human cultures from past to future within a context of the globalization of communications, economy and society and the more intensive intercultural interactions that result
- *Governance* – the institutional mechanisms, rules and norms that encompass decision-making and behaviour by governments, businesses and citizens, the interactions among these stakeholders and among different policy domains.

These five elements of sustainability are by no means incompatible or necessarily competitive one with another. On the contrary, a sustainability framework considers them mutually interdependent, as illustrated in Figure 1.

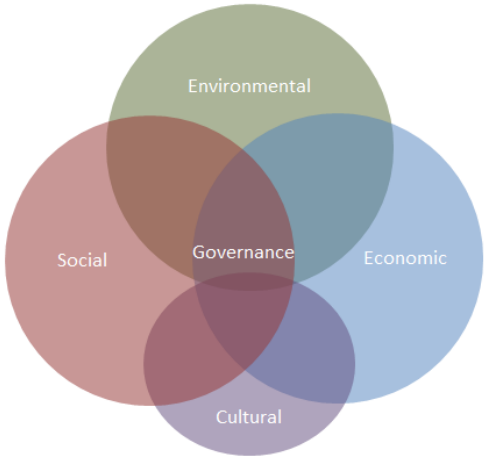


**FIGURE 1: DIMENSIONS OF SUSTAINABILITY**

However, recent human history shows clearly that individual elements within this framework can be pursued, and have often been pursued by governments and others, in silos or in ways that are detrimental to the pursuit of other elements. Economic growth, most notably, has often been pursued in ways that have proved environmentally unsustainable, more obviously so as our knowledge has grown of natural resource constraints and the environmental impact of greenhouse gas emissions. Achieving the overall goal of sustainability therefore requires governments, businesses and citizens to address each element in ways that are compatible and recognize their interactions and interdependence. This is particularly onerous in a context of ongoing population growth, which requires economic growth at comparable rates in order to sustain current levels of prosperity (let alone achieve greater prosperity) and which puts additional pressure on finite resources including land and water.

The desire for sustainability along these lines is strongly endorsed within the international community, though not all commentators believe it is achievable, and many national and international policies seem to prioritize short-term rather than sustainable growth. Achieving sustainability places a demand on human societies to do three things differently from how they have been done during the industrial period:

- *To produce sustainably* – by increasing efficiency and reducing material used in production
- *To consume sustainably* – by reducing the ecological footprint of consumption patterns while enabling real improvements in the quality of life
- *To organize sustainably* – by engaging stakeholders, by encouraging participation, and by improving the quality, efficiency and sustainability of planning, implementation and evaluation of government policies, business strategies and personal lifestyles

Major changes in economy and society, politics and culture have taken place since the Brundtland Commission in 1987 and the first Earth Summit in 1992. That period has seen growth in the world economy from US$17 trillion to US$63 trillion, with temporary setbacks since 2007 affecting industrialized countries more substantially than most developing countries (World Bank, 2012). Political changes from the end of communism to the Arab Spring have allowed societies to emerge from autocracy to liberalism, while the balance of global political and economic power has shifted significantly from West to East and North to South. The threat of nuclear annihilation has been substantially displaced as humanity's principal long-term anxiety by the threat of climate change. Greenhouse gas emissions have continued and continue to grow in volume, rather than recede. The world is now believed to have crossed four of the "planetary boundaries" that represent tipping points beyond which environmental change may become irreversible (Rockström, Steffen, Noone, Persson, Chapin, Lambin et al., 2009).

Discussion about sustainability, in this context, has been seen by many actors as a matter of balancing positive economic growth against negative environmental impacts, reflecting the high priority attached to both poverty reduction and climate change, rather than seeking ways of achieving positive outcomes across the sustainability framework as a whole. The rapid development of information and communication technologies and their increasingly pervasive influence on human activity have added to this complex and evolving context for sustainability.

## 3.0 Transition in the ICT Environment

The change in information and communication technologies that has taken place since the first Earth Summit has been as great and rapid as the adoption of any technology in history. Adoption of mobile phones and the Internet, in particular, has been much faster than that of other widespread technological innovations of the last century or so, including the motor car, domestic refrigeration, television or the telephone. Four aspects of this change illustrate the scale of what has happened: the reach of communications networks, their quality, the range of services that they can deliver, and the adoption and use of networks, services and devices by businesses and individual citizens. It is worth contrasting how these stood in 1992 and how they stand today, at either end of the development spectrum.[5]

[5] An assessment of changes since the World Summit on the Information Society can be found in United Nations Commission on Science and Technology for Development (2011), *Implementing WSIS outcomes: Experience to date and prospects for the future*, available at http://www.unctad.org/Templates/Download.asp?docid=15060&lang=1&intItemID=4839.

## 3.1 Reach

Although telecommunications networks were geographically ubiquitous in most industrial countries in 1987, they had only limited reach in most developing countries, where they were often confined to capital cities and other urban areas. Almost all telecoms networks at the time were based on fixed technology. Mobile networks were then in their infancy, but are now the principal mode of telephony worldwide. Although they have not yet achieved total geographical coverage, the International Telecommunication Union (2010) expects that "complete mobile coverage of all rural areas around the world" should be achieved by 2015 "or even earlier."

## 3.2 Adoption and Usage

Adoption and use of mobile services has grown rapidly alongside the spread of coverage. Three years before the Brundtland Report, the Independent Commission for World Wide Telecommunications Development (the Maitland Commission) (1985) bewailed the very low levels of telephone adoption then prevailing in developing countries, many of which had teledensity rates of less than one telephone per hundred people, and some in Africa less than one per thousand. These figures began to change as mobile networks came onstream. By the end of 2011, the International Telecommunication Union (2011) estimated that there were just under six billion mobile phone subscriptions worldwide (although the number of actual users will be significantly lower than this)—approximately one mobile subscription per world inhabitant, and well over one per adult.

## 3.3 Quality

The third dimension of change in the ICT environment is the quality of networks, and in particular their ability to deliver high-quality data, including the Internet. This is changing rapidly today through the rapid growth of broadband infrastructure, which has brought always-on Internet at adequate speeds for most likely uses to most Internet users in industrial countries, where it also allows the rapid deployment of sophisticated new applications for government and business. Growth in broadband capacity is accelerating in developing countries, although there is at present a growing gap in broadband provision between industrial countries that are seeing very rapid investment and poorer developing countries where investment, while still substantial, is not so fast.

## 3.4 Variety of Services

Finally, the user experience of ICTs has been radically changed through the development of new applications and services that enable users to do things that were far beyond their reach in 1987. First, personal computers with graphical user interfaces brought the efficiency and collaborative working of a modern computing environment to small businesses and home users. Then the Internet, and particularly the World Wide Web, enabled anyone with basic literacy skills and the right equipment to access information and interact directly with other users in any part of the world. It has continued to offer radical new services, in recent years most dynamically the social networking and self-publishing phenomena of Facebook and Twitter. Mobile telephones, and especially today's smartphones, are now much more than mere phones, offering their users a wide range of digital device technologies, including camera, radio, games console, music player, personal organizer, wallet, debit card and cybercafé. In low-income countries, they have become the primary mode of Internet access.

## 4.0 An Information Society?

As these examples illustrate, expansion in the reach and use of ICTs over the 25 years since sustainable development was first defined has been global and pervasive, affecting all countries and all levels of society.

For most populations, that period of one generation has seen transition from a time when information technology played a marginal role in their lives to one in which it is centrally important to most aspects of their lifestyles and livelihoods. The importance of mobile phones and the Internet in domestic and small business environments has been described above. Long-established business sectors, meanwhile, have been uprooted by alternative delivery modes for goods and services, while others have transformed their patterns of production and exchange, and entirely new sectors have emerged to take advantage of the potential of technological innovation. Governments have automated their internal management and offered new forms of service delivery to citizens, who have themselves both been empowered by ICTs and made vulnerable by them to more intense and complex surveillance. Social networking (in its wider, sociological sense) has been transformed by social networking technologies and services. New architectures of information, such as cloud computing (locating information and resources in data centres rather than in terminal devices) and the "Internet of Things" (making objects as well as people and organizations addressable and interactive) are beginning to add further layers of complexity to the interaction between information technology and the wider world.

ICTs, in short, have become general-purpose technologies, which affect economies and social structures in their entirety, rather than specific technologically bounded aspects of economy and society. Rather than being deliberately targeted by specific actors on particular goals, their impact has become pervasive and uncontrolled—changing production and consumption patterns, creating previously unfeasible opportunities, and altering behavioural norms in ways that result from the dynamics of interaction between technology and users rather than the decisions of politicians and businesses. They are also disruptive technologies. It is notable how the impact of many of the mass markets that have resulted from ICT innovations in the past 20 years—from Short Message Service (SMS) to mobile Internet, the World Wide Web to Twitter—has been poorly anticipated by governments and established businesses and/or been led by outsider entrepreneurs who have ridden the wave as dynamic innovations become the spirit of the age.

Some of these dimensions of the evolving information and communications environment, and their implications for sustainability, are explored in this discussion paper. For a good many commentators, their overall impact represents an information revolution comparable with the advent of settled agriculture some ten thousand years ago and the industrial revolution of the 18th and 19th centuries, culminating in an Information, Knowledge or Network Society, in which information/knowledge and the interactions that networking enables among individuals have become the most important factors in changing economies and society, politics and culture. For some, this transition to an information society is an observable reality, for others, an aspirational vision; for many, it is a mixture of the two. Anything that has so fundamental an impact on society as a whole must challenge the assumptions underpinning concepts like sustainable development.

## 5.0 The Impact of Information Technologies and the Internet on Sustainability

It is also not without its difficulties. The development of an information society has clearly been uneven, as a result of other disparities within and between societies—much more rapid in some countries and for some age and occupational groups than others. The "creative destruction" unleashed by ICT-enabled innovation has generated economic and social turbulence in both developed and developing countries by undercutting traditional economic and social structures, challenging established norms and expectations, and creating new kinds of opportunities for crime, terror, harassment and defamation. While the individualization and personalization of terminal devices has diffused much of the fear of information technology that was evident in dystopian literature and cinema of the 20th century, there is still considerable—and perhaps growing—anxiety about the increased potential that it brings for government surveillance and consumer profiling. Some organizations and individuals have difficulty managing the change in information and communication opportunities before them and integrating these successfully with other aspects of their lives. New opportunities for social organization and for reaching vulnerable communities have been as readily exploited by the criminal underworld as by agencies concerned to benefit the poor.

While the changes that have been enabled by ICTs have brought many benefits to people, they have likewise raised new challenges for sustainability. Even some of the economic and social effects of ICTs that appear directly positive have had the indirect effect of reinforcing trends that are unsustainable in the longer term—for example by increasing overall demand for non-renewable energy and facilitating the exploitation of finite natural resources. The ICT sector itself has become a significant source of environmental harm, through both electronic waste and greenhouse gas emissions. Like almost all technologies and social benefits, mobile phones and the Internet have been adopted more quickly, extensively and comprehensively by the rich and educated than by the poor and illiterate. While they have the potential to benefit all significantly, in the short term at least, they are as likely to widen as they are to narrow inequalities.

This raises three questions from the perspective of sustainable development:

- First, what impacts are new media and the Internet having on the achievability of the core elements of sustainability identified earlier in this discussion paper—economic and social development, environmental protection, cultural diversity and governance—and on the balance between them?
- Second, to what extent do these impacts enhance sustainability and to what extent do they, on the contrary, raise new sustainability challenges?
- Third, do the economic, social, political and cultural implications of these impacts imply that we need to revise, rethink or readjust our understanding of what sustainability means from the ways in which it was defined in 1987/1992, before today's communications cornucopia became available?

One widely used framework for analyzing the impacts of ICTs on sustainability was published by the Forum for the Future in 2002. This framework proposes the assessment of hardware, software and usage from three angles:

- The type of impact that results within the different elements of the sustainability framework
- The level or order of impact (see below)

- The different stages within the product or service life cycle at which impact occurs (for example, in design and manufacture, operation and disposal)

Central to this framework is the distinction between different levels or orders of impact:

- First order (or direct) effects are those that result from the physical existence of ICTs and the processes involved in making them available—for example, the jobs created in ICT manufacturing and services, or the carbon emissions generated by manufacturing, data centres and the use of terminal devices.
- Second order (or indirect) effects are those that result from the ways in which those ICTs are used, in particular those resulting from applications and access to content—for example, the loss of jobs in sectors undermined by Internet-enabled businesses (such as music retail) or the reductions in carbon emissions achieved through automated ("smart") management of electricity generation and distribution.
- Rebound effects are the counterbalancing impacts that occur as a result of behavioural changes that themselves result from these first and second order effects—for example, the likelihood that the reduction in vehicle usage resulting from telecommuting will be accompanied by increased use of vehicles for leisure activities.
- Third order (or societal) effects are the aggregated outcomes of large numbers of people using ICTs over the medium-to-long term in ways that alter how economies and societies work—for example, changes in the nature of work and working relationships, in the relationships between diasporas and home communities, in patterns of consumption and human settlement.

This is a valuable analytical framework. It is relatively easy to draw together evidence concerning the first and second order effects of ICTs on the different elements of sustainable development described above, and there is some consensus about the overall balance of effects. First and second order economic and social impacts are generally considered positive on balance, for example, while environmental impacts are more mixed (see below).

Assessing third order effects is much more difficult, however. Society changes much more slowly than individuals or organizations, let alone technology, and we are only a few years past the transition to mass markets for mobile telephony and the Internet. We can discern significant shifts in economic, social, political and cultural behaviour, but it is hard to predict how they will progress, and just as hard to distinguish how far they result from the information revolution and how far from other economic and social factors, such as the economic downturn of the years since 2007, the ongoing shift in economic and political power from Europe and North America towards Asia and other developing regions, or population change. The future evolution of societal responses to changing ICTs and the Internet is even more difficult to assess because of the very rapid changes that take place in information technology and markets and the difficulty that everyone has had in predicting these. By way of illustration, it is notable that mobile telephony—now generally regarded as the lead technology in communications market development—was not significantly discussed in the outcome documents of the World Summit on the Information Society (WSIS, 2003 and 2005),[6] while Facebook—the world's leading Internet application—begin life as a student start-up while that summit was in progress.

[6] There is only one direct reference to telephony, fixed or mobile, in the four WSIS outcome documents, but over 230 references to the Internet. The outcome documents are at http://www.itu.int/wsis/documents/doc_multi.asp?lang=en&id=2316|0.

Sustainability is, of course, about the viability of long-term economic, social and environmental change. It is these long-term, third order, societal impacts of ICTs and the Internet that have most significance for a sustainability agenda, and that are IISD's primary concern in publishing this discussion paper and the other essays and interviews within this project. These essays and interviews set out some of the thoughts of leading figures in the sustainability and Internet communities about the opportunities and challenges involved, from their own distinct perspectives.

Section 6 identifies some of the societal impacts that can currently be discerned in the five core elements of sustainability: in economic and social development, environmental protection, cultural diversity and governance. It aims to set the scene for subsequent contributions.

## *6.0 Societal Impacts of the Internet: Some Current Trends*

The central question in this discussion paper concerns whether the cumulative impact of new communications media, including the Internet, is changing the nature of economies and societies in ways that require us to rethink the meaning of sustainability. To put it another way, does sustainability in the information age—in the Information, Knowledge or Network Society—mean something different from what it meant in the late industrial age of the 1980s and early 1990s? It is not possible in this brief discussion paper to be comprehensive, but it is possible to set out some of the underlying changes that suggest this might be so. Most attention is paid, in this section, to economic and social development, in order to illustrate the diversity of societal impacts that can currently be discerned.

### 6.1 Economic Development

The balance between economic prosperity and environmental sustainability lay at the heart of many early debates about sustainable development in the 1980s. Although the last two centuries have seen general growth in prosperity and reductions in the proportion of people living in poverty worldwide, the experience of poverty remains widespread and its progressive reduction a core target of global endeavour. Ongoing population growth means that economic growth—of at least 2.5 per cent in Africa—is essential not just to grow prosperity but merely to sustain the levels of prosperity that have already been achieved. Since the 18th century, at least, growth models have been built around the exploitation of natural resources in ways that we now know are not environmentally sustainable. The search for "green growth," for prosperity that does not inflict lasting damage on future potential, is at the heart of the Brundtland Commission's definitions of sustainable development. Two terms in current debates about economic growth are especially relevant to this.

The so-called "green economy" is, in many ways, a reformulation of the aspiration of sustainable development, updated for an age in which greenhouse gas emissions have come to be seen as the fundamental challenge of sustainability. The United Nations Environment Programme (UNEP, 2011) has defined the green economy as one that results in "improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (p. 16). The OECD (2011) defines its green growth strategy as being "about fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being resides, … about fostering investment and innovation which will underpin sustained growth and give rise to new

economic opportunities" (p. 18). Both of these formulations are quite close to the Brundtland Commission's definitions of sustainable development as that which meets the needs of the present without compromising the ability to meet the needs of future generations, and does so without breaching the boundaries of what is ecologically possible.

The "Internet economy" and "digital economy" are terms that are increasingly used to describe the economic dimension of a post-industrial Information Society, and are often seen as offering ways forward toward "green growth." Discussions of the Internet economy tend to focus on a few defining characteristics. In a digital economy, the ICT sector is itself an important source of employment and contributor to Gross Domestic Product (GDP). ICTs are widely dispersed throughout the economy, and contribute positively to productivity and economic growth. They are widely diffused, too, in social areas such as health and education, and in the delivery of public services. Digital economies tend to have high degrees of innovation and creativity relative to other economies, with much of their innovation emanating from outside established sources of innovation and entrepreneurship, notably from small-scale, rapidly growing business start-ups. Digital economies tend to be open in terms of international trade and subject to limited domestic regulation.

The extent to which Internet or digital economies now exist in industrial (or post-industrial) countries is open to debate. What is undeniable, however, is that modern ICTs and the Internet have changed patterns of economic behaviour substantially since 1987. There is space only to mention some of these here, rather than to offer any full analysis, but together they present a picture of substantial change in economic structures brought about or at least enabled by ICTs.

- Industrial production—generally in the North, in the dynamic sectors of emerging markets, and increasingly in developing countries—is using much higher levels of automation. Industries such as motor vehicle manufacturing have extensively displaced skilled manual with robotic labour. The consequent thinning out of tiers between management and unskilled work has significant effects on labour markets.
- Industrial production has become quite widely globalized, as information technology enables teams of employees to work on projects collectively from diverse locations; employers in areas of high labour costs outsource design, customer management and back office functions to contractors in areas of lower labour cost; and industrial products (hardware and software) can be assembled from components manufactured or developed in different world regions.
- Supply chain relationships have been further transformed by information technology. The automation of customs administration, integrated border management and the introduction of ICT-enabled port and airport community systems have expedited the flow of goods along trade routes, reducing delays and costs, and enabling more efficient and cost-effective management strategies such as just-in-time delivery. Consignments can be tracked securely using radio-frequency identification (RFID) and other ICT-enabled security devices. Producers—from large firms in the United States to small farmers in Africa—have developed more intensive and more interactive relationships with supplier and customer partners along supply chains by using modern telephony, the Internet and other new communications resources.
- The ICT sector itself has become a significant part of many economies. The manufacture of ICT products is important in countries from Finland to China. Business process outsourcing has become significant in parts of India, the Philippines and elsewhere. In all but a handful of countries, the communications sector has created new markets (computer maintenance, Internet service provision, cybercafés, etc.) and provides jobs for large numbers of people, both highly skilled (such as computer programmers) and low-skilled (such as phonecard vendors).

- Financial markets have been transformed by electronic trading. On the one hand, this has made access to financial markets—capital markets, equity markets, commodity markets, currency markets—much more open. On the other, it has made them more volatile, as new forms of trading, including automated trading, can generate rapid and unpredictable swings in market values. For some commentators, this has destabilized these markets, leading to higher levels of risk (including risk of catastrophic failure), and giving greater economic power to speculators at the expense of economic planners and business managers. More positively, at the other end of financial services, mobile banking and transactions have enabled small businesses in some developing countries to access capital and manage transactions much more effectively.[7] The spread of mobile banking into remittances has great potential for facilitating the myriad small-scale capital movements that, collectively, worldwide, now outstrip large-scale foreign direct investment in total value.
- ICTs have enabled major changes in the ways that businesses are run. Most administrative functions are now computerized, in almost all businesses in industrial countries and in large and medium-sized businesses in developing countries. Small businesses, in particular, are able to use software to analyze business activity in ways that would previously have required accounting expertise. On the other hand, continuous availability online and through mobile phones has undermined the boundaries between work and leisure, and altered relationships between employers and employees.
- There has been significant growth in independent working (self-employment) and homeworking (by employees and self-employed) as a result of improved communications. This has enabled those who are in a position to take advantage of them to vary working patterns in order to suit different lifestyle needs and preferences. Some organizations, including international organizations, are now based around virtual homeworkers rather than conventional office spaces. Although homeworking and telecommuting have not taken off to the extent that was once anticipated, and although not all jobs by any means are suitable, they are likely to become increasingly widespread, with increasingly significant impacts on family structure, working hours and, ultimately, settlement patterns.
- Consumers have an increasing range of options for buying products and services, which has altered relationships within consumer markets. The opportunity to compare prices and goods online has introduced a new layer of competition to many markets. It has undermined long-established retail sectors (especially for books and music, also strongly affected by the enhanced opportunity to share goods digitally without purchase), and may well reinforce the decline of traditional shopping venues (high streets and malls). Online purchasing makes it easier for consumers to access a wider range of goods and services, bypassing the limited market ranges that conventional retailers could offer, especially in rural areas (and also bypassing legal constraints, for example, in purchasing pornography or pharmaceuticals). Large secondary markets have developed, in which individuals and businesses trade goods between one another (for example, auction sites). The growth in international online trade has challenging implications for consumer law and protection and has also offered increased scope for fraud.

These ICT-enabled trends have had a substantial impact on the dynamics of the world economy, contributing substantially to globalization, the diversification of products and services and the growing predominance of service sectors and trade in services. They have interacted with other economic trends, including the dynamic investment

[7] The best-known example of this is Kenya, where the M-PESA mobile transaction service has been particularly successful. However, relatively few countries have seen Kenya's level of dynamic growth in mobile transactions.

profiles of countries such as Korea and China, the growth of industrial production and consumer markets in regions such as South Asia and South America, and the differential impact of the 2007ff economic downturn on different world regions. What impact have these changes in production and consumption patterns had on the sustainability of economic development? What prospects are there for the future arising from them and the likely further evolution of information and communications technologies?

## 6.2 Social Development

ICTs and the Internet have likewise had substantial impacts on social relationships and social development in the 25 years since sustainability was defined by the Brundtland Commission. The social dimension of its definition emphasized poverty reduction, improvements in the quality of education, health, housing and other aspects of individual and community welfare, and enhancements in the quality of social interaction, engagement and empowerment. ICTs and the Internet are widely claimed to have had or to enable transformative impacts on access to some critical welfare and livelihoods resources, and to enable greater empowerment and engagement in society. "Information" and "interaction" might be considered the two keywords defining these impacts. They have accentuated individual choice and opportunity, and led to significant restructuring of social relationships. As with economic development, there is space only to mention some of these substantial changes in social structures here, rather than to offer full analysis.

- The Internet has comprehensively changed the ways in which individuals and organizations can access information, conduct research and exploit the work of others to meet their requirements. The most startling feature of this is access to information. At the time of the Brundtland Commission, access to public information was limited to what was formally published and made available through outlets accessible to the citizens concerned (such as broadcasting, newspapers, magazines and public libraries). Access beyond this was highly constrained, whether for journalists and professional researchers or for ordinary citizens. The Internet has made vast resources of information freely available. As a result, information overload has become a more substantial problem for many users than information deficit.
- The Internet has enabled citizens to bypass legal constraints and social norms that would previously have inhibited aspects of behaviour. By extension, it has arguably brought about changes in legal constraints and altered social norms. Bypassing historic constraints in some contexts is uncontroversial—for example, in the way that online shopping overcomes inequalities in access to goods and services. In others, it is controversial and/or problematic. Examples include widespread non-compliance with copyright, which undermines the sustainability of intellectual property rules, and widespread access to pornography, which was previously constrained by a mixture of legal rules and social norms. As well as undermining these specific constraints, it can be argued that the ability to bypass legal and normative constraints on the Internet has undermined the effectiveness of both types of constraint within society as a whole.
- New media, and especially Web 2.0 developments on the Internet, have changed the relationship between content and its users. In the past, citizens were overwhelmingly consumers of content, which was broadcast or published for them by actors operating within certain constraints (proprietorial and advertorial influence, production costs and the need to recover them through sales, political or cultural content regulation, self-censorship). In the Web 2.0 era, anyone who is online can publish anything, in their own names or anonymously: consumers have become "prosumers," "bloggers," critics. Publishing content, and publicizing one's views, has

therefore become much more democratic, in the sense that there are more and more diverse voices available, and this in turn has reduced the authority of established media and other sources. However, at the same time, people have become more able to select the voices that they want to hear, and so greater diversity in the availability of content does not mean that individuals necessarily experience greater diversity of content. It has also reduced the communal experience of news and entertainment that was once the norm.

- New opportunities for communications have changed relationships between individuals and communities. The near ubiquity of mobile telephones means that, for the first time, the majority of adults worldwide can communicate with one another immediately and at a distance. The ability to do this has radically affected individuals' social relationships and community identities, which can much more easily become rooted not in geography but in self-selecting groups of people who are located in many different places. This might be described as the individuation of communal identity, and it has widespread implications not just for friendship groups but also for people's identity with where they shop or how and where they vote. The abolition of distance as a constraint to communication has also significantly affected the interaction between diasporas and their home communities, accelerating and intensifying exchanges of information that once took weeks and relied on the physical movement of people.
- At the same time, it is suggested that reducing the distance between those who live apart has increased the distance between those who share the same family or domestic space. The proliferation of digital devices and applications that are now available has resulted in people spending much more time interacting with devices and communicating with those from whom they live apart at the expense of communication with those who share their homes. Individuals and their social networks are becoming dependent on digital devices. Social networking sites such as Facebook and Twitter have intensified this readjustment of family and other physical relationships. Sociologists and psychologists are increasingly interested in two other phenomena that are associated with high levels of time spent interacting online: the prevalence and uncertain impact on effectiveness and relationships of what is usually called "multi-tasking," and anxieties related to "digital addiction."
- New opportunities for self-expression seem to be changing attitudes towards interaction between individuals, and towards the balance between the rights and responsibilities of citizens. The quality of public debate, in many countries, is much harsher in the blogosphere, where journalistic conventions such as validation don't apply, than in traditional media. Online anonymity has enabled political activists to organize more freely in conditions of repression, but it has also divorced online content authors from the consequences of their writing. The balance between rights and responsibilities lies at the heart of relationships of trust and confidence. The nature of trust between individuals who communicate mostly online and at a distance may be substantially different from that between individuals who have become familiar through physical contact.
- Privacy is another area in which online behaviour appears to be shifting from previous social norms. Online, and especially social networking, behaviour seems to have made people less protective of their personal information and identities, while also giving them more opportunity to edit the identities that they themselves project. Digitally networked societies may be less discreet than those before them. This may offer more space for individuals, especially the young, to escape constraints imposed by families or religious communities. Businesses, employers and government agencies, meanwhile, can gain much more information than before

about individual behaviour, mining data derived from many different sources, which can then be used for purposes that may be considered more or less benign (planning public services, for example, or tracking the contacts of political activists).

- Lastly, the advent of a predominantly online society, which now exists in many industrial countries, is changing the nature of social exclusion. Those who remain offline are disadvantaged in terms of access to much of what the rest of society has come to take for granted. Digital exclusion tends to coincide with and exaggerate other forms of exclusion resulting from poverty, ethnicity, gender, age and disability. If this is so, the digital age may intensify exclusion of those who are economically and socially most marginal, a trend that, evidence suggests, will be exacerbated rather than reduced by efforts to force the marginal online.

The changing nature of citizens' relationships with other actors in society is at the heart of many of the social developments discussed above, which reflect the outcomes of changes in discussion paper, communications and the Internet. One critical relationship, between the citizen and the state, is discussed further below. Other relationships that may be changing systemically include those between individuals and their families, friends, professional associates, employers and the businesses and service providers with whom they interact. New media and the Internet empower individuals, not least to do what was previously impossible or forbidden, and enable new forms of social association. The question is whether they do so sufficiently to require rethinking of the social structures that relate to sustainability.

## 6.3 Environmental Protection

The impact of ICTs and the Internet on the environment has been explored, not least in previous IISD publications,[8] using the analytical framework developed by the Forum for the Future and described earlier in this discussion paper. The third order effects identified in that framework are, essentially, those impacts on economic and social development, cultural diversity and governance, which are discussed separately in this section. The results from analyzing first and second order effects, which are considered here, are mixed, and there is disagreement about their relative importance.

Net first order effects of ICTs on environmental sustainability are generally considered negative. The production and manufacturing of ICT products, including computers and mobile phones, is carbon-intensive and uses some scarce resources, notably coltan (whose mining has also had significant negative second order effects in the form of armed conflict and land degradation in parts of Africa). The rapid growth in the number of terminal devices (telephones, televisions, computers and peripherals) used by individuals, and the high turnover rate for devices (typically under three years) that results from continuing technological development have led to substantial and growing problems of electronic waste disposal, including that of toxic waste.

The most damaging long-term first order effects of ICTs on the environment, however, are probably those concerned with greenhouse gas emissions. The ICT sector is the fastest growing contributor to emissions, currently contributing around 2.25 per cent of total emissions but with a compound annual growth rate of around 6 per cent (The Climate Group for the Global eSustainability Initiative, 2008). This growing contribution is primarily driven by growth in the range of networks (which enables more devices to reach more users), in the number of devices that are used by individuals and organizations, in the amount of time for which each device is used, in the amount of electrical power required to enable increased access, and in the dependence of individuals and organizations on digital devices. A

[8] See, for example, Souter et al. (2010).

significant secondary factor is the growth in data centres (which are highly dependent on power for air-conditioning) that is associated with greater use of services and applications, including the advent of cloud computing (though this may also lead to lower power consumption by terminal devices).

Second order effects of ICTs on environmental sustainability are generally expected to be more positive. They are anticipated in two main areas. One is dematerialization: the displacement of physical goods by virtual goods and of physical travel by videoconferencing, telecommuting and other virtual activity. The other consists of improvements in the efficiency and coordination of economic activity, particularly the generation and distribution of electrical power, the management of transport and other logistics, the design and construction of buildings, and the remodelling of equipment to maximize energy and human efficiency.

The industry-led Global eSustainability Initiative (GeSI) estimates that the accumulated savings in emissions from dematerialization and the introduction of "smart systems" should be substantially greater than the additional emissions resulting from the first order effects described above (The Climate Group for the GeSI, 2008). However, this optimistic assessment should carry two important caveats. First, while the negative first order impacts resulting from increased usage are effectively certain to occur, the second order effects described above are merely potential impacts: whether they are achieved will depend on decisions that are taken by utility and industry managers outside the ICT sector, on the basis of commercial viability rather than environmental sustainability. Second, the net impact of dematerialization is likely to be substantially influenced by rebound effects as, for example, reduced commuting time leads to more leisure travel and reduced prices for online goods lead to increased purchases.

The ICT sector's own impact on environmental protection is already substantial and growing in importance. Its certain and rapidly growing contribution to waste and greenhouse gas emissions need to be factored into strategies for sustainability. Such strategies can likewise promote or discourage the development of smart systems (which will have most impact in industrial countries and large emerging economies with rapidly growing energy requirements). Finally, ICTs also have significant potential for climate change adaptation, particularly in collating, analyzing and disseminating information on weather, land and water resources. Increased attention to climate change has already required changes in our understanding of sustainability since the Brundtland definitions of 1987. The questions that arise for this discussion concern how far these various ICT-related factors require further changes in thinking about the nature of environmental sustainability in the information age.

## 6.4 Cultural Diversity

As well as the three main elements of the sustainability framework discussed above, discussions of sustainability have paid significant attention to issues of cultural diversity and governance. Some issues related to cultural diversity have already been mentioned—for example, the ways in which ICTs and the Internet have changed the dynamics of relationships between diaspora and home communities, or their potential to enable more rapid transfer of remittances.

The most substantial questions about ICTs and cultural diversity are probably those concerned with the relationship between individual cultures and emerging global cultural norms. These are not new questions. Debates about a New World Information and Communication Order in the 1970s and 1980s, before the Internet became significant, pivoted on anxieties in some countries about the hegemonic power of global media businesses and the predominance of cultural products and values from particular countries and regions. Cultural issues of this kind have moved on substantially from the controversies of the 1980s. Bollywood and Nollywood are now as powerful, in their regions, for example, as

Hollywood. The costs of publishing content have fallen drastically, particularly since the advent of Web 2.0, making diversity cheap for those who wish to share content or just to access it. Concerns about linguistic dominance have been addressed within the ICT sector, especially the Internet, by incorporating multilingualism in mechanisms like domain name systems.

There remains, however, an evolving and dynamic relationship between two trends in the cultural impact of ICTs and the Internet. On the one hand, as a global medium, the Internet enables global access to content which stimulates the development of global brands, including cultural brands such as Lady Gaga, Manchester United and the BBC. A small number of website platforms, including Google, Facebook, Wikipedia and Twitter, have achieved global predominance, at least in the short term. However, as well as representing globalization, these websites also represent a countervailing force to it because they widen access to content production and consumption, and so diversity. Most of the content on Facebook and Twitter, for example, is local rather than global in nature, irrespective of where it is produced (and of interest only to a few). Much the same could be said of file-sharing sites such as YouTube and Flickr. ICTs and the Internet appear, therefore, to be making world culture both more global and more local—or at least making global and local cultures both more visible to ever wider groups of people. Once more, the question is about how far this requires us to adjust our understanding of sustainability.

## 6.5 Governance

The final element of sustainability that seems susceptible to the impact of ICTs and the Internet is governance. As with economic and social development, a number of different factors are important, which can only be summarized briefly here.

- The role of government itself has been questioned by some advocates of new media, particularly the Internet. Libertarian ideas were quite widely held among early technical pioneers of the Internet, and most famously expressed in John Perry Barlow's *Declaration of Independence of Cyberspace*.[9] Although not many share Barlow's gleeful assertion of the Internet as a means to bypass government, he and others have pointed to an important truth: that the global nature of the Internet and the anonymity of much Internet use make it easy for those who wish to do so to ignore laws that they find inconvenient and hard for governments to enforce them (irrespective of public wishes for or against enforcement). Intellectual property law is a particular case in point. Asymmetries have been emerging in the rule of law, particularly the authority of legal agencies and enforceability of laws online and offline. These asymmetries are implicitly inequitable and seem unlikely to be politically sustainable in the longer term.
- The Internet itself is governed very differently from traditional media and other public policy domains, emphasizing multistakeholder participation and consensus, while eschewing intergovernmental arrangements and state-controlled regulation of the kind found in telecommunications and broadcasting. These alternative governance norms have proved challenging for governments and intergovernmental organizations, and are particularly difficult at the interfaces between Internet governance and governance of other public policy domains that are highly affected by the Internet (such as crime and security, taxation and consumer law).

[9] Available, with its original political introduction, at http://w2.eff.org/Censorship/Internet_censorship_bills/barlow_0296.declaration

- The Internet, mobile telephony and social networking have greatly extended the ability of political groups to organize activities, with especial significance in countries where freedoms of expression and association have been suppressed. They have, for example, been credited with significant impact in the Arab Spring and other recent protest movements. While their impact is sometimes exaggerated—the English, American, French, Russian and Chinese revolutions, after all, took place before the Internet—it is nevertheless clear that new media have altered the dynamics of political activity, protest and civil disobedience.
- Likewise, by extending access to information and offering individuals and groups new means to exercise freedom of expression, new media have increased the potential that is available for people to participate in government. Wider publication of official data and freedom of information tend to increase transparency and accountability. More opportunities for freedom of expression make it more difficult for governments to censor political comment (or to prohibit sexual or other content that is held to violate local/national cultural norms). These changes are widely celebrated in the Internet community, and they have changed the scope and parameters of political activity. They have also given the boundaries of information rights and freedom of expression renewed prominence in political debate.
- Discussion about new media and freedom of expression exemplifies a number of issues surrounding rights. The international rights regime—the Universal Declaration, the international Covenants and regional Conventions—dates from before today's media and communications environment. Article 19 of the Universal Declaration of Human Rights declares the right "to seek, receive and impart information and ideas through any media and regardless of frontiers" (United Nations, 1948). A medium such as the Internet is implicitly covered by this article, yet a medium as all-encompassing and ubiquitous as the Internet was not envisaged at the time the Declaration was agreed. Interpretation of this article is therefore challenging. Extensive interpretations have argued that it implies a right of access to the Internet, and therefore an obligation on governments to provide that access (and indeed broadband access). Confusions have arisen between human rights (as endowed by the Declaration and Covenants), civic rights (which are endowed by governments and constitutions) and consumer rights (which are granted in law).[10] Some have argued that the increased significance of information and communications technology today requires the incorporation of a new "right to communicate" in international law.[11] Others have proposed new sets of "Internet rights."[12]
- The changing ICT context has not just raised questions about the meaning of individual rights. It has raised questions too about the balance between different rights that are included in the rights regime. For example, new media have greatly increased the capacity of most people to exercise freedom of expression, beyond what was imagined when the international rights regime was formulated in 1948. Other articles in the Universal Declaration, Covenants and Conventions protect rights that are in balance with freedom of expression, such as the right to privacy, a right to protection against defamation and the right to benefit from intellectual property. Other international rights instruments require governments to protect people against racial hatred and children against sexual abuse. All international rights instruments include clauses reflecting the principle set out in Article 29 of the Universal Declaration that the exercise of individual rights can be limited by law "for the

[10] See, for example, debates in the Internet community following a January 12, 2012, *New York Times* column by Vint Cerf, Internet access is not a human right, available at http://www.nytimes.com/2012/01/05/opinion/internet-access-is-not-a-human-right.html?_r=1.
[11] See, for example, C.J. Hamelink & J. Hoffmann (2008). The state of the right to communicate, *Global Media Journal*. Retrieved from: http://lass. calumet.purdue.edu/cca/gmj/fa08/gmj-fa08-hamelink-hoffman.htm.
[12] See for example, Association for Progressive Communications, *APC Internet Rights Charter*, available at http://www.apc.org/en/node/5677.

purpose of securing due recognition and respect for the rights and freedoms of others and of meeting the just requirements of morality, public order and the general welfare in a democratic society," the meaning of which is clearly open to interpretation. The question that arises is whether our understanding of the international rights regime needs to change in the light of these implications of new media.

- Finally, recent years have seen a range of questions arise about the relationship between security, surveillance, rights and privacy. The international rights regime requires governments to protect "life, liberty and security of person." Since 2001 governments have been particularly concerned with the threat of terrorism, and prepared to use electronic surveillance to gather information and otherwise "protect national security." The Internet itself has raised new security challenges for both governments and citizens, from the threat of disruption to the Internet itself (e.g., distributed denial of access attacks) to new forms of criminality (cybercrime). The means that are available to governments to address criminality and security threats in the context of new media are essentially the same instruments as those that governments can/could use to suppress dissent or deny freedom of expression or association. The question that arises here is whether we need a new understanding of the relationship between security and rights, which helps to determine what measures are legitimate in what contexts.

