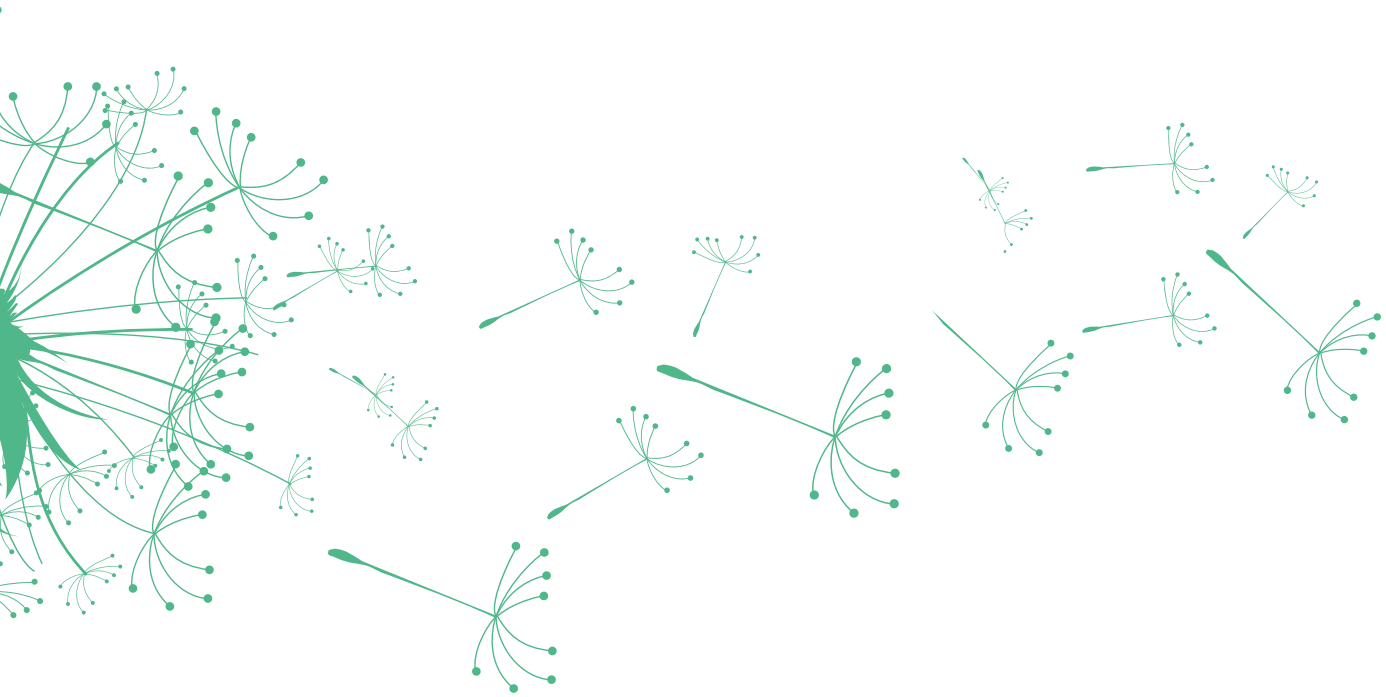
THE BROADBAND BRIDGE

LINKING ICT WITH CLIMATE ACTION FOR A LOW-CARBON ECONOMY

A REPORT BY THE BROADBAND COMMISSION

ITU

UNESCO



THE BROADBAND BRIDGE

LINKING ICT WITH CLIMATE ACTION FOR A LOW-CARBON ECONOMY

A REPORT BY THE BROADBAND COMMISSION

ABOUT

The Broadband Commission for Digital Development is an initiative set up by the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) in response to UN Secretary-General Ban Ki-Moon's call to step up efforts to meet the Millennium Development Goals. Launched in May 2010, the Commission comprises government leaders from around the world and the highest-level representatives and leaders from relevant industries and international agencies and organizations concerned with development.

The Broadband Commission embraces a range of different perspectives in a multi-stakeholder approach to promoting the roll-out of broadband, as well as providing a fresh approach to UN and business engagement. To date, the Commission has published two high level policy reports, as well as a number of best practices and case studies.This report is the result of the work of the Working Group on Climate Change of the Broadband Commission. The working group is chaired by Hans Vestberg, CEO of Ericsson, who also led the production of this report.

More information about the Commission is available at www.broadbandcommission.org

Disclaimer

The information contained in this publication is provided by the lead author and by the interviewees who contributed to the report, and does not engage or necessarily represent the opinions of the International Telecommunication Union (ITU), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the membership and staff of ITU and UNESCO, or the Broadband Commission Secretariat.

The views of Broadband Commissioners reflected in this publication are personal and do not entail any responsibility for their respective governments, or for the organizations to which the Commissioners are elected, with which they are associated, or by which they are employed.

All rights are reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written authorization of ITU or UNESCO. Denominations and classifications used in this publication do not imply any opinion concerning the legal or other status of any territory or any endorsement or acceptance of any boundary. Where the designation "country" appears in this publication, it covers countries and territories.

Printed at
International Telecommunications Union
Place des Nations
CH-1211 Geneva 20
Switzerland

March 2012

ACKNOWLEDGEMENTS

We would like to thank the following Broadband Commissioners (and/or their focal points) for contributing to this report through interviews (listed alphabetically):

Rob Bernard, *Chief Environmental Strategist, Microsoft (on behalf of Orlando Ayala, Corporate Vice President, Chairman of Emerging Markets and Chief Advisor to Microsoft's Chief Operating Officer)*

Helen Clark, *Administrator, United Nations Development Programme (UNDP)*

Stephen Conroy, *Minister for Broadband, Communications and the Digital Economy and Minister Assisting the Prime Minister on Digital Productivity.*

Cheik Sidi Diarra, *UN Under-Secretary-General and High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States*

Peter Gibson, *Wireless Standards and Regulations Manager, Global Public Policy, EMEA, Intel*

Wang Jianzhou, *Chairman, China Mobile Communications Corporation*

Sunil Bharti Mittal, *Founder, Chairman and Group CEO, Bharti Enterprises*

Robert Pepper, *Vice President, Global Technology Policy, Cisco (on behalf of John Chambers, CEO, Cisco)*

Jeffrey Sachs, *Director, The Earth Institute at Columbia University*

Hamadoun Touré, *Secretary-General, ITU and Vice Co-chair of the Broadband Commission*

Ben Verwaayen, *CEO, Alcatel-Lucent*

Hans Vestberg, *President and CEO, Ericsson*

Other government officials, leaders and experts who contributed to the report through their interviews (listed alphabetically)

Luis Alfonso de Alba, *Mexico's Special Representative for Climate Change, the Principal Negotiator of the Mexican delegation to the UNFCCC, and Vice-Vhair during the 2010 United Nations Climate Change Conference*

Paul Budde, *President, BuddeCom,*

Clr Mpho Parks Tau, *Mayor, Johannesburg, South Africa*

Anna-Karin Hatt, *Minister for Information Technology and Energy, Sweden*

Christina Henryson, *Head of Broadband, Ministry for Information Technology and Energy, Sweden*

Stephen Mncube, *Chairman, Independent Communications Authority of South Africa (ICASA*

Luis Neves, *Chairman, Global e-Sustainability Initiative (GeSI)*

Gabriel Solomon, *Head of Public Policy, GSMA*

The editorial team included Elaine Weidman Grunewald (Ericsson), Jose Maria Diaz Batanero, Gemma Colman and Robert Narvaez (ITU), and Amy Brown, Andrea Spencer-Cooke and Astrid von Schmeling (One Stone).