## *7.0 ICTs, the Internet and Sustainable Development: Questions for Discussion*

This discussion paper has sought to provide a frame of reference for discussion about the relationship between ICTs, the Internet and sustainable development. Its purpose has been to raise questions, not to draw conclusions. The two interviews that are published alongside this discussion paper offer perspectives on some of the issues raised in it from two leading figures in the global sustainable development and Internet communities. They provide a basis for further comment and discussion.

As mentioned earlier, this IISD project is concerned in particular with three questions:

- What impacts are new media and the Internet having on the achievability of the core elements of sustainability identified earlier in this discussion paper—economic and social development, environmental protection, cultural diversity and governance—and on the balance between them?
- To what extent do these impacts enhance sustainability and to what extent do they, on the contrary, raise new sustainability challenges?
- Do the economic, social, political and cultural implications of these impacts imply that we need to revise, rethink or readjust our understanding of what sustainability means from the ways in which it was defined in 1987/1992, before today's information and communications technologies became available?

Comments and contributions on these and other aspects of the relationship between ICTs and sustainable development are invited from anyone with an interest in these important issues.

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IISDCOMMENTARY

# *ICTs, the Internet, and Sustainability:*

## *An interview with Jim MacNeill*

The following is the record of an interview with Jim MacNeill, former secretary general of the Brundtland Commission and lead author of *Our Common Future*. The interview was conducted by David Souter, senior associate, IISD and managing director of *ict* Development Associates.

This interview with Jim MacNeill is one of series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability in advance of the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 (IGF 2012), and the International Telecommunication Union World Conference on International Telecommunication in Dubai in December 2012 (WCIT-12).

Jim MacNeill is a Canadian consultant, environmentalist and international public servant. He was director of environment at the Organisation for Economic Co-operation and Development in Paris (1978–1984), secretary general of the World Commission on Environment and Development (Brundtland Commission) and lead author of its landmark report *Our Common Future* (1984–1987). He is currently a member of the Caspian Development Advisory Panel, the jury of the Volvo Foundation Environment Prize and a member of several boards, including the Woods Hole Research Centre, whose mission is to advance scientific discovery and seek science-based solutions for the world's environmental and economic challenges through research and education on forests, soils, air and water.[1]

### Could we start by talking about the Brundtland Report, which was published 25 years ago? What do you think have been the most important changes in society in the time since it was published?

That's a rather tall order. I would say that there have been many significant changes over the past 25 years, but I can't really begin to say which are the most important: the fall of the Berlin Wall; the rise of China and India and the other so-called BRICs; the relative decline of the U.S. and the West and the resulting changes in the balance of power; the Arab spring still unfolding—and that's on the political front only. On the technological front, there have been a huge number of profoundly important changes in fields such as medicine, biotechnology, biopsychology, nanotechnology, geo-engineering and so on. Of course, given the subject of this discussion, the development of a wireless world has affected every living person, putting everybody and every nation in each other's backyard.

[1] Biography abstracted from http://en.wikipedia.org/wiki/Jim_MacNeill

Over the past 25 years, we've also seen a colossal expansion of the world economy. Global GDP has more than doubled, rising from about $33 trillion at the time we wrote our report to over $65 trillion today. As you know, we in the Commission did call for a large and very rapid increase in global production, largely in order to reduce levels of mass poverty. That has, in fact, happened. In many countries, I would say, it has happened more dramatically than we anticipated. However, and this is very important, I think, to an understanding of our report. Our call for a rapid increase in global production came with a very important caveat—a caveat that many people never really understood, or perhaps they simply forgot. Rapid growth was necessary to deal with poverty, and also to accommodate perhaps two more doublings in the size of the global population. But—this was the caveat—we insisted that future growth must be based on forms of development that were sustainable: economically, socially and ecologically sustainable. It should not be a continuation of the unsustainable forms of growth that got us into the situation that prompted the United Nations to call for the Commission in the first place. If that happened, we said, our future would be in peril.

Unfortunately, there was no shift to more sustainable forms of development. "Business as usual" not only continued, it grew enormously, and today our future is indeed in peril.

A lot of the changes experienced over the past 25 years have been very positive: millions of people lifted out of grinding poverty, freedom for the peoples in the Soviet bloc and so on. That said, the one great failure of the past 25 years threatens our survival on this planet. Following the 1992 Earth Summit, most governments decided to simply ignore the commitments they made to lead a rapid transition to more sustainable forms of development. Instead we got 25 more years of unsustainable business-as-usual forms of development in agriculture, in industry—you name it—with the result that economic and life support systems have degraded at an increasing rate, just as we predicted they would.

Keep in mind that in 1987 when we published our report, we had not yet crossed any of the so-called critical ecological thresholds. The Commission's recommendations and the Earth Summit were designed to ensure that we wouldn't actually get there. Today, scientists tell us that we have crossed at least four of the most critical planetary boundaries. Climate is the one that everyone talks about because of global warming, but there are also those relating to nitrogen and the loss of species. In addition, a large number of ecological services are absolutely central to the maintenance of economic systems. In 2005 the UN Millennium Assessment found that 15 out of 24 such services had already been pushed beyond their sustainable limits. We're talking about such services as providing fresh water in many regions, regulating climate and so on. For all our growth and all our new-found wealth, the fact is that the human species is now in much greater peril than it was 25 years ago.

**Can we consider the definition of sustainability? The one that's often cited from the Brundtland Report is that which is concerned with intergenerational equity, and I know you think that emphasis on this has oversimplified the message. I wonder if you could summarize the concept as you saw it then, and talk about how you might think differently today in the light of changing circumstances such as those that you've referred to.**

The definition that you cite—the one that, frankly, most people cite—refers to one element, the intergenerational element, of what was a multi-faceted definition of sustainable development. I have to assume some responsibility here. It was phrased in a very catchy way so it grabbed the headlines in 1987 and stuck, unfortunately to the exclusion of the others.

What were these others? The first was consumption levels. Development that was sustainable, we said, had to be "based on consumption standards that are within the bounds of the ecologically possible and to which all can reasonably aspire." The second was the need to live within nature's limits. Development that was sustainable, we said, was development that "at a minimum must not endanger the natural systems that support life on earth—the atmosphere, the waters, the soils and the living beings." In other words, the intergenerational element was just one of three crucial elements in any definition of sustainable development.

In addition to that, we put forward a number of broad directions that we felt development must take if it is to be sustainable. These directions ranged from ensuring a sustainable level of population to increasing equity within and between nations, to reducing poverty, of course, and managing the resource content of growth. Perhaps the most important was merging environment and economics in decision-making. Movement in these directions, we felt, was fundamental to any transition to sustainability. I could go on but I think that that captures the essence of our definition, which the intergenerational element standing on its own does not.

### Is there any element of that, or the way in which you put it at the time, that you would think about differently now? If the report were written today, are there definitional changes you would expect as a consequence of the changes in politics and economics and society that you've described—or of environmental developments such as increased knowledge of climate change or the fact that we have moved beyond some of the planetary boundaries?

A very good question—and one that has been asked by a number of people, including several who, from time to time, have wanted to establish a commission and update what we said. If the report were written today, the issues that you've just mentioned would obviously make a difference to the way in which we described the nature of the global crisis and the challenge it presents to different actors—not just governments, which we emphasized, but also the corporate sector and civil society (both of which are much stronger today than they were 25 years ago). We would also deal with the international community in rather different terms than we did. But I don't really think those changes, important as they are, would change the meaning of sustainability or the essence of the definition of sustainability. Speaking personally, I would try to formulate a definition that didn't lend itself to the level of misunderstanding that happened as a result of our breaking it up into these separate elements. But these three elements would still be central. Living within nature's limits is fundamental to sustainability, and to the concept of sustainable development. So is maintaining consumption levels that enable us to live within the bounds of the ecologically possible. As the global system is closed, and limited, and technology isn't going to change either of those things, the notion of intergenerational equity also remains a fundamental element in any definition of sustainability.

I'd like to add a couple of comments to that. You may recall, in the late 80s and early 90s, we experienced a worldwide growth industry—as I called it at the time—in attempts to redefine sustainable development. Some of them were frankly quite ingenious; some of them were very elegantly expressed, and quite compatible with ours. But most of them, frankly, were (and were intended to be) totally self-serving. Every industry wanted to ensure that whatever they were doing, and however they were doing it, could somehow be deemed "sustainable." To have their products or practices deemed unsustainable was marketing suicide. For example, in 1988 the forest industry in British Columbia came up with a definition of "sustainability" that embraced the clear-cutting of old growth forests. Just recently, a growing number of Canadian politicians have taken to referring to the Alberta tar sands as a source of oil that is not only ethical but also sustainable. Now, anybody who has lived in Canada understands the politics of this only too well.

But, given the fact that we have long ago exceeded the system's carbon limits, the notion that the development of fossil fuels is an endeavour that can be deemed sustainable belongs, in my view, in another galaxy, not ours.

**Some people believe there's necessarily a trade-off between the economy and the environment. The message of the Brundtland Report, however, is that this is not necessarily so. There is another way. I wondered if you'd comment on how you see the relationship between growth and sustainability?**

Well, there is obviously a conflict between economic growth as we have known it—characterized as business-as-usual or resource-intensive growth—and the environment. After all, history is full of civilizations that collapsed because they over-consumed the ecological capital on which their development depended. Having just passed four critical planetary boundaries, with more to come, we are still on that unsustainable path.

I can recall, in the late 1960s, after 25 years of unfettered post-war growth, we were in a real environmental mess, and our political leaders were forced to do something to clean it up. They established environmental protection agencies with a mandate to do just that. They, of course, made sure that these agencies were given absolutely no power to influence the fiscal and energy and industrial and other policies that had created the mess in the first place. Instead, they gave them a very simple mandate—to clean up pollution and degradation after the fact, using largely end-of-pipe measures to retrofit and to rehabilitate and restore.

The rest is history. In spite of our best efforts to clean up the mess—and we made magnificent efforts and we did clean up a lot—environmental protection agencies simply couldn't keep up with the new pollution and the new environmental degradation generated by runaway, resource-intensive, business-as-usual growth. Trade-offs between the environment and the economy were usually made in favour of the economy. The result was that, by 1984, the environmental crisis had assumed even more threatening proportions, and that's what prompted the United Nations to establish the Commission. It asked us to come up with new ways of addressing the crisis that went beyond the standard after-the-fact environmental protection.

In *Our Common Future*, we called for a rapid global transition to more sustainable forms of development. And we proposed a range of policy and institutional changes that would make it possible for nations to grow and prosper sustainably, all the while keeping within nature's limits. Governments endorsed our recommendations in 1987 and again in 1992, but, as I said earlier, after the Earth Summit they promptly forgot about them. And so today, we're back to where we were in 1972, making trade-offs between the environment and the economy. And in North America today, those trade-offs are being made almost always in favour of the economy. Politicians speak of the environment being the enemy of the economy, a threat to growth and a killer of jobs. To them, the relationship is a simple one. It's like a children's teeter-totter or see-saw, with the economy at one end and the environment at the other. If the economy goes up, the environment goes down, and the resulting degradation is viewed as the inevitable price of progress. If the environment goes up, the economy goes down with a resulting loss of growth, jobs and income. Can't let that happen! With such a mindset in power, it's no wonder that the planet is in peril.

There is only one alternative and that is for governments to return to the commitments they made at the Earth Summit and begin to implement the policy and institutional reforms needed to bring about an urgent transition to more sustainable forms of development.

**Can we now move on to more specific issues around the information technology sector? The Brundtland Report came out in 1987. The Internet did not become publicly available until 1989. There have been enormous changes in information and communications technology, mobile telephony and the Internet in the intervening 25-year period. Going back to 1987, did you anticipate that information technology would have that degree of impact on the future, or on sustainability?**

Well, the short answer is "no." What we did was, I think, to see the fact that we could move information around the globe faster than ever before. We saw that as enormously important, and felt that it would have a fairly positive influence on the transition to sustainable development. We also said that more open information systems were essential to such a transition. But, in 1987, we didn't foresee the ICT revolution—equally, we didn't foresee the fall of the Berlin wall, or the rise of the BRICs and so on—and nor, as far as I am aware, did anyone else.

**How much difference do you think the information and communications revolution has made to sustainability over the past 25 years? Has it significantly affected prospects one way or the other?**

I don't think the information revolution changes what we mean by sustainability. I think that it provides additional tools, perhaps very powerful tools, for achieving the reforms that need to be made in the transition. But a lot of people feel that way, I know, and discussion tends to end there. It seems to me, however, that this can work both ways. ICTs are all-pervasive, they are open to everybody—those who favour change and those who oppose it, those who stand to gain from any transition and those who stand to lose. And I think we have to keep in mind that those who defend the status quo have far greater access to the political power and the reserves of financial capital needed to deploy ICTs in whatever form they are, than do the rest of us.

**I'm interested here in an idea which you included within the definitional parts of the report—the idea of "limitations imposed by the state of technology on the environment's ability to meet present and future needs." Has the state of technology moved forward in such a way that it has removed some of these limitations on the environment's ability to meet present and future needs—or has it imposed any new limitations?**

I think that's a very difficult question. We felt back in 1987 that technology and most of the ways it can be introduced into the market and workplace did put certain limits on our ability to shift from unsustainable to more sustainable patterns of production and consumption. The inertia of social organization also places limits on it. I'd like to give you an example. I belong to a group called the Factor 10 Club. We believe that we can achieve a tenfold increase in the efficiency with which we use energy, natural resources and other materials. We've had the technologies to achieve a fivefold increase for more than a decade now, perhaps two decades, and scientists tell us that we have the potential for at least another fivefold increase. Thanks to the relatively slow pace of capital turnover, however, and to the inertia of the status quo, progress has in fact been very slow. The inertia of social organization has proved formidable, particularly the slow pace at which governments seem able to change the incentive structures that could accelerate the adoption of more sustainable technologies.

**In our discussions before this interview, one of us asked the question whether the information revolution, or indeed technology in general, has made it easier to develop, grow, consume and prosper within the planet's natural limits. Has the information revolution made it easier for governments or people or the international community to envisage development, growth, prosperity within the planetary boundaries or natural limits to sustainability than was the case before?**

I think I answered that in part when I talked about the fact that ICTs work both ways, both for those who favour change and for those who oppose it. But to go beyond that, there is no doubt that ICTs are now a major player in just about everything, that they are all-pervasive. They have changed the nature of domestic politics, and of debate about issues such as global warming. They have also changed the nature of international politics. Witness the very easy global reach now of non-governmental organizations: they can organize not only locally, as they could in my day, and nationally, but also internationally. That is true of both those who want to advance progressively and those who don't. And ICTs have altered the way people behave: witness the Arab Spring. They have had a profound effect on all aspects of economy and society, politics and culture.

But do they make it more easy or difficult to grow and prosper within Earth's natural limits? I must admit that I haven't seen any comprehensive studies on this, so I hope I'm wrong. But in my view, the balance of evidence is that ICTs are making it more difficult rather than easier. ICTs have changed some production and consumption patterns, but I don't see any evidence that they have done so in the positive way that we hoped technology and communications would. Contrary to our expectations, ICTs have reinforced a number of environmentally unsustainable trends. Not only are they large and increasing sources of environmental harm themselves, but they seem to me to facilitate runaway consumption and short-term decision-making.

They are also having—we can't yet be sure but I suspect—a profoundly negative effect on the capacity for governance. When it comes to governance, I think the first question you have to ask is, "What *is* governance?" Yesterday, I looked it up in the Oxford dictionary. That formidable dictionary says that "governance" is "the action or manner of governing a state or organisation." "Governing" is the adjective for "govern" and, according to Oxford again, "to govern" means "to conduct the policy, actions and affairs of a state, organisation or people with authority." I repeat, "with authority." Now I fear personally that the net effect of the all-pervasive use of ICTs, along with other trends, has been to weaken that authority, which could also, I fear, weaken the capacity of governments to govern effectively. I also fear, frankly, that it has made it more difficult politically to challenge the massive power of the status quo regarding unsustainable forms of development—fossil fuels, for example, but not only fossil fuels—and made it more difficult to effect any transition to more sustainable forms of development which will call for very strong actions by government.

ICTs have become no doubt a necessary feature and a powerful driver of modern development, but much as I hate to say it, their runaway use does not increase my optimism for the future. In any event, I suspect that there's no way of controlling the speed of ICTs, the rate at which they are advancing, even if one wanted to. Their growth to date has been largely or totally uncontrolled. I suspect that, given the limits of government, it is now virtually beyond control. So we will have no choice but to react to every new development that comes along and live with whatever the consequences are. I hope I'm wrong and that the consequences are positive, but I think the balance of evidence to date is that they are likely to be largely negative.

**The Brundtland Report recommended and emphasized institutional changes to enable sustainable development—and the kind of challenges you've been describing very much require multilateral cooperation and therefore the authority of government agencies. Governance of the Internet, by contrast, has challenged many of the traditional norms of international governance, including the authority of multilateral agencies. It takes place outside intergovernmental agencies, and it emphasizes multistakeholderism. I wondered if you see that as a model that is likely to spread, or that threatens the kind of international cooperation that's necessary to tackle challenges like climate change.**

We devoted a full chapter in *Our Common Future* to governance in relation to sustainable development. It called for measures to make institutions, national and international, capable of overseeing the urgent transition to sustainable development we called for. In 1987 they were not capable of doing so and, unfortunately, since the reforms we called for were not undertaken, they are still not capable of doing so.

I would like to go back to your earlier question about the relationship between ICTs and sustainable development. You raised the question of ICTs facilitating the possibility for monitoring, and it's clear that we do need better monitoring. There's no doubt that ICTs have made monitoring much easier. But it's more important in my view to address the unsustainable forms of development that lead to the syndromes that we need to monitor—higher global temperatures, melting glaciers, declining rivers, forest fires and so on.

I'm not thinking about sustainable development here so much as about the rapid growth in what I call "the fear society" since 9/11. Ever greater surveillance has been made possible not only of our movements through airports but also on the streets of cities like London, where there's a camera on virtually every lamppost. And then we have attempts by some governments to restrict our rights of privacy, which have been made much easier by certain ICTs. All of this helps to reinforce the unsustainable status quo across the board, and certainly in government. I think that's a very important point. I'd like somebody to argue the opposite of what I'm saying. I think it would be fascinating. I do hope I'm wrong, but maybe somebody in this discussion will take the opposite tack.

**My last question is to do with dialogue between the sustainable development community and the information technology world. It's quite rare to see information technology have much place on the agendas of international conferences on sustainability. It's barely mentioned, for example, in the zero draft for Rio+20. I wondered if you have any suggestions as to how to improve dialogue between these two areas of professional expertise.**

I've thought about this since we talked earlier, and I must say that I'm not sure how to answer it. I feel that dialogue is something that's conducted between two parties. Given the multiple forms of ICTs, hundreds of forms and thousands of applications, who represents the ICT sector? Given that there are hundreds of non-governmental organizations, corporate leaders and others who are promoting sustainable development, who represents the sustainable development community? So I don't know who is going to be communicating with whom. Nevertheless, I think that it would be very useful if people like you and experts from the ICT community, a number of whom would argue the opposite of what I have been arguing, got round a table with a number of leaders from sustainable development non-governmental organizations or institutes. They would represent a small fraction of each, but I think that would be a very useful exercise. The resulting paper or papers could make a contribution to our dialogue. There may be other ways of doing it, but both communities are so diffuse it's hard to come to grips with.

**Thank you very much.**

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## About IISD

The International Institute for Sustainable Development (IISD) contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change and energy, and management of natural and social capital, as well as the enabling role of communication technologies in these areas. We report on international negotiations and disseminate knowledge gained through collaborative projects, resulting in more rigorous research, capacity building in developing countries, better networks spanning the North and the South, and better global connections among researchers, practitioners, citizens and policy-makers.

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IISDCOMMENTARY

# *ICTs, the Internet and Sustainability:*

## *An interview with Vint Cerf*

The following is the record of an interview with Vint Cerf, who was a co-designer of the basic Internet protocols and architecture in the early 1970s and now serves as Google's Chief Internet Evangelist. The interview was conducted by David Souter, senior associate, IISD and managing director of *ict* Development Associates.

This interview is one of series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability in advance of the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union World Conference on International Telecommunication in Dubai in December 2012 (WCIT-12).

Vint Cerf has served as vice president and Chief Internet Evangelist for Google since October 2005. In this role, he is responsible for identifying new enabling technologies to support the development of advanced Internet-based products and services from Google. He is also an active public face for Google in the Internet world. Widely known as one of the "Fathers of the Internet," Cerf is the co-designer of the TCP/IP protocols and the architecture of the Internet.[1]

### You've been part of the Internet since its very beginning. I wondered if you could begin by saying something about what you think are the two or three most profound effects the Internet has had on human society?

That's a fairly big order. Probably the most important thing is that it created a set of standards that could be globally implemented and create interoperability among computers that didn't exist before—a non-proprietary ability to link computers to each other. The most important applications that arose were probably electronic mail in 1971, and Tim Berners-Lee's introduction of the World Wide Web. There could be hardly any debate about the impact that has had because of the ability to share information in such an effective way, and to discover people with like interests. The third, I think, has been the linkage of mobile technology to the Internet. Here we are seeing the side effect of having billions of devices, some significant percentage of which have applications that are amplified by being able to reach computing power and information on the general Internet, and to use it to replicate and distribute information—to say nothing of the fact that mobiles are now capable of recording images and video and sound, and uploading them and sharing them in this web-based environment. I think these are examples of very, very powerful enabling tools that permit a considerable degree of information generation and sharing.

[1] Biography abstracted from www.icann.org/en/groups/board/cerf.htm

It's probably worth pointing out that, over the course of the evolution of the network from 1983 to the present, there has been a dramatic increase in the capacity of the system, not only in terms of computing power, but in terms of transport capability—moving large quantities of information back and forth. The ability to store, manipulate, share and collaborate over large-scale scientific databases is another very powerful outcome, which accelerates the rate of scientific discovery. I'm sure that we could add to this list, but those are the things that immediately come to mind—alongside the effects of social networking, the political dynamics of assembly in cyberspace, and the rapidly growing number and value of transactions that take place on the Internet. All of those things have had significant economic and social impacts on our society.

### If you were looking at that over the period since the Internet became available, how would you place its importance compared with some of the other major changes in global society, such as the women's movement, the end of communism or environmental issues?

The Internet didn't become publicly available until 1989, so all the phenomena that we are seeing today are no more than 23 years old. During that 23-year period we have seen growth from a few hundred thousand users to well over two billion. But keep in mind that the Internet is not something you can point at and say there is an objective behind it. The Internet enables things. The Arab Spring is an interesting example of my point here because it made use of mobiles and of the Internet's underlying capability for replication and distribution, but the replication and distribution and the mobile elements were simply tools. The outcome—in this case the overthrow of the government—is more like the women's movement, for example. We could probably pick a few events that the Internet has markedly affected, but as a consequence of its use rather than of the Net itself.

### I am trying to look back here and identify what specific changes in society have had most impact over the future development of societies—which is related to the concept that many people have of an information society replacing an industrial society. Do you share that view?

Let's talk about this in two forms. First of all, I think right now, in 2012, we are seeing a very significant event happening in the network that I would consider to be comparable to these other major changes in society. The Internet is going through a major period of turmoil because governments now see it as a potential hazard as well as a potential benefit. There is great tension about this. In some cases this is expressed in the form of governments wanting much more control of what people can do on the Internet, and what they consider abuses on the Internet. This is not surprising, because the role of government in a sense is to protect society from people that wish to do harm to society in general or to individuals in it. The problem of course, is that it is very difficult to maintain our principles of openness and freedom of expression while at the same time trying to protect people from the abuses that might arise, whether that is the distribution of child pornography, or the distribution of viruses and worms and other harmful software, or bullying, or the commission of fraud.

We struggle as a society to figure out how we can protect individuals from harm while at the same time not inhibiting everyone's freedom. That has historically been the big challenge, certainly in the United States. So you'll see and have seen, the Russians, the Chinese, the Indians, the Brazilians, the Syrians, the South Africans and others expressing a desire to gain control over the way in which people use the Internet and to suppress threats either to the individuals in the society or, frankly, threats to people who are in charge of the society.

You also see institutional attempts to grasp control of the Net. The ITU[2] is a force for that because its primary focus on telephony is becoming less and less important and overtaken by Internet technology. The ITU is much less relevant today, and so there is an effort to redefine it as having responsibility for Internet and for its security and so on. The other institutions that have grown up around the Internet don't take lightly to this proposition, nor do they take lightly to the idea that it's purely governments that should control things. That's why ICANN[3] is so heavily focused on multistakeholder models for policy development, to make sure that all affected parties are part of that discussion, as opposed to a traditional UN arrangement where only government entities are permitted to participate in policy-making.

So this is a politically important time in the history of the Internet. The other thing that is very important is that, in the core of the Internet, we have run out of address space. The solution is to expand the address space, and the way that is being done is to introduce IP version 6. That is a huge and very difficult change for the network, because the two formats don't interwork with one another. The introduction of multilingual domain names has been another major change. We're going to have to live through the rest of this decade in order to get a sense for how well the political environment, the security environment and the applications environment absorb all these various changes and challenges.

### In a sense, what you are talking about is the sustainability of the Internet itself, particularly the transition from IPv4 to 6.

Yes, and also whether it is sustainable with regard to improving the security of the system. The more we rely on this, the more important it is to make it secure and resilient, and it remains to be seen whether we are capable of sustaining and improving the conditions for reliable use.

### Would you say there are serious doubts about the sustainability of the Internet going forward, or are these problems that you would largely expect to be resolved?

As an optimist and engineer, of course, I hope that the Internet can be adapted to the need for scaling and security and reliability. However, because it's a fully distributed system, because multiple parties are permitted to implement and interconnect to it, and because the Internet operates in multiple national jurisdictions, there are a lot of pieces that have to be made at least interoperable for the Internet to continue to operate. So there are challenges ahead. I don't think that they are insurmountable by any means, but it will take a great deal of will to maintain this system going forward.

A good example is the amount of time it's taken to get people to pay attention to the need for IP version 6. This was standardized in 1996. This past year, on June 8, 2011, for the first time we turned on IPv6 in a large fraction of the Internet around the world, and only a small, a really tiny fraction, of users around the world had the ability to make use of the IPv6 capability. Many of the Internet Service Providers have not turned it on. It's been stunningly disappointing that people haven't understood how important it is to get this implemented and deployed, despite the fact that we officially ran out of v4 address space in February 2011.

[2] International Telecommunication Union
[3] Internet Corporation for Assigned Names and Numbers

**Can I widen the discussion to sustainability more generally? I was struck by your referring to 1989 as the start date of the public Internet, because that is about the same time as the two key moments at the start of modern thinking about sustainable development—the Brundtland Commission and the first Earth Summit. I'd like to take one of the definitions of sustainable development from the Brundtland Report—"development which meets the needs of the present without compromising the ability of future generations to meet their own needs." How do you think the Internet has affected that?**

A couple of possibilities, although I think we might be challenged to show measures and measurements that prove our case. One argument is that we may be able to compute our way to sustainability, by which I mean that the use of computing power, sensor networks, large-scale data and analysis may help us understand better ways to develop sustainable industries, make better use and more efficient use of power, design and build more sustainable and more eco-friendly structures, perhaps make more efficient use of transportation systems. Of course, computer power and instrumentation can be very helpful here, independent of the Internet. Just the fact that we can put chips and sensors into automobiles and buildings and so on may let us do a better job of using energy to operate those vehicles and those residences and office buildings.

They may also help us to do a much better job of predicting what conditions are that we are trying to cope with. For example, the global warming problem is almost certainly going to lead to much more violent weather patterns. The ability to predict those will depend a great deal on data gathering and computation—to say nothing of the really big challenge if we see increasing loss of the ice at the North and South Poles. The sea rise matters not only in absolute terms—how many inches or feet does it go up on average—but also during storm surges. What are we going to have to plan for? How many people are we going to have to move away from the coast? What is going to happen to food production? Our ability to produce high-quality predictive models of the side effects of climate change may be essential to our ability to survive in this potentially hazardous future.

**These are models which would help governments manage societies through periods of transition. That is rather different from the view many people have of the Internet as a way of increasing the power of the individual vis-à-vis governments.**

I think we should distinguish a couple of things here. It's true that some governments are making use of their ability to manipulate the Internet to suppress exchange of information and the like, or may even have made an attempt to suppress the right of assembly. The Egyptians turned the Internet off by shutting down all the underlying transmission capability. That is not sustainable because the transmission capability supports all forms of communication, not just the Internet, and once you deny a society the ability to communicate all of the societal structures tend to disintegrate very quickly. I would distinguish between a government's abuse of the network to interfere with or control or manage society and maintain its own power structure, and the government's use of the Internet to do productive things, for example in health care, where it's hard to establish government policy without adequate information. Although attempts to create electronic health records have foundered a few times, I think that ultimately it will be imperative to have that kind of data in order to understand the state of health of the population, to improve the state of health and to detect possible pandemics.

**ICTs and the Internet are also at present growing contributors to greenhouse gas emissions, because of growth in the range of networks and number of users and devices. Do you think the Internet community has a responsibility to address that problem and mitigate the impact that the Internet is having on greenhouse gas emissions?**

First, it is not so much the network that is consuming power; it is the devices that are at the edge of the network—the cloud-based computing systems, the laptops, the mobiles and everything else. These devices are not themselves the Internet, they make use of it.

Second, there has been, at least at Google, massive investment in reducing the energy requirements to operate its large-scale data centres. One of the reasons for coalescing systems into large-scale data centres is efficiency. We have reported an ability to operate these centres at higher temperatures, which means that we don't have to expend as much energy on chilling. We've also tended to locate our data centres at places where we can use non-polluting sources. I think the issue is that the system is responsible for consuming electrical energy, so how do we generate that energy. We do have an obligation to find alternatives to power generation that produces greenhouse gas. Google has been investing in that. Probably the most important piece of research which is yet to reach fruition is improved ability to store electrical energy. The key to solving the problem of episodic energy production and use is going to be effective, inexpensive and very large-scale energy storage.

**I want to ask you what you think about the relationship between innovation and sustainability. I'm interested in whether there is a need to address the relationship between innovation in the ICT world and innovation in other areas of science and engineering.**

That's an interesting linkage. One thing which I find disturbing is a focus on innovation without recognizing that innovation without adoption is sterile. At the same time that you want to create conditions in which people can have innovative ideas, you also have to think what conditions are needed so those ideas can be taken up. It is important for this that people and businesses should be able to take risks.

**One of the questions I have about sustainability today is whether the Internet implies some sort of paradigmatic shift in our attitude to economies and societies. How much substance do you think there is in the notion of the Internet economy displacing previous economies, or the Internet economy as a green economy which is more sustainable than the industrial age?**

I think the first question that it would be good to get an answer to is the amount of value that is carried through the Internet in terms of transactions—the sale of products and services through the Internet. I don't know how much that is, but it isn't yet a very significant fraction of global commerce. Part of the reason for that is that only two billion people in the world have access, and that's still less than half of the world's population. Of course, the fraction of the world's population that is online is probably the fraction which has the most disposable income. We're also seeing the technology drop in cost, which is good. That means that a larger fraction of the world's population will be able to afford to get access to the equipment and service that puts them online. But we still have some ways to go before the Internet becomes a significant portion of the global economy. One thing that may happen is a move to making use of the Internet as a way of carrying out transactions. You are not going to find the Internet replacing the production of food, the production of clothing, the production of transportation equipment, consumer electronics and so on. It's just that the Internet may infuse a lot of those things so that they become part of the communications environment.

The Internet of Things is sure to have an interesting effect. The more devices we have online, the more opportunities there are to manage them or control them or get information from them in order to make decisions. I think we'll see a lot of robotics become part of the production economy. This may not actually generate a lot of new jobs; what it will generate is a lot of products that are less expensive than they would otherwise be, and that could come from the United States as opposed to China or Cambodia or some of the other low-cost production countries.

### You are implying less of a paradigmatic shift there than would be implied by, say, the Broadband Commission for Digital Development.

I think that it's hazardous to be hyperbolic about these things. On the other hand, if you look at the mobile economy, and the amount of GDP generated by mobiles, it's pretty impressive. The production of equipment and software, the creation of a platform which makes it easy to program new applications: these have created a substantial and vibrant economy which didn't exist ten years ago. If we are to suggest that the Internet will facilitate things like that, I think we will probably be correct; the problem is—I don't know what they are.

### I was also wondering about business models here, and whether you think conventional business models of the industrial age are sustainable, in comparison with the newer business models that companies like Google have built—or whether you see them as that much different in practice.

First of all, the Google business model is based on advertising, which is not new. What it has done is take advantage of the economics of online information relative to other media. It's very costly to print paper and deliver it, which is why you find people shifting from books and print and newspapers and magazines to online content. I think that's a very significant development.

Our business models are not unusual. They've been very effective because people use our products and services and others pay to present advertisements to those users. We distinguish consumers from customers. Consumers use our services for free and customers pay us for advertising. To go a little further, though, into business paradigms, I think you put your finger on something rather important, because the economics of online information really do interfere with conventional business models. For example producing a movie, printing it and physically shipping it to theatres is quite expensive. That's being replaced by digital alternatives that can be transmitted over the line. It's also being replaced by streaming video, which can be distributed to desktops, laptops and high definition television sets, rather than physically shipping DVDs and Blu-ray discs around.

So the economics of the physical world are challenged by the economics of the digital world. There are some companies that are having trouble adapting to that—the news industry being a good example. It had the cheapest way of distributing information quickly and on a regular 24-hour cycle, and because everyone wanted to know what was new, that was a very good business model. Except now it isn't—even though many of us worry that because of that, we are going to lose high-quality news—which is not a good thing in a democratic society. Blogging and tweeting are not substitutes for good journalism. Good journalism costs money, and you have to have people who are devoted to finding facts, documenting them and writing about them. So we have to find ways to adapt business models to sustain that particular societal function even though the present economics are different from what they were 10 or 20 years ago.

**Let's discuss the social dimension. You've mentioned blogging and other forms of social networking. Do you feel that we are moving toward a network society? And do you think that, if we are, that network society will be substantively different from society as it has been?**

We've had a network society in some sense for a couple of thousand years at least. However, the ability to exchange written communication was available to a relatively small portion of societal activity—only a small fraction of people were literate 2,000 years ago—and it took weeks or months sometimes for the exchanges to take place, except in a small geographic locale. What has happened over the course of the last 2,000 years is an acceleration of our ability to exchange information, and the introduction of new media to do it. The introduction of radio and television, and the printing press, accelerated our ability to deliver information in quantity, relatively quickly. The introduction of the Internet, and all the other devices and systems that hang on to it, has exacerbated or accelerated our ability to generate and exchange information in real time.

The consequence of this for society is that it is much more transparent. You can know more and more about what is going on in it because of the way in which communications are facilitated. When people post images on their websites or on Twitter, or post videos on YouTube that tens of millions can see, they create a society which is much more transparent. The side effect here is to reduce the time delay between events occurring and their visibility around the world. I'm sure that that does something to the society, but I'm not enough of a sociologist to know exactly what.

**I'd like to ask a couple of questions that arise from an article you wrote recently in the *New York Times*, in which you say that the Internet should not be seen as a human right in itself but as an enabler of rights. Do you see any need for us to change our understanding of rights because of what the Internet has enabled? For example, because it is much easier to exercise freedom of expression, but more difficult to protect privacy than it was at the time the international human rights regime was agreed. Do we need a new paradigm of rights?**

That's a very interesting question. Let me agree first of all that the transparency which the Internet creates also creates a loss of privacy. This has all kinds of side effects. The fact that that information is widely available changes the exposure that we have to our privacy. Our definition of privacy is changing because technology is allowing people to see and know things that would have been too hard or too expensive to see or know in the past. This leads me to believe that the presence of the Internet—and the things that rely on it—requires us as a society to rethink what our social norms should be now that information is so available. This may not have anything to do with laws necessarily, but with what we decide is acceptable and not-acceptable behaviour.

I'll give you a personal example. I was at a conference. The conference was open to the public and I had things to say when I was on the podium, and I knew that whatever I said was going to be publicly available. Then we had a break, and we were sitting around having a cup of coffee and I thought I was having a private discussion with someone. It wasn't a setting which was intentionally public. The person that I was talking to, without my permission, recorded the conversation with a mobile including video and then published it on the Net. My reaction to this—although I didn't mind what I said being exposed to a wider audience—is that it was an invasion of privacy and a violation of my expectation of privacy in that setting. What this tells us is that the technology—not only the mobile and the recording facility but the network's ability to distribute things—is changing our expectations and changing norms. We're back now to: what things are we willing to do to each other, what risks are we willing to take, and are we willing to establish some social norms that will minimize some of those side effects?

**In the same article, you suggest that engineers have, in effect, a responsibility to promote and protect rights, and I wondered whether you'd extend that elsewhere to, for example, thinking about sustainability. For example, when defining standards, should they pay attention to the environmental sustainability of the impact of those standards?**

I'll tell you what led me to my comment. I was thinking about civil engineers. If a civil engineer designs a bridge, and the bridge collapses, there is a liability for that. If it turns out there was an implementation flaw and the builder used improper concrete, the engineer is off the hook but the builder is not. So for certain kinds of constructions—and I don't want to limit the word "construction" here to bridges and buildings and physical things, but for "constructions" in general—certain engineers already experience liability. One of the issues that arises—and this is hotly debated—is whether engineers who do things like the Internet or software and applications should have any liability associated with that.

I want to come back to this more general question about sustainability. I think that it would certainly be very helpful to remind engineers that sustainability is an important part of design, given that we now realize that our present practices may not be sustainable. If we want to preserve the ability of the human race to stay on the surface of the earth, we have to start recognizing what the challenges are and how responsibility for meeting those challenges devolves to a variety of actors in our society. So I think the answer to your question is: "yes, but it's going to be difficult." The difficulty that we have is the ability to predict what the side effects are going to be. The guy that designed the mobile phone may have had hopes but he had no ability to predict that five and a half billion people were going to want one. The mobile phone by itself may not be an environmental hazard. Five and a half billion of them are a different matter—not only consuming power but what happens when you throw them away, when they end up in landfill? The guy that designed the mobile phone doesn't have a clue how to predict that that's going to happen. So the problem we have is finding better ways to understand what consequences these designs might have in the environmental context. I find that pretty challenging.

**I'd like to end by asking whether you have any thoughts on dialogue between the Internet community and the sustainable development world.**

The answer's "yes." I think the dialogue has focused primarily on Internet as an infrastructure to promote the exchange of information, helping us to make predictions and assessments of environmental impact. There is a feedback loop here which the Internet can help to facilitate. And that has to do with helping people to understand the environmental consequences of their choices. Trivial examples of this are shopping in the store, scanning the barcode, learning how much water was consumed or used up in producing this product. Learning about the consequences of choices—and environmental consequences in particular—is an important role for Internet and digital technologies. The smart grid program, similarly, is intended to help people understand how their lifestyle choices influence their electrical bill. It has the potential to help people towards a more efficient use of electricity, because it's in their own interests to do that if they are able to save money. The Internet has a role to play in reflecting the way in which people's choices influence the environment and influence their own situation.

**Thank you very much.**

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IISDCOMMENTARY

# *ICT Innovation and Sustainable Development*

*Robin Mansell*

This is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

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Expectations are high that progressive innovation in information and communication technologies (ICTs) can be harnessed to sustainable development and, specifically, to environmental sustainability, goals. As environmental sustainability gains a high profile internationally, so too do hopes that digital technologies, globally interconnected networks, and increasingly inclusive Internet applications will lock ICT innovation into step with policy agendas aimed at curbing environmental threats. Such hopes are evident in aspirations for a "green" information or knowledge society. They translate into calls for research and development on green ICT products and services, organizational change aimed at substituting virtual interaction for travel, or efforts to harness the full potential of ICTs. ICTs can provide a basis for improved control systems for managing energy consumption and other changes in household and firm behaviour, but the question is, how can ICTs contribute to the development of a sustainable world?

Environmental sustainability goals sit uncomfortably alongside the drive to achieve a more inclusive and interconnected information society. The expectation is that innovations in ICTs will stimulate economic growth through investment in broadband infrastructure or in "e" applications in the health, education, agriculture, commerce, government and other sectors.

[1] Biography abstracted from http://www2.lse.ac.uk/media@lse/whosWho/AcademicStaff/robinMansell.aspx

The ambition is to extend the reach of the Internet and the mobile phone into every corner of the planet. However, this ambition neglects the fact that innovations in ICTs are implicated in exacerbating environmental threats. This is because the spread of digital devices and control systems is consuming and wasting natural resources at an increasing rate.

There is a pervasive utopian belief that the spread of digital ICTs eventually will secure a cleaner post-industrial society but, unfortunately, ICTs are Janus-faced. ICTs support environmental monitoring, but they also foster environmental decline. Satellites are used to monitor deforestation, desertification, and to support climate modelling, but space junk from satellites is a growing problem. These contradictions have been around for a long time. The ICT revolution has led to major changes in production, expansion of economic dependence on services, increasing virtualisation of production and consumption, disruption in business models and competitiveness strategies, and changes in the way geographical space and time influence, social, cultural, political and economic activity. Yet from the standpoint of sustainable environmental change, the promise of the potential of ICTs to contribute to sustainable development is receding. This is because of the comparatively slow pace of change in the practices needed to achieve environmental goals.

A persistent problem is the decoupling of efforts aimed at stimulating the development of an ICT-based information society from those aimed at encouraging changes consistent with sustainable development. The former is driven overwhelmingly by a focus on the impacts of ICT. These are often seen as exogenous shocks to other components of the social and economic system. Impact studies usually zero in on the effects of ICT innovations on greenhouse gas emissions, efficiency gains in power production and consumption, or reductions in physical movement as a result of online interaction, for example. However, such studies ignore evidence of the complex, systemic and unpredictable ways that ICT innovation is coupled with changes in all areas of society.

The idea that progressive innovation in ICTs holds the solution to environmental problems is a symptom of this exogenous thinking. In exogenous models of change, it is assumed that processes external to the operation of the economic system generate technological progress. The long-run rate of economic growth is seen as being determined exogenously because technological change is modelled as being exogenous to the system. An overemphasis on the importance of investing in leading-edge ICT innovations is consistent with this exogenous vision. The primary focus is on the speed of diffusion of ICTs, with the assumption being that the diffusion process is linear and reasonably predictable. This is consistent with studies of first, second and third order effects of ICTs on the economy and society. The focus on effects distracts attention from the recursive character of innovation, from choices that are leading to the design and applications of some ICTs and not of others, and from possibilities for altering the trajectory of innovation so that it becomes consistent with sustainable development.

Empirical studies of changes in ICTs demonstrate that there is no pre-determined or linear relationship between innovation in the sphere of digital technologies and the consequences for society. In reality, innovations are influenced by the preferences and actions of people and organizations with conflicting interests. Some ICT innovations fall by the wayside, while others, as in the case of the unexpected flourishing of online social media, lead to unforeseen pervasive changes in organization.

The information society describes societies whose populations aspire to the wide-scale appropriation of digital ICTs and information. The knowledge economy is associated with a privileged role for virtual commercial activity. Both these labels are being used to depict societies that are consistent with the values of democracy. But only very rarely is it noticed that such societies must embrace the goals of environmental sustainability if they are to be consistent with

long-term sustainable development.

The changes in train in ICTs are the results of human decisions that are reflected in the trajectory of ICT innovation. The ways in which the fruits of technical progress are coordinated, accommodated or resisted, come from within a complex system, not from exogenous shocks to the social and economic system. They are endogenous to the system and they are responsible for the direction of economic growth and development based on ICTs. The challenges for sustainable development are not simply about faster, cheaper or more ubiquitous ICTs. They are about choices on the part of stakeholders, including civil society, companies and governments, about which technological developments should be favoured and how they should be deployed in ways that achieve sustainable development. This endogenous approach to these challenges is messier than the idea of technological shocks to society, but it is close to the reality of the way change happens. This approach means treating the origins and consequences of ICT innovation as part of a complex system, which not only requires explanation, but also requires coordinated changes in production and consumption practices and policies.

This approach evokes the idea that change proceeds from within a system with all its complexity. It draws attention to discontinuities or mismatches in the institutional (social, political and economic) environment that are associated with the development of ICTs. Instead of treating ICT innovation as part of a rag-bag of exogenous factors, ICT innovations can be seen, like earlier innovations such as electricity, to have widespread consequences for all sectors of the economy and society.

The digital ICT paradigm is accompanied by new types of organization, skills, product mixes and patterns of investment. ICT innovations significantly reduce the cost of storing, processing, communicating and disseminating information and they become linked to new patterns of behaviour and practices. Whether problems like unsustainable energy consumption or other environmental risks are reversed is a matter of choice. Since this is a choice, it is possible to examine alternative arrangements that might be feasible for ensuring that labour standards are established for online work, that policy curtails unwanted intrusions in online worlds and, in the case of sustainability issues, that the design and deployment of ICTs is encouraged in a way that ensures that environmental risks are tackled. In this perspective, we cannot assume that the existing trajectory of ICT innovation is "fit for purpose" just because it exists.

ICT innovation, including the trend toward convergence, is spawning huge numbers of new applications, but the trajectory of change can be altered, abandoned or subordinated to cultural, social, political and economic values. When we emphasize the complexity of interdependent systems of technology and society, we can see that learning occurs through time and that this has the potential to change habits and to redefine cultural, social or economic goals, consistent with environmental priorities. This way of seeing the challenges gives us an opportunity to move away from the false impression that the progress of technological innovation is fixed. It creates a basis for assessing technological innovation in a way that acknowledges conflicting interests and it draws our attention to existing incentives and disincentives for change and how they might be altered.

With attention focusing on these issues, it is possible to turn to governance approaches for ICT innovation that are consistent with what is valued in society, including aspirations for sustainable development. Focusing on the prevailing visions of the information society or knowledge economy alone offers little guidance for building a sustainable information society. Acknowledging that ICT innovation is linked both to stability and instability in different components of the social and economic systems, helps to draw attention to how stakeholders are acting in patterned ways influenced by power relations and to how this can change. While a short-run, market-led vision of ICT innovation is dominant

now, making it difficult to shift ICT innovation onto a more sustainable trajectory, a novel (better) outcome could emerge if decisions are made to alter the incentives motivating the different stakeholders. A system perspective on ICT innovation sensitizes us to the idea that a system that destroys its environment, ultimately destroys itself!

ICT innovation is not a one-way street with impacts on society and outcomes that hinder environmental sustainability. ICT innovation is a complex system of interactions involving all areas of production and consumption and civil society activities. The trajectory of ICT innovation is neither "natural" nor pre-determined. It emerges from self-fulfilling visions based on the decisions of multiple actors and their expectations about the future.

In the current ICT paradigm there are possibilities for more accurate monitoring and control of industrial processes. ICTs can be applied in support of inventory control and the miniaturization of digital components. But what is overlooked is that "the realm of the scientifically conceivable is infinitely greater than the realm of the technologically feasible and the realm of the technologically feasible is far greater than the realm of the economically profitable and the socially acceptable" (Freeman, 1992). The message is that ICT innovation can be shaped in an environmentally friendly direction, but that ICT itself does not embrace environmental objectives. If hopes for the contribution of ICT to environmental sustainability are to be transformed into reality, policies need to foster bottom-up local initiatives and top-down market incentives to stimulate changes in the ICT trajectory. This will only start to happen when long-term environmental objectives are embedded within every dimension of information society developments.

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IISDCOMMENTARY

# *Using ICT for Adaptation Rather Than Mitigation to Climate Change*

*Bill St. Arnaud*

This is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

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To date most efforts addressing climate change have been focused on mitigation strategies such as increasing energy efficiency and/or using renewable energy sources. The fundamental philosophy of mitigation strategies is that we can still prevent the onset of climate change or at least keep the global average temperature below 2°C to prevent more severe outcomes.

Unfortunately, despite the best intentions of many committed individuals and organizations, we are currently headed in the opposite direction. We are already committed to a 2°C average global temperature increase from the greenhouse gases that have been injected into the atmosphere since the dawn of the industrial age. Total carbon dioxide emissions now exceed 392 parts per million and are accelerating with the increased emissions from newly industrializing nations such as China and India.

Many scientists believe that we need to keep carbon dioxide emissions below 450 parts per million if we are to avoid catastrophic climate disruption. There appears to be little political will in most countries to address this challenge. In many ways, concern and addressing the reality of climate change has gone almost in the exact opposite direction to the severity of the problem. "Denialism" now largely shapes the debate about climate change.

[1] Source: http://billstarnaud.blogspot.ca

Even where there is political and public acceptance for climate change, a number of economists argue that the public will never be prepared to make the huge sacrifices and substantial investments to avoid the worst possible outcomes. This is especially true in developing countries, which are now starting to experience first world energy-consuming lifestyles. Awareness and concern about climate change are very low on the public radar in nations such as India and China; water, energy, roads, education and other basic necessities are seen as higher priorities. As the noted political economist Roger Pielke, Jr. stated in his famous Iron Law on climate change, "When policies on emissions reductions collide with policies focused on economic growth, economic growth will win out every time" (Pielke, 2010). The unavoidable reality is that policy-makers and the public at large are committed to sustaining economic growth, raising society out of poverty, and expanding access to energy. Greenhouse gas emission reductions will not be achieved by policies that seek to constrict or reduce economic activity.

As many scientists and thought leaders are starting to argue, given the political climate, that economic growth will always trump any meaningful economic costs to reduce greenhouse gas emissions, we need to seriously think the unthinkable: we are unlikely to undertake any meaningful reduction in greenhouse gas emissions and, consequently, we must prepare ourselves and society as a whole to adapt to a much warmer planet. President Obama's science and technology advisor, Dr. John Holdren, said it most succinctly in his address to the National Climate Adaptation Summit: "Mitigation alone won't work, because the climate is already changing, we're already experiencing impacts. Nothing we can do in the mitigation domain can stop it overnight, so a mitigation only strategy would be insanity…we're going to have to maximize both mitigation and adaptation" (Holdren, 2010).

A recent report from the Organisation for Economic Co-operation and Development (OECD), The Environmental Outlook to 2050 (OECD, 2012), paints a grim picture of what the future will be like with ongoing planetary warming. The report forecasts that global greenhouse gas emissions are projected to increase by 50 per cent, primarily due to a 70 per cent growth in energy-related carbon dioxide emissions. Global average temperatures could be 6°C higher by the end of the century. To put this in context, it is important to note that the average global temperature during the last ice age was 6°C colder than current temperatures. At that time, most of Canada and Europe were covered by an ice sheet several kilometres thick. We are now looking at a temperature of 6°C in the opposite direction within less than 100 years. Where once there were massive ice sheets, there could soon be deserts.

We don't have to wait until the end of the century to be seriously affected by climate change. Within the coming decade we should start to witness dramatic changes to our weather patterns. Most people are under the impression that climate change will be gradual, with slightly hotter summers and milder temperatures. A warming planet, however, is more likely to significantly increase weather extremes rather than the average temperature and precipitation. A recent paper on the effect of climate change on severe weather events demonstrates that if the normal temperature/precipitation distribution curve is shifted toward the warm end by one standard deviation (well within current warming forecasts), "then, a moderately extreme temperature that is 2 standard deviations above the mean becomes 4.5 times more likely. But a seriously extreme temperature, that is 5 standard deviations above the mean, becomes 90 times more likely! Thus the same amount of global warming boosts the probability of really extreme events, like the recent US heat wave, far more than it boosts more moderate events" (Coumou & Rahmstorf, 2012).

Already we are starting to see evidence of such extreme weather events directly linked to climate change (Hansen, Sato & Ruedy, 2012), such as the 2011 drought in the southwest United States and Mexico and the 2010 forest fires in Russia. This year's warm spring in eastern North America, the floods in Pakistan and forest fires in Russia are only mild precursors to what is expected in the coming decade.

All sectors of society are going to be impacted by these extreme weather events. To date, the ICT industry and research community have largely focused on mitigation strategies with respect to ICT, both in reducing its direct environmental impact as well as in aiding and abetting other sectors in reducing their respective carbon footprints. The most often quoted study in this regard is the SMART 2020 report that claimed that up to 15 per cent reduction in greenhouse gas emissions could be achieved through the use of ICT.

Consequently, many researchers, institutions and businesses have undertaken Green IT initiatives. Most of these have focused on energy efficiency strategies by reducing the electrical energy consumption of devices such as computers, printers and networks. Despite some modest achievements in energy efficiency, the direct energy consumption and carbon dioxide emissions of the ICT sector continue to increase. The ICT sector already represents 8 per cent of global electricity consumption and this is predicted to grow to 10–12 per cent of all electrical consumption in the next decade (GreenCom'09, 2009). Future broadband-Internet alone is expected to consume 5 per cent of all electricity (Tucker, 2008). Carbon dioxide emissions from US data centres, which were virtually non-existent ten years ago, have grown to be greater than all carbon dioxide emissions from the Netherlands and Argentina combined (Lucente, 2010).

It is not only large businesses and data centres that have seen spectacular increases in energy consumption and greenhouse gas emissions. According to the International Energy Agency (2009), in many Western homes the aggregate energy consumption of ICT devices now exceeds that of traditional appliances such as refrigerators and stoves. The impact of ICT on other sectors, in terms of reducing their carbon footprints, is considered to be negligible.

Clearly, the ICT sector is moving in the wrong direction in terms of a mitigation strategy. The failure of the ICT sector to reduce, or even slow, its own emissions and/or enable other sectors to reduce their impacts is attributable to several factors: Firstly, there have been few initiatives such as carbon taxes or cap-and-trade that would place a significant cost on greenhouse gas emissions, so there has been little incentive to undertake or implement energy efficiency strategies. Secondly, the global demand and growth of new ICT applications and services continues to outstrip any modest gains in energy efficiency.

Given the imminent increase in severe weather and other dramatic climate impacts in the coming decade and the years beyond, and with little hope of global political will to deal with the problem, we need to seriously think of an adaptation strategy for ICT, even it is only for a worst case planning analysis. While we should not abandon mitigation strategies such as increased energy efficiency, it is time now to seriously look at how the ICT sector itself can adapt to a warming planet as well as assist other sectors of society in their adaptation strategies. More importantly, any adaptation strategy should, by its own right, be a complementary mitigation process as well.

The biggest impact severe weather and other climate impacts will have on ICT is disruption of the electrical power grid. Record high temperatures, droughts, deluges and hurricanes will strain the electrical distribution system and the production of power. Electricity production and distribution could be particularly affected as hydroelectric reservoirs dry up and power plants shut down due to a lack of cooling capacity. In the European heat wave of 2006, for example, French nuclear reactors had to shut down because inlet water temperature from local rivers was too high to sustain cooling of the reactor.

At the same time, many network utilities are looking to increase the amount of power they draw from renewable resources such as solar panels and windmills. The challenge with renewable power is its unpredictability and unreliability. Although energy storage is part of the solution on the supply side, utilities will also be looking to shed power loads on the demand side during periods when demand is high. Currently, demand-side management such as the use of smart

meters are only designed for short periods of demand exceeding supply. During extreme weather events, utilities may need to shed power loads over periods of days or weeks.

If nothing else, as part of an organization's disaster recovery strategy, it should look at implementing ICT solutions that will allow the organization to continue to operate regardless of whether or not they have electrical power from the grid. To date, diesel generators and battery backup have been the standard approach for providing local power in the event of loss of power from the grid. While these may be useful for relatively short outages lasting perhaps up to a week or so, they are not sustainable (and very costly) for time periods lasting weeks or longer.

Thankfully, a number of research groups have been looking at this problem for some time and have been experimenting with adaptation solutions that enable ICT products and networks to operate without being connected to the electrical grid. The foremost example of such an approach is the CANARIE-funded GreenStar project (GreenStar Network, n.d.), led by researchers at the École Polytechnique in Montreal, Canada. The GreenStar project was the first in the world to conceive of deploying what is called a "follow the wind/follow the sun" architecture of a global computing cloud and network where all the computer nodes are powered solely by renewable energy such as solar panels, windmills and hydroelectric power. The system is designed such that when the wind dies or the sun sets at a given node, the computing jobs and tasks are immediately forwarded over a high-speed optical network to another node that has power, located elsewhere in the world. The system operates completely independently of the local electrical grid and can provide services regardless of the state of the local power system. Not only is it designed to survive a much warmer planet, it is a low-carbon mitigation architecture in its own right.

Following the launch of the GreenStar network, many other research organizations have undertaken similar projects. Most notably, these include initiatives such as "Free Lunch" (Akoush et al., 2011) at the University of Cambridge, the EU-funded Mantychore Project (Mantychore, 2010) and the Hewlett-Packard and Advanced Micro Devices project GreenCloud at Clarkson University in New York state (St. Arnaud, 2011b). The GreenCloud project is notable in that it is funded by the New York state electrical regulatory authority, concerned about the many stranded windmills deployed in the state that are unable to connect to the electrical grid due to opposition from rural landowners who don't want electrical transmission lines running by their backyards. Locating distributed computing facilities right at the windmill and linking them with optical fibre is a way of circumventing the "not in my backyard" problem.

In addition to building clouds and networks that are adapted to severe climate change, we also must look at ICT devices in our homes and businesses. Up to 50 per cent of ICT energy consumption and greenhouse gas emissions are from devices in the home, business and on the person (i.e., mobile phones). Attention also must be paid as to how they could operate independently of the power grid. Many of these devices, such as cell phones and computers, may be critical in saving lives and for other emergencies during severe weather events.

As mentioned previously, the aggregate power consumption of all the ICT devices in many Western homes—televisions, set-top boxes, computers, wall chargers, etc.—now exceeds the total power consumption of traditional appliances such as stoves, dishwashers and refrigerators. The Economist (2006) reports that in one year, the aggregate power consumption of the clock on a microwave oven exceeds the actual use of the oven to heat food! Most set-top boxes also draw more power than modern refrigerators (Murphy, 2011).

In terms of an ICT adaptation strategy, the inherent advantage of these devices is that their power draw at any instant in time is very small. Most of them could be easily powered by small rooftop solar panels and/or micro windmills. As well, many of these devices have their own internal battery storage: they are not dependent on being plugged

in all of the time. As such, several teams of researchers and a number of innovative start-ups, rather than taking the conventional approach of pursuing greater energy efficiency, are looking at how to power these systems exclusively from independent renewable power sources such as small solar panels and windmills. If all such devices in our homes could be powered by small local renewable resources, then we would not have to be concerned about the ongoing proliferation of ICT devices in the home or business and their impacts on electrical consumption or greenhouse gas emissions.

Another novel approach to ICT adaptation is to use the electrical vehicle as both an energy storage and an energy transportation system in direct competition with the electrical grid. Until quite recently, the conventional thinking was that electric vehicles would be charged at home from the grid (usually overnight) and then driven around the city during the day, slowly depleting the batteries. But a number of research teams around the world are investigating what is called "dynamic" or "pathway" charging, where the electric vehicle's batteries are charged as it travels along the road (Green Car Congress, 2012). Dynamic or pathway charging, in most cases, uses independent roadside solar arrays or windmills to charge the electric vehicles as they drive by. The charging of the batteries can be done either through inductive charging plates embedded in the road or through ultra-capacitor "umbrellas" located at periodic distances along the road or at stoplights and drive-through restaurants or banks.

Instead of having the electrical vehicle arrive back at the driver's home with depleted batteries, the vehicle, with its fully charged battery bank, can provide electrical power to a multitude of devices in the home, including traditional appliances (Wikipedia, 2012). A natural extension of this idea is to think of the electrical vehicle as not only a human transportation mechanism, but also an energy transport system. Electric vehicles could be used, in essence, as energy "packet" networks delivering power from roadside renewable power sites to homes and businesses.

Delivering energy in discrete packets has considerable appeal to many researchers and businesses, as they have seen the benefits of packet networks (e.g., the Internet) versus traditional circuit switched networks. Packet networks have enabled an explosion of innovation and new business models. As such, some speculate that integrating the electrical vehicle as an energy packet delivery system with modern ICT architectures for climate adaptation will enable the future "Energy Internet" (St. Arnaud, 2011a). Not only will this reduce greenhouse gas emissions from transportation, but it will also allow the efficient transport of renewable energy from remote sites to homes and businesses. Who would have guessed that the suburban lifestyle, once seen as the epitome of waste and inefficiency, may be the solution to global warming?

There still remain many challenges and uncertainties in developing solutions to address climate change. To many of those committed to the environment, talk about "adaptation" smacks of defeatism and giving up hope of developing a successful mitigation strategy. But as we have seen, solutions designed for the worst case scenario analysis of adapting to a warmer planet are also much more prudent and credible mitigation strategies. Relying solely on tools such as increased energy efficiency for mitigation will not slow down, never mind reverse, climate change. Nor will they be very effective in adapting to a warmer planet. Efficiency is of little value if you have no power in the first place.

While we do face a very ominous future with the rapidly approaching onslaught of extreme weather caused by climate change, there may a sliver of hope that through innovation and development of such ideas as the Energy Internet and the use of ICT, to paraphrase the words of William Faulkner, humankind will not only persevere, but will prevail against such adversity.

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IISDCOMMENTARY

# *Smarter and Greener? Information Technology and the Environment: Positive or negative impacts?*

*Graham Vickery*

*This article draws on Organisation for Economic Co-operation and Development (OECD) (2010a); Pupillo, Salanave & Vickery (2009); and Mickoleit (2010).*

This is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

*Graham Vickery, Information Economics, Paris, served as Head of the Information Economy Group and program director for OECD information technology, digital content, e-business and industry, and ICT and environment programmes.*

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Information and communication technology (ICT) applications are widely seen to have the potential to improve environmental performance and tackle climate change. On the supply side, there are numerous areas in manufacturing, energy, transport systems, buildings and urban systems where smart ICT applications can help optimize performance and reduce inputs per unit of output. And on the demand side, better information and smoother communication foster sustainable consumption and greener lifestyles.

Boosting sustainable economic growth is a top priority for all economies. At the same time, economies and populations continue to grow, with accelerating global rates of production and consumption. Innovative and sustainable modes of production, consumption and living are needed to deal with environmental challenges, and ICTs can and will play a key role in addressing these challenges. Governments have a major role in both directly improving the environmental performance of their ICT-related activities, and in encouraging the wider application of ICTs across the economy to improve environmental performance and underpin green growth (for OECD work in this area, see www.oecd.org/sti/ict/green-ict). In particular, green growth strategies have become part of broader economic and industrial policies. They

have been somewhat eclipsed in the economic slowdown and debt crises in Europe, the United States and Japan, but nevertheless they remain a core preoccupation in many countries and have been embedded in national policies, even if not to the extent that was earlier hoped at the outset of the crisis.

## *Defining "Green ICTs"*

Green ICTs are those that have positive impacts on environmental performance and ecosystems, either directly by reducing physical and energy inputs in their production, use, disposal and recycling, or indirectly through their wider application and use in other equipment and systems. ICTs and their applications can have both positive and negative impacts on the environment. For example, reductions in greenhouse gas emissions associated with ICT applications to improve energy efficiency in buildings, transport systems or electricity distribution must be balanced against increased emissions resulting from their development, production and operation and potential environmental degradation associated with their uncontrolled disposal. ICTs also fundamentally affect the ways in which people live and work and how goods and services are produced and delivered. They offer opportunities to significantly improve environmental performance, but at the same time the proliferation of electronic equipment and applications increases energy consumption, exhausts scarce resources, and increases disposal and recycling challenges.

The interaction of ICTs and the natural environment can be categorized at three levels: direct impacts, enabling impacts and systemic impacts, going from the most easily understood to the widest impacts (see Figure 1). Most analysis and the majority of environment-related ICT policies have focused on direct impacts, despite the potentially very much larger gains to be reaped from strategies focusing on increasing enabling and systemic impacts. (A comprehensive overview of policies focusing on direct and enabling impacts of ICTs is contained in Reimsbach-Kounatze, 2009.)

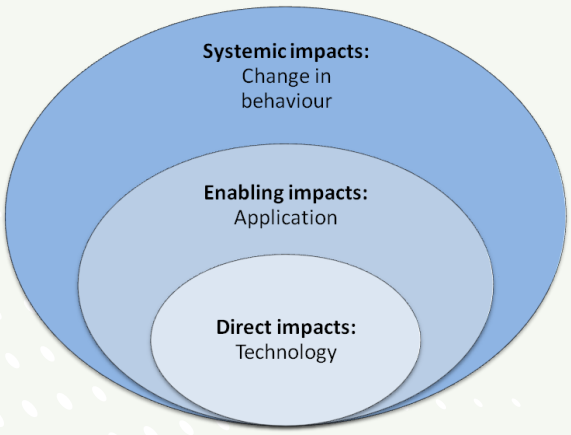


**FIGURE 1: FRAMEWORK FOR GREEN ICT IMPACTS.**

*Source: OECD, 2010a. Diagram adapted from Hilty, 2008; MacLean & St. Arnaud, 2008.*

## *Three Levels of ICT Impacts on the Environment: Going from Direct Impacts to Systemic Impacts*

***Direct impacts:*** Direct impacts of ICTs on the environment ("first-order effects") refer to positive and negative impacts due directly to ICT goods and services and related processes. Direct environmental impacts of ICT products come from ICT manufacturing and services producing firms and related intermediate goods producers, and from final consumers and users of ICTs. ICT producers affect the natural environment during ICT goods and services production and through related operations (e.g., operating infrastructures, building functions, vehicle fleets and logistics). All of these production operations can have more or less environmental impacts.

At the other end of the value chain, consumers and users influence the shape and impact of the direct environmental footprint through purchase, consumption, use and end-of-life treatment of ICT goods and services. Consumers can choose energy-efficient and certified "green" ICT equipment over other products. At the end of a product's initial useful life, they can choose to return equipment for re-use and recycling, adopting "cradle-to-cradle" approaches to their purchase and disposal of ICT goods and services. This lowers the burden on the natural environment compared to disposal in a landfill, incineration or uncontrolled dumping in developing countries.

***Enabling impacts:*** ICTs affect how other products are designed, produced, consumed, used and disposed of. Enabling impacts of ICTs ("second-order effects") come from ICT applications that reduce environmental impacts across economic and social activities outside of the ICT-producing sector and straightforward ICT applications. But potential negative effects need to be measured when assessing "net" environmental impacts, such as greater use of energy by ICT-enabled systems to improve traffic flow or the functioning of buildings and urban systems, due to perceived efficiencies leading to greater use.

ICT products can affect the environmental footprint of other products in four main ways:

- *Optimization:* ICTs can reduce another product's environmental impact. Examples include investing in embedded systems in cars for fuel-efficient driving, "smart" electricity distribution networks to reduce transmission and distribution losses, and intelligent heating and lighting systems in buildings and urban environments.
- *Dematerialization and substitution:* Physical products and processes can be replaced by digital ones with lower impacts on the environment. For example, digital music and video can replace physical music and film media, and teleconferences can replace business travel, with reduced environmental impacts.
- *Induction* effects occur if ICT products induce increased demand for other products. For example, more efficient printers stimulate demand for high quality paper, increasing pressure on forest and paper-making resources, even if direct resource use is decreased in the production and operation of printers.
- *Degradation* can occur if ICT devices embedded in non-ICT products lead to difficulties in disposal management. For example, "smart" tags in car tires, bottles and cardboard often require specific recycling procedures that are more onerous and potentially add to the pollution load.

Life-cycle analysis (LCA or cradle-to-grave analysis) is a necessary analytical tool to obtain an overall view of these impacts and the balance among them.

***Systemic impacts:*** Systemic impacts of ICTs on the environment ("third-order effects") are rooted in behaviour and behavioural change. Positive systemic outcomes of green ICT applications largely depend on end-user acceptance, lifestyle adjustments and changes in collective social behaviour.

ICT applications have systemic impacts in a number of ways, including:

- *Providing and disclosing information:* ICTs and the Internet facilitate monitoring, measuring and reporting information on the environment. Access to and display of data inform decisions by households (e.g., "smart" metres), businesses (e.g., choice of suppliers, "green" advertising claims) and governments (e.g., allocation of emission allowances). Sensor-based networks that collect data and computer-based interpretation can be used to adapt production, consumption and lifestyles. For example, ICT-enabled observation and research on rainfall, ground cover and desertification provide data for long-term agricultural, economic and social decision making.
- *Enabling dynamic pricing and enhancing real-time price sensitivity:* ICT applications enable dynamic pricing systems, e.g., in the provision of electricity or trade in farm products. Electricity customers can choose to turn off non-critical devices when renewable energy is scarce and turn them on again when it is more plentiful; small-scale rural producers can choose when and where to market their products.
- *Changing technologies impacting consumer and user behaviour:* The evolution from desktop PCs to laptops to netbooks to tablets is changing consumer preferences, with major effects on raw material exploitation and power use. Digital music, Internet communication, social networks and teleconferencing technologies are affecting the ways in which their physical counterparts are produced and consumed, with major impacts on recorded music, written letters, social gathering and physical business travel.
- *Triggering rebound effects:* Higher efficiencies at the micro level (e.g., the use of more energy-efficient products) do not necessarily translate into equivalent savings at the macro economy-wide level because of greater aggregate consumption and use of more efficient individual products. For example, nationwide application of a technology that is 30 per cent more efficient does not necessarily translate into aggregate energy savings of 30 per cent, due to greater use triggered by the greater efficiencies. Much lower semiconductor energy use must be weighed against the very rapid growth in numbers of ICT products incorporating these components, e.g., in smartphones and tablets. The "rebound effects" from increased use at the micro level may result in greater resource use at the macro level.

Systemic impacts of ICTs and their environmental repercussions are relatively unexplored, mainly because of the complexity of assessing technological change, production and consumption in the medium and longer term. Product life-cycle analysis is an important tool to provide insights into the effects of ICTs on behavioural change and the effects of behavioural change on ICTs.

## *What is the Role for Governments?*

Governments have generally been slow to shift from a laudable but narrow focus on making the direct production, use and disposal of ICTs more environmentally positive. Initiatives have largely concentrated on greening ICTs rather than tackling global warming and environmental degradation through the use of ICT applications. Policies to address environmental impacts over the complete ICT life-cycle have been lacking, and initiatives targeting energy production and consumption have been pro-cyclical and followed energy price trends rather than being a part of longer-term economic strategies, and have led to, e.g., scrapping support for solar energies due to budget constraints. On the positive side, investments to support development and use of clean technologies were an important part of government economic stimulus packages over the last few years, and promoting the enabling environmental impacts of ICTs has been an important priority in ICT policies for economic recovery.

Governments need to tackle challenges at all levels. For example, a basic PC's contribution to global warming is highest during its use phase, but significant environmental impacts also occur during the manufacturing and end-of-life phases, making life-cycle analysis crucial for better management of government computing investments. Government "green ICT" policies can be instrumental in promoting such life-cycle approaches, both in their own activities and through leading by example.

Across the economy, large environmental benefits are possible in major resource and energy-using sectors, e.g., transport, energy and housing where governments are both major producers and consumers, either directly or through procurement and public-private partnerships. To be effective, products must be co-developed and their diffusion well coordinated by all stakeholders, including governments. At geographically local levels, the priorities of government ICT managers have in some cases moved toward green ICT and sustainable cities. Over 50 per cent of the world's population already lives in urban centres and they are responsible for 60-80 per cent of global emissions, illustrating the size of challenges locally and globally.

Information and communication are pivotal for system-wide mitigation of and adaptation to changes in the environment. However, further research into the systemic behavioural impacts of the diffusion of ICTs is needed to understand how ICTs and the Internet contribute to environmental policy goals such as fostering renewable energy sources, reducing transport volumes, optimizing household energy use and reducing material throughputs. Governments have a key role to play in supporting this research and in being innovative and systemic model users of ICTs.

Finally, at the international level, there have been ongoing initiatives to provide frameworks to enhance the positive impacts of ICTs on the environment. For example, the OECD (2010b) *Recommendation of the Council on Information and Communication Technologies and the Environment* laid out a 10-point checklist on how governments can employ ICTs to enhance national environmental performance. It encourages cross-sector cooperation and knowledge exchange on resource-efficient ICTs and "smart" applications, and highlights the importance of governments supporting R&D and innovation. By doing so, governments send positive signals for private sector investment.

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IISDCOMMENTARY

# *ICTs, the Internet, and Sustainability:*

## *A discussion guide for Rio+20*

***by Don MacLean, David Souter and Heather Creech***[1]

> We recognize that the twenty years since the Earth Summit in 1992 have seen progress and change. There are deeply inspiring examples of progress, including in poverty eradication, in pockets of economic dynamism and in connectivity spurred by new information technologies which have empowered people.
>
> We acknowledge, however, that there have also been setbacks because of multiple interrelated crises—financial, economic and volatile energy and food prices. Food insecurity, climate change and biodiversity loss have adversely affected development gains. New scientific evidence points to the gravity of the threats we face. New and emerging challenges include the further intensification of earlier problems, calling for more urgent responses. We are deeply concerned that around 1.4 billion people still live in extreme poverty and one sixth of the world's population is undernourished, pandemics and epidemics are omnipresent threats. Unsustainable development has increased the stress on the earth's limited natural resources and on the carrying capacity of ecosystems. Our planet supports seven billion people expected to reach nine billion by 2050.
>
> Excerpt: United Nations (2012, January 10). The future we want. United Nations Zero Draft Outcome Document for Rio+20. Retrieved from: www.uncsd2012.org/rio20/mgzerodraft.html

The year 2012 marks the 25th anniversary of the publication of the Report of the Brundtland Commission, *Our Common Future*. The report defined the concept of sustainable development, introduced it into global policy discourse and recommended a set of policy directions to put the world on a new sustainable development path. These policies sought to reconcile economic growth and social development with environmental sustainability by ensuring that development would take place within the Earth's natural limits. In this way, the Commission believed it would be possible to meet the needs of the present, particularly those of the world's poorest people, without compromising the ability of future generations to meet their needs.

[1] Don MacLean and David Souter are senior associates of the IISD Global Connectivity program. Heather Creech is the program director. Their professional profiles can be accessed at www.iisd.org/infosoc.

This year also marks the 20th anniversary of the United Nations Rio Summit on Environment and Development. This summit built on the work of the Brundtland Commission and adopted Agenda 21, a comprehensive action plan that sought to address a wide range of economic, social and environmental challenges through coordinated actions involving governments and major stakeholder groups at the international, national and local levels.

On June 20–22, 2012, governments and other members of the world community will reconvene in Rio to assess progress made over the past two decades toward the goal of sustainable development. Participants intend to adopt a new action plan that will take account of the changes that have taken place in the world since the first Rio summit, as well as the lessons learned from 20 years of sustainable development efforts. As a result of this experience, the Rio+20 Summit plans to take a more focused approach to sustainable development by concentrating on two agenda themes only—the green economy in the context of sustainable development and poverty eradication, and the institutional framework for sustainable development.

The "zero draft" of the summit outcome document published by the United Nations in January 2012 acknowledges that there have been many setbacks on the road to sustainable development and that many of the challenges facing the world today loom larger than they did in 1992, in spite of efforts that have been made by different actors and of the effects of new developments such as information technology. This view is shared by the report of the High Level Panel on Global Sustainability, which was established by the UN secretary-general to provide input to Rio+20.

The main purpose of IISD's online forum on "ICTs, the Internet and Sustainability" is to raise awareness of and stimulate debate about a question that should be central to the discussions that will take place at Rio+20, but which seems to be largely absent from its agenda. As David Souter's introductory discussion paper makes clear, rapidly evolving information and communications technologies (ICTs) and the Internet have had significant impacts—both positive and negative—on the components of sustainable development in the 20 years that have passed since the first Rio conference. This suggests that one of the main questions participants in Rio+20 should be asking themselves is: what actions are needed to maximize the benefits and minimize the harms resulting from the impact of ICTs and the Internet on sustainability?

In the interview that accompanies this discussion guide, Jim MacNeill is blunt in his assessment of where the world stands today. In his view, because most governments ignored the commitments they made at the 1992 Earth Summit, instead of a rapid transition to more sustainable development, "we got 25 more years of unsustainable 'business-as-usual' forms of development in agriculture, in industry—you name it—with the result that economic and life support systems have degraded at an increasing rate." These words should carry considerable weight since MacNeill served as secretary-general of the Brundtland Commission, was lead author of *Our Common Future* and has remained involved in sustainable development policy at the highest levels.

While acknowledging that the Internet and ICTs provide powerful tools for achieving the reforms that need to be made in development, and that they have had a profound effect on all aspects of economy and society, politics and culture, MacNeill doubts that ICTs make it easier to grow and prosper within Earth's natural limits, since they can be used both by those who favour change and those who oppose it. While hoping studies may prove him wrong, in MacNeill's view, ICTs:

- Have reinforced a number of environmentally unsustainable trends
- Are large and increasing sources of environmental harm themselves
- Facilitate runaway consumption and short-term decision-making
- Are having a profoundly negative effect on the capacity for governance
- Make it more difficult politically to challenge the massive power of the status quo regarding unsustainable forms of development

MacNeill concludes this assessment by suggesting that there is no way of controlling the rate at which ICTs are advancing, even if we wanted to, and that "we will have no choice but to react to every new development that comes along and live with whatever the consequences are."

Vint Cerf, who was a co-designer of the basic Internet Protocols in the 1970s and now serves as Chief Internet Evangelist for Google, has very different assessments of the relationship between ICTs and sustainable development, and the possibility of controlling their advance.

In his interview, Cerf suggests that "we may be able to compute our way to sustainability" by using computer power, sensor networks and large-scale data analytics to build sustainable industries, make more efficient use of energy, build more eco-friendly structures and make more efficient use of transportation systems. In addition, he suggests ICTs will help us adapt to climate change by improving our ability to predict its consequences for weather patterns, sea levels and food production among other things, as well as give individuals the capacity to better understand and manage the environmental consequences of the choices they make in their daily lives.

While he sees significant potential for ICTs to contribute to sustainable development in these and other ways, Cerf warns that the Internet—the infrastructure that underpins many ICT-enabled innovations—may not be sustainable in its present form.

Cerf sees three main threats that could undermine the Internet:

- The first threat comes from governments that want more control over the Internet and how it is used within their jurisdictions and internationally.
- The second threat comes from within the Internet community itself, which so far has largely failed to adopt "IPv6," a new version of the Internet Protocol needed to support the continuing growth of the Internet, as well as to enable the development of innovations such as smart systems and the "Internet of Things."
- The third threat arises from information and network security issues that must be resolved to ensure that the Internet, which was not originally designed to be secure, can function as a critical infrastructure for sustainable development.

In Cerf's judgment, these challenges are not insurmountable but "it will take a great deal of will to maintain the system going forward."

David Souter's discussion paper that introduces the issues to be debated in this forum sets out three general questions:

- What impacts are new media and the Internet having on the achievability of the core elements of sustainability—economic and social development, environmental protection, cultural diversity and governance—and on the balance between them?
- To what extent do these impacts enhance sustainability and to what extent do they, on the contrary, raise new sustainability challenges?
- Do the economic, social and cultural implications of these impacts imply that we need to revise, rethink or readjust our understanding of what sustainability means from the ways in which it was defined in 1987/1992, before today's ICTs became available?