For additional information on the initiatives presented in this report visit the Broadband Commission's on-line repository of information:

www.broadbandcommission.org/sharehouse

All are welcome to access its content, and to submit further contributions.

TABLE OF CONTENTS

FOREWORD

Dear Fellow leaders and Stakeholders,

Climate change is among the biggest challenges humankind has ever faced. No country will remain untouched: some may experience extreme weather events, others severe drought, or sea level rises, resulting in the loss of coastal areas. World leaders, based on scientific consensus from the Intergovernmental Panel on Climate Change (IPCC) have for several years been working towards a goal of preventing temperatures from rising more than two degrees Celsius (3.6 degrees Farenheit) to contain the most severe risks and consequences of climate change. This will require substantial reductions of greenhouse gases (GHG), in particular CO_2 —a daunting task that can only be achieved with transformation to a low-carbon economy.

Tackling climate change requires coordinated global action—indeed this is the focus of the global climate negotiations held within the United Nations Framework Convention on Climate Change (UNFCCC). It is only through a unified approach based on cross-sectoral collaboration by governments, the private sector, international organizations and civil society that we can achieve the necessary conversion to a low-carbon economy. Incremental measures are not enough. But governments can accelerate the pace of transformation by integrating the use of Information and Communication Technologies (ICT) such as broadband networks, services and applications, with climate change policy to set their countries on a forward-looking course while working to meet national development and poverty reduction goals.

Broadband is the gateway to the networked economy. Its potential to transform the way we work and live opens a door to new business models and growth opportunities at a time when many countries are struggling to jumpstart their economies from a period of financial crisis.

Creating a low-carbon economy means transitioning from the energy-intensive physical infrastructure of the 20th century to the innovative, connected, information-based infrastructure that will be the hallmark of the 21st century. Governments that recognize the opportunities broadband offers for addressing a range of socio-economic goals as well as climate action, are making the expansion of affordable, reliable broadband access a key priority, with positive economic results.

In the past, rising GDP per capita has tended to equate to greater consumption of resources—and therefore increased environmental impacts such as higher CO_2 emissions (one of the major contributors to GHGs). ICT can help to decouple GDP from CO_2 emissions. Today the technology exists to deliver services more effectively and assist countries onto a more sustainable path by meeting needs more efficiently. To date, however, progress in the uptake of such transformational technologies has been limited and the policy frameworks to support the necessary changes in consumer behavior are lacking.

With vision, effective policy choices, cross-sectoral partnerships and targeted investment, we can turn this unprecedented global challenge into a remarkable opportunity to reshape our world into one that is sustainable—in other words green, prosperous and equitable.

This report aims to show how broadband can contribute to reducing GHG, as well as mitigate and adapt to the effects of climate change. To fulfill this potential a new policy framework is required. To illustrate this, this report showcases best government practices in mobilizing ICT to reduce GHGs and build inclusive societies. This report proposes 10 recommendations for policy makers that we believe would hasten and strengthen the ability of ICT and broadband to accelerate global progress towards the low-carbon economy and further progress towards achieving the four targets set by the Broadband Commission.

The report is based on interviews and supporting material from more than 20 leaders and experts in the field, spanning a broad stakeholder group of industry, government, academia and international organizations. This includes several members of the Broadband Commission, representatives from several national governments, and other experts. The interviews were complemented by relevant reports and data.

We welcome your feedback and hope that the report will be a springboard for further discussion and action.

Hans Vestberg,
President and Chief Executive Officer, Ericsson
Chair of the Broadband Commission Working Group on Climate Change

Dr. Hamadoun Touré,
Secretary General
International Telecommunication Union (ITU)
Vice Co-Chair of the Broadband Commission

1

THE PATH TO TRANSFORMATION

1.1 A TRANSFORMATIONAL TECHNOLOGY

Broadband has huge potential to help shift the world towards a low-carbon economy and address the challenge of climate change. Broadband can deliver vastly enhanced energy efficiency, mitigation, adaptation, real-time monitoring and emergency response, as well as broader benefits such as Gross Domestic Product (GDP) growth and job creation, social inclusion and improved governance and wider access to education and health.

The Promise of Broadband

A number of studies have linked the expansion of broadband networks, services and applications to global GDP growth. In China, for instance, every 10 percent increase in broadband penetration could contribute an extra 2.5 percent to GDP growth.[1] Research by the World Bank indicates that for high-income countries, a 10 percent rise in broadband penetration adds a 1.21 percent rise in economic growth, or 1.38 percentage for low- and middle-income countries[2]. The potential in several countries and regions such as India, China or Africa to harness broadband to meet the Millennium Development Goals (MDGs[3]) while leapfrogging to and moving towards a low-carbon economy is especially significant. Moreover, a low-carbon economy is increasingly likely to be a strong economy as countries face rising energy prices along with the potentially crippling costs of dealing with the consequences of climate change.

The ICT sector has been estimated to contribute 2-2.5 percent of global GHG emissions, including radio communications systems and equipment; but by far its largest contribution is in enabling energy efficiency in other sectors (the remaining 98 percent). According to "Smart 2020: Enabling the low carbon economy in the information age,"[4] a study jointly conducted in 2008 by the Global e-Sustainability Initiative (GeSI), the Climate Group and McKinsey, ICT has the capacity to deliver carbon savings five times greater than the sector's own total emissions. The study found that the potential to reduce global emissions with ICT solutions is more than 7.8 Gt by 2020—equivalent to15 percent reduction of global emissions, for only a low increase in ICT's own emissions.

More recent studies have shown even greater potential, in particular as new services and applications enabled by high-speed high-capacity broadband are introduced. An analysis by Accenture and Vodafone in 2009 of five sectors in Germany (logistics, transportation, buildings, smart grids and dematerialization) concluded that the smart use of ICT solutions could reduce CO_2 emissions in Germany by as much as 25 percent.[5]

Broadband has a vital role to play in three key areas related to climate change:

- Transformation: helping other sectors of society to reduce GHGs through dematerialization of physical products and systems, for example, substituting travel with collaborative tools or substituting need to produce physical products by delivering e-products and services
- Climate mitigation: reducing the sector's own emissions, often referred to as Greening ICT, for example, specific efforts to cut emissions of greenhouse gases within the ICT industry itself, such as developing energy lean products and solutions, setting and delivering on tough reduction targets
- Climate adaptation: changes in processes, practices and structures to reduce the vulnerability of natural and human systems to climate change effects. Broadband can provide viable solutions, for example, weather information and disaster alerts.