The contrasting views of Jim MacNeill and Vint Cerf on these questions provide a good starting point for discussing the relationship between ICTs, the Internet and sustainability in advance of the Rio+20 Summit. In addition, to help focus discussion and stimulate debate, it may be useful for participants to consider these three general questions in terms of two other, more specific, frames of reference.

The first of these frameworks is based on distinctions between the direct, indirect and systemic effects of ICTs on the various dimensions of sustainable development. This framework, which has provided the foundation for most of the analytic work done on the relationship between ICTs and sustainability in the past decade, is described in the discussion paper. It suggests that participants in the online forum may want to address the following kinds of more specific questions:

- In terms of **direct effects**, what policies, programs and practices are needed to ensure that the ICT sector itself is sustainable, from technical, economic, social and environmental perspectives? What role should ICT and sustainable development policy-makers and stakeholders play in "greening" the ICT sector? What are the responsibilities of the ICT industry, its customers and consumers in moving toward this objective?
- In terms of **indirect effects**, what policies, programs and practices are needed to enable and promote the development, deployment and use of "smart systems" in the energy, transportation, building, manufacturing, agricultural and resource sectors? What are the responsibilities and roles of policy-makers, the various industry sectors involved in these activities, their major customers, ordinary consumers and other stakeholders? What are the implications of smart systems for developing countries that lag in their development? Are they a new form of digital divide that will maintain or widen development gaps?
- In terms of **systemic effects**, what has been the impact of "virtualization" on the components of sustainability? What policies, programs and practices are needed to maximize the benefits and minimize the harms resulting from the virtualization or dematerialization of products, services, processes and structures throughout the economy and society? In particular, what kinds of policies and practices are needed to control "rebound effects"—for example, the propensity to consume more when efficiency improvements cause the prices of products and services to fall or when people enjoy longer leisure hours? What is needed to transform individual and societal attitudes and values in support of sustainability? What different challenges are faced in developed and developing countries?

The second frame of reference is provided by the agenda for the Rio+20 Summit itself. As mentioned previously, only two themes are on the agenda—the green economy and the institutional framework for sustainable development. Participants in the online forum who wish to address the role of ICTs in relation to either of these themes will find copious amounts of background documentation available on the summit website that could assist in making linkages and identifying issues. In general, though, in order to connect with the Rio+20 process, it might make sense to discuss the following kinds of questions:

- With respect to the **green economy**, what role can ICTs play, in terms of their direct, indirect and systemic effects, in relation to the main topics to be discussed under the green economy theme—jobs, energy, cities, food, water, oceans, disasters? What policies and practices are needed to enable these roles? What are the respective roles and responsibilities of ICT policy-makers, the ICT sector, sustainable development policy-makers, green economy sectors and other stakeholders?

- With respect to the **institutional framework**, what role can ICTs play in strengthening the institutional framework for sustainable development at the global, national and regional levels, including its economic, social and environmental pillars (e.g., through improved access to and sharing of information, new forms of stakeholder engagement, improved analysis of policy options and evaluation of policy outcomes)? What policies and practices are needed to enable these improvements? What are the roles and responsibilities of different actors and stakeholders?

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IISDCOMMENTARY

# *Life After Rio: A commentary by Mark Halle, IISD**

June 23 and the planet continues its slow decline, unimpressed by the sustainable development summit that has just finished in Rio. Yet another UN mega-conference ends in disappointment, the low expectations fully justified. Once again, our governments have failed to demonstrate leadership, have lacked courage to make the compromises necessary to ensure a fairer, more stable world. Once again they have kept their eyes riveted on short-term electoral deadlines and sold out future generations. We have come to a sorry pass.

When, two years ago, the UN decided to hold this conference, there was no particular reason for it except that the twentieth anniversary of the original Earth Summit was looming. There were plenty of general reasons, including the fact that most of the decisions taken in 1992 have been ignored, most of the agreed actions never taken, and the planet has continued to decline. But nothing suggested that the necessary political will could be mustered to take transformative steps, to agree game-changing resolutions, or even to stimulate implementation of the myriad decisions, resolutions and undertakings that were made in Rio in 1992 or in the two decades since.

Instead, we pinned our hopes on the losing prospect that global expectations for Rio, the presence of Heads of State or Government, and the sheer mass of talent concentrated in one place at one time could effect breakthroughs for which our normal political processes have proved inadequate. But if this once worked, it no longer does. Heads of State are perfectly content to make flowery speeches, hobnob with their peers, and head home to face the electorate. Mass is no longer majesty, and large conferences, far from generating momentum, have, in the words of one commentator, become "too big to succeed." Global expectations of large UN conferences have, with considerable justification, sunk to very low levels on the back of repeated disappointment.

Things began to go wrong in the preparatory process. Groups of governments camped firmly on their positions; the UN secretariat offered no vision and little mobilizing power and failed to generate the funding needed to put together a proper team. And the host country, Brazil, never gave the sense that this conference was a high political priority. Instead, it looked very much as if it was more a dress rehearsal for the upcoming football World Cup and the Rio Olympic Games.

Despite adding extra negotiating sessions, only about one-seventh of the draft outcome document was agreed before the delegates assembled in Rio. Clearly, there was no way to complete negotiations in time for Heads of State to flourish the pen. So the Brazilians pulled a text from their back pockets and offered it on a "take it or leave it" basis to the stunned delegates. Leaving it would have meant a huge, public failure and, for many countries, an affront to their Brazilian ally. Taking meant giving up aspirations, but not much in reality since the text is free of genuine commitments. Accepting the text and declaring the conference a success was the easy way out, and the one taken.

* This commentary is the opinion of the author, and does not necessarily represent the considered views of the Institute.

## What's in the Outcome Document?

So what can we conclude from the outcome document, the fruit of tens of thousands of person-hours of effort, the expenditure of tens of millions of dollars, and the repository of so many hopes and aspirations for saving our planet?

Roughly one-third of the text consists of reaffirmation of decisions taken previously. In these reaffirmations, we declare that what we said before is still valid, that these aspirations still exist. By not slipping backwards and by not actually losing ground on these issues, we can to some extent hold the line. Some would say that, in the present global atmosphere of suspicion and mistrust, this is a positive result. If it is, expectations have sunk appallingly low.

Roughly another third of the text spells out considerations that governments should bear in mind in advancing along their development paths. These include the rights of indigenous peoples, the requirements of food security, the special problems of Small Island and landlocked States, and many, many more. While these considerations are no doubt worthy, they do not amount to new visions, new understandings or, sadly, new commitments. They simply spell out our understanding of what good development comprises.

The final third of the outcome document consists of language, mostly familiar but sometimes new, that identifies priorities in a wide array of areas ranging from oceans, cities and food security to water, sustainable consumption, economic development and institutional design. This is the section of the text on which most will focus. It is not that it embodies firm undertakings or calls for action that are targeted, specific and accountable. It is more that it offers hooks on which different stakeholders can hang their hopes. By referring to the specific language in the outcome document, they can claim that their special topic was endorsed by the world's governments in Rio and therefore constitutes a legitimate priority for attention.

The two central themes of the Rio Conference—the green economy and governance reform—fared poorly, in particular the latter. Hopes that the world community would anoint the green economy as the new guiding paradigm of economic development were dashed early on in the preparatory process when much of the developing world expressed severe doubts about it, fearing a resurgence of trade protection, a dominance of rich-country technology, and a commoditization of nature. In the end, the question was whether the notion would even secure a mention in the final text and the fact that it does—that it is offered as an option for countries to consider—is considered a success. It certainly is, considering the alternative.

The real disappointment comes in the failure of the conference to agree on any serious reform of sustainable development governance. If there is a consensus on anything in the international system, it is that the configuration of organizations, conventions and forums dealing with sustainable development is overlapping, inefficient and unresponsive to the fundamental needs. But 60 years of reform ambition have unearthed another immutable rule: that the multilateral system is in essence unreformable. It is possible to add new organizations, forums or processes to the existing maelstrom, but it is impossible to shift what is already there in any fundamental way.

Rio reaffirmed this rule. Efforts to upgrade UNEP by giving it a higher institutional status failed. The only genuine achievement was to give UNEP universal membership, something that in effect it had already and that is, in any case, a dubious gain. For the rest, UNEP will have to pick apart and analyze the language of the outcome document in the hope of finding something resembling a determination to treat it with more respect.

Nor did the New York end fare much better. The moribund CSD is put out of its misery after 20 years of underperformance; it will be replaced by some form of "high-level forum" whose shape and content is still to be defined. The debate now moves back to the shark pool of the New York UN community for resolution. How it will end up is uncertain, but on past record, it will join the long list of disappointments that the UN community has chalked up over the past decades.

A process was put in place to adopt Sustainable Development Goals by 2015. If successful and if set within a strong accountability framework, these goals might deliver on the specificity that Rio lacked. But this process, too, goes back to New York and will be tossed around on the political currents before sailing into harbour.

## So what was good?

It is, of course, short-sighted to see Rio only through the lens of the official process and the conference in which it culminated. The vast majority of the participants did not come for that; certainly, they hoped that by some miracle Rio would prove to be a game-changer, but they came for something else.

Rio and similar events are, like the annual gathering of gypsy groups in the French Camargue, an important gathering of the tribes, a get-together of the vast and diverse community involved in the search for a better future. Without events like Rio, it is unlikely that they would come together in the same way at any other forum. So what is the value in this assemblage and interaction?

It is, of course, impossible to measure, so anyone can make whatever claim they wish. The networking that goes on is certainly precious; so is the exposure to other ideas, whether from business groups, indigenous peoples, or global think tanks. Rio served as a vast trade fair through which the curious could wander, taking in an exhibit here, a workshop or teach-in there, hearing about experiences often far from their own, and understanding better the issues some stakeholders face. It served as an open university at which you could expose your own ideas and proposals or learn from others. This certainly has some value; indeed, it is undoubtedly the most (and some would say only) valuable thing about the Rio events.

## Was it worth it?

In the collective disappointment there were many who felt it was good that we didn't slip back, that we held the line. Many firmly believe that the seeds planted in Rio will bear fruit, that initiatives started here will develop and flourish, and it is certainly true that the value of Rio will only become clear in the next two to three years. Others extolled the energy that was evident everywhere except the official negotiations and came away enriched and inspired by the many encounters and ideas received. Others simply had fun, looking forward to dinners, parties, samba evenings or walks on Rio's wonderful beaches. And it is important not to lapse into jaded cynicism because the world did not take a great leap forward towards sustainable development.

There were, and always are, silver linings, and glittering bits of mica in the general dross. But it is important to step back as the Rio phenomenon fades and to remember that there are massive opportunity costs associated with the process and event, and that these must be justified by the outcomes.

This is where Rio really falls down. The event was called simply because an anniversary was approaching, not because the international community was building towards important consensus on key issues and required a high-level event

to secure the necessary breakthroughs. The preparations took up a huge amount of time and engaged a massive expenditure in travel, meetings, side events, exhibits and consultations. That was time and money not spent on alternative approaches. Given that it secured essentially nothing in terms of new engagement for sustainability, the process must be deemed a failure even on its own terms. It is like setting out to build a high-speed rail link between two distant cities and ending up asking people to be satisfied that the station signs received a fresh coat of paint.

Worse still, this failure is not an isolated one. Although it reached a consensus conclusion, what happened in Rio is a mirror of what happened at the climate change summit in Copenhagen, and resembles the failure of the last few WTO ministerial meetings. Far from being a sad exception, low expectations and disappointment in global intergovernmental process have become the new norm, at least when success requires consensus on economic policy. We can no longer afford years of straining that ends up giving birth to a mouse.

## What can we do to move forward?

If the approach is not working, surely we must change it. So why are we failing and what can we do to fix it? The first observation is that the principal problem lies with national governments, and particular the groupings in which they congregate to negotiate. The rich OECD countries can no longer effectively impose their will on the rest; the G77 group of developing countries has even more problems in holding to their common positions. Everyone observes the new pride and confidence of the emerging economies—in particular China, Brazil and India—but the groupings to which they belong (BRICS, BASIC) have in common only the fact that they are all, well, emerging. They continue to have vastly different foreign policy interests and do not represent a credible negotiating group. So the old order is fading but the new order has not yet taken its place. We are in abeyance, and this explains much of the negotiation failure.

Further, international negotiation is perceived, especially by the developing countries, as having been long on promise and short on delivery. Nothing in all that we have achieved over the past decades has changed the basic inequity in the international system. That countries like China and Brazil can grow rich is a meagre consolation to poor countries like Malawi or Bangladesh. Impatience with the failure to address the equity agenda has been steadily growing and it has now reached the point where it is simply blocking all progress at the international level, whether in UNCTAD, in WTO, in climate change or in Rio. Every issue involving equity in the Rio process was contentious, and none of them was resolved except by draining the language of all genuine content.

If we are to move forward multilaterally, we will have to begin, finally, to address the glaring gaps between rich and poor countries, and the rich and poor within countries. And since we do not seem ready to do that, we must put a stop to the massive waste of money represented by events like the Rio conference. If our governments are not prepared to move towards sustainability, it is better that our voting populations know this. Calling a failure a success—even a guarded success—is to paper over the ever-widening cracks in the system.

So the first conclusion we must reach is that we should call a moratorium on all global multilateral negotiations on the environment and begin to address the thousands of unfulfilled promises and commitments we have made. To do so would be to build a momentum of success that would once again instill hope and belief among our populations. The various meetings, conferences of the parties, etc. should continue to convene, but with the single purpose of addressing the implementation gap and of raising confidence that there is a direct link between promise and fulfilment.

The second conclusion is that our intergovernmental structures are tired, lack vision and courage, and are increasingly left behind by the natural momentum of creativity and innovation in our societies. Worse still, there can no longer be any doubt that they are to all intents and purposes unreformable. Instead of once again launching attempts to streamline the UN system, we should simply assume that coordination, efficiency, accountability, responsible use of scarce funds, good governance and transparent process are now and always will be elusive goals and act accordingly. We should put our money and effort into organizations and processes that are not exclusively government-based.

If we follow these two recommendations, where should we then put our efforts? The good news, and the principal grounds for hope in the future, is that in the face of intergovernmental intransigence and lethargy, the world has not stood still. Instead, it has spawned an explosion of creativity and innovation that is truly impressive.

If national governments have found it difficult to progress, this is not true of sub-national jurisdictions. The movement among states, provinces, megacities and municipalities is taking off with the speed of a rocket, making commitments to the green economy or to climate change action that are truly inspiring. And even national governments, acting regionally, begin to feel that they may make more progress within the region than they can make globally.

The same is true of the private sector. For all the problems still associated with corporate activity, there is more advanced strategic thinking, more deep analysis of problems, more attachment to innovative thinking in the corporate sector than is evident in inter-governmental dialogue.

And, as always, civil society in its diversity and flexibility represents an untapped force which, if harnessed, would wield incredible power. Yet it is extremely difficult to herd the swarm of cats that civil society resembles. They cover the spectrum from multinational centres of intellectual power through to fronts for religions and a wide variety of cranks of all shapes, colours and smells. It is their connection to the ground level, to communities and local interests that gives them their particular strength and value.

So, on the one hand, we have a government-based process that is hopelessly stuck in the mud. On the other we have a mass of energy, creativity and strength that is not only committed to action but raring to go if only we can find the forms and channels to harness it. This, surely, is the creative field of endeavour for the future.

*Upon this gifted age, in its dark hour,*
*Rains from the sky a meteoric shower*
*Of facts ... they lie unquestioned, uncombined.*
*Wisdom enough to leech us of our ill*
*Is daily spun; but there exists no loom*
*To weave it into fabric ...*

Edna St. Vincent Millay

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IISDCOMMENTARY

# *Moving Beyond the Tool: ICTs in the Sustainable Development Discussion at Rio+20*

***Shawna Finnegan and Lisa Cyr***

Rio has a long history with information and communication technology (ICT). The Earth Summit in 1992 was one of the first United Nations conferences to be set up with "communications centres," which facilitated online discussion and kept civil society around the world informed about the UN talks.

Twenty years later, ICT featured prominently in the day-to-day activities of the Rio+20 conference. ICTs could be found everywhere: from interactive information kiosks and super-WiFi demonstrations for participants, to overflowing computer labs, blogging rooms and media areas, with rows of wireless devices plugged into every available electrical outlet. People were connected, and the Internet was a vital part of the daily interactions and work being carried on throughout the summit. Participants tweeted, blogged, uploaded photos, shared and gathered information at rates far greater than could ever have been possible at the original Earth Summit.

Ironically, despite the dependence on and ubiquity of technology at the Rio+20 conference, there was very little reflection on the ways that technology has shaped economic, social and political structures in the 20 years since the first Earth Summit or on the challenges to sustainable development that ICTs present.

This paper examines the ways in which ICTs were addressed in the formal and informal summits, noting critical discussion points as well as highlighting gaps and missed opportunities.

## *ICT as a Facilitator of Sustainable Development*

The International Telecommunication Union (ITU) was the main ICT actor at Rio+20, hosting three side events alongside the Global Alliance for Information and Communication Technologies and Development (GAID) and the Office of the UN Chief Information Technology Officer (CITO). With speakers from government, the United Nations and civil society, along with the private sector, the panels covered an array of topics, focusing primarily on the opportunities for ICTs to connect, educate and empower.

In one (GAID and CITO hosted) multistakeholder panel on the impact of new technology and ICTs on sustainable development, panellists described how online mapping tools facilitate participatory governance by allowing anyone to submit geo-located information on incidents such as natural disasters, government services, crime and corruption. These online mapping tools allow users not only to submit data, but to tailor the basic mapping structure to any situation or issue, whether social, economic or environmental. Local entrepreneurs are empowered through start-up communities—such as the iHub in Nairobi—that support the development of online tools and projects.

The private sector was represented primarily at the ITU's final, afternoon-long event at Rio, which provided an opportunity for companies to highlight efforts to "green" their activities, as well as to discuss future plans for green technology. Most described innovative programs to implement sustainable development, including Microsoft's demonstration of the potential for unused radio frequencies to expand network connectivity, and a presentation from Ericsson on the benefits of telecommuting and digital delivery in transitioning to the low-carbon economy.

At the same time, some of the most obvious threats that ICTs pose to sustainable development, such as e-waste and the extraction of conflict minerals, were largely absent from the discussion. Qualcomm, for example, described how 3G technology can enhance sustainable fisheries management in Brazil, but failed to address the energy-intensive process by which these 3G devices are manufactured or their impacts on the environment when discarded. The Brazilian telecommunications regulator, Anatel, proposed a green agenda during its presentation at the ITU event, including energy efficiency standards and green labelling, but it was unclear what level of commitment the agency has in taking that agenda forward. No opportunities were provided for audience questions or discussion during the ITU event, suggesting that this was not a space for critical analysis of ICTs and sustainable development.

While ICTs were mentioned on several occasions in the outcome document as enablers of sustainable development, including sectoral inclusions in farming, forestry, fishing, energy efficiency and education, these inclusions were minor and barely skimmed the surface of how ICTs have changed the landscape of sustainable development economically, socially and politically. Moreover, the absence of technology and e-waste mentions in sections such as Article 213, which deals with hazardous waste, suggests that those drafting the outcome document were not interested in addressing even the most obvious challenges posed by ICTs.

## *Challenges to Effective Use*

While sessions mainly focused on the positive impacts of ICT, there was some discussion of the awareness and capacity to fully utilize the benefits of emerging technologies. As Quinn Sutton, a panellist from Digital Alliance, pointed out, "As much as the digital divide is an important issue, what is more important is the knowledge and skills divide between nations" (Sutton, 2012). Technology is merely a tool, and just as the failure of the One Laptop Per Child program in Uruguay has demonstrated, unless a user has the capacity to use a tool, it will continue to be underutilized. At the same time, the development and successful use of innovative online tools, including crowd-sourced mapping, suggests that as ICT—particularly mobile technology—has become more prevalent, individuals are finding ways to use that technology to meet their day-to-day needs, including their development needs.

Despite large-scale uptake by most of the world—particularly in the case of mobile technology—barriers still exist, especially for women who lag behind in terms of access to education, employment income, and therefore the income necessary for access to ICTs. Such were the observations by Lakshmi Puri of UN Women—one of only two women

among the more than 30 panellists speaking at the three ITU events. The observations made by UN Women echoed what women's organizations involved in the ICT movement have been expressing for years: ICTs are pivotal to gender equality and play out in women's "productive, reproductive and community roles and in exercising their rights" (Puri, 2012). Investing in women and ICTs also has a multiplier effect and is vital to women's empowerment and quality of life—but we must be deliberate in ensuring that women also benefit from ICTs. Puri urged for gender-specific and gender-responsive strategies in order for women to truly benefit from ICTs. While some women do have access to ICTs, in general, they still have less access to technology, ICT employment skills, and relevant content addressing their needs, and they have lower digital literacy. This needs to change, Puri urged, and she recommended that the outcome document address this specifically, which it ultimately did not do.

James Fahn, director of the Internews environmental program, spoke on behalf of alternative media, suggesting that we have only barely scratched the surface on how ICTs are revolutionizing the way we deal with information. Certainly, they have been extremely useful in allowing journalists and civil society to learn about and act on things in collaboration with one another, but they also have allowed for previously unreleased data to be accessed by virtually anyone. The challenge is what to do with this flood of information and how to use it.

According to Fahn and others, the main challenges moving forward are how to interpret and "translate" newly-available information so that it is meaningful to a general public, particularly to those who most need access to it (for example, information concerning logging in the Amazon). Accessing the information is in and of itself a challenge; even if information is made available, large file sizes and graphics make accessing data prohibitive without a broadband connection.

## *Broader Discussion of ICT: Civil Society and Sustainable Development Professionals*

Outside of those sessions specifically focused on ICT, discussion of technology as a tool for sustainable development was sporadic and shallow. At a side event hosted by the UN Department of Economic and Social Affairs (UNDESA), which reported on progress since the original Earth Summit, the rise of information technology, open databases, and opportunities for e-governance were mentioned briefly, without an examination of the challenges of implementation or the risks of unintended consequences and negative impacts. Even in those sessions focused on youth engagement, only social networking sites such as Facebook and Twitter were mentioned, without any consideration of access, privacy or content ownership. Within the official conference, new technologies appeared to represent benign tools for some, while they were altogether ignored by others. This superficial approach is reflected in the Rio outcome document where, for example, in Article 109, the promotion of universal access to social services is discussed, but there is no mention of the role technology might play in this process.

ICT was also largely absent in discussions at the People's Summit, the alternative civil society space at Rio+20, in part because access to technology is still very limited in many of the communities represented at the summit. Farming and indigenous communities in many parts of the world are still lagging in access because large telecom companies have not yet found it profitable to set up much-needed infrastructure, and governments have not established universal service obligations with supporting financial mechanisms.

Although organizers and participants at the People's Summit struggled with broad issues of environmental justice, participatory governance and intersecting movements, there was no discussion regarding the potential of ICT to facilitate the realization of those objectives. At a session on representative environmentalism, some speakers expressed concern about the green economy, including the relationship of market and environmental outcomes, and highlighted the potential for community ownership and management to protect important natural resources. Rainwater harvesting, rather than the development of large-scale dams, was presented as one community-based alternative. However, the knowledge transfer needed to harvest rainwater effectively (and for other community-based management projects) was not discussed, nor was the potential of ICTs for facilitating that knowledge transfer.

It is worth noting that many of the issues raised in the People's Summit did not influence debate at the official conference, including perceived risks of the green economy and the danger of co-option by powerful interests. At times it appeared that the benefits of ICTs simply masked underlying challenges and threats to sustainable resource management. Brazil's new satellite mapping technology, for example, which displays up-to-date information on deforestation in the Amazon, was touted as a landmark tool for forest conservation at Rio+20; however, there was no discussion as to the strategies employed to protect the Amazon forest based on the information collected or of the potential for private interests to use satellite data to exert control over the land and its inhabitants.

## *A Missed Opportunity: Critical Discussion of ICT as a Threat to Sustainable Development*

Although ICT was seen as a powerful tool in implementing sustainable development at Rio+20, a number of potential dangers presented by technology were left unaddressed, suggesting that a critical examination of ICT is not taking place.

Many of the trends, including threats, referred to by Jim MacNeill and Vint Cerf in their interviews with the International Institute for Sustainable Development (IISD) were entirely absent from the discussion of ICT at Rio+20, including government oversight or control of the Internet and its usage, the security of information online, reinforcement of unsustainable consumption patterns, and short-term decision making. Dangers associated with e-waste and energy consumption were mentioned only briefly during some sessions, with no substantive discussion of the necessary changes for policy-makers and technology companies, and neither were they addressed in the outcome document.

Despite the good work being done by local ISPs and global technology companies, the link to important conversations surrounding implementation of sustainable development is somewhat tenuous. While many governmental and intergovernmental organizations are working in partnership with these private actors, grassroots civil society was not really engaged, and the potential for "greenwashing" may be a threat that keeps grassroots movements from collaborating with technology companies to move the sustainable development agenda forward.

As Jim MacNeill points out in his interview with IISD's David Souter, ICTs can be used by powerful actors to maintain the status quo. This is even the case, for example, with open data. Access to information and data is a central tenet of sustainable development. However, critics of open data can point to cases where commercial interests have undermined the power of local communities by gaining access to information previously only held within informal knowledge networks (Slee, 2012). In such cases, technology can undermine, rather than facilitate, the efforts of civil society to participate in the management and protection of natural resources. The lack of discussion around these dangers at Rio+20 is further evidence of the need for critical multistakeholder examination of the impact of ICTs on sustainable development.

## *Conclusion*

In each of the three UN-hosted ICT sessions at Rio+20, representatives from the ITU underscored the significance of the 2011 Istanbul Action Plan, in which Least Developed Countries emphasized ICT networks as essential infrastructure for development, on a par with water and transportation (ITU News, 2012). While this statement is indeed an important contribution to the inclusion of ICT in the sustainable development agenda, a more critical discussion is needed around the ways in which technology changes our understanding of sustainable development and how it impacts social equity, economic prosperity and environmental protection.

As was mentioned in one of the ITU panels, information technology has grown at an exponential rate, far surpassing any other modern infrastructure. What this means practically is that policy and development agendas are not necessarily able to keep up with changing technology. Moreover, unlike water and transportation, ICTs are much newer to the development agenda and are tied up in issues of awareness, capacity, privacy, security, freedom of expression and power/knowledge dynamics in ways that are only beginning to be recognized and understood. Although some of these issues were addressed at Rio+20, many were not, suggesting that the discussion needs to be re-framed—not only concerning the impact of ICTs on sustainable development, but as regards the very meaning of sustainable development in the context of the growing Information Society, including the changing roles of government, business and other actors.

One element of this re-framing is bringing in mainstream civil society actors, including women's organizations, environmental action groups, labour unions, faith groups and local media. ICTs also need to be better woven into general development discussions related to health, education, livelihoods and economics, and the environment. Unless this happens, the discussion will remain within the close-knit ICT-for-development circle. Without critical multistakeholder discussion of the opportunities and threats posed by technology, ICTs may contribute to another 20 years of unsustainable development.

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IISDCOMMENTARY

# *ICTs, the Internet and Sustainability:*

## *An interview with Angela Cropper*

The following is the record of an interview with Angela Cropper, Deputy Executive Director of the United Nations Environment Programme (retired). The interview was conducted by David Souter, senior associate, IISD and managing director of *ict* Development Associates, in June 2012.

This interview is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

Angela Cropper recently retired as Deputy Director of the United Nations Environment Programme (UNEP). She is also a former independent member of the Senate of Trinidad and Tobago.

### I'd like to ask you first about your priorities for sustainability today—your own priorities and those of UNEP.

I would say that the first priority is to get the economic model right—to make sure that our economic model is fully integrated with the outcomes that it should yield, not indifferent to whether it delivers the desired social and environmental objectives or works within environmental parameters. I strongly believe we have to reverse the way in which economy leads while social and environmental outcomes follow, and that we should have the economy configured in a way that's better related to generating those outcomes than we have consciously attempted before.

If you recall, that was one of the things that the Brundtland Commission report proposed, but then we went about business as usual after 1992. The world as a whole didn't galvanize itself to make that kind of reversal. So we have seen the lead going in the opposite direction, an increasing divorce between the financial world and the real world of results and benefits, culminating in the experience we've had since 2009. I would say that's the first priority.

The second priority, I think, is to change the culture by which many people approach their future and the concept of development. I think that we are way off the mark if we think that we can actually deliver development as we now envisage it, for an increasing number of people on the same resources. That will require a lot of supporting work in terms of education, which I don't think we have pursued sufficiently or systematically.

The third priority, I would say, is that we should reverse some of the boundaries that we have crossed, where that is possible; and, where it is not, we should try and make sure that from here on we restrain ourselves within the boundaries that are left to us.

Obviously, all of these have to be approached in a very integrative fashion. I don't think that we can any more approach them as three pillars. We really have to do so with an integrated and multifunctional kind of approach.

### Has Rio+20 moved us towards those three priorities at all?

I think there is recognition—at least rhetorical—of the need for a more integrative approach. That is a step in the right direction. As you know, the UN proceeds in very incremental steps, so it remains to be seen how it turns out, but that is one way in which it has approached the unification I described, what we call in UNEP a triple helix approach to moving towards the economic, social and environmental objective. That's one way.

The other way, I think, is the recognition of the "green economy," as a cutting edge to have a new approach to economic organization, putting more emphasis on ecological parameters, ecological security and so on. It's not a very strong decision on the green economy, because it's bounded by many of the reservations that countries associated with the concept. But I think that the fact that it has gone through—in terms of countries saying this is one tool for approaching our economic futures, though only one tool—that's another way to getting there.

I think the adoption of the sustainable consumption and production 10-year framework of programs is a third [example of progress], because we've taken 10 years since 2002 to work at that set of programs. UNEP has been at the centre of that. The failure in the CSD19 last year [2011 session of the UN Commission on Sustainable Development] was a major blow, so to have that adopted is another step in the right direction, though the commitment is still a voluntary commitment. It isn't clear that it can be anything other than a voluntary commitment at this stage.

I think that the decision to encourage industry to move towards a higher bar for reporting on sustainability is a good measure because it puts pressure on them and elevates their role in achieving sustainability, even though it doesn't make it mandatory, as some of us would have liked. Nevertheless it moves it up the ladder, in the right direction.

The decision to develop the Sustainable Development Goals is another reflection of the realization that we need to treat the social, economic and environmental together, rather than looking at environmental goals vis-à-vis social goals vis-à-vis economic goals, continuing to trade these off one against the other.

### Can I take you back to the Brundtland Commission report and the concept of sustainability developed around that time? Since then there have been a lot of major changes in the world: the end of communism, for example; shifts in economic power towards Asia; the growth of the women's movement and other social changes; much greater understanding of climate change; and also the "information revolution." Do you feel that any of these require rethinking of our definitions of sustainability?

Well, I always thought that the definition of the Brundtland Commission was a little too hedged-in, because it put the emphasis on intergenerational equity. Yes, it served to encapsulate the central core, the quintessence of it in that phrase, focusing on the need for us to leave something behind for future generations, but there is also a lot to do with contemporary equity that is relevant to sustainability, that we haven't emphasized enough. (Nor, let me say, have we emphasized enough the generational, except to repeat it in the definition.)

I think that there are certain implications of developments since then. One is that there is greater recognition that everybody has responsibility and should take responsibility. I think the emergence of different stakeholders—you cited women, but we could add more—is another factor that should help us to redefine sustainability away from being an intergovernmental commitment to policies and actions, and more to societal transformation. Developments in ICT can lead us to explore how a more connected world, one that is capable of better communication among these different players, can be configured to make sustainability happen in a way that perhaps 25 years ago was less achievable.

### What linkages do you see between ICTs and the Internet, on the one hand, and the green economy approach, which has been important in UNEP as well as at Rio?

First of all, the ability simply to accumulate, to access and to reflect on information on the state of things—be they social, economic or environmental—is foundational. If we didn't have that, we wouldn't be clear about our condition, or the state of anything to which we are working.

The second thing is the communication that it enables among societies and groups and stakeholders—the ability to have dialogue, to consolidate and forge positions. That can only help contribute toward a more unified path towards sustainability.

The third thing would be the harmonization of approaches at the global level, and forging the commitments to that that are so necessary to having us work in the same direction.

Those are the key ways in which ICT developments would support a movement towards sustainability. I think that we are seeing it in many of the frameworks for information and communication that are there within UNEP. We can see their relevance and importance to what we are trying to do.

### The ICT sector is trying to understand the relationship between positive and negative environmental impacts of information technology. On the one hand, there is significant potential to make energy production and industrial processes more efficient, and thereby reduce energy use, etc. On the other hand, information technology is one of the fastest growing sources of greenhouse gas emissions and of waste. Do you have a particular view around that—or does UNEP?

Yes. We [at UNEP] have done a survey of electronic waste. We have also been servicing the International Resource Panel of experts, which has been looking at the scarcity of materials, the need for resource efficiency, and the need to decouple economic production from some substances. We've done a report on rare earths, many of which are used in the electronics industry, to alert the world about these issues, propose early measures for conservation, recycling, reuse and so on.

We had hoped that in the Rio+20 outcome document we might have introduced the idea that there are certain metals, for example, used in the ICT industry, where we need to examine how we can make them available to the most imperative things for the global community and ensure that they don't just go to the highest bidder. But that idea didn't get very far, because it is hugely political and runs into the whole issue of national sovereignty over resources. So we thought it was a little premature to actually bring it to the table, but it is an area on which we and the International Resource Panel will continue to work.

**I want to ask about dialogue between the sustainable development world and the ICT sector. Is it your impression that people in the ICT sector have much understanding of sustainability issues? Do people in the sustainable development community pay enough attention to the changes that are due to information technologies?**

With the former question, I don't know. I'm not close enough to that community to know how well they are connected or reach out, but I would suspect that there is room for improvement there.

I think that the sustainable development community has been looking with interest at how the ICT community can be supportive of its agenda, rather than the other way around. I don't know that I can see immediately how the ICT community would want to have recourse to the sustainability community for its own interests, except concerning scarce resources and so on for its products. But I would say that the sustainable development constituency is very excited about how the ICT potential of today can contribute to sustainability.

**What about within the UN system? How much dialogue is there between UNEP and, say, ITU [International Telecommunication Union] and other agencies that are more concerned with the ICT sector?**

You know, I don't think there is a lot. I hope there will be more, especially after Rio, which has put more of a spotlight on the science policy interface. I don't think that from UNEP we have a lot of communication with ITU or with WIPO [World Intellectual Property Organization]. We do have more with UNESCO as a natural partner for us in the science world. But it's still not anywhere where I think it should be.

**I want to take the opportunity to ask you about the region you are from, the Caribbean. Are the challenges of sustainability any different for small island countries, such as those in the Caribbean, than they are elsewhere?**

Well, I think at the core the issues are the same: how we are going to sustain ourselves into the future. But I think there are some issues, in addition to the core ones, that warrant attention.

The first is the limited options that result from small size. You don't have anywhere to retreat, you don't have many options, your land space is limited, your population size is limited—so your options are limited. Whether it is fielding a cricket team or trying to carve out some new kind of activity that might be viable on the scale of small populations, it's the same. Those are structural limitations that have to be considered.

The second set of issues would be those arising from climate change, which has rendered such countries much more vulnerable. And, given the first point I have made, the resources and options and people to depend upon to find solutions are not necessarily there.

The third thing is that investments at any moment in time are very small, disproportionately small in terms of what is required.

**Do you see globalization—and I am thinking of both economic and cultural globalization—working to the benefit of small island societies, or to their disbenefit?**

I think it's mixed. On the one hand, a more globalized society can bring about more of a unified pathway towards sustainability. But at the same time, cultural diversity is also important. Having the space for cultures that are distinguishable has a value in itself.

Let me say, I think these small populations are already globalized, certainly in the Caribbean. We are hugely connected with the rest of the world, not only historically, but also now in terms of the shared communication that we can make with the rest of the world. I think that that is a benefit. If we were isolated from or unable to participate in that, it would be a disbenefit because we would not be moving along with the rest of the world.

**If you look back over 20 years or so at the way the ICT sector has changed in the region, how big a difference has that made to the way people live in the Caribbean or to how government works there?**

I don't really think it makes a difference to how governments work. I think what is required to make a difference in how governments work concerns the need to involve and educate their society and so on, and in the Caribbean that is still not the way in which governments work. They feel that their function is something that is up to them alone. Of course, this is a generalization. We haven't done much and advanced much in terms of participation and participatory democracy of the kind that the ICT revolution would permit and would enhance. I think there is huge room for the ICT infrastructure to assist in developing the way in which our governments work, in terms of their responsibility for leadership in the society, for communication in the society, for education of the society and so on.

**In his interview for this project, Jim MacNeill talked about two things on which I would like to ask you to comment. The first is that he said that intergenerational equity had been taken much more seriously than issues such as planetary boundaries since the Brundtland Report was published, which was unfortunate. The second was that there had been a failure of global leadership, that governments had not taken seriously the commitments they'd made in Rio 20 years ago. Do you think there is a failure of governance here and, if there is, what would you like to see happen?**

If you recall my earlier comment on intergenerational equity and definition, the way in which it was carried forward rhetorically whenever we spoke about sustainability, I suggested then that it was an insufficient definition of sustainability because, although it implied it, it did not emphasize the ecological dimension to equity and to sustainability. So I would agree with him there. And we have proceeded since then on neither intergenerational equity nor ecological sustainability in the way we should have done.

I would agree with him on the second point also: there was a failure of leadership. We came to Rio+20, 20 years later, and realized that what we needed to do here and now was to pick up the pieces from Rio 1992. We had lost two decades because we didn't have a focus, because we didn't have a clear sense of purpose. So I think the political leadership there was very lacking—and I would say not only political leadership, I would say institutional leadership as well. There are things that UNEP might have done in a different way, and many other UN entities as well. We allowed those 20 years to drift, and the challenge here and now is, having recognized that, to ensure that it does not continue into the future. The challenge is how to get hold of this supposedly new political commitment and endorsement of the Rio agenda, the Rio principles, the Rio objectives and so on, and move forward with some sense of urgency. Because the urgency we need is not the urgency we manifested in the last 20 years.

**Thank you very much.**

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# *ICTs, the Internet and Sustainability:*

## *An interview with Anriette Esterhuysen and Alan Finlay, Association for Progressive Communications*

The following is the record of an interview with Anriette Esterhuysen and Alan Finlay of the Association for Progressive Communications (APC), an international networked organization that focuses on the use of ICTs by civil society for social justice and development. The interview was conducted by David Souter, senior associate, IISD and managing director of *ict* Development Associates, in June 2012.

This interview is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

Anriette Esterhuysen is the executive director of APC. She was executive director of SANGONeT, an Internet service provider and ICT training institution for the development sector in South Africa, from 1993 to 2000. Prior to that she worked in development and in human rights organizations involved in the struggle against apartheid in South Africa.[1]

Alan Finlay is ICTs and sustainability project coordinator with APC. He has worked in the ICT4D sector for more than 10 years in project development, research, writing and editing.[2]

### I would like to start by asking how APC defines sustainability and sustainable development. Do you have something you would call a vision for sustainability?