In the journey towards a low-carbon economy, broadband has the possibility to transform rural as well as urban areas of the world, in both developed and developing countries. The positive socio-economic

1 A 2010 Leadership Imperative: the future built on Broadband, Broadband Commission, ITU, UNESCO, 2010, http://www.broadbandcommission.org/Reports/Report_1.pdf

2 Broadband: A platform for progress, A report by the Broadband Commission for digital development, ITU and UNESCO, June, 2011, http://www.broadbandcommission.org/Reports/Report_2.pdf

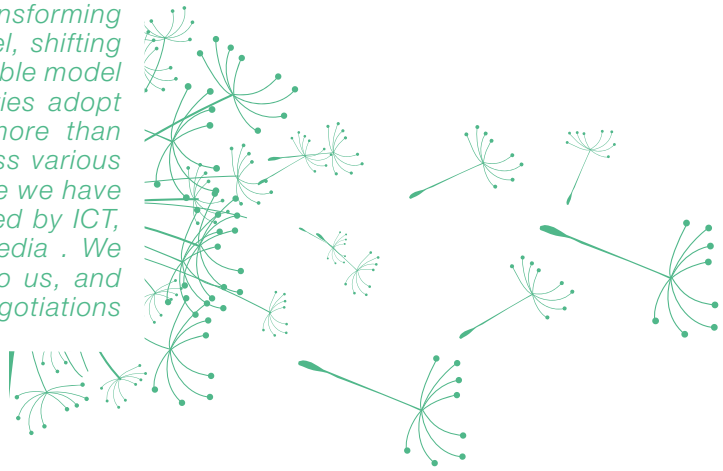
3 Resolution adopted by the General Assembly: United Nations Millennium Declaration, ref: A/RES/55/2, United Nations, 18 September 2000, http://www.undemocracy.com/A-RES-55-2.pdf

4 Smart 2020: Enabling the low carbon economy in the information age, The Climate Group on behalf of the Global eSustainability Initiative (GeSI), 2008, http://www.gesi.org/LinkClick.aspx?fileticket=tbp5WRTHUoY%3d&tabid=60

5 Carbon Connections: Quantifying mobile's role in tackling climate change, Vodafone and Accenture, July 2009, http://www.vodafone.com/content/dam/vodafone/about/sustainability/2011/pdf/carbon_connections.pdf

"Addressing climate change implies completely transforming our way of life, the way we work, the way we travel, shifting our model of development to a fairer, more sustainable model to ensure our survival. As more and more countries adopt national broadband plans – already there are more than eighty – we will be able to reduce emissions across various different sectors of the economy. In the last decade we have seen several sectors being dramatically transformed by ICT, including transportation, e-commerce and multimedia . We need to put at stake all the resources available to us, and mobilize the political will to turn discussions and negotiations into agreements and actions."

Hamadoun Touré,
ITU Secretary General



impacts of broadband on the lives of people in the least-developed countries—those at the base of the pyramid—are well described in the Broadband Commission's first report, A 2010 Leadership Imperative: The Future Built on Broadband[6]. For some developing countries, particularly small island states and land-locked countries, broadband has the potential to play a critical role in the urgent need for climate adaptation.

The Framework

The United Nations Framework Convention on Climate Change (UNFCCC) is the global mechanism dealing with the causes and effects of climate change. Opened for signature at the 1992 Earth Summit, the Convention has the ultimate objective to achieve "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."[7] To date, the key achievement of the Convention, which with 195 signatories enjoys nearly-universal membership, has been the adoption of the Kyoto Protocol in 1997[8], which for the first time established legally-binding emissions targets for industrialized countries and introduced market mechanisms to promote low-carbon development.

Although some stakeholders have criticized the lack of ambition of the targets defined by the Kyoto Protocol, the global community continues to work within the Convention to agree on a long term climate regime that will define emissions reduction targets to keep the expected increase in temperatures under two degrees Celsius. The latest progress in this direction was achieved during the 2011 United Nations Climate Change Conference (COP-17 / CMP-7), held in Durban, South Africa. At this conference, country delegations agreed to establishing a second commitment period for the Kyoto Protocol (starting on 1st of January 2013), as well as to initiating a new round of negotiations to define a new universal legal agreement by 2015.

The forthcoming global events on climate change and sustainable development, which include the 2012 United Nations Conference on Sustainable Development (Rio+20) and the 2012 United Nations Climate Change Conference (COP-18/CMP-8), will be key to define a global green growth agenda based on low-carbon technologies and strategies. Governments involved at these events may find answers in the solutions-perspective offered by broadband and ICT. By promoting the seamless integration of climate change, energy and broadband initiatives to shape a low-carbon economy in the way best suited to their nation, governments have the opportunity to show leadership and build economic resilience.

"One of our National Digital Economy Strategy goals is to better manage the energy use of our infrastructure and environment. High-speed broadband can help to improve Australia's environmental sustainability by supporting smart technology applications that encourage more efficient use and demand management of water, energy, transport and infrastructure.

The Australian government has taken a lead in integrating climate change and ICT policies by implementing an ICT sustainability plan to assist in lowering its carbon footprint. Government ICT operations are estimated to be able to improve its energy management up to 20 per cent on current consumption levels by mid-2015. This equates around 325,000 tonnes of carbon emissions mitigated over the five year plan.[9]"

Stephen Conroy,
Minister for Broadband, Communications and the Digital Economy and Minister Assisting the Prime Minister on Digital Productivity.

6 A 2010 Leadership Imperative: the future built on Broadband,Broadband Commission, ITU, UNESCO, 2010, http://www.broadbandcommission.org/Reports/Report_1.pdf

7 United Nations Framework Convention on Climate Change, FCCC/INFORMAL/84 GE.05-62220 (E) 200705, United Nations, 1992, http://unfccc.int/essential_background/convention/background/items/1353.php

8 Kyoto Protocol to the United Nations Framework Convention on Climate Change, United Nations,1998 http://unfccc.int/resource/docs/convkp/kpeng.pdf

9 Australian Government ICT Sustainability Plan, Department of the Environment, Water, Heritage and the Arts, 2010, ISBN: 978-1-921733-15-4, http://www.environment.gov.au/sustainability/government/ictplan/publications/plan/pubs/ict-plan.pdf

1.2 MITIGATION THROUGH TRANSFORMATION

The processes of 'dematerialization' and 'virtualization' of products and services made possible by broadband have the potential to decouple economic growth from environmental impact, helping sectors from energy to healthcare, government services and communications become more energy-efficient, more intelligent and accessible.

Closed-loop thinking, or a circular economy, is clearly one way forward. Tapping the potential of broadband and ICT to deliver efficiencies and spur the transition to a more circular economy can yield significant reductions in resource use, waste generation and carbon footprint. The circular economy is based on a closed materials loop, where everything is designed for recycling and the lowest possible use of energy. The aim is to create a benign production system that rebuilds social and natural capital while increasing quality of life. ICT and broadband will be significant enablers of the practical realization of the circular economy, as the dematerialization at the heart of the circular model depends on advanced technology to decrease dependency on finite resources.

In a 2008 report[10], WWF and Ecofys identify 10 key areas in which ICT could help deliver up to one billion tonnes of strategic CO_2 reductions, including: smart city planning, smart buildings, smart appliances, dematerialization services, smart industry, i-optimization, smart grid, integrated renewable solutions, smart work and intelligent transport. To achieve these solutions, one of the report's key recommendations to policymakers is to increase the penetration of broadband Internet access to all households.

Transformative broadband solutions are those that reinvent business models or allow countries to "leapfrog" from high emitting technologies to low carbon development. Such innovations can deliver smart buildings that are net producers of renewable energy, electric cars that drive a zero emission economy, and e-services from, for example, e-health to e-education, e-commerce, e-governance and teleworking. The SMART2020 Study showed that while the ICT sector's own contribution to carbon emissions is around 2%, transformative broadband solutions allow other sectors to significantly reduce the remaining 98% of global emissions.[11]

Ericsson has developed a number of case studies showcasing a method for assessing the potential CO_2e emission reductions that can be achieved by introducing an ICT-based service. From a life-cycle perspective, both the environmental impact of the ICT-based service and the service it replaces need to be considered. The method includes an analysis of ICT system infrastructure (such as antenna towers and site buildings) as well as conventional systems (such as airports, roads and buildings). It introduces a figure called the "potential reduction ratio," namely the direct emissions of the new ICT-based system in CO_2e in relation to the enabling effects in CO_2e. The case studies include mobile money, collaborative work, and e-health and the potential CO_2e reduction ratio ranged from 1:45 to 1:100.[12]

In the US, a follow-up study to Smart 2020 produced by the Boston Consulting Group, Climate Group, and GeSI puts reductions from ICT-enabled energy efficiency at between 13-22 percent. An American Council for an Energy Efficient Economy 2008 study[13], meanwhile, has shown that for every kilowatt hour of electricity consumed by ICT, the US increased overall energy savings by a factor of 10. The clear implication of this analysis is that ICT provides a net savings of energy across the economy.