ANRIETTE – I'll give a very general answer. I think the traditional or historic definition of sustainability in APC is very much the one that was developed by the Brundtland Commission, and that was most pervasive in the buildup to and immediately after the Earth Summit, though maybe not expressed in exactly the same way. It is a definition which emphasizes human development, perhaps even more than it does economic development, and that places a strong emphasis on environmental sustainability. It assumes that social justice is an important element of sustainability: significant inequality between people and between countries results in all kinds of conflict, and conflict undermines sustainability.

[1] Biography abstracted from http://www.intgovforum.org/cms/speaker_bios_08/speaker_access_anriette.html
[2] Biography taken from http://www.idrc.ca/EN/Programs/Agriculture_and_the_Environment/Climate_Change_and_Water/Pages/NonIDRCBookDetails.aspx?PublicationID=1092

There is another element important to APC, which I think has had too little attention. Sustainability also requires change—changes in consumption, changes in production, changes in governance. Our approach is that, unless there is sufficient regulation and governance to ensure that economic development takes place in ways that don't harm the environment or harm particular sectors of society, then the necessary changes in production and consumption won't take place, and the resulting development is therefore not likely to be sustainable.

It might be interesting to mention that in 2002–2003 there was an internal debate in APC about sustainability and sustainable development. A subset of members, mainly from Eastern and Central Europe, felt strongly that APC had started on a path of ICTs for development and a rights-oriented approach—concerned with human rights and women's rights—at the expense of a more holistic focus on sustainability which includes environmental sustainability. We have tried since then to integrate that more holistic approach—and I think that's where we are now. We certainly went through a period when environmental sustainability was absent from our approach to sustainable development. That is no longer the case.

ALAN – I'm not a sustainable development expert, but I think it's an evolving question rather than something you can pinpoint and say "This is the position." My sense is that APC thinks it's worth trying to keep the questions open because to nail down a very clear position for environmental sustainability is difficult. But I think in general it takes the view that you can't have the kind of economic development that we've seen in developed countries happening in developing countries, because the resources aren't there. That's in line with what environmentalists have been saying for 20 years or so already.

ANRIETTE – I think we've been quite consistent in one aspect of our understanding of what sustainable development is, in that we've questioned the "development as growth" paradigm, certainly in the last 10 to 12 years since we started focusing very actively on ICTs for development. I think that's something that has always distinguished APC as an actor in the ICT-for-development field—that we questioned the notion of massive proliferation of ICTs, and expanding consumption and growth in GDP, as being the path to sustainable development. We've always emphasized issues of equity, and social justice, and the potential negative impacts of ICTs.

### If you go back to the Brundtland Report and the Earth Summit, they were trying to identify ways of enabling the three objectives of economic prosperity, social equity and environmental protection all together. You seem to be suggesting there are disconnections there.

ANRIETTE – I'm a skeptic as to whether you can enable these objectives at the same time. Maybe in a utopian sense, you can, or in some parts of the world, but not at a "system-wide" level. Take a country like Sweden, which managed to convert its economy away from a heavy industrial economy that massively damaged the environment. Sweden is a global player in a much more sustainable way now because it has invested in new economies and emerging industries. I think there are countries that feel that they have achieved some kind of balance and some capacity to focus on all three elements, but that's not the global picture at all. In fact, some of this success in some parts of the world actually contributes to dissonance in other parts of the world. We live in a very aspirational society and so you have the more powerful emerging economies trying to mimic economic development in developed economies. That just increases some of the disconnects.

### In Sweden there is also effectively zero population growth, and therefore a static GDP doesn't imply impoverishment. In countries with rapid population growth it does. How would you respond to that?

ANRIETTE – I think the fact that there are some countries with continued high population growth is one consequence of how the vision of the Brundtland Commission is just not being achieved. If you have a country where people still need to rely on subsistence economies—subsistence farming or very small trade—you'll have continued high population growth unless there is significant human development—investment in health, investment in education, investment in women's equality. What you have at present is improvement at a surface level in health care—through availability of medications, control of diseases like malaria—so you have a drop in mortality rate, but you don't actually have sustainable improvement in levels of human development as a whole.

### Are we any closer to sustainability of the kind that you have just described than we were at the time of the Brundtland Report?

ANRIETTE – I think we are. If you look for a net effect, possibly we are not, but many of the components that have the potential to contribute to sustainable development at a holistic level are in place. If you look at something which is generally considered a very important component of development, gender equality, for example, there've been massive differences in many parts of the world when it comes to recognizing the importance of equality between men and women, and empowering women socially and economically as a means of achieving better levels of health, better levels of social well-being, economic contribution and so on.

That doesn't mean that there aren't still huge challenges. But I think there's also much more understanding of the need for sustainability today: there's much more knowledge of the decline in biodiversity in many parts of the world, more understanding of climate change. Particularly after this financial crisis, there's also more awareness that the "growth as development" model is not sustainable. The problem is that there isn't really a framework whereby all of this can be brought together.

I thought your interview with Jim MacNeill [for this project] was very interesting. He said that governments must return to the commitments they made at the Earth Summit and begin to implement policy and institutional reforms needed to bring about an urgent transition to more sustainable forms of development. I agree with him. Later on, he also said that he fears that the net effect of all-pervasive use of ICTs has been to weaken the authority of governments, and therefore their capacity to govern effectively. I think that's a really important point.

### I want to explore your views about the impact of ICTs. Looking back over the past 25 years, we have seen what is often called an information revolution or the development of an Information Society. How would you rate the importance of that in comparison with other global trends over that period, such as the end of communism or the rise of the women's movement?

ALAN – These are huge questions. Myself, I don't particularly like many of the social developments that have taken place as a result of the Internet. I think there is a lot that's negative in terms of human interaction—while there have also been lots of positive possibilities for issues like health and education, really practical tangible positive impacts. If you are twinning globalization with the Internet, some of the ways of interacting that have emerged seem to me problematic. I think they are creating ways of interacting that are potentially non-sustainable. I would rate the birth

and end of communism, and the birth of the women's movement, as much more fundamental influences on the future sustainability of the human race than the Internet. What I mean is that issues of how society is structured, with the extremes of communism versus capitalism and whatever falls in between or outside of that dynamic, as well as the power relationships between men and women, still fundamentally inform human decision-making processes, including decisions on how to govern the Iinternet. They set the terms of engagement of probably any discussion on human relations—I think more fundamentally than how the Internet can change the way we relate.

ANRIETTE – I think it's very hard to isolate the changes and general trends in ICTs. The social changes we are talking about are not just consequences of ICTs but also consequences of changes like the fall of communism and a more globalized world. It does not make sense to focus on the relevance of ICTs on their own because their impact is through other social processes. However, thinking long term, I think ICTs will have a far more profound impact than the fall of communism, for example, and are already doing so. Language and tools are probably the most profound developments that have defined what we've done and where we go as a species. That's why ICTs are uniquely significant, because they bring together those two fundamental human characteristics, language and the capacity to use and make tools, which are both consequences of change and drivers of change.

### Let's take the positive side first. What would you say has been the most positive impact of ICTs on the nature of societies and economies over the past 25 years?

ANRIETTE – I think the most positive aspect has been impacts resulting from increased access to knowledge and to information about what's happening and how people experience it happening: for example, chemical spills into the Danube where APC members were involved in campaigns to expose the acts of mining companies and thereby effect change. Similarly, when there's been famine, when there's been war, and when governments engage in acts of corruption or decisions that are very harmful, the capacity for people to access and exchange information means that very little is not exposed.

The other impact is that ICT empowers individuals. Where governments are failing to make the policies that would enable more sustainable forms of development, individuals are better off if they are empowered, if they can speak out and can use these new tools to strengthen their livelihood capacity. ICTs don't solve problems but, where problems are not being solved, access to ICTs leaves individuals, communities and institutions in a better position to act, and make an effort to solve their own problems.

### Let's pursue that for a moment. There is one strand within discussion of the Information Society which argues that information technology is positively transformative in all aspects of society, and so developmental problems are resolvable because of ICTs. Your comment was narrower than that.

ANRIETTE – Yes. I would say they are transformative, definitely. I don't think they have the capacity to solve developmental problems, but, in contexts where developmental problems are not being solved at a sustainable holistic level, they can have an ameliorative effect.

## What about the downsides?

ALAN – You can't really argue with the position Anriette puts forward. I'm more interested, though, in what gets left behind when people start to overemphasize the interaction between technology and society—and I think a lot does get left behind. There are powerful forces involved, like consumerism, big business and so on, that's the first thing. These forces tend to drive or shape the interaction, at least when it comes to the mainstream. Then, on the more practical level, there are impacts on the environment that we need to take care of. I used to think it was all about everyone having their voice, but I'm less convinced now that that's a productive model of human interaction. I think constructive and orchestrated debate and exchange is much more important than voice. The problem with the Information Society is that it's very hard to find places where that constructive exchange happens.

ANRIETTE – Can I respond to that? There is a bit of a chicken-and-egg point to consider here. I think that if voice is linked to organization and to advocacy, when voice feeds into dialogue and debate and the development of demands and people and institutions coming together—in other words, if voice can feed into politics—then the consequences are fantastic, and ICTs can strengthen that.

## The ICT sector is the fastest growing contributor to climate change, and also one of the fastest growing contributors to waste generation. Whose responsibility is it to address that?

ALAN – Obviously governments have a massive role to play and consumers have a responsibility, but the biggest role surely is big business. The problem with ICTs is that it is an unsustainable business. We talk about the rise of Asian economies, but when they're based on ICTs—or more specifically on ICT production—there is something of a false economy going on there. To go back to what Anriette was saying: one problem is that the conversation is often unclear about the ideological underpinnings of how people use the term "sustainability." To my mind, environmental sustainability should pose a new model of society. I'm sure a lot of people agree with that. But that is getting left out because it's being driven by the interaction between profit making, consumerism, the dependency of emerging economies on ICT industries, etc. etc. So how do we unpack that? Business has a massive role to play but it's tricky. How can they take responsibility and how can we ask them not to make the profits they are making at the same time? So the government would have to play a strong role in shaping the balance of responsibilities between business and the consumer.

## You just said that "ICTs are an unsustainable business." Why?

ALAN – Well, on the one hand, in a practical sense, the resources that they depend on are finite—if you think about the mining of the rarer minerals and metals that go into ICTs. Maybe we will develop something that replaces those, but I think that's an uncertain future. On the other hand, it's based on a profit-driven model—it's about getting more consumers and shortening the lifecycle of technology. The finite resources and consumerism don't go together. That's not a sustainable equation.

ANRIETTE – I don't think that ICT business is, in itself, more unsustainable than any other industry—than the motor vehicle industry, for example. I think it actually has the capacity to be far more sustainable. The lost opportunity has been that it has not pursued a path of sustainability, and that's a really huge lost opportunity. I think the Internet in particular started out with lots of people who, maybe quite naively, had a vision of the Internet being a force for good. But they don't take responsibility, and they're not forced to take responsibility. It's interesting to look at what Vint

Cerf said in his interview, that the unsustainable practice in the ICT industry comes from the edges, not from Internet companies like Google, but from, for example, manufacturers of hardware.

This illustrates in a sense how the ICT industry has developed in a way where it's not taking sufficient responsibility. Is the footprint of Facebook, which keeps millions of users online for hours, really less than that of a notebook manufacturer? We need more awareness and change at broad ICT industry level and this will take time, and contestation. You can compare it with mining. No one who's into making money out of mining starts off being interested in sustainability or social change or doing things in a different way. But the extractive industries have been put under increased pressure—at national level through communities that are directly impacted, in home countries where there's more focus on environmental standards. And the overall effect of the extractive industries is less harmful now than it was 20 years ago. I don't see any real such movement in the ICT sector. The potential is there to use more renewable energy, to use different materials, to have equipment last for longer periods, but this is not likely to happen without widespread regulatory intervention and consumer activism.

## The Global e-Sustainability Initiative and others have argued that ICTs will achieve major reductions in greenhouse gas emissions. Do you buy that?

ALAN – Well, that's not new. The World Wildlife Fund's been saying something to that effect for a while now. Of course there are going to be lots of areas where that will be the case. But the thing is, how do you calculate it? I don't have faith in the calculations.

ANRIETTE – I don't either. There's no consistency. So you have that potential for reduction in greenhouse gas emissions on the one hand; and then, on the other, you have large numbers of cheap mobile phones of poor quality that don't last very long flooding African markets. The ICT for development sector tends to see this as a "solution" and without considering the harmful impacts of the resulting explosion in e-waste. So I would agree with Alan. It will take much more than is happening now to put an end-to-end approach, making ICTs more sustainable, in place. The potential's there but I don't see either industry or governments moving in that direction. It will only change when imperatives on profit force the ICT industry to change. And that's a trend in all industries—so maybe yes, maybe in 20 years' time the cost of energy, the cost of waste processing and so on will force them to change their practices.

## Can we go on from that to rights and governance? What effect do you think ICTs have had on human rights?

ANRIETTE – They have increased awareness of human rights and human rights violations. I think ICTs are a huge enabler of certain types of human rights—particularly rights to freedom of expression and opinion, and freedom of association, and also of rights to culture and access to culture. On the other hand, maybe—I think this is what Alan was saying—they enable voice but they don't necessarily enable social change or social justice on a sustainable level. For ICTs to create all this awareness and to be an enabler of rights in the long term you need institutional capacity: you need changes in governance, you need rule of law, you need mechanisms that will deal with violations, and you also need a rights culture. One of the points Alan was making was that having so much expression doesn't necessarily build a rights culture.

I remain optimistic. I think ICT has had a positive effect on rights and can continue to have a positive effect on realizing rights. But not on its own. The capacity to speak comes with the capacity to be heard and to be censored, and to be

imprisoned, as well as the capacity to be listened to and for governments to make change. You need changes at other levels as well. You need an ecosystem, as in so many other aspects of work on sustainable development. Just having ICTs play a catalytic role is not enough.

### What about the impact of the Information Society on governance?

ALAN – This is much more Anriette's terrain than mine, but my gut feeling is that there was something of a peak when it had a positive impact but now it's declining in some way, that it's now not necessarily being taken that seriously as a mechanism to promote good governance.

ANRIETTE – ICTs make everything very immediate, including negative actions on the part of governments, and governments' incapacity and corruption. This is very challenging. Dealing with being watched and having your mistakes exposed all the time, as an institution, is extremely difficult—governments don't like this. One of the big challenges in poor governance is political will, but lack of capacity and lack of resources are also major contributors. ICTs challenge governments enormously. There was a very short-term approach to this—an approach to ICTs that saw it as a means of fast-tracking progress from inefficient or poor governance to good governance—and that has not turned out to be true. In fact, I think the contrary: rather than the ICT revolution making it easier for governments that lack capacity and the political will to become better, I think it makes it harder for them to become better.

The positive effect is that citizens are more empowered, but I'm not sure that governments are more empowered. For a government to be a good government and do its job well, it does need to be empowered. It also needs legitimacy. The sad thing is that so many governments are responding to ICTs and the challenge that ICTs pose by trying to become more authoritarian rather than by becoming more legitimate.

### How do you see that evolving?

ANRIETTE – I think institutional capacity is absolutely critical. Political will is also absolutely critical. A government must want to be a good government, one that makes policy and implements policy and regulation in the interest of the public, with a particular focus on those who are excluded in its society. Once that is in place, I think they can cope. Governments also need more human capacity development.

But what will happen with governance will be a consequence of institutional capacity development at *all* levels of society, because the stronger other institutions (civil society, the media, institutions of learning and culture, and so on) are at a national level, the more likely you are to have a stronger public sector. Investments in education and in political and social development that integrate ICTs can make a difference. It will be different in different countries, and the consequences will be very uneven.

### Going back to something you were talking about earlier, the responsibility of governments to act as public interest regulators in the information and communications sector. That's consistent with quite a lot of past thinking about the role of governments, particularly in democratic societies. Isn't it also at odds with some of the philosophy that's been around within the Internet, of minimizing the role of government?

ANRIETTE – It's completely at odds with that philosophy. The Internet sector is such a private sector-driven terrain, and, you know, there's a bit of a frontier mentality to it as well. The ICT sector also has a kind of moral high ground, you know, thinking, "We're different from the big mining companies. We're different from other global industries. We're nice guys, we're not bad guys; we don't need to be regulated." The reason why you can't just glibly dismiss that attitude is because governments' track record in regulating telecommunications and ICTs hasn't been very good. If you look at other areas where you need to regulate for sustainable development, governments don't have a particularly good track record either, and so it becomes harder to argue in favour of them playing that regulatory role.

## But, if not them, who else?

ALAN – That's exactly the problem. In South Africa we tried to get a business-led e-waste management program together, and it's basically dissolved into nothing. It was meant to be business-led. But quite frankly, because of its cost implications, business will do superficial marketing in its response, primarily. I think there are places where you do need a strong government; it needs to be legislated.

ANRIETTE – I don't think there is an alternative to governments here. Maybe the only alternative way of looking at it is to do with how you get there, which is where the rights-based approach becomes a very useful one for us to think about. In the ICT sector we talk a lot about multistakeholderism or multistakeholder policy approaches. But there's also a discussion that emerged from human rights, a rights-based approach, which is also based on modes of dialogue and partnership, and inclusive policy and regulation. Whether you call it multistakeholder or inclusive or rights-based, having business involved in developing policy and regulation is important—but I don't think self-regulation is a sustainable alternative. It can play a very constructive role, but it is not enough.

## One last question. We've just had Rio+20, and the outcome document barely mentions information technology. In a year or so we'll be holding the 10-year review of the World Summit on the Information Society. Do you think there is enough dialogue between these two worlds, and do you have any suggestions about how to improve it?

ALAN – I personally don't think so. There's some work we've been doing, for instance, in the water management sector. There are people who've been in it for years, but don't think about ICTs as something separate from their work. They assume technology to be just a natural project decision choice and not something with its own agency in the way that the ICT-for-development sector does. I don't know if this is their shortcoming, or a challenge for the sustainability of the ICT-for-development sector itself. Perhaps ICTs are so mainstreamed in the everyday that the sector has to some extent lost its relevance to others—but there are bound to be lessons lost if that's the case. Despite groups like APC having links with environmental groups historically, there seem to be massive gaps between the work that the ICT-for-development sector does and work that environmentalists have been doing. I'm not even sure there is a co-awareness of each other's work.

ANRIETTE – I don't think that any conversation is really happening anywhere about sustainable development as an integrated approach. If you are talking about conversations between the ICT universe and the sustainable development universe, I would say, "I know who the ICT people are but who are the sustainable development people?"

I see the sustainable development sector or movement as completely fragmented. On the one hand, there is a focus on climate change, which is quite narrow and quite conservative—it's really just about dealing with what's already happened. Then you have the biodiversity people, you have the pollution and air quality people, and you have trade justice and poverty-eradication people. I don't really see sustainable development being talked about anywhere, not in an integrated sense.

I want to make one more point, which is to do with the Millennium Development Goals. I think that we went from the Earth Summit, a kind of holistic sustainable development approach, to one in which governments started acting on the MDG process, which is in many ways not a sustainable development approach. I'm not saying that it wasn't necessary to focus on those specific targets, but one shouldn't underestimate the effect that doing so has had on the discourse around development, and also the responses at national level, and on the engagement between civil society and government policy-makers. The MDG approach followed the path of dealing with symptoms and consequences of the absence of sustainable development, rather than on drivers for sustainable development. It's had quite a profound effect. When we talk about interaction between the ICT sector, ICTs for development, and justice and development, we should factor that into our analysis.

**Thank you very much.**

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IISDCOMMENTARY

# *ICTs, the Internet and Sustainability:*

## *An interview with Caroline Figuères*

The following is the record of an interview with Caroline Figuères, managing director of the International Institute for Communications and Development (IICD). The interview was conducted by David Souter, senior associate, IISD and managing director of *ict* Development Associates, in June 2012.

This interview is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

Caroline Figuères has been managing director of IICD—a Dutch-based, non-profit foundation specializing in ICT as a tool for sustainable development—since 2008. From 1999 to 2002 she worked with NEDECO, Netherlands Engineering Consultants, as marketing manager and water expert. In 2002 she became head of Urban Water and Sanitation at the UNESCO-IHE Institute for Water Education, where she was a member of the management team and involved in education and capacity-building programs for the water and environmental sectors, carrying out identification, formulation and need assessment missions in several countries.[1]

### IICD is principally concerned, as an NGO, with ICTs and development. How important do you consider ICTs to be in relation to other development instruments that are being used at present?

I would say ICTs are very important because they are overarching to all other kinds of development. ICT can be put in everywhere, not just because you have to do it, but because it's really helpful. It gives you the opportunity to really increase your impact, to reach out to more people.

ICT is different from other tools because it has an impact in all stages of development, whoever you are, wherever you are. In ICT there are three dimensions—you have the technology, you have the information and you have the communication. Everybody at the moment is talking about the technology. James Wolfensohn was saying recently that we should give mobile phones to women worldwide, suggesting that problems would be solved. That's not what it is about. What is important is what you can do or are allowed to do with your phone. If you

[1] Biography abstracted from http://www.iicd.org/about/organisation/biography-caroline-figueres

want to have development, you need technology, yes, but you also need the information which is spread thanks to the technology; and much more important still is the communication which is done with the technology, which is what is really going to create change. What is important is to enable the people to get connected and to use the technology to facilitate communication.

A second thing, which is probably more important, is that when you've started with ICT, you cannot get rid of it. It changes people's behaviour. People have found in many of our projects that the value they got out of the project through using ICT was higher than it would have been not using it. That is why ICT is very important in this process.

### Can you give a couple of examples of projects to illustrate the kind of work that IICD does with ICTs? Perhaps one from entrepreneurship and one from education.

In terms of entrepreneurship, let's take an example from Zambia. We have been supporting a professional training centre there for a few years, in the suburbs of Lusaka. This training centre was a traditional one. There were a lot of kids there with no parents because they had died from AIDS—young people who were a little bit out of the system, who did not have a background in traditional education. They learned in this training centre to become a carpenter or a mechanic, for example. We added to this a specific direction in the program which was concerned with ICTs—using spreadsheets, for example, and also operation and maintenance of ICTs. We also included ICTs in the education side. By the end the young people that were trained there had increased value on the [labour] market because of this use of ICT. It was putting them a step ahead of their colleagues because they had been exposed to it, they had used it, and they were much more aware of its potentiality. This program was seen as so successful that about 15 training centres are now being developed in that way.

Another example is in education. You can use ICTs in education in different ways. One example is the management of schools. In Burkina Faso there are many students that have the same name. It is very important to have a good database in which you can differentiate them. That's a very small practical thing, in which the use of ICT is very important. You can really make a big difference in education by enabling access to educational materials from other sources, and translating them to a local context—and, when I say translating, it's not just the language that I mean, but adapting material to local contexts. We have also many experiences with using ICTs to design part of the educational program with the teachers. This is something which is quite innovative, even compared to what is happening in Europe.

### In your annual report, IICD refers to ICTs for development as "the appropriate and sustainable use of information, communication and supporting technologies." What do you mean by "sustainable"?

In IICD, sustainability has two dimensions. The first is really linked to the use of ICT as a tool. With the projects that we do, the intention is that within three or four years they are embedded in the [partner] organizations in such a way that they do not need any financial support from IICD to continue by themselves. After two or three years they [the project partners] should be able to run it by themselves: to pay for the operation of the system that has been put in place, the connectivity, the training of the people that are using the system. That is one dimension of sustainability, which is very practical and linked to our projects.

The other dimension, on a bigger scale, is the value of ICT in promoting a greener economy, in which people are dealing with the world in a way which is not just about economic outcomes but also takes into account the environment.

At the moment what we do is mostly focused on the first dimension. The second one is something we try to do but we are a very small player. However, if we have to choose between two projects, for example in the agriculture sector, our intention would be more to support organic farmers, and small farmers, rather than agriculture that uses a lot of pesticides and so on.

### You talk about working with communities to enable them to make full use of ICTs in ways that are sustainable from their point of view—relatively short-term interventions which are supportive of their development needs. What constraints are preventing people from making full use of ICTs on their own initiative? Why is your intervention necessary?

We are in a world where technology is seen as the solution of everything. People think that by putting computers somewhere, or cellphones, or whatever, then people will just use them and do it. But technology- and innovation-driven activities are not so successful. This is one of the reasons the One Laptop Per Child initiative was not really successful, as it focused on the children and not the teacher. Education is about inspiring children to learn. What makes added value in the process is that we support the beneficiaries, the people that are supposed to use the devices, to really make the best of it. Capacity building is very important—the training component and coaching on the job—so that people are using the ICT and can adapt it to the job they have to do.

### The work you do is, by and large, made up of small-scale interventions. How do you relate that to some of the schemes for large-scale infrastructure investment that are at the heart of many international discussions on ICTs for development? Can you reach people effectively without large-scale investment?

If you want to see the same changes to people in developing countries as to people in the West, then it's important that the infrastructure is there. So broadband is indeed needed. But it's not equally available within countries. The digital divide was between the North and the South, and now the digital gap is more between the urban area and the rural area in developing countries. You really need to have infrastructure in place, but you also need to have the social culture around it to ensure that it can be used in the most efficient way. That's the reason that when we go into a rural area, we often use the radio or cellphone rather than waiting for the Internet.

### What would you mean by an Information Society, and do you see any negatives in it from a development perspective?

There is nothing wrong with an Information Society, because then people can find information wherever they are, whenever they want. This is a very good thing. The question is more, "How can you make sense of the information that you receive?" That is the reason why, when you are doing ICT for education projects, you need to focus more on the teacher than on the children, because the teacher will help the children to make use of the information, to research information and to make knowledge out of information. So, an Information Society, yes, that is good; but we need to enable everybody to make sense of the overload of information, to make knowledge out of it, to turn data and information into knowledge.

### Let's turn to the bigger picture of sustainability, which is under discussion at the Earth Summit in Rio. How influential do you think the ideas of sustainable development have been on the way in which IICD and other development NGOs that are concerned with ICTs think about things?

ICT is part of the problem, and also part of the solution for sustainability. If you want to use computers and other ICTs, you need electricity, and at the moment in many countries there is a problem of electricity. You are also creating e-waste if you are not addressing the disposal of ICTs in a good way. It is important to take this into account in projects. If you are making use of computers, then you should take care to ensure that there is not going to be a negative impact on the environment at the end of the life cycle of those computers. If you are using computers, you should make sure that they are not adding to the energy problem that we have at the moment. And if you are looking for an energy solution for your activities, it's better to have a solar system than a diesel generator. Those are the kind of things we are trying to take into account in our projects, to ensure that the added value of ICT is not having a negative impact on the environment of the people. This is not easy but it is the direction we are moving in. About other organizations, to be honest, I don't know.

### Do you have a formal process for thinking that through within your project design?

Partly. We have in our procedures that, when we are supporting our partners to search for equipment and so on, we take into account the need for low-cost energy, for example. We have a couple of initiatives where we try to promote the recycling of computers and reduce e-waste. It's not something which is very structured within the organization, but it is in process. We are now starting a couple of initiatives, and when we have learnt from them, we can put it in our standard procedures.

### Have you been following the Earth Summit debate?

To be very honest, from a distance. We wrote recommendations last October in a document called *ICT for a Greener Economy* and submitted this to the Dutch platform for Rio+20. We gave these recommendations to our minister of development cooperation. That's our involvement, because we have no time to be there.

### Can you summarize what you were saying in that document?

We have 10 different recommendations based on our experience. Half of the recommendations focus on sustainable agriculture, and the remainder on the ICT component.

If I start with the ICT component, the first one is to secure optimal technical use of ICTs, making sure that people are making the best of the infrastructure that's in use, and using the most suitable technology in their context. We are not pushing computers where you can do what you want with a radio, for example. The second one is to limit energy usage, and to be sure that you are not contributing to the additional use of energy. The third is to include affordability of ICTs in rural areas. It is very important that the cost of the device and the solution you are bringing are not too much for the local population, so we are trying to find innovative ways of helping affordability. The fourth one is tackling e-waste. Those are the four main recommendations focused on the ICT component.

The other recommendations focus on ICTs for a green economy. The first is to use ICTs to introduce and enhance sustainable agricultural practice. We try to help farmers' organizations to make sense of the information that they get from suppliers in order to support ecological and organic production, and to encourage sales on the local market, not just on the international market, in order to reduce transport costs, etc. The second recommendation is to use ICT to accelerate economic development, while conserving the environment and maintaining biodiversity. We have some activities that are concerned with ecological tourism. The third recommendation is linked to the role of ICTs in transforming the attitudes and the values of citizens and consumers, encouraging people to buy green products. We also urge support for smallholder farms.

The last two recommendations are about how important it is to learn from local knowledge and the local context, and to make sure that there is not a gap between what is working in the field and what the government is doing at the policy level.

### There are very few references to ICTs in the final statement from the Earth Summit. What do you think about this?

This is what you find everywhere—a lot of discussion of ICT, but very often people mean only the technology. They are saying you need more computers, more cellphones, more cables, more broadband. They are just thinking in terms of technologies. This is good, but it is not enough. It was the same thing last year at the G-8. This is the reason we made these recommendations, to try to move the discussion beyond the technology, to how to use the technology, and what you can get out of the technology.

### Many people see a contest between economic and environmental outcomes. How do you react to that? Can we have both economic prosperity and environmental protection?

My position is that, if we continue to do what we have done, we will continue to get what we got, and that means we're not going to solve any issues in terms of climate change or whatever. We really need to have a change in our way of doing business, to do it in a more sustainable way. That means that we have to move to another kind of development process. There are European countries that are moving in that direction, making use of clean energy, using solar power, etc. My dream is that there can be a leap in development by going to a new development model which really takes sustainability into account.

If we support small farmers in Africa, I think it could be this leap. The traditional way of doing things would be that these farmers are going to grow big, to use pesticides, to use modified seeds and whatever, but this is not working and it is not aligned with sustainable development. If we support them in such a way that they can sell their produce on the local market and in the international market at higher prices, then we will get the sustainable world that we want. We need to promote this more: the idea that you don't have to do agriculture as it has been done in Europe in the last hundred years, that you can go directly to something that is sustainable.

### Do you think that business is moving in the direction of sustainability?

If you look at big companies, they are out to sell more of their products, and that's fine. There is a movement by some big organizations which are reviewing their approach, not doing just corporate social responsibility but having sustainability as a core of the business. That is a good development, but I am not sure that we have this yet with IT companies. I don't want to be negative. Maybe there are some companies that are doing it, but I have not seen it. If we get some of these IT companies to realize that laying down cables and whatever could be done in a different way, making sure that it is going to be used in a very effective and efficient way, then we will be in a much better position with the sustainability of this planet. And we would be delighted to contribute—to show how the technology and capacity building around the best use of the technology can make an impact.

### Thank you very much.

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IISDCOMMENTARY

# *ICTs, the Internet and Sustainability:*

## *An interview with Ashok Khosla*

The following is the record of an interview with Ashok Khosla, president of the International Union for the Conservation of Nature (IUCN) and one of the world's leading experts on the environment and sustainable development. The interview was conducted by David Souter, senior associate, IISD and managing director of *ict* Development Associates, in June 2012.

This interview is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

Ashok Khosla is founding director of the Indian government's Office of Environmental Planning and Co-Ordination, the first such agency in a developing country. In 1976 he was appointed director of the United Nations Environment Programme (UNEP), where he designed and launched Infoterra, the global environmental information exchange. He left the UNEP in 1982 to found Development Alternatives, a Delhi-based non-governmental organization devoted to promoting commercially viable, environmentally friendly technologies. Dr. Khosla has been president of the IUCN since 2008.[1]

### What would you say have been the main successes and failures of sustainability over the 20 years since the first Earth Summit?

In a sense, this is actually the 40th anniversary of the first major event in the field of environment, the United Nations Conference on Human Environment, in Stockholm in 1972. The only two real outcomes of Stockholm, apart from the principles agreed there, were GEMS—the Global Environmental Monitoring System—and Infoterra, which was called IRS at the time, the International Referral System for Environmental Information. So the idea that information is critical in improving our ability to manage both environment and development goes back all the way to Stockholm. I spent the seven or eight years after that first helping design and then founding and heading the Infoterra system—which was in direct response to governments saying that they were not bad people, they just didn't know and needed better information.

[1] Biography abstracted from http://www.devalt.org/dr-Ashok-khosla.aspx and http://www.principalvoices.com/voices/ashok-khosla-bio.html

So it is not a recent phenomenon, the nexus between information and sustainability. It dates back to the beginning. The question you're asking is really about what has happened from Stockholm, through Stockholm+10 in Nairobi and then Stockholm+20, which was the first Earth Summit held in Rio de Janeiro, and then Johannesburg 10 years later, to today—another decade later in Rio once again. All these progressions have not really led to deeper commitment to action. They've led to more widespread understanding and commitment to raising the issues on the international agenda. No other subject has had so many summits. But they haven't led to action on the ground very much, or to commitments of financial and other resources in the way one would have hoped. Apart from a few products that deal with issues that are really technical, like the Montreal Protocol, very little that involves multisectoral action on a multilateral level has made much progress, and in some cases things have gone backwards over the 40 years.

It is pretty clear that the outcomes of the original Earth Summit in Rio in 1992—such as Agenda 21 and the conventions on climate change, biodiversity and desertification—were very carefully negotiated documents. There was a commitment embedded in each of them, generated through two or three hard years of preparatory work, which led to outstanding documented agreements—and yet the world seems to be deteriorating in many of these areas. So I can't really truly say that we've been successful. That doesn't mean that we don't have a future—or that the world's coming to an end—although if we continue on the path we are on, we could well be headed for a life that is, as the philosopher said, "solitary, poor, nasty, brutish and short."

I would say things have deteriorated on many fronts. First of all, there's the incidence of poverty in the world. Poverty, hunger, deprivation, marginalization of people, disempowerment: these are all things that are, in absolute numbers, actually worse today than they were at the time of Rio 1992. Of course, economists and politicians like to look at percentages, and we may be holding steady or maybe even improving in some areas in terms of percentages. But that's ridiculous. People are not just statistics: they are individuals with their own aspirations and expectations of a good life. When we talk about halving the percentage of hungry people in the world, we have to remember that the population has almost doubled in the 25 years stipulated in the Millennium Development Goals (MDGs) from 1990 to 2015. So, if you are going to halve the percentage, and the total number has doubled, that means you are leaving the number of persons afflicted more or less where it was. And that is what the MDGs do. The MDGs are important because for the first time, they express the intent of the global community to set time-bound targets to deal with fundamental issues of sustainable development. But while some people go around the world saying they are "bold and ambitious," they would seem to me to be somewhat meaningless even if they were to be fulfilled—which most of them will not be. What is bold or ambitious about having nearly 1 billion people in the world without clean drinking water within a mile of their homes? It's nonsense to have a world that annually turns over 60 or 70 trillion dollars where 1.8 billion people continue to be without access to a toilet.

Things are getting worse on almost all fronts. On environmental issues, what is really frightening is that many of the things that we're talking about in Rio+20 didn't even exist in anybody's mind in the original Rio. There are such big surprises coming up every year. Ocean acidification, the collapse of fisheries, the disappearance of corals—nobody thought about these things in 1992. A decade earlier, maybe climate change was a little bit on the radar screen, maybe biodiversity was beginning to be—but now we find that we are in the sixth mass extinction, losing species at a rate not seen since the demise of the dinosaurs. And not much that governments or corporations are doing is really directed to dealing with these issues, even superficially, let alone systemically. The problem is that, when we meet again in 20 years at Rio+20+20, we'll be discussing things that are not even on the agenda now. And the problems of today will be intensifying and getting worse if we don't do something urgently.

So the answer to your question is really complex. It's not that recognition hasn't been given to the issues, but the fact that nobody seems to be willing to do anything about them. There are countries in the Middle East and Europe that are using 10 times as many resources as their resource base produces sustainably. The time horizons we have for our decisions are far too short to foresee the problems they will create. The conceptions and understandings of the situations that we face are compartmentalized into silos that make it virtually impossible for all the expertise needed to come together, so it is impossible to come up with systemic solutions. Almost every crisis we're facing, including the financial mess the world is in, is deeply interrelated—and it's going to get worse. It's a big problem.

### Thanks for putting it so comprehensively. If I might summarize: 20 years in which not a lot has been achieved, but a lot has happened that has made things substantially worse. Is there anything about this that is specific to or different in your own region of South Asia?

South Asia, like every other region, is a complex area. Let me say that in my opinion there are two South Asias. The South Asia that consists of India, Pakistan, Bangladesh, Sri Lanka, Afghanistan, Nepal and maybe Burma/Myanmar as it opens up: that is one group, one side of South Asia, that is really trying to become "modern"—as defined by the global North. They are trying, basically, to catch up with America. They are pursuing a mirage aspiration, that everyone can extract and consume resources more or less like Japan, and now China, are doing. It's all part of the competitive mythology of neo-liberalism. We are going towards hell in a handbasket, on the basis that we have a right to because other people did it.

That is one part of South Asia. But then there is another part of South Asia, which happens to be rather small—only three quarters of a million people—and that's Bhutan, which has rejected this notion. It says, "We don't want any part of this; we want a totally different concept of what is a good life and we're going to pursue it in our own way." And although this landlocked nation may be very small, in my opinion, they count for almost as much as the rest in terms of evolving solutions that might work for the future of all. I think they feel they would like to achieve a better life and a modern world, and that there are options available using good technologies, including information technologies, that can help them to achieve their goals. They have a pretty pure Buddhist attitude that creating more physical and financial wealth is not the only way to measure a good life. There are other factors that go towards the ultimate purpose, which is to make people—oneself and the people around one—happy.

"Sophisticated" people may laugh. Yesterday I was interviewed by somebody who asked, "How do you measure happiness?" Well, frankly, one should ask, how do you measure GDP? And when you do measure it, leaving out virtually all the domestic work of women, the services provided by ecosystems and the benefits of community and social capital, what is so great about the concept of GDP? The Bhutanese have done a lot of very good work in defining and quantifying how you measure happiness. Some in the West are working on these issues too. The science is only at the beginning, but I think it's profoundly important. You can certainly critique it, but that's not the issue. The issue is that they're heading towards an analytical framework that is probably comparable to what GDP looked like 20 years after Kuznets proposed it. It's not something to be ashamed of, the place they've reached.

So, if you ask me about South Asia, I say there are two South Asias. There are 1.6 billion or so people pursuing a chimerical dream of becoming rich and affluent in the way that people in North America and Japan are. And there's one group of about three quarters of a million who've said, "No, we're not going this route, we've a whole new world that we've got to create and we're going to set an example." With the exception of this little spark of hope in the mountains, I don't really see a very good future for South Asia. It would be difficult to claim that my own country, India, is heading

in the right direction. Its policies are built on a model based on neoclassical economics that has no long-term meaning whatsoever in a finite world, pursuing a dream of making a few people extremely rich, and a very large number of people very miserable.

## How would you relate technological innovation to a sustainability agenda?

If there is a future, it is in innovation. As proof of my conviction of this truth, the business model of my own organization, Development Alternatives, which was set up 30 years ago and was the first social enterprise in the world aimed at sustainable development, is based on the primacy of innovation, both in technologies and institutions. We are the biggest R&D organization in the Third World dealing with rural technology. And we have numerous innovations in designing effective organizations for innovation, delivery and policy influence.

But innovation has to be geared to the needs of the people—not just for the few that are rich, but for everybody. There must be today some one and a half to two billion women in this world who cook on stoves that have zero innovation in them. They are wasting fuel, creating indoor air pollution, dying of lung disease and cancer, and nobody has put more than a few pennies into improving the cookstove. We need innovation for health, for education, for well-being, for cooking, for mobility. We need huge amounts of innovation, but the kind of innovation that's needed doesn't get you Nobel prizes. It's not mainstream in the sense that's been defined by universities like Cambridge and Harvard and, frankly, it has nothing to do with improving the lives of half the population of the world.