In summary, it has been identified that in order to limit global temperatures to 2°C, emissions need to be capped at approximately 44 Gt of carbon dioxide equivalent ($GtCO_2e$) by 2020. If the lowest-ambition pledges made in Copenhagen at the 15th Conference of Parties to the UNFCCC1[14] are implemented,

10 The potential global CO_2 reductions from ICT use: Identifying and assessing the opportunities to reduce the first billion tonnes of CO_2, WWF Sweden, May 2008, http://www.wwf.se/source.php/1183710/identifying_the_1st_billion_tonnes_ict.pdf

11 ICT Solutions for a Smart-Low- Carbon Future, Supporting a solution agenda in Cancun, GeSI, Nov 2010, http://www.gesi.org/LinkClick.aspx?fileticket=hlCL44h0Jwg%3D&tabid=130

12 Measuring emissions right, Ericsson white paper 284 23-3135 Uen Rev B, March 2010, http://www.ericsson.com/res/docs/whitepapers/methodology_high3.pdf

13 Laitner J. A and Ehrhardt-Martinez K, Information and Communication Technologies: The Power of Productivity: How ICT Sectors Are Transforming the Economy While Driving Gains in Energy Productivity, E081, ACEEE, Feb 2008, http://colombiadigital.net/newcd/component/docman/doc_download/822-information-and-communication-technologies-the-power-of-productivitypdf

14 Copenhagen Accord, UNFCCC, 2009, http://unfccc.int/resource/docs/2009/cop15/eng/l07.pdf

> *"Instead of viewing the need to reduce carbon emissions and increase resource efficiency as a problem, it is time to ensure that a new generation of ICT solution providers seizes the opportunity to deploy innovative products and services needed to create a low-carbon society."*
>
> **Luis Neves,**
> Chair of Global e-Sustainability Initiative (GeSI)

it is estimated that 2020 emissions would be in the region of 53 $GtCO_2e$, leaving a significant emission gap of 9 GtCO2e[15]. ICT and broadband-enabled applications offer the potential to decrease this gap to1.2$GtCO_2e$ (an 87% reduction).

Smart Cities

Cities stand to be at the forefront of ICT-led transformation. With world population expected to soar to more than nine billion people by 2050, roughly 70 percent of whom will live in cities according to the United Nations Population Division, making our urban centers smarter is essential. Urbanization is currently a major global trend. By 2016 over 30 percent of the world's population are expected to live in metro and urban areas with a density of more than 1,000 people per square kilometer. These areas represent less than one percent of the Earth's total land area, yet they are set to generate around 60 percent of mobile traffic by 2016.[16] Applying trans-sectoral ICT-based innovation in cities can yield multiplier effects that benefit the entire economy, leading to more interconnected sustainable communities. And while countries debate national emission reduction targets, it is cities which have to implement changes to reach those targets.

What smart living can mean for citizens is being tested in Beijing with the Smart Beijing Action Plan which consists of more than 60 projects, seen as vehicles to promote China's ICT industry and ranked highly in government planning goals on all levels.[17] The plan encompasses transport, healthcare, individual consumption, culture, education, ways of working, tourism and e-government. All government services for the public are included in the concept. Beijing's Municipal Commission of Economy and Information Technology will implement the plan, which is in the planning stage. As a public-private collaboration, the government will implement some of the projects; companies, organizations and others will drive the e-commerce platform, mobile learning or e-health, etc., and businesses will be encouraged to make the best use of ICT in their operations. Beijing is considering appropriate changes to legislation to allow the smart city to function. Current laws do not address all the implications of a smart city—for example, around protection of personal integrity and privacy. These issues will have to be addressed to create the 'harmonious' vision at the heart of the plan.

Smart Grids

One of the areas under strongest development of the low-carbon economy is smart grids, whereby electricity companies use ICT to reduce losses, prevent outages, and provide customers with real-time information to manage their own energy footprint. The World Energy Council calculates that production and use of electricity accounts for 40 percent of GHGs globally, making the sector the single largest contributor. Governments and utilities are expected to invest a total of USD 200 billion in smart grids worldwide by 2015, according to Pike Research. For more examples of how smart grids are becoming part of low carbon economy infrastructure see Chapter 3.

Intelligent networks for homes and office buildings can control indoor climates, with positive results for energy use. An example is the Urban Energy Management project for apartment complexes launched in 2009 in Madrid, Spain. In each apartment, a smart meter and the building's broadband infrastructure enable residents to manage their consumption of electricity, gas and water. The system also allows building managers and relevant authorities to monitor and manage energy use across different buildings and urban areas and provide a wider community view of energy consumption. It can provide, for example, real-time graphs displaying energy use, as well as comparison data. The pilot scheme is part of a project that aims to incorporate such innovations as heating and cooling using geothermal and solar panel technologies. With the management and control systems, it is expected that these innovations can deliver major energy savings.[18]

15 The Emissions Gap Report, UNEP, 2010 http://www.unep.org/publications/ebooks/emissionsgapreport/pdfs/EMISSION_GAP_REPORT_LOWRES.pdf

16 Traffic and Market data Report: On the pulse of the networked society, Ericsson, 196/287 01-FGB 101 220, Nov 2011http://hugin.info/1061/R/1561267/483187.pdf

17 Ericsson Business Review, Issue No. 2, Ericsson, 2011 http://www.ericsson.com/res/thecompany/docs/publications/business-review/2011/issue3/EBR_2_2011.pdf

18 Broadband: A platform for progress, A report by the Broadband Commission for digital development, ITU and UNESCO, June, 2011, http://www.broadbandcommission.org/Reports/Report_2.pdf

"It is important for governments to identify the advantages of using ICT technologies and to address the question of access to those technologies. A number of developing countries still need to embrace this potential and it should be reflected in their national development strategies. It is a question of resources, capacity building, and technology transfer, not just for ICT, but for other areas as well. ICT must be part of a new Green Economy model that reduces fossil fuel dependency and fosters renewable energy sources and energy efficiency. If you combine a sense of responsibility from the private sector, with economic incentives and the right regulatory framework from the government, then you have the process for moving forward to address climate change."

Ambassador Luis Alfonso de Alba,
Mexico's Special Representative for Climate Change, the Principal Negotiator of the Mexican delegation to the UNFCCC. Vice-Chair during the 2010 United Nations Climate Change Conference.

Interoperability and standardization are key elements needed for the uptake of smart grids. To advance on these lines, between February 2010 and December 2011, ITU conducted a preliminary assessment on the needs of standardization for smart grids within the ITU-T Focus Group on Smart Grids (FG Smart)[19]. The objective of this activity was to collect and document information and concepts that would be helpful for developing future standards to support smart grids from an ICT perspective.

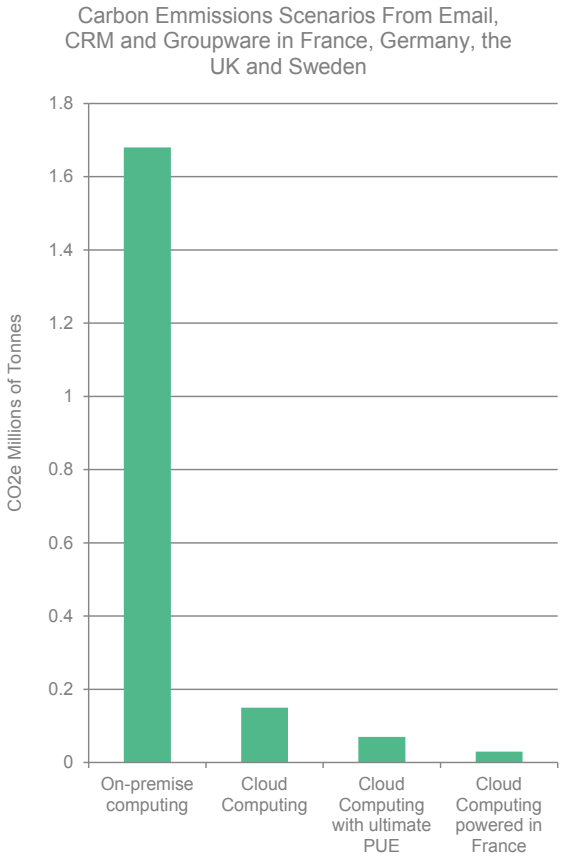
Within its work, the FG Smart delivered a number of reports on uses for smart grids, requirements of communications for smart grids, smart grid architecture, as well as terminology. These outcomes will be followed up by the recently created ITU-T Joint Coordination Activity on Smart Grid and Home Networking (JCA-SG&HN), which will continue encouraging collaboration among the different actors involved in the development of this new technology.

ICT's potential as an enabler is extensive. Moreover, by tapping into the potential synergies that exist between different ICT applications, there are opportunities to create virtual cycles, or low-carbon feedbacks to achieve additional transformation.

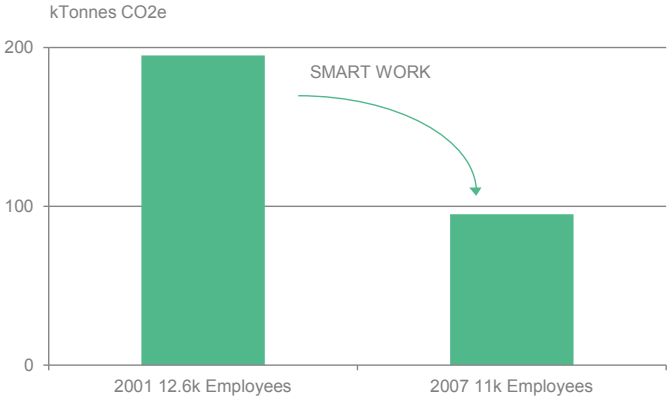
Smart Work

For several years Swedish telecom operator TeliaSonera has used ICT-based smart work solutions such as teleworking, flexi-working, virtual or telepresence conferencing and flexi-office. Their goal: to reduce air business travel, car travel and need for office space. TeliaSonera, together with Ericsson, measured the impact of these ICT-enabled solutions, including reductions of infrastructure over time. Using 2001 as a baseline year, the study found that by 2007:

- Smart work initiatives reduced CO_2e emissions by 40 percent per employee-over 2.8 tons of CO_2e per employee per year.
- Scaling the results to country level, the study found that similar initiatives could reduce Sweden's total CO_2e emissions by two to four percent if reductions of 20-40 percent can be achieved per employee in a 10-20 year timeframe.
- Scaling to a global level could potentially reduce global CO_2e emissions in the same order, by two to four percent.



CO2 reductions possible from smart work solutions in Sweden. Courtesy of Ericsson and Telia Sonera



19 http://www.itu.int/en/ITU-T/focusgroups/smart/Pages/Default.aspx (Nov. 2011)

1.3 GREENING THE ICT SECTOR

Compared to other sectors, it is estimated that the ICT industry is responsible for a relatively small portion of global GHG emissions—about two to 2.5 percent[20]. This is a full life-cycle figure, including the production, manufacture, use and disposal phases of delivering ICT services. Fixed-line telecommunications account for some 15 percent of the total emissions from the ICT sector, while mobile telecommunications contribute an additional nine percent and LAN and office telecommunications about seven percent.

Managing Growth

The ICT sector's carbon footprint comes mainly from the power demands of devices (such as phones or computers) and the operation of ICT networks (including or telecommunications equipment). This contribution is likely to rise in parallel with the strong market growth and growing use of data and ICT services worldwide. Analyst IDC suggests that within five years there will be some 15 billion devices connected to networks worldwide. According to ITU statistics, global mobile penetration is now at 87 percent, putting the total number of mobile subscriptions around 5.9 billion[21]. Growth is particularly rapid in China and India, where 50 million new subscriptions were added in Q3 of 2011. Mobile data traffic is predicted to grow tenfold by 2016.[22]

The Smart 2020 study indicates that the sector's current contribution to GHG emissions is set to double by 2020 (from 0.83 Gigatonnes of CO_2 equivalent (Gte) to 1.4 Gte). This expanding ICT usage, especially in developing countries, makes it imperative for the sector to actively manage its own energy use. ICT companies are taking steps both to reduce their own energy consumption and to provide more energy-efficient equipment, such as the amplifiers and base stations used in mobile networks. Thanks to new techniques and technologies, ICT equipment energy reductions are currently running at 10 to 20 percent annually. Mobile networks are making greater use of renewable solar and wind energy sources, fiber-optic cables are cutting energy consumption in fixed networks and energy-efficient cooling systems are being widely introduced.

There are a number of industry research initiatives addressing this growth. GreenTouch™, a consortium of leading industry, academic and non-governmental research experts, aims to significantly reduce the carbon footprint of ICT devices, platforms and networks. By 2015, its goal is to deliver the architecture, specifications and roadmap needed to increase network energy efficiency by a factor of 1000 from current levels.[23] The Energy Aware Radio and neTwork tecHnologies (EARTH), funded by the European Commission, comprises 15 partners from industry, academia and research institutions from 10 European countries. Its target is to reduce energy consumption of mobile systems by a factor of at least 50 percent.[24]

The GSMA Mobile Network Energy Efficiency Benchmark (MEE) offers a methodology for evaluation and comparison of network energy efficiency across a range of variables. It 'normalizes' for variables outside the energy managers' control—for example country, market and technology factors—enabling like-for-like comparison. Energy consumption can be converted into GHG emissions using country grid electricity and diesel conversion factors to help the mobile industry to lower its GHG emissions per connection. MEE now has 35 mobile network operator participants covering over 200 networks in 145 countries. The GSMA methodology helped shape the recently approved set of methodologies from ITU to assess the environmental impact of information.[25]

20 Gartner, Green IT: The New Industry Shockwave, presentation at Symposium/ITXPO conference, April 2007

21 The world in 2011. ICT facts and figures, ITU, 2011, http://www.itu.int/ITU-D/ict/facts/2011/material/ICTFactsFigures2011.pdf

22 Traffic and Market data Report: On the pulse of the networked society, Ericsson, 196/287 01-FGB 101 220, Nov 2011 http://hugin.info/1061/R/1561267/483187.pdf

23 Green Touch, Global Mission, retrieved Nov 2011 http://www.greentouch.org/index.php?page=about-us

24 Earth, Driving the Energy Efficiency of Wireless Infrastructure to its Limits, retrieved Nov 2011,https://www.ict-earth.eu/

25 Mobile Energy Efficiency: An Energy Efficiency Benchmarking Service for Mobile Network Operators: Methodology, GSMA, June 2011 http://www.gsmworld.com/documents/mee_met_june_11.pdf

We live in a connected world. A world where the demands for green are greater than ever before. Can we make that connection between what ICT can do to be truly involved in the economy on a global scale and at the same time do it in a way that is more eco-friendly than what we did in the past? The answer: absolutely, yes. Maybe the answer is that you do it in places that are most unlikely to be among the leaders—rural areas, for example, where the need for improvement is so great and at the same time the opportunities to develop are so fantastic. We have a broadband agenda that can bring "green" and "growth" to life."