I believe that there are a few high-tech innovations, like the cellphone and the Internet, that have really made a difference for the people of the world, but these are very, very few. The innovations that are needed are those that improve people's health, create means of livelihood and provide cooking and lighting. Raising crops without poisoning the land. Building homes that need less material and energy. This is real innovation. But what do you get instead? You get GMOs, you get chemical- and energy-intensive agriculture—anything that will make more money for a few corporations. That's not living innovation, that's killing the earth.

## You mentioned the cellphone as an exception to the non-inclusive nature of most technological innovation. The 20 years since the first Earth Summit have seen a huge change in the nature of information and communications. How would you describe that?

There are different kinds of innovation. Innovation that leads to higher productivity, that improves efficiency, that reduces entropy: that's good innovation. Innovation that creates more burdens on nature, that destroys the links between people and society, or people and nature: that's bad innovation. Innovation that creates things like the Internet, or leads to better information processing or data handling, or improves the relationship that people have with society or with Mother Nature—this is positive. Every innovation carries with it certain advantages, certain benefits, and also carries with it certain liabilities and negative impacts.

With all its good points, the cellphone is still not a purely benign innovation. Its net impact is probably highly positive, but it has goods and bads associated with it. It's a technology that poisons the environment, for example. It uses rare earths and scarce minerals, in the mining and processing of which people's health is impacted. But by and large it has liberated people. It has created employment and opportunities for people to have more fulfilling lives, whether it's a tool for entertainment, for leisure, for interaction or for work. I can think of no technology in the recent past that has had such a huge impact even on very poor people, for example creating opportunities for them to find markets for their skills and products and services. Even a carpenter, even a farmer, can now benefit hugely from being able to interact through a mobile phone.

There are goods and bads with any innovation. Nobody should deny that innovation has made this world a much more interesting and fulfilling place than it was. But, except for these few information-related technologies, its benefits have been largely appropriated by a very few people and have not done much for the many.

### In your own organization in India, you've extensive experience of using information technology for development purposes, for development that reaches the people as a whole. How would you see that experience evolving? Do ICTs have transformational potential in the sense of changing the way in which society works?

Yes, absolutely. In Development Alternatives we do use information technology a great deal. I kick myself for not having been the inventor of the cellphone. It is the most appropriate technology that I can think of, and if only we in Development Alternatives had not got stuck on things like mud houses and cookstoves for the very poorest, we might have even anticipated its impact. But the impact has really exploded without people having predicted it. It was a technology, originally, that only a very few people—CEOs, government officials, film stars—could afford. Innovation inexorably managed to bring it within reach of virtually everyone, including the very poor.

That does not happen with many innovations. We have a few technologies—television, cellphones, the Internet—that actually scaled up in this way, partly because of economies of scale, partly because scaling up feeds on itself, as expressed in Metcalfe's law.[2] But a few good technologies like that doesn't mean that all technologies have been great. For example, even the Internet has its downsides. Ultra-high-speed connectivity also enables high frequency trading, which in turn enables several trillion dollars a day to slosh around the world in nonsense transactions. These transactions have nothing to do with the real economy, and they are one of the things that has brought the world economy to its knees. So it has its costs too.

I would say that information technology has been truly transformational. It has changed people's behaviour, their relationships, the family, the community, the political system, the ability to elect people, the ability to get rid of people from positions of power, to be able to monitor their doings. And of course, all the things it is well known for—trade, transactions, banking and all the other aspects of modern commerce and business—these have all been made possible by information technology.

### Does that imply that we need to rethink sustainability as it was understood 20 or 25 years ago?

Perhaps, but not very deeply. Sustainability is sustainability whether you have good technology or not, whether you have good information or not. Sustainability is more or less a given. You can fine-tune it a little here and redefine it a bit there. You can say that sustainable use of natural resources—let's say sustainable fishing—may be possible if information technology gives you a better idea of what is happening to fish populations. But the idea that we need to sustain our fisheries is still exactly what it was. Your objectives have not changed, but your strategies for getting to them may well be radically changed by the use of information technology. The overall objectives of living within the world's means, of ensuring that the limits of the resource base are not transgressed, those are not changed at all.

[2] Metcalfe's Law asserts that the value of a telecommunications network is proportional to the square of the number of users that are connected to it.

**Can I take you to governance, and again come back to Asia? Both India and China have put a great deal of emphasis on the information technology sector—in China's case in terms of manufacturing, in India's in terms of services. What is your view of how governments in those countries have addressed the opportunities that they've seen there? Have the ways in which they've done so helped, or hindered, a sustainability agenda?**

The Chinese policy-makers were proactive in enabling the hardware sector to flourish by making investments, opening doors, changing laws to attract capital and technology and open up new markets. That, of course, has an impact on sustainability because hardware takes up a great deal of limited resources. I don't think they really looked at sustainability in terms of physical resource limitations, but primarily in terms of the financial implications. The Indian government, I don't think, has given any thought to it at all.

The interesting part of this is that services have a huge impact on resource use as well, not much less than manufacturing. For example, Google and Wikipedia and Facebook have server farms so huge that they are using electrical power at rates comparable to those of a sizable city. The amount of scarce resources needed for the hard discs, processors and switching systems in server farms is phenomenal, not to mention the amount of steel and copper in their racks, cables and buildings. Another example: in 1995, less than 20 years ago, there wasn't a single cellphone in India—in fact, there were hardly any landlines. Today, the cellphone industry has grown so much that virtually everybody has a phone, and that means that virtually everybody has to be within sight of a tower, a base station. Now, within these two decades, the base stations in India have come from nowhere and are the second largest consumer of diesel in the whole country, second only to the Indian Railways. This sector has a huge impact on our oil imports, on the use of fossil fuels, on the emission of carbon dioxide. While we think the cellphone is a service, in fact the handsets, the switching systems and the base stations are huge consumers of energy and resources, including some that are toxic and some that are very scarce.

I believe that not enough thought was given to the implications of this. It could have been very easy to use the base towers, many of which are in remote areas—far away from the grid, with their own stand-alone diesel generators—to share some of that power with the local communities. We should look at how to get win-wins for the cellphone sector. These are extremely rich companies that want to cut costs—and you can cut them hugely, by factors of two or three in electricity bills, if you can improve their power generation, and that needs a little scaling up of the operations. Both the community and the operator can benefit from this, but such possibilities do not occur to a business. Companies have very narrow views; they don't see their job as supplying electricity to the community, which is deprived of power, lighting, whatever. This requires a proactive approach, a thinking-through approach, on the part of both corporations and governments. Such an approach would have led to cross-cutting decision making across different ministries—renewable energy, power and telecommunications—and fiscal or other incentives that would encourage such outcomes. This is not possible in any normal government, and in India it's even less so.

When you talk about transformation and policy, you're talking really about proactive policy, about how one can use the interests of the rich and the powerful—their perceived self-interest—to generate benefits for everyone else. Adam Smith cottoned on to this idea, but nobody has ever really worked it out in real life. It's got to be done. There's no invisible hand on its own; it's got to be designed into the business plan.

## How much attention is being paid to the relationship between ICTs and sustainability?

There are lots of people who are concerned about these issues. But this is a can of worms. One can spend a lot of money developing databases and knowledge systems, which nobody then uses. It happens all the time. It happened with Infoterra after a while. Infoterra was terrific; it worked for many years. We managed to bring in more than 130 countries as members—and there were only about 150 countries in the world at that time—into sharing information on the environment in the late '70s and early '80s. But with the advent of the Internet, it got left behind. And even when it was actively used, it wasn't used really for the purpose that we had in mind, which was better decision making. It was used for justifying political decisions that had already been made for particular interests or for political convenience. The art of governance is (and probably always has been) not to do things for rational reasons but finding seemingly rational justifications for doing things that have already been decided. And so databases for politicians, and economists unfortunately, are seen as useful only if they feed into their self-interest or pet theories. This is not going to change at Rio de Janeiro. Rio is not about governments doing the right thing; it's about governments trying to justify doing what they want to do and finding arguments that will be plausible to the wider public and the global community.

## Are there messages that should feed into the ICT process—for example, the 10-year review of the World Summit on the Information Society—from the Rio Summit?

There are a lot of people here in Rio. Every single one of them is intelligent, knows what the issues are, and knows that the world is in pretty serious trouble. They all come with antennae, and as everyone knows, there are two kinds of antenna: a transmission antenna and a receiving antenna. The strength of the receiving antenna is hugely diminished, and the strength of the transmission antenna is simply huge. So the ability for people to receive new information and process it and incorporate it into their thinking at an event like Rio is dwarfed by their ability to talk about their own viewpoint. It would be amazing if many people were to go away from Rio on the 23rd of June having fundamentally changed their minds. I've never really seen that happen. But if as a result of our discussions here we collectively change our course by five or ten degrees and manage to swerve off the road heading for the cliff, yes, things will possibly change. It may not in the long run be enough to save us from the cliff, because the cliff's pretty long and we may hit it at a slightly different and less dangerous point. Having said that, I don't think, basically, that the world's policy-makers, including those in companies and in civil society, are going to go back fundamentally changing their minds.

But, you know, the problem is that everything here in Rio is in tied up in packages that have labels: it's a North/South thing for population and consumption; it's an East/West or North/South or developing/developed thing for sovereignty, protectionism, and all the buzzwords that go with looking at these issues. People use the word "green" as a qualifier for "economy" in very different ways. Some people believe the green economy is a desirable thing, but costly, because it involves change from convenient and comfortable patterns that we have become accustomed to and therefore seem better than the alternative, which is change. So it's got to be sold as a moral thing and an ethical thing. For others like myself, what we need is a win-win situation. So, we don't talk about the green economy anymore: it's the "blue economy" or the "ultra-violet economy." We need a transparent system of governance for an economy that fully respects the earth. And the word "green" doesn't carry the same connotation for half the people of the world. "Green economy," for most Group of 77 people, carries the idea of another hegemonist neo-colonizing exercise. We're using jargon and labels that really don't carry the meaning that they intend to carry. So it's going to take a while and, frankly, the preparation for this conference wasn't adequate to make that transformation happen.

So, as I say, I'm not optimistic about people going away from Rio having changed their minds or coming to their desk on June 24th morning saying: "From now on, we're going to respect the earth and respect our fellow human beings." I don't think that's going to happen. But I think that our social, economic and political processes will take a step forward. The next time there are three or four catastrophes like Katrina or Deepwater Horizon, that will bring home that we can't go on as we are.

The implication for the information domain is that more information is almost always desirable, provided it is accessible, timely and digestible—by the lay public as much as by the scientists, by governments as well as the captains of industry, and by political leaders. We're not getting such information because a large part of the power people at the top have comes from keeping everybody else in the dark. Information technology is a democratizing force, and to that extent it's going to have as deep—and transformative—impact on political systems as on technological and social ones.

Thank you very much.

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## About IISD

The International Institute for Sustainable Development (IISD) contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change and energy, and management of natural and social capital, as well as the enabling role of communication technologies in these areas. We report on international negotiations and disseminate knowledge gained through collaborative projects, resulting in more rigorous research, capacity building in developing countries, better networks spanning the North and the South, and better global connections among researchers, practitioners, citizens and policy-makers.

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IISDCOMMENTARY

# *ICTs, the Internet and Sustainability:*

## *An Interview with Jay Naidoo*

The following is the record of an interview with Jay Naidoo, chair of the Global Alliance for Improved Nutrition and a member of the Broadband Commission for Digital Development. The interview was conducted by David Souter, senior associate, IISD and managing director of *ict* Development Associates, in June 2012.

This interview is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union (ITU) World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

Jay Naidoo was a prominent activist against apartheid in South Africa. He was the founding General Secretary of the Congress of South African Trade Unions (COSATU), one of the central pillars of the anti-apartheid struggle. He was elected to the first democratically elected Parliament in 1994 and served first as the Minister of Reconstruction and Development Programme in President Mandela's office before becoming Minister of Communications. He left formal politics in 1999 and co-founded an investment company while remaining engaged in the development sector. He served for a decade as Chairperson of the Development Bank of Southern Africa, a premier development finance institution that drives the delivery of infrastructure. He also became Chairperson of the Global Alliance for Improved Nutrition, a public–private partnership fighting world malnutrition, and serves on a number of international bodies including the Broadband Commission for Digital Development.

### You've just come back from Rio+20. Can you tell me how you feel about it? Was it a step forward or a missed opportunity?

It was a completely missed opportunity. I am convinced that we will never make a breakthrough if we continue engaging in a negotiations process without grassroots organizations connecting to the challenges that people face daily as a result of climate change: from lack of access to clean drinking water and energy to sanitation, food and nutrition security.

The Rio+20 negotiations process was dominated by those that are causing the climate crisis because they are powerfully organized. They represent the "dirty industries"—the extractive industries—and powerful political elites with vested interests. The voices of concerned governments, civil society, trade unions and the private sector in the green economy are being marginalized.

We need a completely new approach. A prerequisite is going back to where people are at the coal face and connecting the challenges they face to the way in which the global economy works.

### Can I take you to the big picture over the 25 years since the Brundtland Report? Would you say the adoption of sustainable development as an objective of the international community has made any difference to ordinary people's lives in Africa since then?

Nearly 60 years have passed since the world declared the end of war and the promise of an era of peace, prosperity and sustainable development for all. We have seen the accumulation of unprecedented global wealth but still billions are living in extreme poverty. We need to ask ourselves where we went wrong and what are the systemic structural causes that trap so many in such hardship and adversity.

The Brundtland Report 25 years ago took us forward and defined a conceptual framework for sustainable development that placed the symbiotic relationship of people and the environment at the centre. Out of that flowed a conviction that tackling poverty and inequality through an environmentally sustainable economic strategy was going to be the heart of sustainable development. It shaped the character and the outcome of the Earth Summit held in Rio in 1992.

This debate then morphed into a paradigm that economics driven by free markets on its own could lift people out of poverty. The fall of the Berlin Wall was a victory for democracy but opened the way for a unipolar world and a form of triumphant capitalism. The evidence today is contrary. An unfettered free-market system has created an economic crisis, a deep financial crisis that led to widespread speculation, caused spikes in the prices of staple foods, plunged hundreds of millions into poverty and hunger and jobless despair.

A new apartheid rises in the world dividing the global rich from an overwhelming majority of global poor. We face a perfect storm. We stand at the edge of the precipice, where we are plundering the Earth's resources far beyond its capability and sustainability—a completely unsustainable path of economic development that puts the very planet we live on at risk. This for me is our greatest challenge.

### In a recent article on the outcomes of Rio, you argued that there had been a failure of global leadership on sustainable development. You also lamented the absence of "people's voices" from the debate. I wonder if you could say something about how you think these two issues, which you obviously see as being linked, might be addressed, given the structures of international policy making and national policy making that we have. If there is a failure of global leadership, how do you get global leaders to take a more responsible approach?

I reflect on our freedom struggle in South Africa. 1976 was our Tahrir Square, when millions of my generation went into the streets to protest against apartheid. We were smashed by a brutal state. We went back to the drawing board and realized that unless we organized our people, we would not achieve fundamental change. We organized our communities around the "bread and butter" issues of high rents and transport costs, access to quality education and health, water, housing and the basic rights of our people.

We built the most powerful labour movement in Africa and one of the most militant in the world. What we realized was that freedom didn't stop when we won rights at the factory floor. Our membership recognized that rights we won there were inextricably linked to the struggle for political rights. It was that coalition of mass-based organizations that created the political stalemate that allowed iconic leaders like Nelson Mandela to pursue a negotiations strategy that created our political miracle.

It had taken us 18 years from 1976 to install South Africa's first democratically elected government with President Nelson Mandela at its helm. Our political miracle was the mobilization of billions of people across the world who took a stand against social injustice, racism and apartheid.

I see the same thing today. In the world there is an absence of global leadership that is inspiring, that can lead by example, which can present a view of the world we want, that is sustainable for our people and for the planet. Powerful and narrow economic and political elites dominate many of our governments.

I look at the solutions they present. They do not answer the economic, financial, food and ecological crises we face. Their solutions are based on a paradigm of consumption from the past which we know is unsustainable. The science shows us that it will lead to rises in global temperature of over two degrees. I've been to north of Kenya around Lake Turkana: I've seen one of the largest lakes drying up, the fish dying and people starving to death. I have seen the growing conflicts over the fast disappearing grazing lands. Wherever I go across Africa and Asia I see desperation of the poor, who hardly own a refrigerator but face the brunt of climate change.

I see the impact of flooding in Thailand, Pakistan and India. I am told by villagers how they now have to drill 10 times deeper for water from their boreholes. I see the rising household food insecurity in the growing slums that surround our cities, which are collapsing under the uncontrolled urban migration fleeing the poverty and hunger in the rural areas.

And yet the climate skeptics dominate the talks at a global level like we saw at the Rio+20 Summit. We need to bring in the legitimate leaders that come from the communities that are worst affected. We need to organize these communities so that their voices and their issues are heard. We need to build a political narrative around issues that the poor face. It is the issues of food, water and sanitation that lead to diarrhea and pneumonia, and kill millions of innocent children each year; it is the infectious diseases like HIV/AIDS and measles that drive infant mortality. The poor do not talk about greenhouse gases or carbon sequestration. Until civil society can connect the debates at a global level to where the bulk of the people live, we will be weak and fragmented and ineffectual at determining the big picture.

My conviction is that we need the poor to speak for themselves. And ICTs can help to give them voice.

### Is there a failure of civil society there as well? Are civil society's structures failing to bring the kind of people you are talking about into the centre of the debate?

I have sat in many conferences and workshops on sustainable development. A whole development industry has spawned a class of poverty consultants. Global development assistance has been packaged into projects. A new obsession with evidence-based funding has razed the "green shoots" —projects with promise—to conform to a narrow basket of indicators used to assess "best practice." They squash innovation and batter activists into a compliance nightmare that mainly satisfies bean counters in some distant foreign capital.

This has weakened and fragmented our struggle for social justice and human dignity. There is ferment in the world, as demonstrated in the Arab Spring that toppled the unassailable dictators of North Africa. Their cries have been echoed in the Occupy Movements and the growing momentum against corruption and the demand for the fundamental human right of access to quality education, health and food across the world. Civil society cannot claim any leadership role in these spontaneous outbursts of people's anger.

There are many civil society organizations and NGOs doing sterling work, but very much in silos. Institutional brand competition, often for funding, is distorting the mechanics of organizing our communities around the bread and butter issues they face.

We need to go back to the basics. Technology and the social media are important tools that can be harnessed to mobilize and organize our people but do not replace the painstaking work that needs to happen. We have to build the bargaining power of our people and bring grassroots voices into the forums where our future is being negotiated. That is the only way civil society leaders can have legitimacy.

## Can I shift the focus to the relationship between ICTs, the Internet and sustainability? Has the information revolution of the past 25 years contributed to sustainability?

I think it has. When I was Minister of Telecommunications in the Mandela cabinet I regarded ICTs as the basic need of all basic needs. Closing the digital divide is a revolutionary step towards delivering sustainable development. Our struggle against apartheid was a struggle for voice. Once people have voice, knowledge and information, they are able to make decisions that affect their lives at a very personal level. We can use communications technology to leapfrog stages of development.

In 1996, African Ministers of Telecommunication met and agreed to find African solutions to the African problem of connectivity. We were not convened by an international agency. Our starting point was: "Sub-Saharan Africa has fewer telephones than the city of New York or Tokyo." That was an indictment on us.

We identified the obstacles. How do we create an environment that attracts private sector investment because it was the private sector that was largely driving the growth of telecommunications globally? Telecommunications went beyond our geographical boundaries. We ensured that the spectrum was harmonized, that our laws and policies gave certainty and predictability to the potential investors we were talking to. We sought to set up independent regulators which would guarantee a level playing field between different operators and ensure universal obligations and would deliver services to rural areas and underserviced areas.

We worked systematically to prepare the ground for investment in Africa. We understood the need to facilitate cross-border operations, which needed the economy of scale.

Within South Africa we recognized that telecommunications would not be the spending priority of the new government, given the competing social needs around education, health and basic needs of our people. The requirement for modernizing the backbone and digitizing the infrastructure ran into billions of dollars, which meant that we had to crowd in the private sector.

But we made mistakes. One was not appreciating how quickly mobile technology would take off. I remember the first debate I had with the mobile operators in South Africa, when I said I wanted them to build base stations in the rural areas. They said to me, "But Minister, we have just started our operation. We cannot afford to go into the rural areas yet because we are still building up a business."

However the regulations on community obligations spurred R&D that produced the prepaid card, which was the game-changer in telecommunications. Suddenly individual customers across the income spectrum were able to budget and afford to have a mobile phone. It no longer just served the wealthy. The most modern technology had become accessible and the era of fixed line phones had become increasingly obsolete.

Economic opportunity and efficiency was enhanced and the mobile phone became an essential part of people's lives. If you go to townships today we see old containers that have been transformed into phone shops that offer not just digital uploads of airtime but a whole range of other electronic services. They became businesses. I could see the way that telecommunications was transforming the lives of people – giving them access to computers, technology, information, knowledge and livelihoods for the first time.

## Does it offer regulatory models for any other areas of sustainability, like climate change and so forth, or is it specific to the ICT sector?

The use of technology, and mobile technology in particular, is so wide-faceted in development today. Rwanda and other countries are using it to monitor administration of anti-retrovirals and getting information on people's resistance to treatment in real time. Ten per cent of the GDP of Kenya now circulates in the M-Pesa payment system that operates on a mobile platform. Women farmers can access markets to find out prices so that their bargaining power is boosted when they negotiate with the middlemen. Increasingly people are adapting the technology to their specific needs.

The inclusion of community obligations within the regulatory framework for ICTs nurtured many of these innovations; it is possible that similar approaches could be put in place to stimulate innovation around locally managed green technologies.

I am convinced that access to broadband is going to deepen democracy—and ensure greater accountability from leaders, whether they are in the corporate, government sector or the civil society sector. The more informed the people are, the more aware they are of their rights, and the more they can demand transparency and accountability of their leaders. I think that there is enormous anger rising in the world today—that of ordinary people who can barely feed themselves a plate of food, but who see the wealth of a small minority who flaunt their wealth.

I believe that for the first time in the history of humanity we have an opportunity for all of us to talk the same language. Young people are increasingly connecting with other young people around the world, to solve the crisis that my generation has caused.

## What you are describing is what many people would call the emergence of an Information Society. How important do you see that to the movement for sustainable development?

Young people have grown up with technology. Like my children, they don't need to read manuals anymore. They connect seamlessly. They understand each other. My generation has betrayed them. We have created an ecological crisis and an economic system driven by human greed that is unsustainable. One activist at the Peoples Summit in Rio asked me, "These people have been negotiating for 20 years. Have any of them changed?'"

Young people today need to define their bold vision, find their voice and discover that anything is possible if fearless leaders embrace the human values of respect, honesty, humility and service.

Technology can accelerate social and income inequality or it could be used to level the playing field. The Arab Spring demonstrated the positive spinoff. Technological innovation could be key in driving social inclusion.

**The outcome document from Rio+20 barely mentions information technology. Changes in information technology are probably the most substantial and dramatic changes in society over the last 20 years, yet they didn't seem to be discussed at Rio. Would that be fair?**

Industrialized nations have backtracked from the commitment made in Rio 20 years ago. Today we are talking about transfer of technology on a pricing model that is market-related. They are reversing obligations on development aid equivalent to 0.7 per cent of GDP. We need to take the negotiations about the sustainable development goals out of the hands of elites and the bureaucrats in the global development industry and bring organized voices of the poor, who experience the impact of climate change, to the table. Civil society voices are much more engaged in international debates like Rio than they were 30 years ago—but the process needs to be accelerated, widened and deepened. Clearly, ICTs can support these processes—most likely in ways that will be defined by people participating in them.

**There is also an environmental downside to the information revolution, which is that it is a growing source of greenhouse gas emissions and a major source of waste generation. Those are issues that need to be addressed, but whose responsibility is it to address them?**

The technology revolution contributed hugely to the consumption patterns we see in the world; that is the root of our climate crisis. It created an obscene scramble for gizmos that could make people millionaires overnight. Our human greed was the altar on which new idols of wealth were worshipped. When that toxic mix of advertising, derivatives and fund managers coalesced, the bubble had to burst, as it did in the financial bubble of 2009.

The technology is not a magic bullet. It does not replace organizing people, working on concrete initiatives and building our capacity to demand our rights. It has to be exploited to build the human resources and systems to deliver development. Many philanthropists fail to understand that politics is the greatest hurdle. The search for a vaccine for HIV/AIDS or malaria, for example, must go alongside strengthening the health care systems that are supposed to get that vaccine down to the village level.

The development equation succeeds when people feel that they are part of the decision making that led to the initiative being taken; success reflects the extent to which they own it and the extent to which they can benefit from it. When people are organized around their demands, then we'll be delivering sustainable development. Technology harnessed for development has the potential to leapfrog the poor in our global village into the 21st century, as we see with mobile phones.

But the ICT industry also exposes workers to hazardous substances and produces e-waste, especially in parts of South East Asia, where major corporations locate their companies in zones that are union- free and where labour conditions laid down by the International Labour Organisation are not observed.

The Brundtland Report placed an active citizenry at the core of sustainable development. We will win when we understand our human rights and are able through that lens to declare, "These are our rights as citizens of the world, and we need to hold our leaders accountable."

**Thank you very much.**

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The International Institute for Sustainable Development (IISD) contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change and energy, and management of natural and social capital, as well as the enabling role of communication technologies in these areas. We report on international negotiations and disseminate knowledge gained through collaborative projects, resulting in more rigorous research, capacity building in developing countries, better networks spanning the North and the South, and better global connections among researchers, practitioners, citizens and policy-makers.

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IISDCOMMENTARY

# *ICTs, the Internet and Sustainability:*

## *An interview with Luis Neves*

The following is the record of an interview with Luis Neves, chairman of the Global e-Sustainability Initiative (GeSI) and vice president, Corporate Social Responsibility, Deutsche Telekom. The interview was conducted by David Souter, senior associate, IISD and managing director of *ict* Development Associates, in July 2012.

This interview is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union (ITU) World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

In addition to his current affiliation with GeSI and Deutsche Telekom, Luis Neves has served as the deputy general secretary of Communications International and department head at Marconi, now Portugal Telecom. He was a permanent member of the Joint Committee on Telecommunications in the European Union and chaired diverse Work groups.[1]

### I'd like to start with a general question about corporate social responsibility [CSR]. As someone who works in that area with Deutsche Telekom, what are your priorities in CSR?

We take three dimensions of CSR into account in our activities—the social dimension, the environmental dimension and the economic dimension—that is, with our approach, we strive to bring value added to the company. Of course, that's not always possible. Most of the things we do are related to reputational risks and the reputation of the company, but we try as much as we can to drive our sustainability strategy, to show that there is really a benefit, a value, and we report on that.

We have been focusing activities around three main areas. One is what we call "Connected Life and Work," another is very much related to the digital divide, "Connect the Unconnected," and the third is a "Low Carbon Society." The first of these is focused on our own employees and customers. We try to show the benefit of ICT in providing a better working life balance through the use of ICT services and solutions and for these being a major driving force for sustainable life and work. The second is about using our products and technology to integrate people who

[1] Biography abstracted from http://www.itu.int/themes/climate/events/bios/neves.html

have been excluded from it into the Information Society. We want to set an example in the integration of people in the Information Society. And the third, a Low Carbon Society, is about showing the enabling impact of ICTs, using ICT to drive down greenhouse gas emissions and to create more sustainable living. We also try to improve our own environmental efficiency in all of our activities—from transportation to using videoconferencing, flexible working and so on. Through this, Deutsche Telekom wants to be a leading company on the road to a low carbon society.

### How widely shared is that approach within the ICT sector? Do some companies seek to fulfill those kinds of objectives while others drive down standards? Is there a collective view across the industry?

I would say yes, if you look at the most relevant companies, the biggest players. My experience, from exchanges with other companies or with my peer group within those companies, is that most of them are looking at it more or less in the same way as we do. What can vary sometimes is the focus. In our case we are focusing on these three main areas.

### Do you think governments should be using regulatory powers to make businesses more environmentally responsible?

I think there always needs to be a mix between what can be regulated and what companies can be left to do by themselves. I see a role for governments in providing a better, more appropriate framework to drive the enabling impact of ICTs. That is not happening today. Governments could put in place some more support through what I would call soft legislation. When governments put in place soft legislation or soft regulation, there is a clear benefit not only in growth creation but also job creation.

The ICT sector could show more how the ICT sector can not only drive down emissions but also create growth opportunities and job opportunities. That has been demonstrated in the different SMART studies that GeSI [the Global e-Sustainability Initiative] has been carrying out—not only the global study, but also national ones we did in Germany, the USA, Portugal and Spain.

We already see a trend towards governments regulating CSR in some critical areas. There is a recent initiative from the European Commission on CSR that will be finalized by 2014. That shows there is a political perception that some areas need to be regulated. Our technologies are becoming more pervasive. You see the potential of technology for both good and bad. There is clearly a need to put in place some mechanisms that make sure we do business in a sound and responsible manner, and therefore I can understand in some cases that governments are now pushing more on the regulatory side. From my perspective, that will help us to better drive our business because I do not see always at management level the perception that CSR is important. Boards of management are driven by fulfilling shareholders' interests and short-term profitability. Corporate social responsibility is about long-term and sustained profitability, which is treated as secondary.

### So is there a risk that shareholder interest can drive down standards?

Indeed I do see a risk there. Some shareholders are concerned about CSR. In our company we have big shareholders that require us to act responsibly and who value CSR. But, of course, as I said, for shareholders there is always a short-term objective, while sustainability is about long-term objectives. Let's say, our role in the company, the role of the CSR department, is to be a kind of missionary in explaining and convincing top management, but also employees and different leadership levels, that the long-term perspective better serves shareholders' interests.

## Can we turn to GeSI, the Global e-Sustainability Initiative, which you chair? Could you describe it—its origin and objectives, how it works, which parts of the industry are involved and what you think it has achieved so far?

GeSI has been working pretty well. I can look back six years, since I took over as chairman. We were then a small group of, I think, 12 companies, coming together twice or three times a year to exchange views on environmental issues—very much focused on the environment. Since then we have established ourselves in Brussels, in an office with staff. We are now 32 companies and we are engaged in the debate about the role of ICT—to be a transformational industry, to make the world more sustainable and also to contribute to welfare and growth. I think to some extent we have achieved that.

We are engaged in different critical areas. We started to work on our supply chain, because of the reputational risks derived from the fact that our industry moved to developing countries to produce there—to China, South America and many countries in Asia. We started to focus our activities on this, to address the challenges in our supply chains and in our first- and second-tier suppliers. From there we moved to other areas like energy efficiency and climate change, the extractives industry and raw materials, and the challenge that our products have a very short life cycle and we are to some extent damaging natural resources and creating huge environmental impacts. So we have been moving in that direction, trying to have a common perception and to find the right solutions to address the challenges.

That has been well perceived by companies that joined GeSI. We are now 32 multinationals but, most importantly, we also managed to establish alliances with important organizations like the ITU and UNEP, the World Business Council for Sustainable Development and the StEP Initiative [Solving the E-Waste Problem], as well as with Green Touch and ETSI [the European Telecommunications Standards Institute]. These organizations came to us to engage with us, so the overall perception was that what we were doing was relevant not only for the ICT Industry but for all industries. They are engaging with us in different activities. For example, last week we started the first e-waste academy in Ghana, where we are educating policy-makers to address the e-waste problem, which represents a major challenge nowadays.

## Looking at GeSI's membership list, the big Web 2.0 businesses are not included. Is there a reason for that?

I think the reason is mainly that GeSI was created by traditional telcos, former monopolies and vendors. Google is in discussions with us to join. The reason for that is that we have just engaged in a new area that has not yet been publicized. We are now part of the debate on privacy and freedom of expression. GeSI is well positioned for that because we are the only global industry organization that is concerned with both upstream and downstream issues. On the one side we have the supply chain challenges like working conditions and child labour issues, working time and so on. Then we have the extractives industry, which also poses quite a lot of social challenges to us and to our industry. On the downstream side, we have privacy, freedom of expression and Internet issues and so on.

So we are now involved in that area. I am part of the advisory group of the European Commission for the ICT sector, and we are involved in the discussion to provide guidelines on this by the beginning of next year. Inside GeSI, we are creating a multistakeholder group. We are bringing together different NGOs and politicians, investors, academia and the industry, to start our own internal debate about the challenges and to get into better shape the upcoming legislation in Europe. Through this open platform process we will be able to better understand the challenges ahead and what kind of mechanisms need to be put in place to respond to the human rights challenge.

**More generally, can you put in one or two sentences how GeSI sees the relationship between information technology and sustainable development?**

There is a strong relation. One aspect has to do with the enabling impact of ICT—the potential for ICT to generate huge efficiencies in almost every single sector. The other is related to virtualization of goods—the more you see ICT developing, the more you see how amazing it is for ICT to virtualize things that were material. I think this is a trend that will continue. We will see that ICT is unique in ensuring sustainable lifestyles in the near future.

**The SMART 2020 report was very influential. It emphasizes two dimensions of the relationship between ICTs and climate change—the negative impact of the spread of ICTs on greenhouse gas emissions; and the positive impact, which you've just mentioned, the potential of virtualization and smart systems to reduce emissions. There's a tendency among some people to try and trade those off one against the other. Do you think that's reasonable, or do you see them as separate challenges that need to be addressed in separate ways?**

I would put it this way. Everybody has an impact, a negative impact, on environment. We as human beings, we have our own footprint, our own negative impact—and we also can do good things, positive things. With industry, it is the same. There is no industry that does not have a negative impact, and there are industries that have a much bigger impact than others. But no one is out of the negative side of the impact on climate.

In the case of ICT, I think we are unique in the sense that there is no other industry that can help other industries so much to reduce their impact. Yes, we have our own negative impact, and we acknowledge as an industry that this impact will grow. The more we develop services and solutions, and with increasing traffic in our networks, there will be more energy consumption and therefore our carbon footprint will increase. But at the same time there is a positive side whereby, although we will increase our footprint, that increase is allowing others to reduce their footprint.

So we have a positive natural balance, which no other industry has. We have that potential, and I think we should use that potential. If we don't cooperate with other industries like the energy sector, the logistics sector or the building sector, the problem will be much bigger than we have today. We need to integrate the different energy sources, to make them "smart." We need to help the building sector get more synergies and implement monitoring systems. In the transportation sector, it's the same, we have a complementary role and we should use that complementary role. I think it's important to invest more in ICT, to put our efforts into ICT innovation, so that we can better help other industries to face their own challenges.

**Decisions about whether smart systems are used in other sectors aren't made in the ICT sector. They are made in those other industries—big utilities, energy companies, manufacturers and so forth. How easy are you finding it to get the message across to them that they should be implementing smart systems?**

It's a very good question and it's a very difficult one to answer. The problem is that every single industry has its own business models, which are designed to make the companies profitable. It's very difficult in dialogue with them to explain that there is a need to change business models and that there is a clear benefit to be achieved by doing that. We have not yet been able to show that to other industries, unfortunately. I think the reason lies in the fact that the changes that should take place also need to have political support and some regulatory support as well as the necessary sound and secure investment framework. That brings us back to an earlier question that you raised, that there is the need for

governments to understand the challenge that we are facing and, through the right incentives, to support the processes that should take place. The industries alone will not be able to do that in a very short time.

**Can we turn to the mitigation challenge facing the ICT sector? As the sector expands, so does its carbon footprint. Do you think the industry is doing enough to reduce that footprint? Are there things it should be doing that it's not doing?**

It's hard to say if more could be done. I can only speak on behalf of Deutsche Telekom, but we have been doing everything possible to keep down the footprint. We have been changing internal policies. We have been putting more emphasis on sustainability in our supply chain. We have been changing contracts. We now have a sustainability clause in our contracts whereby part of the decision on procurement is based on sustainability. We have been reducing our energy consumption. We are putting very strong targets on reducing carbon emissions.

If you look at most of the telcos and the major vendors, they are establishing very high targets for reducing emissions up to 2020. I can hardly see any other sector that has been doing so much. The question is always: can we do more? If I go to Brussels, Commissioner Reding, when she was ICT commissioner, and now the new commissioner, they always say "You can do more." But it's easier to say than to do.

**Is the motivation for that primarily reputational or is it also advantageous to the bottom line?**

I think the motivation is both. Of course we always like to speak about the things that we do and to promote them. We want to be a sustainable company. If we want to be sustainable and we want to make that public, then we need to put in place the right mechanisms to achieve that. We have been doing that in every single part of the company. I myself am now leading a climate change group in Deutsche Telekom. I have in my group every single part of the company that has an impact. Everyone has to give me the measures that they have in place. I can challenge all of them and say, "You are not doing enough, you need to do more." What we have now to resolve is the overall energy consumption of the company. We are using the energy mix in Germany, and what we are now discussing is how we can go 100 per cent renewable. That's not an easy one to resolve.

**Can I take one specific issue you mentioned earlier, which is the life cycle of devices? *Prima facie*, it would seem that if the life cycle of a device were three years, rather than two years, that would have a significant positive environmental impact—in terms of waste, certainly, and probably also in embedded carbon. Does the industry see it as desirable to reduce the rate of churn or increase the life cycle of devices? And can you say something about how that might be done?**

I think the question you raise is a very important one. We have been looking at it, of course. It's a very difficult one to address because, as a telecommunications company, we want people to use our network—to make phone calls and to be on the Internet, to transfer data and so on. For that to happen, people need devices and state-of-the-art devices, and they always like to have the most recent one. This is creating a huge environmental impact that we have not yet been able to address.

I think that we understand the dimension of the problem, but I'm not sure if we are ready to respond to the challenge that we have ahead of us. It's not possible, it is not sustainable, that we continue with the current business model. But I really do not see anyone looking at it carefully and thinking about what other ways we have to do things differently—how we can engage in a different dialogue with our supplier base, to make sure that they do not come up with a

new device every two or three months. I have not yet seen this dialogue take place. And this is a huge challenge; it is something that we need to think about very, very seriously. I do not have an answer.

What I try to do is to go to our suppliers and tell them, "Look, you need to change things, you need to think in a different way, you need to develop different business models with us." Companies like Samsung, Apple and so on, they always think about producing new gadgets, but I don't think that is the right way forward. I think we need to think about it differently. We need to engage in a dialogue with suppliers whereby they think differently if they want to continue to be successful.

### GeSI has developed a number of tools and methodologies for businesses to use to assess their impact on the environment and how they might reduce that impact. How much take-up have you had for those tools?

Actually, the tools that we have been developing have been used not only by the GeSI community, but have also been used by suppliers. For example, e-TASC [Electronics-Tool for Accountable Supply Chains], which is a tool for measuring sustainable performance of a company, has been broadly used in the ICT industry. It was developed in a quite neutral way whereby it could be used not just by the electronics sector but by other industries as well. The problem is always about the willingness of companies to engage in the sustainability debate, to be credible and to do what they say.

We have been promoting not only e-TASC but other tools. For example, we developed a tool to measure carbon, "the ICT enablement methodology." The tools are being used, but not as much as we were aiming at. It's really a pity because the tools that we have developed are free. No one pays for them; we just bring them to the market and anyone can use them. We never set any target in terms of how many thousands of companies should be using them, but the take-up of these tools has not been to the level that we were aiming at.