Ben Verwaayen
CEO, Alcatel-Lucent

Focus on data centers

Data Centers are one of the fastest growing parts of the ICT industry and it is essential to reduce energy consumption and GHG emissions from these. ITU-T Recommendation L.1300 "Best Practices for Green Data Centers" states that reducing energy consumption and GHG emissions should be considered at the design and construction stages, and that constant monitoring will be required to consistently manage and improve energy consumption while the data center is in operation.

Best practices are provided for data center utilization, management and planning of data centers, cooling and power equipment, optimum design of data center buildings, and monitoring of data centers after construction. For example, applying best practices on the use of cooling could reduce the energy consumption of a typical data center by over 50%.
In one example of best practice, the Singapore telecoms regulator, Infocomm Development Authority (IDA), in partnership with the IT Standards Committee, developed the Singapore Standard for Green Data Centres, which aims to help organizations establish the policies, systems and processes necessary to improve data center energy efficiency.

Fulfilling the Potential

If broadband is to fulfill its enabling potential as a technology for transforming other sectors, it is vitally important that its growth not be prematurely restricted. Capping the industry's emissions at this stage would limit its ability to transform other sectors—a trade-off that could result in even greater costs for society in the long term. The upfront costs of investing in more energy-efficient broadband technologies pale into insignificance compared with the longer-term costs of coping with the effects of climate change.[26]

This is a view upheld by WWF, in its 2008 report From Fossil to Future[27], which advocates an increase in the footprint of ICT if this can deliver more substantial savings elsewhere: "Obviously emissions from the ICT sector should not be ignored, but the emphasis on reducing the emissions from the sector itself should be proportional to the potential for reductions through services provided. There is probably no other sector where the opportunity to provide solutions with dramatic emission reduction potential is as significant."

With the right type of policy and investment framework, ICT's enabling potential to transform, mitigate and adapt to climate change can far outweigh the sector's own carbon impacts.

26 A 2010 Leadership Imperative: the future built on Broadband, Broadband Commission, ITU, UNESCO, 2010, http://www.broadbandcommission.org/Reports/Report_1.pdf

27 From fossil to future: Innovative ICT solutions: Increased CO_2 emissions from ICT needed to save the climate, WWF, March 2008, assets.panda.org/downloads/fossil2future_wwf_ict.pdf

"There are barriers such as taxes, high license fees, spectrum charges, high tariffs that can discourage investment and expansion. The government has to decide what it wants: on the one hand it says broadband has the power to change society; on the other it wants to maximize revenue. Broadband needs to be seen as a public good. The industry needs to do its job while the government needs to promote e-governance, online public services, and provide the impetus for private investment."

Sunil Mittal,
Founder, Chairman and Group CEO,
Bharti Enterprises

1.4 ADAPTATION

Broadband can play a vital role in helping countries adapt to minimize the possible effects of climate change. Climate adaptation will require smart planning and reliable access to real-time data for climate monitoring, as well as the implementation of early warning systems. These solutions are particularly important for least developed countries and small, landlocked countries. An early warning system for small island nations is vital to provide life-saving alerts in the event of a tsunami, typhoon, flooding or other natural disaster.

For instance in 2011, the Japan Meteorological Agency's earthquake early warning system relied on broadband to automatically issue alerts via cell phones and TV after the first, less harmful earthquake shock wave, providing a short window for people to prepare. The broadband-based warning system also caused many energy plants, industrial facilities, and transportation services to shut down automatically, averting problems at these locations. Similar applications could be enabled for climate-related natural disasters.

Addressing climate risks for farmers

The livelihoods of billions of poor farmers are threatened by climate-induced risks that affect food security, water availability, natural disasters, ecosystem stability and human health. As the recent UNEP report, "Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication,"[28] points out, finding ways to improve the livelihoods of the poor are important challenges in the transition to a green economy, especially for developing countries. The UNEP report called ICT "powerful enablers of the green economy through the transformation of economic infrastructure, industry sectors and social behaviors," including information-based monitoring of climate risks and other ecological impacts.

China Mobile is addressing the challenges facing poor farmers in China with its Rural Communication and Information Networks. By the end of 2010 89,000 remote villages were part of its mobile communications network, contributing to the national goal of 100% coverage of all administrative villages in mainland China, reached in 2010. More than 19 million rural customers were sending out an average of 19.5 million SMS a day on the Agricultural Information Service by the end of 2010. Automated monitoring and control systems, automatic drop irrigation, wireless water quality monitoring of fresh water aquaculture, and water conservancy are among the ICT applications. Remote transmission of meterological data provides timely forecasts for the 1,100 monitoring areas in Xinjiang, for example, giving farmers accurate warning in the event of disastrous weather. Through mobile information services, 29 organizations were able to collect and release flood and drought information, and conduct remote monitoring for all 12 regions in Xinjiang. In yet another ICT application, in Fujian, a Rural Microcredit Self-Service Information Platform enables farmers to apply for loans from their handsets or rural information terminals by SMS, making the loan application and the approval process paper-less.

Monitoring weather in Africa

Weather is critical for the 3.5 million people living along Lake Victoria in East Africa. The Weather Info for All Initiative (WIFA) is an initiative of the Global Humanitarian Forum to mobilize public and private partners to ensure availability of reliable weather information to vulnerable communities affected by poverty and climate change. It aims to roll out up to 5000 automatic weather observation stations throughout Africa, where less than 300 stations are reporting today. Reusing infrastructure at new and existing mobile network sites, the stations will dramatically improve information crucial to predicting and coping with climate shifts. The initiative also seeks to distribute weather information by mobile phone.[29]

28 Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication, UNEP, 2011, http://www.unep.org/greeneconomy/greeneconomyreport/tabid/29846/default.aspx

29 Weather Info for All Initiative 2008-2012, Global Humanitarian Forum, 2008, http://publicintelligence.info/WIFA_Project_Outline_Executive_Summary.pdf

"The introduction of the National Broadband Network will enable high-quality videoconferencing to become the norm, reducing the need to travel to meetings. This in turn will reduce GHG emissions caused by traffic congestion. Reliable, high-speed broadband delivered by the National Broadband Network will make the uptake of teleworking a possibility for more Australians but cultural issues on the part of both employers and employees remain a barrier to teleworking."

Stephen Conroy,
Minister for Broadband, Communications and the Digital Economy and Minister Assisting the Prime Minister on Digital Productivity

Information harvesting through ICT-based sensing and monitoring is increasingly pervasive in many aspects of day-to-day life and is being used to drive changes in sectors such as health, food, energy, environment, waste collection, news and media. For example, sensors enhance environmental surveillance, helping policy-makers devise suitable strategies and make more efficient use of resources. Broadband-powered Global Positioning Systems (GPS) applications can help monitor environmental abuses (i.e., pollution levels) and transmit that information to authorities.

Early warning systems

ICT is particularly valuable in disaster management. ICT-based early warning systems are already instrumental in providing people with alerts and information regarding threats like extreme weather events. Other possible applications of these systems could be to help improve water catchment management or access to energy management at community level, storm warnings, or helping farmers know when to plant seeds. There are many successful examples using simple mobile technologies, which could be significantly amplified through high-speed broadband networks. The importance of ICT is such that several countries have explicitly recognized the importance of creating robust and resilient telecom networks to support natural and manmade disaster mitigation[30].

Protecting human health

Climate change has the potential to affect human health in a number of ways, for instance by altering the geographic range and seasonality of certain infectious diseases, disturbing food-producing ecosystems, and increasing the frequency of extreme weather events, such as hurricanes. The World Health Organization estimates that climate change is already causing over 140,000 excess deaths annually, not to mention the deterioration of health caused by changes in clean air, safe drinking water, sufficient food and secure shelter[31].

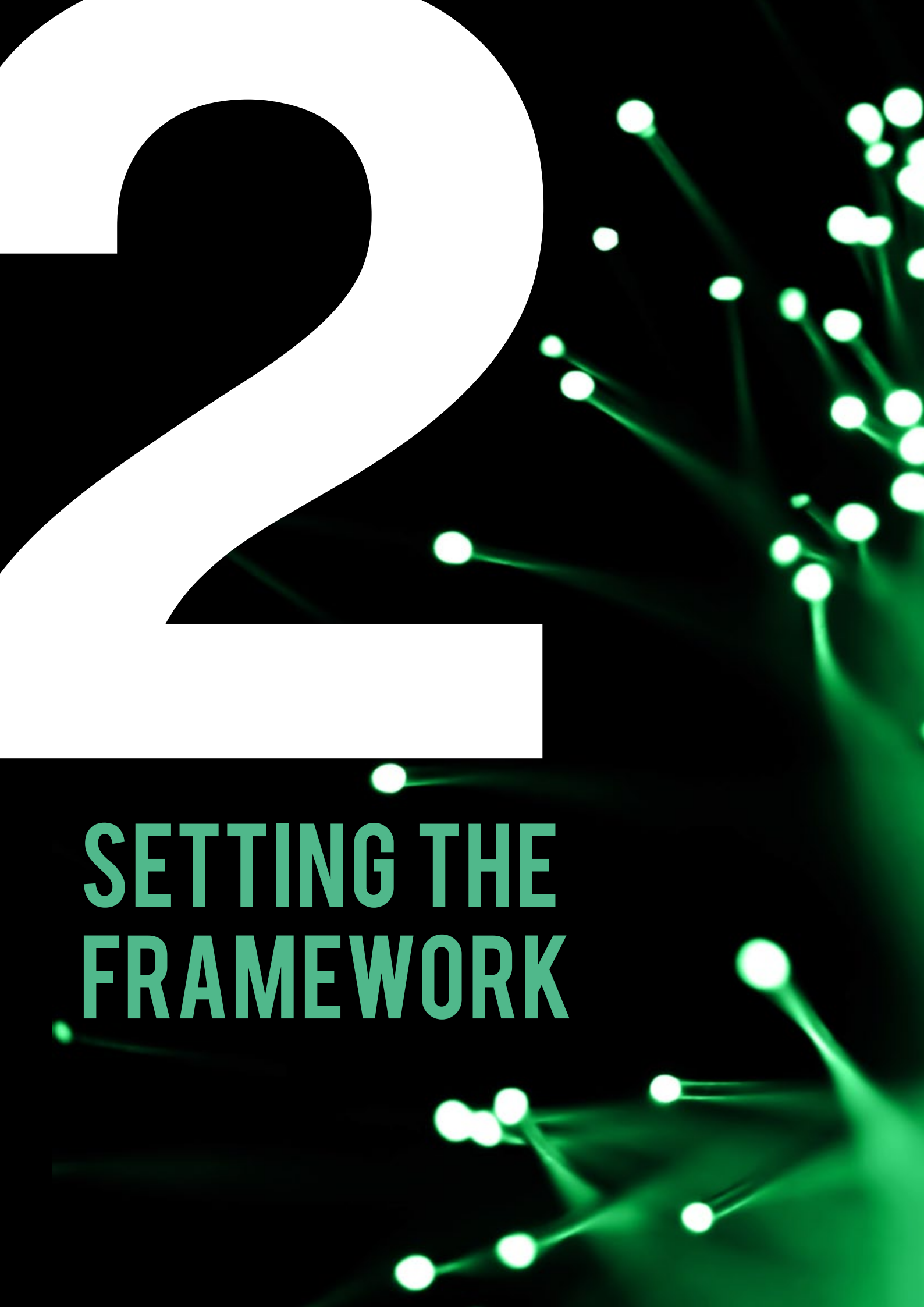
Through e- and mobile health, smart ICT enables digitization of records, remote consultation and intervention, or even simple services such as SMS alerts. These can bring down costs while improving delivery of services, especially in the event of pandemics and new health challenges where local knowledge might be insufficient. These intelligent solutions also enhance communication with groups that are more vulnerable to heat waves, such as the elderly. Finally, the key to resilience in any society is building human capacity through education. These applications are a preliminary example of the transformative solutions that can be implemented through broadband, helping to reduce costs, enable access and improve the overall quality of education systems.

"Broadband enables the provision and exchange of vital information and research, and it fosters the creation of new networking platforms which can bring dispersed groups of people together. It helps to overcome bottlenecks in service delivery and information provision. That is important for populations facing imminent threats from environmental destruction as well as populations that want and need to participate in policy and decision-making processes about how to adapt to and mitigate the impacts of climate change. Broadband networks are opening up new spaces for connecting poor and marginalized populations. The hope is that more people who cannot afford computers, or who live in areas not reached by fixed lines or by electricity will be able to access key services through mobile broadband."

Helen Clark
Administrator, United Nations Development Programme (UNDP), member of Broadband Commission

30 A triad of policies to drive a national agenda for ICTE, India's National Telecom Policy, 2011, http://india.gov.in/allimpfrms/alldocs/16390.pdf

31 Climate change and health, Fact sheet N.266, WHO, 2010, http://www.who.int/mediacentre/factsheets/fs266/en/index.html



2

SETTING THE FRAMEWORK

2.1 OBSTACLES AND CHALLENGES

Broadband offers unique opportunities to spearhead the transition to a carbon-constrained world. But to reach its full potential, broadband needs to be a component of climate change strategy, backed up with strong policies in support of economy-wide emissions reductions. In many countries, it is this integrated regulatory framework that is the crucial missing link to achieve carbon reduction commitments through the use of broadband networks, services and applications. For broadband to deliver on its climate change reduction potential, a range of obstacles and challenges need to be overcome. Foremost among these is the need to break down the silos that tend to exist between different sectors of society and within governments, through greater dialogue and collaboration. Developing and adopting a long-term view is necessary too, particularly at a time of financial crisis and austerity measures that could otherwise inhibit investment and result in short-term planning. Finally, incentivizing consumers to make the 'right' behavior choices will also be key.

Among the main obstacles we identify that currently hinder broadband-driven transformation are:

Vision

Without a clear strategy and shared objectives for national broadband development, getting all the pieces of the puzzle together is impossible. A strong vision is needed to anchor ICT policy and frameworks, steer investment and unite the various players around a common goal.