### Is enough attention paid to environmental impacts in standard-setting processes for ICT products and services?

I think so. On that, there has been a positive development. We have been looking more carefully to refine standards in a way whereby they would provide a better and a more credible basis to measure our impact. Look for instance at the development of Scope 3, the greenhouse gas protocol. With the World Business Council and the World Resources Institute we were part of that general debate, and we came to the conclusion that the standard that was developed was not really the one that we needed for the ICT industry. So we engaged last year together—with the Carbon Trust, with the World Business Council and the WRI [World Resources Institute]—in the development of an ICT standard that is also a Scope 3 standard addressing the challenges that we have in our industry.

We have been doing quite a lot of good work. I think more work can be done, but we will continue in that direction.

### I am interested in what you think about the third level or societal effects of information technology—the extent to which we are moving towards an Information Society in which there are substantial changes in production and consumption patterns, in the nature of human settlements and so forth. Does GeSI look ahead to that kind of long-term societal change as well as dealing with the more immediate direct and indirect effects of ICTs?

Indeed, we are looking at that as well. We started a debate two months ago about how we will be living in 2050—not just an internal debate but we invited some 60 or 70 different stakeholders globally. We looked at it from an ICT perspective, with the objective of understanding what kind of role we can play as an industry to make sure that by that time [2050] this planet will still exist and we will have a good place to live in. Recently in Brussels we organized a big roundtable with around 80 or 90 different stakeholders to continue that debate.

**If you read the outcome document from Rio+20, it says almost nothing about information technology. Do you think the sustainable development community has underestimated the significance of information technology on the way in which the world is developing?**

I think you are right. It is very difficult for any sector to position itself in the framework of those conferences. Those conferences and the agreements that are made there are done by different organizations with different objectives. Organizations such as the Business Action for Sustainable Development, which is a business initiative, are very much driven by heavy industries. Or take the European Round Table of Industrialists, which is probably the most powerful business organization. You have the major ICT companies there and the major telecommunications companies there, but you don't see anything coming out in the papers from that initiative, which is clearly ICT-relevant. Of course they have a different focus. They are more driven by lobbying and regulatory issues, which is of course also needed. But we are starting to do the dialogue process and I am sure ICT will come up in the future as one of the relevant sectors in the framework of those discussions.

**Thank you very much.**

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IISDCOMMENTARY

# *ICTs, the Internet and Sustainability:*

## *An interview with Nii Quaynor*

The following is the record of an interview with Nii Quaynor, who has played an important role in the introduction and development of the Internet throughout Africa and is currently Chairman of Ghana Dot Com LTD. The interview was conducted by David Souter, senior associate, IISD and managing director of *ict* Development Associates, in June 2012.

This interview is one in a series of papers being published by IISD's Global Connectivity team to inform and stimulate discussion and debate on the relationship between information and communication technologies (ICTs), the Internet and sustainability, surrounding the UN Conference on Sustainable Development in Rio de Janeiro in June 2012 (Rio+20), the UN Internet Governance Forum in Baku in November 2012 and the International Telecommunication Union World Conference on International Telecommunications in Dubai in December 2012 (WCIT-12).

Nii Quaynor established some of Africa's first Internet connections and was involved in setting up key organizations including the African Network Operators Group (AfNOG) and AfriNIC, the African Regional Internet Registry, of which he was founding chairman. From 2000 to 2003, he served as a director of ICANN (Internet Corporation for Assigned Names and Numbers) for the African region. He was previously an executive chairman at AfTLD (the Africa Top Level Domains Organization). He has served as chairman of the Ghanaian company Network Computer Systems, as chair of the National Information Technology Agency of Ghana, and as a member of the Multistakeholder Advisory Group of the Internet Governance Forum.[1]

### I'd like to start by taking you back 20 years or so, to when you played a critical role in introducing the Internet in Ghana. How important did you expect the Internet to be?

We knew that it was going to be important. That is why we sacrificed much of our livelihood to ensure that our people had some access to this new knowledge. It is why so many people took a not-for-profit approach to things, sharing their knowledge and coming together to educate themselves. We understood, at least those early folk who got exposed to it, that it was vital and that, if governments were not able to do it because they were absorbed in telecom regulation at the time, we had to do it from civil society or from the private sector.

[1] Biography abstracted from http://icannwiki.com/index.php/Nii_Quaynor and http://en.wikipedia.org/wiki/Nii_Quaynor.

### Has it exceeded the expectations that you and your colleagues had at the time? What have been the most dramatic differences between what you anticipated and what we have today?

The expectations could not have been precise. They were correct in that we knew the importance of the impact on education and other domains, but we could not have imagined the types of uses and applications that have evolved. We knew it would go in a certain direction, which is the direction of networking and sharing knowledge, but we could not have precisely imagined social networks and those sorts of things, or the impact in cybersecurity, for example.

### What do you think the government's role should be? Should the Internet be led by the private sector or should it be government-led in a country such as Ghana?

It needs to be both—and even civil society—because the challenge is much larger. I believe in the multistakeholder approach. That is a prerequisite for what I have done in Ghana and, for that matter, in Africa. If at the time I brought the Internet in to Ghana I had not been a university professor, and I had not been a regulator, on the board that assigned frequencies at the time, and therefore not regarded and accepted by these three different communities, it would have been impossible for me to introduce the Internet. It meant that policy-makers did not feel that I was going to create something that was ridiculous or did not make sense. So having those three attributes at the time, in the early '90s, we were able to do that. But I might say, as a corollary, when that trio breaks down, it destroys the Internet as well. That should be a lesson, in my opinion, to the discussions going on regarding the International Telecommunication Regulations [ITRs] at present.

### Some people in the Internet community see the ITRs as a threat to the Internet. How significant a challenge to the Internet, as it has been working, do you think that WCIT and ITR discussions represent?

I feel a significant risk, partly because I feel many things have not been understood by the newcomers. My biggest concern is about anything that closes the efforts to bring Africa to the world, whether it is through an ITR issue or through a security issue or anything else. I need to connect my research networks, I need to connect my technology parks, I need to connect my people. Other countries have been able to develop and deepen their Internet adoption with an open environment. Africa and similar developing countries deserve the same, not to find themselves in a situation where you use the open Internet to develop yours, then you are going to go to a closed environment. And if it is Africans who are pushing for that, I think they are confused, they do not understand, unfortunately. I need to be frank and say that.

### Can you compare the importance of the Internet in Africa with other major changes that have taken place on the continent in the last 10 or 15 years— say, democratization or the impact of oil?

It's difficult to say. Democratization is indeed occurring, in the sense that there's much freer flow of information. Our environment is bombarded with newspapers and websites and radio stations, media and their websites, which were not there before. So, since I believe that openness is an important part of the democracy, I see that it has taken hold. But we are yet to get critical mass. It's okay for an African to check his mail a couple of times a week. But you want it to reach a stage where he's able to check his mail daily, all the time, continuously. That level of intensity of use, of "real-time-ness" is not yet present. "Real-time-ness" means you must be able to respond in real time, whether it's by mail or by tweet or by this or by that. We are yet to get there.

### That's an example of what might define an Information Society, one in which information transfer is continuous. How far off do you see an Information Society in a country such as yours?

I guess it is coming. We are now getting close to 10 per cent Internet penetration. I suspect that when we start reaching the 20th and the 30th per cent, you get a large percentage of the users, especially the new ones, moving in that direction. So the Information Society is emerging, but it hasn't taken shape, it hasn't fully occurred. And the spread is not total. If you have 25 per cent market penetration, the chances are there will be some communities completely isolated. There will be large communities that are completely isolated if you have less than 10 per cent Internet penetration.

Of course, we are excited about mobile broadband, but some of us are also wary of it because it does not support development of the tool itself. I get to use it, but I don't get to add to it, at least not in terms of programming and so on. If you want to write a Java program for an Android, you need to go and get a PC. And the same way, if you want to write new software for iPhone or iPad, you've got to buy a Mac. We are viewing it like this. Let's not lose our communities. Bring them in quickly. But we have to be following up with much higher bandwidth investments as well.

### Whose responsibility do you see it being to bring about that investment?

Broadband is the responsibility of the three principal communities. Government has a role and the private sector has a role, and so does civil society. The private sector is principally responsible for getting investment and building the actual infrastructure. But when government sees that no one is going to an area, it should build the infrastructure. Government needs to build its own infrastructure. It has to be able to communicate with every district. It cannot say it depends on the provider to establish community access. That would mean the provider is determining our state of readiness or digital divide. The provider cannot do that, because the provider may be a foreign operator. So government has a responsibility of ensuring—whether it's through a provider, through a civil society organization, or by itself—that it's able to communicate with its people everywhere.

Of course, governments will create the right enabling environment, the right protections for private sector investments, and give the right level of incentives so businesses will think of long-term investment and build more and more infrastructure and so on and so forth. That's what they will do. At the same time, if they see that the underserved areas are being left out, and they want jobs for their people and so forth, then governments have to do something. That's how I see it.

### What impact do you think the Internet is having on traditional media in Ghana? In a country like the United Kingdom, traditional media have made great use of the Internet, but the Internet is also seen as undermining their long-term viability. What is happening in the different context of Ghana?

It's similar, but not yet at the same pace. I used to run a newspaper, so I'm quite familiar with that impact. In the olden days you published your paper, and people read it. But now media houses, radio and television stations, they have to tell what is the story in town. They go 'round and they buy the papers and they have a whole morning program discussing them. So nobody buys the paper because they will hear about it on the radio. The ecosystem is not the same as it was. The only real option is: don't try to gain revenue from print, but try to gain revenue from your online presence and so on, from advertising and promotion. What was negative I'm beginning to see as an opportunity.

### What about the relationship between the state and the citizen? Ghana has seen democratization and successive changes of government since the Internet became available. Has the Internet reinforced democratization?

I think the relationship between the state and the citizen is increasing because citizens can now interact with the state using that medium. Our penetration is not large enough for it to be a major factor, but it is increasing, so I expect it to accelerate. It has deepened knowledge of people, of all kinds of backgrounds—those who can't read, they will hear it in their local language on radio stations. I think that transparency helps in deepening the democracy, but we don't yet have a large enough percentage of users for us to be able to truly assess the impact of technology on the relationship between the state and the citizen.

### What about security issues, including the way that governments can use ICTs to monitor and potentially control the behaviour of citizens, and the way that they are asking private sector companies to act as instruments on their behalf to do so? Do you see that as a substantial threat?

I think government needs to govern, and if governing means that they have to be intrusive, there is a procedure for it, and they will follow it, and they should be intrusive. Law enforcement has to do its lawful interception, when and where it's needed. We don't expect that government will change the law simply to allow control of the people, but while it is concerned with cybercrimes increasing, law enforcement agencies need to be empowered to do their work—and if their work involves telling an operator to change the way he runs his network, they should do it, because we want good clean networks. Bear in mind, however, that we have passed the data protection act, and there is the right to freedom of information bill. There is very active debate about the process in Ghana.

### How much impact has the Internet had on the relationship between Ghanaians living in Ghana and Ghanaians in the diaspora?

The early adopters of the Internet included parents whose children were overseas, and so it has certainly deepened. The need was for that, as I can tell you from my customer base. In fact it is getting to the stage where there is serious consideration of how we can establish our technology parks to enable the diaspora to participate. Those are good discussions, because the technology is becoming more and more reasonable for them to be able to participate from afar.

### Can I turn to the issue of sustainability? This is the week of the third Earth Summit on sustainable development. The concept of sustainable development as we know it now originated 25 years ago, with a couple of core values: intergenerational equity and the principle that we shouldn't go beyond the sustainable use of planetary resources. Has the Internet helped in that or hindered it?

I think that the Internet has helped and will continue to help with intergenerational equity, because it kind of flattens things. Everyone will have roughly the same opportunity for knowledge. In fact, the next generation has more power in terms of knowledge than the one before it. You see old folks asking their children to do things for them. We need a special program to help the old not have a generational equity problem, while they are alive.

As for the issue that we have to live on our own planetary resources, the Internet and computer technologies can certainly be an asset there in the sense that they can help us know how well we are doing with respect to damaging the Earth. But I also have to admit that we contribute to the problem that we help solve. We do consume a fair amount of

energy, and we have some waste. Not all countries have mechanisms to manage this waste. And perhaps Africa and other developing countries will become a dumping ground for waste by the West, because people will see that "We are helping Africa" if they have a piece [of equipment] that's two years old, refurbish it and ship it to Africa. It depends on how fast you use it. If you don't use it fast, it will become waste more quickly. But if you use it fast, to create new things, perhaps it will not be so much of a waste. So that is why I say it is a mixed bag. On the one hand, the tool will allow us to know exactly where we stand, but at the same time the tool itself generates waste.

**Thinking of your peers, your colleagues within the Internet community in Africa, how conscious do you think they are of these challenges of waste and of energy use and greenhouse gas emissions?**

I think it is an appreciable concern, partly because the energy is quite erratic here.

**I'd like to ask about the sustainability of the Internet itself. When I interviewed Vint Cerf for this project, he emphasized the importance of IPv6 to the sustainability of the Internet. What is your view of the sustainability of the Internet in African contexts?**

Like I said, only on the average 11 or 12 per cent of all of Africa has any form of access to the Internet. Broadband is lower. So people who don't have it don't care, right? And when they do have it, they don't care about the numbering system. So they don't see IPv6, IPv4 and those kinds of things as important to start with. Secondly, given that the number of users is much lower, the number of able professionals is also much lower.

And—fortunately or unfortunately—there is some time lag that the numbering registry has to allow for the transition. We still have IPv4 numbers. What is happening now is that the African Regional Internet Registry [AfriNIC] is providing training to engineers and operators, to government, the regulators and so on, so that they can have a task force that will guide them in their country to do the transition. This is the phase we are in. We are not exactly at the beginning and we are not exactly at the end. The concern may not affect that many people because we don't have that many users and we don't have that many engineers. But at the same time, we have some slight time within which to do a migration, and so the numbers registry is putting a lot of effort into training the people who do the migrating, ensuring that the regulators develop a transition plan so that the government network will not be heavily affected, and then creating an environment that encourages the providers to do so too.

**It sounds to me as if you're saying that the transition will be managed satisfactorily. Is that correct?**

Yes. I think it will be managed okay because the right things are being done, and we are not yet at the point where we fall over the cliff. It is an issue, but not yet desperate. There is continuous pressure for people to move, but we have some movement and we have some time.

**One last question. What do you hope will have been achieved in the Internet in Africa in the next 10 years?**

For me it is very simple: education, education, education. If you are not literate, you can't use the Internet, so if my literacy rate is 50 per cent already my maximum number to benefit tends to be 50 per cent. All the other things like infrastructure, they are just barriers to it.

**Thank you very much.**

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The International Institute for Sustainable Development (IISD) contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change and energy, and management of natural and social capital, as well as the enabling role of communication technologies in these areas. We report on international negotiations and disseminate knowledge gained through collaborative projects, resulting in more rigorous research, capacity building in developing countries, better networks spanning the North and the South, and better global connections among researchers, practitioners, citizens and policy-makers.

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IISD REPORT

# *ICTs, the Internet and Sustainability: Where Next?*

***David Souter***
***Don MacLean***

***October 2012***

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**ICTs, the Internet and Sustainability: Where Next?**

October 2012

Written by David Souter and Don MacLean

## *Acknowledgement*

IISD gratefully acknowledges the generous support of the International Development Research Centre (IDRC).

The International Institute for Sustainable Development (IISD) project summarized and reviewed in this report has explored the relationship between information and communication technologies (ICTs), the Internet and sustainability. Written and published around the time of the second Earth Summit, Rio+20, in 2012, the project asked one central question:

- How far and in what ways do we need to change our understanding of sustainability in the light of the information and communication revolution?

The project has included:

- An introductory discussion paper by David Souter exploring the ways in which ICTs and sustainability have interacted since the Brundtland Commission in 1987 and the first Earth Summit in 1992.
- Two keynote interviews with influential thinkers on ICTs and on sustainability, Vint Cerf and Jim MacNeill, who have played leading roles in those fields throughout the past 25 years.
- Three commentaries on ICTs and sustainability at the Rio+20 Summit: one (by Don MacLean, David Souter and Heather Creech) raising issues that should be considered in anticipation of the meeting, one (by Shawna Finnegan and Lisa Cyr) describing what actually happened at the event, and an overall assessment of the scope and outcomes of the summit by IISD's European Representative, Mark Halle.
- Three short papers on critical themes by leading experts in different aspects of the relationship between ICTs and sustainability—Robin Mansell, Bill St. Arnaud and Graham Vickery.
- Seven further interviews with prominent experts in different areas of ICTs and sustainability—Angela Cropper, Anriette Esterhuysen and Alan Finlay from the Association for Progressive Communications, Caroline Figueres, Ashok Khosla, Jay Naidoo, Luis Neves of the Global e-Sustainability Initiative, and Nii Quaynor.

This concluding report is divided into three sections.

The first section summarizes the responses to the project's core question, set out at the opening of this report, which have emerged from the contributions listed above.

The second section looks at the Rio+20 Summit and its outcome document, *The Future We Want*, noting and seeking to explain the very limited extent to which the summit recognized the impact and implications of ICTs and the Internet on sustainability.

The third section asks what needs to be done now to address the themes explored in the project, and concludes with suggestions to governments, businesses and other stakeholders in both ICT and sustainability communities. These suggestions are concerned with ways to address four challenges that are central to the interaction between ICTs and sustainability:

- Mitigation of the environmental impact of ICTs
- Maximization of their potential contribution to environmental adaptation, sustainable economic growth and social equity
- Understanding of the long-term changes that are inherent in an evolving Information Society
- The need for more productive international discourse around ICTs, the Internet and sustainability than that which currently takes place

## *Section 1—Where Are We Today?*

The introductory paper for this project asked one central question: "How far and in what ways do we need to change our understanding of sustainability in the light of the information and communication revolution?" This question, it suggested, could be divided into three subsidiary questions, which provide a framework for this section of the report:

- What impacts are new media and the Internet having on achievability of the core elements of sustainability—economic prosperity and social equity, environmental protection, cultural diversity and governance—and on the balances among these elements?
- To what extent do these impacts and implications of ICTs and the Internet enhance sustainability or, to the contrary, raise new sustainability challenges?
- Do these economic, social, political and cultural impacts and implications require us to revise, rethink or readjust our understanding of what sustainability means from the ways in which it was defined in 1987 and in 1992, before today's ICTs became available?

There are, of course, different ways of defining sustainability. Our starting point in this project has been the ways in which it was defined in the 1987 report of the Brundtland Commission. These might be summarized as ensuring:

- Intergenerational equity—"development that meets the needs of the present without compromising the ability of future generations to meet their own needs,"
- ...that development does "not endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils and the living beings," and
- "...consumption standards that are within the bounds of the ecological possible and to which all can reasonably aspire."

Collectively these require an integrated or holistic approach with three pillars of equal significance: economic prosperity, social equity and environmental protection.

This understanding of sustainable development was broadly endorsed by the 1992 Earth Summit and has provided a basis for subsequent work by sustainability specialists and reviews by the international community. It has not, however, as Jim MacNeill and other contributors make clear, prevailed politically. For most governments and many other stakeholders, economic objectives (poverty reduction, enhanced prosperity) have been granted primacy over environmental goals whenever they've been deemed to be in conflict. Whatever the impact of this on economic prosperity, the environmental and ecological consequences have been negative. We have, it seems, now crossed four of the acknowledged "planetary boundaries," including loss of diversity, resource depletion and significant impacts from climate change as a result of greenhouse gas emissions. Where prosperity has grown—in industrial countries until the recent downturn, in the BRICs and many other "emerging market" and developing countries throughout the period, in some less developed countries much less or not at all—it has not necessarily been equitable, and growth may not be sustainable over the longer term if industrial country markets fail to recover and negative environmental impacts accumulate. Several contributors to this project—including Anriette Esterhuysen, Ashok Khosla and Jay Naidoo—explicitly or implicitly questioned established development growth models, emphasizing the importance of social justice, equity and access to resources rather than financial measures of prosperity. Although use of the term

"sustainable development" has become established, almost required, terminology in international agreements, it has often been included as a token. Sustainability specialists are at least as likely to be pessimistic today as optimistic about the future.

ICTs and the Internet have been more economically dynamic and enabled wider social change than any other economic sector in the period since the Brundtland Report and the first Earth Summit. In that period, telecommunications have been liberalized in almost all jurisdictions, and technologically transformed. Mobile has displaced fixed telephony as the principal means of interpersonal communications, offering relatively cheap access in almost all locations. There are now more mobile phone subscriptions than people on the planet. Computers, like mobile phones once rarities, are now commonplace in most countries and extensively used in government and business, even in low-income developing countries. The Internet has emerged, becoming first the principal source of information access and exchange worldwide and, more recently, a dynamic new means of social networking. Even traditional ICTs, like broadcast radio and television, have become much more diverse in technology and content, reaching deeper into societies around the world. Communities and individuals for whom ICTs would have been luxuries 25 years ago are now dependent on them.

These dynamic changes are often described as an information revolution or the emergence of an Information Society, a development potentially comparable in importance to that of settled agriculture in the distant past or industrialization two or three hundred years ago. As indicated in the introductory paper for this project, the Information Society is variously seen as an observable phenomenon—something that is currently occurring—and/or as an aspirational vision—a transformation of society toward which, advocates believe, governments, businesses and other stakeholders should set their course. It may—and, for many, should—develop further into what might be described as a Knowledge Society or Network Society.

Whatever view one takes of the extent to which digital networks are displacing or should displace other social structures, it is undeniable that the changes that have taken place in access to and use of information and communications technologies and services over the past 25 years have significantly affected personal and social behaviours, economic production and transactions, and relationships between citizens and their states. As Vint Cerf points out in his interview, governments and economies have now become so dependent on ICTs and the Internet that they would find it difficult to maintain services or continue transactions if these were suddenly to fail; the ways in which they now do things, in other words, are not sustainable without these new technologies. An Information Society, as generally understood, would/will involve even more profound re-ordering of the ways in which we do the things we do, and consequent dependence on ICTs. The emergence of settled agriculture and industrialisation had as profound implications for sustainability, in their own time and for future generations, as any developments in mankind's history. If the "information revolution" is genuinely analogous to these, its implications will be as profound. While the jury is still out on that big question, we can't afford to ignore what this might mean for sustainability today, especially when sustainability is under such pressure from the ongoing effects of industrialization.

The introductory paper for this project identified some of the more specific ways in which changes in ICTs and the development of the Internet have been affecting society, economy, politics and culture during the period since the Brundtland Report. Communications, it argued, are central to human interaction, whether within the family, in economic exchange or in the power structures that surround them, including the relationships between governments and citizens. Information is critical to the development of knowledge, the quality of decision making, empowerment and the

rights, responsibilities and opportunities of individuals and communities. Substantial changes in the mechanisms and dynamics of communication and information are therefore likely to have profound implications for the ways in which people interact, economies develop, societies and cultures evolve, and people relate to governments. Three factors have been especially important in the development of new media and the Internet since the Brundtland Commission reported 25 years ago:

- New ICTs are acknowledged to be general-purpose technologies, changes in which are not contained within a single sector but enable and often require change in most other economic sectors and areas of public policy, from the production and distribution of goods and services to the delivery of health and education.
- The pace at which new ICTs have developed has been exceptionally rapid, more so than any other sector in our history. In particular, telecommunication has become close to universal within a generation, giving the vast majority of people the ability to exchange information and views instantly and affordably without proximity.
- The Internet has drastically altered access to information, making far more information available and making access to that information more equitable. This has altered and continues to alter decision-making capabilities, including more inclusive participation in governance. It also alters relationships between governments and citizens, making easier both protest and surveillance.

One, widely recognized, way of analyzing the implications of these changes on sustainability has been to separate the effects of ICTs, or technological innovations in general, into different "orders." This approach, which was developed for the ICT environment by the Forum for the Future, is described briefly in the introductory paper and more fully in Graham Vickery's contribution to the project. In summary, it distinguishes between:

- First order (or direct) effects that result from the physical existence of ICTs and the processes involved in making them
- Second order (or indirect) effects that result from the ways in which ICTs are used, in particular those that result from applications and access to content
- Rebound effects that result from behavioural changes caused by the interaction of first and second order effects and that may mitigate or exaggerate those impacts
- Third order (or societal) effects that are the aggregated outcomes of large numbers of people using ICTs over the medium- to longer-term

It is widely believed that the first order effects of ICT manufacture and use are proving strongly positive in terms of economic prosperity (through job creation, improved efficiency in manufacturing and trade, etc.) and social equity (empowering people by giving them greater access to information and more opportunities to coordinate activities). Equally, however, first order effects are widely acknowledged to be strongly negative for the environment, because of the large amounts of waste generated by the sector, the short life cycle of ICT devices, and the rapidly growing greenhouse gas emissions that result from equipment manufacturing, network operations, data centres and the use of an ever-growing range of terminal devices by an ever-growing consumer base.

Second order impacts, being indirect, are less certain. ICTs provide individuals, businesses and governments with the opportunity to do other things that are not part of the ICT environment differently from how they did them before, responding to opportunities to make efficiency gains, reduce staffing levels, add consumer value, increase profit

margins and meet other corporate objectives. Resulting impacts on economic prosperity and social equity will vary according to the objectives being pursued and the ways in which they are impacted by technology. Net or summative economic and social outcomes are therefore hard to predict. Net environmental impacts are also unclear. As the Global e-Sustainability Initiative (GeSI) has demonstrated, ICTs offer the potential to enable large-scale reductions in carbon emissions through what are called "smart systems," particularly in energy production and distribution, manufacturing, transport, construction and building management. Decisions about these, however, are made outside the ICT sector and are dependent on the cost-effectiveness of required investments for those other sectors. As the chair of GeSI, Luis Neves, admits in his interview, it has been harder to persuade managers in those sectors to adopt smart systems than GeSI had expected.

Assessments of these impacts are also complicated by the uncertainties surrounding rebound effects. Energy efficiency does not necessarily lead householders to use less energy and so save money: the financial savings due to energy efficiency may lead them to use more energy for the same financial outlay. Working at home does not necessarily lead to decreased use of motor vehicles: it may displace commuting on public transport with leisure travel by car. Assessing net outcomes requires sophisticated modelling and retains high levels of uncertainty.

It is clear, and should be recognized here, that the impact of ICTs and new media has sometimes been exaggerated or overemphasized. Some advocates of an Information Society or of ICT4D (ICT for development) have seen ICTs and new media as catalysts of transformation, able to overcome the challenges that defeated post-war and post-colonial governments and development agencies and to usher in a new age of prosperity, empowerment and, indeed, sustainability. Exaggerated claims for the transformative potential of ICTs in the run-up to and during the World Summit on the Information Society (2003 and 2005), which often detached them from the underlying human and other resource constraints facing developing countries, led to considerable disillusion within development agencies toward the end of the last decade, which has only recently been replaced by more enthusiasm for more realistic exploitation of ICTs' potential. While there is now better understanding in the development community that the Information Society is a human development rather than a technological development issue—a point made by several contributors to this project—this is not always replicated in the ICT community. A new wave of optimistic rhetoric from the Broadband Commission for Digital Development is again urging the transformative power of technology on the United Nations and the development community. This needs tempering by context. IISD believes that, if technology and innovation are to have a major impact on development and sustainability, that impact must be rooted in the societies and economies concerned. Successful public policy must be located in a thorough understanding of the real world with which it is concerned—the development challenges facing people in their daily lives; the capabilities and assets they have available; limited institutional capacities and financial resources; the constraints posed by their environments—rather than in technological aspiration—a point to which we will return.

It is at least possible in broad terms to quantify and predict the first and second order effects described above with some degree of confidence. This is not the case with societal, third order effects, about which we have much less lasting evidence and which are inherently more unpredictable. They concern the ways in which society and economy, politics and culture are structured. It is changes in these underlying structures of human experience that are likely to have the most unsettling implications for sustainability, challenging assumptions about human behaviour and prospects for social and economic change that were reasonably held when the Brundtland Report was written and the first Earth Summit held, but which no longer stand. These long-term implications for society are described in Section 6 of the introductory paper and need not be repeated here in detail. Most contributors to the project saw them as

positive in most respects, though some—including Jim MacNeill—were concerned about what they saw as negative implications for social coherence and the quality of decision making. A list of examples of the implications for societies and economies described in the introductory paper is useful, and cannot be short. They include:

- The globalization of industrial production and business management (including outsourcing), shifting from local and national to global labour markets
- The transition from managed to automated financial markets, elevating risk and giving greater economic power to finance traders at the expense of economic planners in government and managers of businesses in goods and other services
- The implications of these developments on economic relations between the global North and South, West and East
- Changes in relationships between employers and employees, including the delayering of management and the individualization of employment (home-working, freelancing, micro-entrepreneurship, etc.)
- The virtualization of some goods and services, particularly cultural goods
- Changes in consumption patterns, in particular, purchase of goods and services online rather than in markets, shops and malls, with consequential impacts on the viability of urban centres
- Changes in patterns of social interaction—within families, friendship groups, diasporas, social, political and business associations—as a result of the universal availability of immediate interactive communications at a distance and of Internet applications enabling different forms of social networking
- New patterns of human settlement that may emerge from these developments in economic production and consumption and in human interaction
- Changes in the ways in which information and knowledge are acquired and used as a result of the much wider availability of far more information
- Shifts in the balance of rights and responsibilities of governments, businesses and citizens as it becomes easier to exercise expression and to associate in diverse physical and virtual communities but more difficult to maintain privacy
- Changes resulting from the ability of individuals to use ICTs, and especially the Internet, to bypass legal constraints and social norms
- Changing relationships between the citizen and the state, as behavioural records are automated, surveillance opportunities increased, and databases linked
- Changes in the ways that people understand their own communities and remodel their identities within the nation–state and according to their other preferences
- New interactions between cultural traditions, as ICTs both spread global brands and enable smaller social and cultural groups to intensify their interactions and maintain/establish their own traditions
- The development of multistakeholder models of governance alongside more conventional national and multilateral forms

In her contribution to this project, Robin Mansell criticizes the widespread perception of ICTs and other technological innovations as exogenous—as external shocks to societies and economies rather than as developments within them. This focus on the effects or impacts of ICTs on societies, in her view, ignores the recursive character of innovation, the ways in which innovation and society continually affect one another iteratively over time. Societies and ICTs, she emphasizes, interact in complex, systemic and unpredictable ways. Sustainable development approaches to ICTs and the Internet need to build on this endogenous perspective rather than exogenous impacts, to remember that change proceeds from within a system rather than being delivered from without.

The societal concerns described above are related to this insight. These long-term, unpredictable challenges to sustainability result from the interaction between information technologies and the societies and economies in which they are increasingly available and increasingly diverse. It is important for those concerned with sustainability to concern themselves with first and second order effects, with mitigating the environmental harms that result from rapid growth in the availability and use of ICTs, and with maximizing the environmentally beneficial gains that they have the potential to deliver.

The crucial message of this project, however, is that understanding of the relationship between ICTs, the Internet and sustainability must concern itself with the long-term structural changes that evolve as a result of iterative and recursive interactions between those technologies, societies, economies, power structures and cultural identities. Contributors who discussed the core question for this project in their interviews generally felt that the defining principles of sustainability remained broadly unchanged by events since 1987/1992, but that it was right to reassess how those defining principles could and should apply to circumstances that, in many ways, now differ from those at the time of Brundtland. ICTs and the Internet are among significant changes that have taken place within that time. Whether they are seen as primarily exogenous or endogenous, they are enabling or facilitating change in the nature of societies and economies whose sustainability is today in question, and therefore also enabling or facilitating changes, including opportunities, in how sustainability can be achieved. That is why, in our view, ICTs and the Internet do require us to rethink the meaning of sustainability in ways that the sustainable development community has so far not addressed. The next section of this report looks at how unaddressed they were at the recent Rio Summit.

## *Section 2—What Happened in Rio?*

The second Earth Summit, held in Rio de Janeiro in June 2012, has been widely considered disappointing. As Mark Halle points out in his commentary, insufficient progress toward agreement had been made before the event took place, while the outcome document that was finally agreed, *The Future We Want*, was both under-discussed and superficial. Of the two main themes that had been advertised for the event long in advance, one (the green economy) proved too controversial for many governments and barely made it into the outcome document, while only limited progress was made on the other (improvements in the institutional framework for sustainable development). Where new initiatives did emerge from Rio—the development of a 10-year framework for consumption and production, the introduction of Sustainable Development Goals—they were only partially developed and are dependent on future negotiations at the United Nations General Assembly, where political priorities will carry even greater weight. All in all, few people regard the summit as having added much to thinking about sustainability, or indeed as rehabilitating a summit process that is increasingly seen as failing to deliver productive outcomes. Those involved in sustainable development need to think seriously about how to reinvigorate multilateral and multisectoral debate if they want to see it lead to changes in policy and practice that are commensurate with the challenges we face.

Our principal concern here, however, is with the extent to which the Rio Summit recognized the impact and implications of ICTs and the information revolution for sustainability—the issues discussed in Section 1 above. The answer to that question, as Shawna Finnegan and Lisa Cyr make clear in summarizing their Rio experience, is that attention was neither systemic nor substantial.

In Section 1, we argued that changes in information and communications since 1987/1992 have had profound implications for the ways in which society and economy, politics and culture have developed and are developing. In doing so, as we have made clear, we do not argue that ICTs offer solutions in themselves to the environmental crisis or to the development challenges facing humanity. On the contrary, we believe that, if solutions can be found, they will lie in human development experience, which may (and should) use technology as instruments to deliver change. What primarily concerns us is that international discourse on sustainability should pay attention to its changing context. The challenges and opportunities of sustainability today have evolved from those at the time of the first Earth Summit, most obviously as a result of failures to secure sustainability objectives since 1992—greenhouse gas emissions have continued to grow in volume; we have crossed a number of planetary boundaries—but also because of other developments, including those concerned with information and communications that we have described. Indeed, we have argued that those changes concerning information and communications are particularly important because they are so fast and unpredictable, and—because ICTs are general-purpose technologies—these changes have implications for most, if not all, other economic sectors and areas of public policy. If we ignore them, we will be addressing challenges and opportunities as they used to be, not as they have become. This is not sustainable.

Yet no consideration of this is apparent in the Rio outcome document. It is almost as if these changes had not happened or could be considered insignificant from a sustainability perspective. There is no systematic assessment of the developing Information Society in *The Future We Want* or of its impact, nor is one proposed in its recommendations for the future. So far as Rio+20 was concerned, the sector might as well have been in stasis—surprisingly so given that, as Jim MacNeill makes clear in his interview, the Brundtland Commission did anticipate the potential of ICT developments and expected them to make a significant contribution to sustainability.

Rather than considering the relationship between ICTs and sustainability as a "thematic" area, *The Future We Want* makes only occasional references to the relationship between ICTs and aspects of sustainability. Sections of text address other infrastructures and economic sectors, including energy, water and sanitation, agriculture, transport, mining, even tourism, but there is no separate section addressing the communications sector or ICTs—either exploring the impact that they have on sustainability or their potential to contribute to it. The only other major issue in sustainability to receive such nugatory treatment is population growth.

Here is the sum total of what the outcome document has to say about ICTs and/or the Internet:

- Paragraph 44, which is mainly about civil society engagement, includes the following. "We recognize that information and communication technology (ICT) is facilitating the flow of information between governments and the public. In this regard, it is essential to work toward improved access to ICT, especially broad-band network [sic] and services, and bridge the digital divide, recognizing the contribution of international cooperation in this regard."
- Paragraph 65 begins as follows. "We recognize the power of communication technologies, including connection technologies and innovative applications to promote knowledge exchange, technical cooperation and capacity building for sustainable development."
- Paragraph 114 resolves "to improve access to information, technical knowledge, and know-how, including through new information and communication technologies that empower farmers, fishers, and foresters to choose among diverse methods of achieving sustainable agricultural production."
- Paragraph 230, which is about education in general, and sustainable development education in particular, mentions "more effective use of information and communication technologies to enhance learning outcomes."
- Paragraph 274 recognizes "the importance of space-technology–based data, in situ monitoring, and reliable geospatial information for sustainable development policy-making, programming and project operations." (These are all ICT applications.)

In addition, paragraph 128—which recognizes that improving energy efficiency, increasing the share of renewable energy, and cleaner, more energy-efficient technologies are important for sustainable development—could be considered as implicitly recognizing the role of ICTs in increased energy efficiency, although no explicit reference is made to them.

ICTs, in short, are seen in the Rio outcome document as incidental tools that might help in a few areas of sustainable development activity. They are not seen as playing as significant a role in the state of sustainability today or in the potential for achieving sustainability tomorrow as other infrastructure and economic sectors. They are most certainly not seen as having altered the underlying structures of social and economic development that sustainability needs to address.

It is instructive to contrast this with the outcome documents from another UN summit, the 2003/2005 World Summit on the Information Society (WSIS). This summit, not surprisingly, saw the Information Society as the future, claiming "that the ICT revolution can have a tremendous positive impact as an instrument of sustainable development"[1] and that it would have a pervasive impact on almost every aspect of human life. A commitment to sustainable development was reiterated three times in the first three paragraphs of WSIS's *Declaration of Principles*.[2] It called on international

[1] *Tunis Commitment*, para. 13, http://www.itu.int/wsis/docs2/tunis/off/7.html
[2] Geneva *Declaration of Principles*, http://www.itu.int/wsis/docs/geneva/official/dop.html

development agencies to "develop their own strategies for the use of ICTs for sustainable development, including sustainable production and consumption patterns"[3] and listed fields of activity in which ICT applications could facilitate sustainable development.

There is, of course, nothing surprising in governments, gathered together in a summit to discuss the Information Society, regarding it as of primary importance to global development, nor in the same governments gathered together to discuss sustainable development treating that as having primacy. It should, however, be surprising—and concerning—that there are so few links between the two. A theme considered so significant to global development by the international community that it merited two global summits in 2003 and 2005 cannot sensibly be so comprehensively ignored by a subsequent summit concerned with the sustainability of development itself, particularly when WSIS's expectations of the growth in the adoption and impact of ICTs have been exceeded in the intervening years.

It is particularly striking that *The Future We Want* entirely missed the relationship between ICTs, the Internet and the two themes that were chosen by the international community for Rio+20: the green economy and reform of the institutional framework for sustainable development. The Rio+20 discussion guide published as part of this project outlined the questions arising here as follows:

- What role can ICTs play in relation to the main topics to be discussed under the green economy theme—jobs, energy, cities, food, water, oceans, disasters? What policies and practices are needed to enable these? What are the respective roles and responsibilities of ICT policy-makers, the ICT sector, sustainable development policy-makers, green economy sectors, and other stakeholders?
- What role can ICTs play in strengthening the institutional framework for sustainable development at the global, national and regional levels—including its economic, social and environmental pillars—through improved access to and sharing of information, new forms of stakeholder engagement, improved analysis of policy options and evaluation of policy outcomes? What policies and practices are needed to enable these improvements? What are the roles and responsibilities of different actors and stakeholders?

It was not just the formal summit and its formal outcomes that ignored the impact and implications of information and communications technology. Much the same could be said about the side events that were organized in Rio by business and other organizations in the margins of the formal summit, and about the alternative People's Summit, which was populated largely by civil society. Although there were a few ICT-related discussions in both of these, almost none of them—as Shawna Finnegan and Lisa Cyr report—addressed the Information Society in any systematic way. Business sessions were preoccupied with presentations of ways in which individual companies are developing ICT applications that can be used to support the monitoring of environmental impacts or adaptations to improve efficiency in other industries. The International Telecommunication Union's (ITU) main half-day event in Rio provided ICT companies with an opportunity to show how they are "greening" their activities and to discuss future plans for green technology, but without an opportunity for broader multistakeholder discussion. ICTs were largely absent from discussions at the People's Summit, beyond a few contributions from specific NGOs.

Yet ironically, as Shawna Finnegan and Lisa Cyr also report, in another sense ICTs were everywhere in Rio. Everyone was using laptops and wireless devices to write and monitor contributions, keep up with email, gather information from the Internet and one another, share photos, plan what to do next within the summit and where to have dinner in the

[3] Geneva *Plan of Action*, para. 8, http://www.itu.int/wsis/docs/geneva/official/poa.html

evening. While the impact of ICTs on society was largely ignored in formal and informal discussions, it was pervasive in how the delegates themselves behaved. Perception of the importance of ICTs and the Internet seems to have been lost somewhere between the personal and the political.

Two questions arise in light of this analysis of Rio outcomes:

- Why did Rio+20 fail to recognize the relationship between ICTs, the Internet and sustainability as an important issue for sustainable development policy?
- What can be done about this?

The final paragraphs in this section address the former of these questions; Section 3 of this report is concerned with the latter.

The idea that there is a paradigm gap between the ICT sector and other sectors with which it interacts is quite familiar. Even where ICTs have been used for governmental purposes, understanding between ICT professionals and those concerned with administration or service delivery has often been weak, leading to poor performance and unsustainable investments. A number of contributors to this project have emphasized that ICTs, indeed technologies in general, do not provide solutions, but tools that can be used to enable improvements to be achieved—citing in support the failure of technology-led development initiatives like "One Laptop per Child" to deliver what they promised. In her contribution, Robin Mansell argues that inadequate policy responses follow from analyses that treat ICTs and other innovations as exogenous influences that impact on established social and economic structures, rather than understanding the relationship between them and the social, human, power and other structures with which they interact.

One explanation for Rio+20's failure to address the implications of the Information Society can be found in this kind of paradigm gap. Sustainable development professionals have generally failed to adapt their notions of sustainability to accommodate changes in underlying characteristics of society, including those described in the introductory paper and in Section 1 above.

Indeed, development professionals more generally have often missed these underlying changes. This is partly because they are preoccupied with their own priorities: the crises within their own mandates, from climate change to food security, which leave them little time to investigate new intersecting influences. Partly, too, it is due to bad experience. The grand claims made for ICTs and the Internet by some advocates of ICT4D—for example, in delivering the Millennium Development Goals—have looked and proved unrealistic from development professionals' points of view. Bed nets are obviously more effective at preventing malaria than ICT devices, and it is hard to see how ICTs can be the lead technology in improving sanitation. Lessons concerning the limitations of ICTs have been learned, sometimes through bitter experience, within the ICT4D community, particularly among those with direct experience of delivering projects on the ground. The importance of understanding that ICT4D initiatives depend on human capacity and enabling institutional and developmental contexts is emphasized by Caroline Figueres and Ashok Khosla in their contributions to this project.

But development interventions are not the only ways in which ICTs and the Internet are influential. The adoption of ICTs and the Internet by individuals and organizations for their own purposes has, in practice, mattered far more and been far more influential on social and economic development than interventions by governments and other agencies that seek to use them for developmental purposes. Development and sustainable development policy-makers and

practitioners should pay more attention to the changes in society that are associated with adoption of innovations like mobile telephony and the Internet by general populations, including their target beneficiaries—changes that are often not valued as "developmental" but that represent important developments in society, economy and culture. As Angela Cropper noted in her interview for this project, the disconnection between environmental, development and ICT sector professionals and their thinking is as significant amongst multilateral agencies and within the UN system as it is elsewhere.

The most prominent submissions advocating ICTs within the context of Rio+20 were those of the ITU and its associated Broadband Commission for Digital Development. These argued that ICTs could have dramatic impacts on both conventional and sustainable development outcomes. The Broadband Commission, for example, urged the summit to adopt "broadband for all" as a Sustainable Development Goal, one that it claimed would help (for reasons that were not detailed) to achieve a low-carbon future.[4] The ITU's Secretary-General argued that "[i]nformation and communication technologies should be at the top of any outcome adopted by the Rio+20 conference" because "ICTs have a catalytic impact on all three pillars of sustainable development—economic growth, social inclusion and environmental sustainability," while "broadband connectivity in particular facilitates transformative change in … sectors from power [to] transportation, buildings, education, health and agriculture with the potential to achieve our Sustainable Development Goals."[5] These contributions both lie at the "transformative" end of perceptions of the impact that ICTs can have, well removed from the perception held by most participants. GeSI's more nuanced balancing of positive and negative outcomes, summarized in the project's interview with Luis Neves and discussed above, was less evident in Rio. In practice, as indicated by the extracts from *The Future We Want* quoted above, none of these interventions was considered during negotiations and none had any impact on the final outcome document. The ITU's claim, summarized in the headline of a press release issued at the end of the summit, that "Rio+20 recognizes essential role of ICT and broadband networks as catalyst for sustainable development" is, unfortunately, disingenuous. Rio did not say anything significant about ICTs and sustainability, and the word "broadband" appears only once in its report (as "broad-band"; see above). Far from being won, the challenge of integrating ICTs and the Internet into perceptions of sustainability within the United Nations and the sustainability community has barely begun. The question for the final section of this report is: How might this integration challenge be progressed?

[4] Broadband Commission for Digital Development, *Leveraging Broadband for Sustainable Development*, http://www.broadbandcommission.org/Documents/BBCom-Rio+20-v15.pdf

[5] International Telecommunication Union, "ITO at *Rio+20* promotes ICTs as key to the 'Future We Want,'" http://www.itu.int/net/pressoffice/press_releases/2012/CM03.aspx

## *Section 3: Where Do We Go from Here?*

Two starting points for answering this question emerge from the discussion in Sections 1 and 2:

- Firstly, it is clear from the analysis in Section 1 and from contributions to this project that there is a significant relationship between changing information and communications and sustainability, and that our approach to sustainable development could be significantly improved if more attention were paid to this.
- Secondly, it is clear that insufficient attention is being paid in practice, particularly by the sustainable development community—that there is a paradigm gap between policy-makers and businesses in the ICT sector and those which are primarily concerned with sustainability. This is demonstrated by the weakness, in this respect and others, of the Rio+20 outcome document and the limited discussion of ICTs, the Internet and sustainability throughout the Rio fora.

Paradigm gaps don't disappear if they're ignored. This project is concerned to point toward ways in which this one can be tackled. The final section of this report looks, in turn, at four areas of activity that need to be addressed:

a. Mitigation of the environmental impact of ICTs
b. Maximization of their potential contribution to environmental adaptation, sustainable economic growth and social equity
c. Understanding of the long-term changes that are inherent in an evolving Information Society
d. International discourse around ICTs, the Internet and sustainability

The first three of these four areas correspond quite closely with the Forum for the Future's taxonomy of impacts of ICTs on the environment. The first is concerned primarily with mitigating direct or first order effects; the second with exploiting the potential of indirect, second order effects; the third with the long-term societal implications with which this project has been most concerned.

It is a moot question whether first and second order effects can or should be juxtaposed or traded off against one another. In his interview for this project, Luis Neves argued that they can. This is because, in his view, the ICT sector is unique, as its own environmental impacts (e.g., greenhouse gas emissions) enable reductions in the impacts of other sectors.

While this case can certainly be made, it relies on including very different applications and issues when describing "information and communication technologies" and the sustainability challenges to which they relate. In practice, the causes of these direct and indirect impacts, and the contexts for dealing with them, are very different.

Negative direct impacts result from two principal sources—reliance on carbon-based energy sources to power the manufacture and use of ICTs; and the consumption of material resources, some of which are highly toxic—throughout ICT product life cycles. The growth in these impacts results from the expansion of networks and from the adoption and usage intensity of ICTs by all within society—individuals, organizations and businesses—across the world. This growth increasingly emanates from developing countries. Given that demand for ICT products and services will continue to increase, dealing with these direct negative impacts requires increased energy and material efficiency, reduced waste and toxicity, and a shift toward green energy sources—decisions that depend principally on ICT businesses, policy-makers and regulators.

Most of the potentially positive indirect impacts that have been identified, on the other hand, depend on decisions taken by power utilities, government service delivery departments, manufacturers and construction businesses in sectors that use, rather than make, ICTs. The most significant of these are based in Europe, North America and parts of Asia. For these indirect effects to have significant impact, these businesses and public agencies not only need to improve the energy and material efficiency of their existing operations, but also to adapt their business models and their relationships with suppliers and consumers—for example, by giving end users tools to monitor and control their energy consumption and feed distributed energy sources into smart grids—even, as Bill St. Arnaud suggests in his contribution to this project, by creating energy Internets through the convergence of electricity and transportation infrastructures.

The causes and principal interventions in these two cases are distinct. The sustainability challenge of mitigating negative direct effects of ICTs is only incidentally linked to potential positive indirect effects. For this reason, we believe it is better to regard the mitigation of direct impacts of ICTs and the fostering of more environmentally sustainable indirect impacts as separate challenges. The following paragraphs suggest ways of taking forward each of these.

## Mitigation

The environmental damage caused by the ICT sector does not attract the same level of antagonism drawn, for example, by the aviation sector, although its impact on greenhouse gases is roughly comparable and its impact, on both greenhouse gases and waste, is growing significantly faster. Given the rate of growth in ICT networks and usage, and the challenges involved in shifting them from carbon-based to green energy sources, it is not realistic to expect their greenhouse gas and waste impacts to fall in the foreseeable future. GeSI has projected, for example, a 6 per cent compound annual growth each year in greenhouse gas emissions from the sector, up to 2020 (with likely continued growth thereafter). Sustainability, it seems, will have to live with growing negative impacts on greenhouse gases, waste and some scarce resources from the ICT industry. This increases the need for reductions in other sectors in order to achieve the overall reductions in emissions required for sustainability.

It should also increase the pressure on ICT businesses to mitigate their own impacts. Some ICT businesses already see this as a significant challenge in terms of corporate social responsibility and reputational risk, if not yet in terms of profits. Customers want the latest devices and the latest services, leading to rapid rates of churn (short device life cycles) and high levels of use (including power requirements). Sustainability and environmental considerations are not yet influencing customer choice significantly where ICT devices are concerned, not even in the limited way that they have begun to influence markets for motor vehicles and food in some industrial countries. As with carbon-based fuels such as petrol/gasoline, price is likely to be the most effective driver for more sustainable customer preferences, but there are no indications yet that price is beginning to play that role where ICTs are concerned. Indeed, technological improvements are driving prices down at the same time as they increase devices' capabilities.

If the consumer market is unlikely to shift to more sustainable choices in the near future, the question moves further up the supply chain toward the business models and practices of network operators and manufacturers. There is likely to be some economic pressure on manufacturers to reduce dependence on scarce resources such as coltan (required for capacitors in devices such as mobile phones) as these become more scarce. Reduced energy use (and therefore cost) in production processes and network management also carries bottom-line attractions for profit-oriented businesses. However, adjustments in business practice, network management or device design responding to these kind of price

incentives are not likely, as things stand to counteract the profit gains to manufacturers of users frequently replacing terminal devices or to network and service operators of maximizing the amount of time that consumers spend using their facilities and applications.

Luis Neves suggested in his interview that mitigation of the negative environmental impacts of ICTs would require both business and government involvement. This can be most readily achieved by standards agencies and/or regulation. The ITU and, to a lesser extent, GeSI and the Organisation for Economic Co-operation and Development (OECD) have paid attention to the former, but relatively little attention has been given to the latter. As discussed later in this section, a number of meetings organized by the ITU will shortly be considering standardization issues related to environmental impact, including the World Telecommunication Standardization Assembly (WTSA) in November 2012.

It would be beneficial if the ITU, GeSI and other industry organizations could work more closely with sustainability specialists, including those from civil society, to consider ways in which governments, businesses and consumers could share responsibility for mitigating negative impacts of networks and devices. Four issues in particular are suggested here for that consideration.

- Standards applying across the ICT industry to the design and deployment of network equipment, network architecture, the design and use of devices, and the ways in which applications using networks and devices are configured. The existing work of the ITU's Standardization Sector (ITU-T) and GeSI in this area should be acknowledged here. ITU-T brings together governments and major businesses, as well as other multilateral/public–private standards bodies and less formal coalitions of businesses active in different parts of the sector. Those processes can pay more or less attention to environmental outcomes. At the very least, where a choice needs to be made between alternatives, it would be better for the industry to select that which is less environmentally harmful or more environmentally sustainable. ITU-T Study Group 5 has supported this, for example, by developing energy efficiency metrics for telecommunications equipment. Specific initiatives could be taken to develop standards that reduce environmental impact, for example in extending battery life, improving charging technology and reducing the incentive for users to keep equipment running in standby mode. Standardization bodies could pay more attention to developing principles and standards for low-carbon networks and devices.

  A similar culture to incorporate environmental impacts would be welcome in Internet standard-setting processes. At present, standards developed through the Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C) prioritize value to the Internet itself. There has been some reluctance in the Internet community to consider impacts in other public policy areas as relevant to protocols and standards. As Vint Cerf commented, however, in his interview for this project, "it would certainly be … helpful to remind engineers that sustainability is an important part of design, given that we now realize that our present practices may not be sustainable."

- The biggest mitigation challenge may well be that concerned with churn and the short life cycle of ICT devices. Metcalfe's and Moore's Laws—that the value of a telecommunications network is proportional to the square of the number of connected users, that the capacity of ICT devices doubles approximately every two years—explain why users like to increase the number of devices and services they use and to replace these regularly with the latest versions. The dynamic nature of ICT technology and markets also encourages businesses to compete through the features rather than the efficiency of their devices. At present, the average life cycle of

mobile phones, computers and many peripherals is around two to three years. This has major implications in terms of waste, including toxic waste, and for embedded carbon (the energy use required in the production of devices). In his interview for this project, Luis Neves acknowledged the importance of this issue and that the ICT sector has no idea at present how to get to grips with it. It needs to do so urgently, bringing together for this purpose network, service and content providers to consider ways of delivering what consumers want, with lower churn. One possibility may lie in the development of multipurpose or converged devices, which is already underway. The mobile phone has morphed for many users into a multipurpose digital device—one instrument delivering many different applications from telephony to broadcast radio, camera to debit card. Other devices including laptop and tablet computers are also used for multiple purposes, and this may at least reduce the demand for numbers of devices. We need to know more about the impact now and in the future of these trends, particularly their impacts on the life cycle of devices.

- The development of cloud computing, shifting data and application software from individual hard drives to data centres managed by global communications businesses, is likely to have a significant influence on environmental impacts. Data centres are notoriously dependent on air conditioning to lower the temperatures generated by their equipment and ensure that it maintains optimal performance. The ITU-T's Study Group 5, IISD and equipment manufacturers have all promoted research that explores ways of reducing the power requirements of data centres—by reducing heat generation, improving the tolerance of equipment, storing energy, relocating to cooler site locations, relying on renewable energy sources, or exploiting heat generated for other, environmentally sustainable, purposes. These are important research areas as requirements for data centres will grow rapidly over the next decade.

  The net impact of movement toward cloud computing, including consumers as well as data centres, is unclear. While data centres have more environmental impact, devices that rely on cloud computing will require less energy, and some reduction in churn may result from reduced demand for computing power within devices. Assessments of cloud computing's sustainability also need to take into account economic and security aspects of such large volumes of data being held by a small number of global operators. More research and foresight analysis is also needed in these areas.

- A fourth area of possible intervention is regulation. Communications sector regulation is largely undertaken at national level, although what are effectively regulatory decisions are also taken at global level—by the ITU's Radiocommunication Sector (which manages the radio-frequency spectrum and satellite orbits), through its International Telecommunication Regulations (which are to be reviewed this year, see below), through the World Trade Organization's agreements on telecommunications services, and by regional institutions such as the European Commission. Since the 1980s, communications regulation has been principally concerned with the establishment and maintenance of competitive markets as the primary means of achieving consumer welfare, although some regulators also address standardization issues (type approval of terminal devices) and public policy objectives (most notably, promoting universal access/service). Different regulatory strategies—for example, concerning the structure of competitive markets, interconnection arrangements and pricing strategies—will have different outcomes in terms of network configuration and usage levels, just as will the different business models implemented by communications operators. These, in turn, will have different environmental impacts.

Communications regulators have not generally had, within their mandates, powers to orient market development toward environmentally less harmful outcomes. Nor, with the exception of the Basel Convention, which covers e-waste at an international level, have environmental regulators paid significant attention to the ICT sector. However, it would be possible for regulators to address these issues, not just where network deployment is concerned but also (through type approval) with respect to consumers' terminal devices. Regulators and businesses could explore whether there are ways of using regulatory frameworks to encourage more sustainable device choice by consumers and network configuration by operators, without distorting markets in ways that would otherwise be detrimental to consumer welfare.

## Adaptation and Enhancing Sustainable Outcomes

Many sustainability challenges require both mitigation—the reduction of harm—and adaptation to the impact of the harm that has already occurred and that will continue to occur, at least until mitigation is effective. This is particularly true in areas such as climate change. In his contribution to this project, Bill St. Arnaud emphasizes the need to recognize that, however successful future mitigation efforts concerning climate change may be, significant change is already inevitable and it is therefore crucial for societies to adapt to this, a task in which ICTs can play an important role.

As noted above, some commentators have sought to juxtapose the negative direct impacts of ICTs with positive indirect impacts expected to arise, in particular, from the adoption of smart systems in power generation and distribution, transport management, manufacturing and construction. Smart systems exploit the capacity of ICTs to manage production and distribution processes in ways that increase their energy efficiency, thereby saving both costs and carbon. They can be considered relevant to both mitigation and adaptation, depending on one's viewpoint: climate change specialists are likely to think them mitigation, while from the perspective of those within utilities and ICT-using businesses their value will lie principally in adaptation to new economic and environmental circumstances.

ICT businesses and policy-makers have encouraged the adoption of smart systems through policy initiatives (such as GeSI's *SMART 2020* publication) and research collaborations. Significant initiatives include the following:

- GeSI has sponsored modelling studies of the impact of ICT use in the energy, transport, manufacturing and building management sectors. It has developed a methodology for evaluating the carbon-reducing impacts of ICTs for use by companies and customers (notably business customers). It has also published assessments of carbon savings that might be achieved through dematerialization and the adoption of broadband applications within households.
- ITU-T has organized a series of seminars in different world regions to explore the relationship between ICTs and industry. As well as measures concerned with direct impacts (above), its Study Group 5 has developed methodologies for assessing the impact of ICTs on energy consumption. The ITU's Development Sector has provided policy guidance to developing countries on the application and use of ICTs to combat climate change and address other environmental issues.
- The Information, Computer and Communications Policy Committee of the OECD has done significant work on the role of smart systems within green growth strategies, smart grids for power generation, the value of sensor networks, the effectiveness of environmental awareness initiatives such as eco-labelling, and related issues. At a ministerial level, OECD has issued declarations on green growth and the Internet economy and a Recommendation on ICTs and the Environment that sets out 10 principles as a general framework, from enhancing the contribution of ICTs to improving environmental performance. This is one of the few documents of its kind that addresses first, second and third order effects holistically.

The potential carbon-saving impact of smart systems, GeSI estimates, comfortably outweighs the growing carbon-burning direct impacts that it identifies. The problem, as Luis Neves acknowledges in his interview, is that decisions to implement smart systems are not made by the ICT sector and it has proved difficult for GeSI to get across to utilities and manufacturers, construction and transport businesses, that smart systems would be beneficial both environmentally and to their bottom lines.

GeSI's excellent analytical work in this area needs to be accompanied by much stronger dialogue between the ICT sector and those other businesses and by more government support for investment in smart systems. More analysis needs to be undertaken of the cost and cost-effectiveness to utilities and other businesses of introducing smart systems in place of the less technically efficient systems that are currently deployed, and into ways of cutting costs of implementation that would allow them a quicker rate of return on investment. Given the public interest in positive environmental outcomes, it would be useful to engage regulators, particularly in the utility and transport sectors, in discussions about how to incentivize the adoption of smart systems. As well as looking at potential savings from smart systems, it is also crucial for government, business and regulators to consider the incidence and likelihood of rebound effects, in particular the possibility that savings through energy efficiency will lead to consumers raising energy consumption. It is essential that this is factored into any policy approaches or new business models.

Adaptation does not stop at smart systems, however. IISD recently completed a study for the African Development Bank, exploring ways in which ICTs are being used to support adaptation to climate change. Relevant uses of technology range from sensor systems, through data analysis and information-sharing networks of professionals, to early warning systems and monitoring of climate change outcomes by local communities. Although quite a wide range of applications could be identified, there were also large gaps in implementation—both geographic and thematic—while coordination and experience sharing were poor. These areas of adaptation also require attention from governments and development agencies.

## Societal Impacts

It is the uncertainty surrounding societal or third order effects that makes them much more challenging, from a policy perspective, than first and second order effects, and potentially of much greater impact on our understanding of sustainability. Changes in production and consumption patterns, employment and leisure profiles, social interaction and human settlements, norms and values, and the rights and responsibilities of governments and citizens: these concern the fundamentals of society and economy, politics and culture. It is much harder to see what will happen as a result of changes in these underlying characteristics of society than it is to predict the outcomes of device adoption or the deployment of smart systems. Societal impacts such as these also take place over long periods of time. They are recursive, changing shape and character as they evolve. And they will be affected by ongoing changes over time in the nature of ICTs themselves, as technology and markets develop in ways that are, at present, highly unpredictable. (The rapid growth of social networking on the Internet, which was poorly anticipated by the industry, illustrates the challenge of anticipating rapid change in communications markets.) The uncertainty and unpredictability arising here in many ways resemble the uncertainty and unpredictability of the consequences of climate change, and policy responses will need to be as adaptive as those required in that domain.

A first step—in the context of this report and, particularly, of the complacency around these impacts evident in the Rio outcome document—is simply to raise awareness of policy-makers that significant underlying changes are happening in their societies, which are being influenced by the information revolution. That in itself would be of value.

What would be much more valuable, however, would be for policy-makers to gain a more sophisticated grasp of the ways in which the Information Society is developing and in which ICT technology and markets are influencing the direction of large-scale characteristics of societies, such as patterns of production and consumption, employment and human settlement. This deeper awareness and understanding could be linked, as Jim MacNeill, Ashok Khosla and other contributors to the project have indicated, to reconceptualizations of development, development models, and social and economic outcomes that are consistent with environmental/ecological sustainability. Contributors such as Anriette Esterhuysen and Jay Naidoo also emphasized the relationship between ICTs and issues of social justice, participation, empowerment and governance.

This is partly a research agenda—we need empirical evidence of what is happening now—but it is also fruitful ground for foresight analysis: looking forward, for example through scenarios, at how societies may develop and at the implications of the directions they may take for government, businesses and citizens alike. The forthcoming development of a framework for sustainable production and consumption, agreed in Rio and to be discussed further by the UN General Assembly, offers one opportunity in which the societal impact of ICTs might be explored. IISD would welcome the opportunity to work with other organizations concerned with ICTs and sustainability to develop a research and foresight agenda around this and other societal themes.

## International Discourse

In his contribution published as part of this project, Mark Halle argues, in effect, that the time for grand summits such as that in Rio has now passed. These, he feels, can no longer deliver big picture outcomes, forcing heads of state and government to sign up to agreements on intractable problems, in the way that, arguably, they once did. In practice, it might be said, big summits have become inherently conservative—their outcome documents built around lowest common denominators of agreement; the governments that take part in them unable to agree, let alone to implement, far-reaching change. His frustration with Rio+20 was echoed by a number of other contributors, notably Jai Naidoo, who observed the same delegates and delegations taking part in repeated summits, with very little participation by those most affected by the problems concerned (particularly those most marginalized), more likely (in his view) to backtrack on previous commitments than to take steps that are critically necessary to avert coming catastrophe.

If not summits, though, then what? The following paragraphs look, firstly, at how forthcoming planned fora—multilateral or multistakeholder—might be used to push forward new agendas, and secondly, at whether alternative new fora might give more substance to discussion of ICTs, the Internet and sustainable development.

A number of important ICT sector and sustainability fora will be held during the remainder of 2012 and in early 2013. Some of these are relevant to discussions around ICTs and sustainability, while others address the overall framework for future development of the sector and progress toward what can be regarded as an Information Society. They include the following:

- ITU-T held a "Green Standards Week" in Paris in September 2012, in conjunction with other intergovernmental organizations, standards bodies and private companies. A series of discussions took place around ICT standards and methodologies for greener cities, smart grids, the ICT supply chain, e-waste, the green economy, environmental monitoring and disaster communications.

- The ITU's World Telecommunication Standardization Assembly (WTSA) will follow in Dubai in November 2012. This will adopt a four-year program for developing standards on ICTs, building (among other areas) on the work of ITU Study Group 5 (SG5), which has considered ICTs, the environment and climate change over the past four years. As well as furthering work on energy efficiency, environmental impact assessment, impact reduction (including e-waste) and adaptation to the effects of climate change, SG5 has proposed that work should begin on "leveraging and enhancing ICT environmental sustainability." Proposals in this context include development of a global database standardizing information about environmental impacts of ICT products and services, development of an eco-rating program to provide information on ICT impacts to governments, businesses and users, and recommendations concerning ICT procurement policies that would support environmental sustainability.
- The global Internet community will hold its seventh annual Internet Governance Forum (IGF) in Azerbaijan, also in November 2012, with the overall theme of "Internet governance for sustainable human, economic and social development." As is often the case, it is hard to say whether the inclusion of sustainability in a titular theme will lead to substantive discussion about sustainability itself. Much of the Forum will be preoccupied with regular IGF topics such as critical Internet resources, IPv6, access and content issues, as well as with "enhanced cooperation" between governments and other stakeholders on issues of Internet public policy. Few of the workshops that have been proposed for it explicitly address sustainable development as this would be understood by the sustainable development community. However, many of the subjects that will be discussed do relate indirectly to sustainability, while the sustainability of the Internet's current modalities—in both technology and governance—represents another underlying theme.
- Discussions about the future of the Internet amongst ITU members (member-states and [private] sector members) will continue at the World Telecommunication/ICT Policy Forum, which will be held in Geneva in May 2013 with the theme of "International Internet-related public policy matters," alongside the 2013 meeting of the WSIS Forum.
- Immediately following WTSA, in December 2012, the ITU will hold the World Conference on International Telecommunication (WCIT-12), also in Dubai, with the aim of revising and updating the International Telecommunication Regulations (ITRs), the treaty between ITU member-states that regulates international telecommunications infrastructure and services (which, among other things, underlie the Internet). There has been controversy about the scope of this conference, with some in the Internet community fearful that it will lead to greater ITU control or oversight of Internet governance. It will certainly address some of the security-related threats to the sustainability of the Internet that were identified by Vint Cerf in his interview for this project. In addition, there is a proposal to add energy efficiency and reductions in e-waste to the treaty as a basic principle of international telecommunication regulation.
- In the last quarter of 2012, the UN General Assembly will discuss and develop recommendations from the Rio+20 Summit, including the issues to be covered by proposed Sustainable Development Goals and the development of a framework for sustainable production and consumption. The General Assembly will also agree arrangements for the 10-year review of outcomes from WSIS (see below) and for the 2015 review of the Millennium Development Goals, which, in turn, will lead to a new UN Development Agenda.

- The 10-year review process for WSIS will begin in February 2013 with a conference entitled "Towards Knowledge Societies for Peace and Sustainable Development," to be hosted in Paris by UNESCO. Subsequently, an action plan proposed by the UN Group on the Information Society has proposed that, rather than a 10-year review summit along the lines of Rio+20, there should be a smaller high-level review meeting dovetailed with the ITU's quadrennial World Telecommunication Development Conference—the conference that establishes the program for its Development Sector, which is due to be held in 2014. Some governments and some other stakeholders would prefer a full-scale UN summit along the lines of Rio+20, and a decision on this will be made by the UN General Assembly at the end of 2012.

These events all provide opportunities for governments, businesses and other stakeholders to explore aspects of the relationship between ICTs and sustainability, particularly first and second order effects. It would be helpful if those with relevant expertise—including GeSI, the OECD and IISD—could work more closely together to identify ways of increasing awareness of the issues discussed in this project and of instigating more thorough investigation and sharing of ideas and experience, including research and foresight analysis. The role of the private sector is especially important here. None of these international fora, however, provide the same degree of opportunity to address societal impacts as the Rio+20 Summit might have done. For that, new ways of addressing international policy-makers and business decision-makers will be required.

Experience at the second Earth Summit—and at the Copenhagen climate change summit in 2009—has lowered expectations among environmental specialists about the effectiveness of UN summits in dealing with the kind of challenges they face. While the United Nations has bravely asserted that Rio+20 moved agendas forward, most participants regarded it as "disappointing" or worse. Where global summits did, at one time, offer opportunities for breakthrough in deadlocked negotiations on intractable issues, they no longer seem to be doing so. Repeat summits, held one or two decades after an earlier event, seem to be particularly unproductive. As Jay Naidoo puts it in his interview, they see the same people negotiating again and again on the same issues, reinterpreting and sometimes backtracking on previous commitments. Perhaps partly because it was such a repeat summit, responding to the outcomes of its predecessors, Rio+20 also proved unable to accommodate new issues, such as the information revolution, in the framework that had been established in those earlier events. Additionally, as Mark Halle notes in his contribution, summit processes have high opportunity costs: they not only take a lot of money, they also divert the attention of sustainability professionals in government, business and civil society for lengthy periods of time. This can only be justified if they are likely to produce significant results, rather than stasis and disillusion. We should, he argues, drop the summitry and concentrate on the implementation gap.

The challenge to the international community, therefore, is to find an alternative that offers a more realistic prospect of achieving gains—a challenge that is far from trivial. The universality of UN summits and other UN processes—the essence of multilateralism—is rightly valued by developing countries. There are, however, three clearly identifiable problems with summits at present, each of which inhibits real progress from being achieved:

- The first is the overwhelming significance attached within summits' formal structures to their outcome documents. In many ways, summit processes are extended negotiations around a text that culminate with the signing ceremony that is formally designated as "the summit." Instead of seeking to learn from one another, delegations—often in practice led by diplomats rather than subject specialists such as experts on sustainability—focus on developing a text that can be presented as global agreement or consensus. Not surprisingly, this text often comprises lowest common denominator consensus, deliberate ambiguity and prevarication, deferring real decisions to a later forum where they may or may not prove less contentious. As time goes by, in spite of these unpropitious origins, the outcome text becomes the starting point for future negotiations, where it is treated (and argued over) as if holy writ. The problem here is that achieving universal agreement on *something*, no matter how unconvincing, has come to be seen as more important than achieving progress that is meaningful (and that need not be universal).
- The second problem is that summits and other UN processes have too little space for expertise that comes from outside government. The case for multistakeholder engagement is not—or is not only—that it is more equitable, as many in civil society would argue. Nor is it—nor should it be—a challenge to the sovereignty and authority of governments, certainly not to those that are elected by and accountable to their people. The central case for multistakeholder engagement is that it draws essential expertise into the process of developing relevant policies, gives that expertise due weight, allows more informed discussion, and facilitates agreement on measures that are much more likely to achieve results than agreements by non-experts pursuing political or diplomatic goals. At present, almost every global summit sees angry exchanges about the extent to which multistakeholder participation should be allowed, with non-governments camped outside the main event in a disconnected and discontented forum of their own. The private sector is often largely absent from something it considers will have little value for it, other than perhaps in marketing. The challenge here is to find ways of engaging private sector and other non-governmental expertise that governments accept as positive rather than threatening. This problem, also, is not trivial.
- The third problem is the insistence, within the UN system, that every summit must be pronounced successful, even when everyone knows that it was not. At the start of the Rio+20 Summit, the UN Secretary-General said that progress on sustainable development had been too slow since 1992 and that, in Rio this time round, "words must translate into action."[6] After the event, he said: "Let me be clear. Rio+20 was a success. In Rio, we saw the further evolution of an undeniable global movement for change."[7] Not many people who took part think that the summit turned "words into action," however, or that the evolution in global movement for change was anything near fast enough. The problem here is that pretending failure is success, or very limited success is real progress, saves face not planets. It isn't credible, and it isn't sufficient to meet the needs for which the summit had been organized.

[6] BBC News Science & Environment, "Rio+20: Progress on Earth issues 'too slow' – UN chief," http://www.bbc.co.uk/news/science-environment-18527141

[7] United Nations Conference on Sustainable Development, "UN senior officials highlight Rio+20 achievements," http://www.uncsd2012.org/index.php?page=view&nr=1308&type=230&menu=38

The current model of international discourse on sustainability, in short, is not sustainable. What is needed instead, or at least alongside it, are other and less formal processes that inject new dynamism into international dialogue, that have the potential for moving dialogue forward rather than encouraging it to rest on its laurels. This is particularly important in the two areas covered by this report—in sustainable development, because the world is heading rapidly toward a crisis of unsustainability; in the Information Society, because the ICT sector is moving so fast that summits cannot respond quickly enough to its dynamic growth.

This report is not the place to explore in detail the kind of processes that are required here, though a number of aspects of what might work better are implicit in the comments made above. A revitalized dialogue on sustainable development needs to engage all stakeholders, not merely governments, because governments alone cannot bring sustainability about. The engagement of the private sector is particularly crucial. It needs to question assumptions and to learn how changing times and circumstances—including the crossing of planetary boundaries and including the advent of an Information Society—have changed the context and meaning of sustainability and the ways in which achieving it must be addressed. Policy approaches need to be adaptive to the changing world. International discourse needs to value the exploration of ideas and options rather than seeking to lock debate and innovation within parameters that are acceptable to all. Substantive dialogue needs to address big issues like population growth and GMOs rather than parking them because they are too controversial. It needs to recognise that failure to agree on something is not the same as failure, and that agreement on something not worth saying is not success.

There are a number of ways that could be suggested for improving dialogue along these lines. The commission model of the 1970s and 1980s—including the Brandt Commission on international development issues and the Palme Commission on international security issues, as well as the Brundtland Commission—is one model that has worked previously. Bringing together a small and representative group of global opinion leaders, with an expert secretariat, to explore a specific theme and make recommendations of global relevance, is one way of trying to break the logjam inhibiting discourse in international summits.

Such a commission needs, however, to include diverse experience and opinion: it must be more than a coalition of the like-minded. The present Broadband Commission is quite widely felt to fail this test because it is seen as an advocacy body for a particular view of the relationship between ICTs and development, making the case for broadband rather than that for development. Other commission processes in the past are felt to have been disappointing or unsuccessful in their outcomes; they can be highly dependent on the personalities involved and the resources available to enable insightful research and analysis.

A better model in recent experience would be the Working Group on Internet Governance, which was held between the two phases of WSIS, whose members (at least in theory) participated as individuals rather than as representatives of governments or businesses and that sought to achieve multistakeholder consensus around a definition of Internet governance and possible ways forward on contentious issues. A series of even more informal meetings, drawing together experts for discussions that are off-the-record or held under Chatham House rules, could also help to invigorate debate that reaches well beyond the meetings' own participants. Informal gatherings of experts along these lines can end with summary reports whose insights can be highly influential.

Another option might be a more informal international gathering, such as the multistakeholder IGF that emerged from WSIS. This has no decision-making powers and produces no outcome documents along the lines of those that emerge from summits. Some participants find this frustrating, others liberating. As a forum, it has certainly helped to build trust across multilateral and multistakeholder boundaries, where previously this was absent, and to foster more creative discussion around difficult issues, not just in the IGF itself but in other Internet fora. It has showed that international fora can be organized without large bureaucracies in charge. While it has its critics, they are less vehement than those of Rio+20. The IGF has also spawned national and regional meetings that explore its issues at a less-than-global level.

Why is this particularly important for this project, which is concerned with the relationship between ICTs and sustainability? Three reasons indicate why it would be particularly valuable to instigate new forms of discussion around this theme, as a contribution to discussion about sustainable development in general.

The first is the pace of change. As many of the contributors to this project have indicated, and as the UN Secretary-General acknowledged, the last 20 years have seen many sustainability indicators moving in a negative direction, particularly where climate change and other planetary boundaries are concerned. The pace of change is fast and the time available before impacts become irreversible is short. The pace of change in information technology has also been exceptionally fast, and it has had substantial impacts on society, economy, politics and culture—impacts barely noticed in the formal dialogue in Rio or in *The Future We Want*. With change so rapid, it is urgent that serious understanding of it is injected into the sustainability debate.

The second is that the present paradigm gap between the ICT and sustainable development communities is contributing to unsustainability. As in other public policy domains, understanding of sustainable development in much of the ICT community is weak and shallow. Understanding of ICTs and their impacts and implications in the sustainable development community, as Rio+20 demonstrated, is equally poor. Sustainable development is not possible if it ignores major dimensions of sustainability.

It is crucial, at the same time, that the complexity of the relationship between ICTs and sustainability is understood and dialogue about it fully nuanced. As we have argued earlier, technocentric strategies and programs will not deliver sustainability. Sustainable development must be encompassed within the planet's natural constraints—must be "within the bounds of the ecological possible," in the words of the Brundtland Commission—and will always be dependent on human agency—the choices made by governments, businesses and individuals, the limits imposed by human capacity, etc.—rather than determined by what is technically feasible.

The third reason is that ICTs offer new ways in which debate can be invigorated. Smaller and less formal meetings are not the only way in which dialogue can move on from big, more formal meetings. Even where formal meetings with restricted participation are required, for example in the UN system, it is possible to use ICTs to draw in expertise from the private sector and civil society, refreshing debate, ensuring that it is informed by insights from those who, in practice, are affected by it and, in many cases, will be responsible for implementation. Spaces for debate, open and closed, can be made available online. Standards and policy documents alike can be discussed and developed online over a period of time, as is the case with standards developed by the Internet Engineering Task Force and the World Wide Web Consortium or policies developed by the Regional Internet Registries. Even international treaty documents can be opened up to wider scrutiny and input from outside the negotiating process, as the ITU has recently done with the International Telecommunication Regulations to be reviewed at WCIT-12.

IISD's Global Connectivity program has explored the relationship between ICTs, the Internet and sustainability for the past decade. Its work has revealed a number of barriers that stand in the way of mutual awareness and understanding, better communication and more effective collaboration on issues of common interest to the ICT and sustainable development communities. As indicated, these include differences in world views and guiding principles; professional, institutional and ideological rigidities; the lack of an overarching paradigm concerning the interaction between communications and sustainability; and the absence of fora in which members of the two communities can meet, explore relationships and synergies between their fields of work, and identify opportunities for joint research and joint development of ideas. All of these factors, as confirmed by many of the people interviewed in this project, contributed to Rio+20's failure adequately to address the relationship between ICTs and sustainability.

This brings us to one last proposal. In his interview for this project, Jim MacNeill suggested that "it would be very useful if … experts from the ICT community … got round a table with a number of leaders from sustainable development non-governmental organizations or institutes," in order to discuss the relationship between ICTs and sustainable development. A group of that kind—more focused in its subject, smaller and less high-level in its membership than the Brundtland Commission—would be one way to build on the insights in this project, increase understanding across the paradigm gap that has been identified between ICT and sustainability professionals, and inject this crucial new dimension into discourse on sustainable development. IISD would welcome the opportunity to work with other organizations to bring about that forum and use it to inspire wider and better dialogue about the relationship between sustainability and the Information Society.

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