Access

Gaps in broadband penetration and affordability persist not only among countries, but also between rural and urban areas within a nation. The digital divide remains a stubborn obstacle to progress. By 2010, nearly a quarter of people in developed countries had fixed broadband access, and more than half had access to mobile broadband. The corresponding figures for developing countries are estimated at 4.4% and 5.4% respectively—although penetration is significantly higher than this in urban areas in India, for example.[32]

Regulatory environment

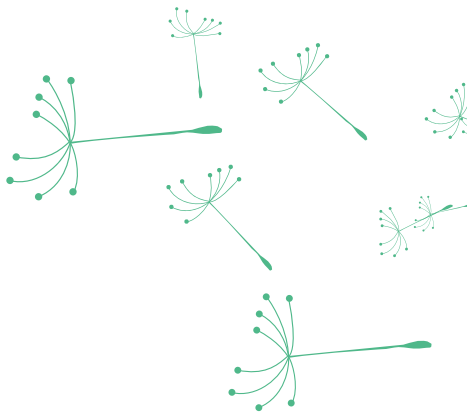
The current regulatory environment promotes a 'silo' approach in which decisions are made in isolation and separate communication networks are built in parallel. High licensing fees, spectrum charges and high tariffs also inhibit market development and discourage investment and expansion.

Policy

There is a lack of policy targeted at, on the one hand, introducing incentives to adopt greener ICT solutions, and on the other, dismantling barriers to implementation like the subsidization of CO_2 intensive industries—a situation that is compounded by a lack of cross-ministry co-ordination. Technological advances are currently outpacing government policy—a gap that needs to be closed by raising awareness of the opportunities technology presents to achieve national climate goals.

The market

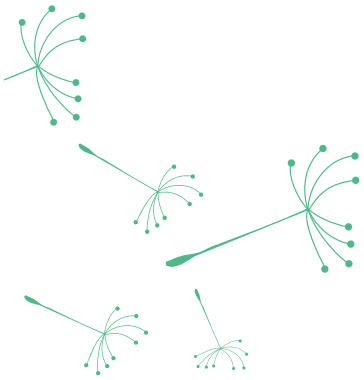
Full understanding of the market opportunities for broadband is often limited, since it requires industries to think beyond their traditional business models. In just one example, there is too little incentive for the risk-averse, fragmented electricity industry to invest in the possibilities offered by smart grids. As utilities are not responsible for contributing to national climate change goals, this hampers more rapid deployment of broadband solutions.



32 Broadband, a platform for progress, Broadband Commission,ITU, UNESCO, 2011, http://www.broadbandcommission.org/Reports/Report_2.pdf

"With smart grids, we are just at the beginning, like the early days of the Internet. Traditional grid operators are trying to figure out how to use the technology. Some are moving forward. For many others, it's a major learning curve. But there is huge potential. As grids become smarter and look more like the Internet, there will be a significant per user reduction of energy and therefore a significant reduction of user contribution to GHGs. We will also see energy savings from greater use of renewables, like hydro, solar, wind."

Robert Pepper,
Vice President of Global Technology Policy, Cisco



Pilots, investment and research:

Broadband—and the CO_2-reducing services and applications it opens up—are only in their infancy. There is a need for enhanced investment in research and pilot studies to determine how best to leverage this powerful technology platform. To date, most climate-related pilots have been too small-scale. Through government and private sector collaboration, large-scale tests at city or national level—like Stockholm Royal Seaport (see section 3.3)—would help develop a convincing economic case for further investment and a basis for knowledge-sharing.

South Korea, has established the Korea Smart Grid Institute, which is implementing a Smart Grid test-bed, a pilot city, and 10 pilots. The Smart Grid test-bed on Jeju Island is expected to become the world's largest Smart Grid community for testing advanced smart grid technologies and for the development of new business models. A total of 64.5 billion South Korean won (about USD 56 million) will be invested between 2009-2013. About 10 consortiums in five industry sectors will participate in testing technologies and developing business models.[33]

Awareness and education:

Another key obstacle is the broad lack of awareness and understanding of the energy efficiency benefits of ICT and the central role that broadband can play in addressing climate change. Efficiency gains at the individual level can have a major impact when implemented throughout a region or country. Policy should therefore promote and incentivize responsible consumer behavior by helping people learn about and take up new ways of doing things.

Standards:

The need for universally agreed standards for assessing and reporting energy use and GHG emissions by the ICT sector has emerged as a clear need in the last few years. ITU took up this challenge and developed a set of standardized methodologies to assess the environmental impact of ICT goods, networks, services; cities, countries, projects and organizations The industry needs to continue to engage in the development of common and standardized methodologies aimed at improving environmental sustainability. Such standards must ensure maximum interoperability and preserve openness and transparency. Industry should also commit to reduce its own emissions and improve its performance.[34]

"Participatory governing mechanisms utilizing new media can have a broad impact on efforts to adapt to climate change. New networks and communication channels – including the pervasive presence of mobile devices - can help governments and development partners capture the priority demands and ideas of stakeholders within local communities. That in turn can help guide decisions about what public investments are required. That will not only link supply better to demand, but will also give voice to the poor and most vulnerable."

Helen Clark, Administrator,
United Nations Development Programme (UNDP), member of Broadband Commission

"The role of government is extremely important in such a regulated industry. They need to become enablers, to help to build a world-class broadband network and promote e-government applications. In countries such as Denmark and Sweden and in Southeast Asia, for example, governments actively promote broadband, provide subsidies, lower taxes, etc. to ensure it happens. They realize there are spin-off benefits from supporting the industry. Industry needs to be responsible and build the most efficient network possible while ensuring, through bodies such as the Broadband Commission, that its recommendations to governments are widely disseminated in various fora and become adopted."

Sunil Mittal,
Founder, Chairman and Group CEO,
Bharti Enterprises

33 Korea Smart Grid Institute, retrieved Nov 2011, http://www.smartgrid.or.kr/eng

34 ITU-T, retrieved Nov 2011, http://www.itu.int/ITU-T/climatechange/index.html

2.2 A CENTRAL 21ST CENTURY STRATEGY

Expanding affordable access to broadband is becoming a high priority for governments of developed and developing countries alike. A 2009 OECD/InfoDev report[35] found that in developing countries broadband provides significant economic and social benefits. When seen as a public good for meeting sustainable development objectives—including climate goals—investment in broadband infrastructure becomes a priority.

A clear strategy

According to ITU's latest statistics, 161 countries and territories had a national e-strategy in place by April 2010, with another 14 countries and territories in the process of formulating a national e-strategy.

By 2009 at least 30 countries had explicitly mandated access to broadband, including Brazil, China, Ghana, Kazakhstan, Malaysia, Morocco, Nigeria, Peru, Spain, Sri Lanka, Switzerland and Uganda, and the number is growing. Some countries have gone even further: Finland, for example, was the first nation to declare broadband Internet access a legal right in 2009, entitling every person to a 1 Mbit/s Internet connection by mid-2010.[36]

It is generally those countries with coherent national strategies that are most successful in fostering the diffusion of broadband. Countries that lead in broadband penetration include: Netherlands, Switzerland, Denmark, South Korea and Norway (for fixed line broadband) and South Korea, Japan, Sweden, Australia and Finland (for mobile broadband)[37]. Some pro-market economies originally reluctant to define a central government role—the UK and the US—have also now created national broadband plans. As a first step towards an integrated framework, governments should therefore consider developing a national broadband strategy or plan that provides the vision and certainty needed to raise and channel private sector investment.The Low-Carbon ICT Leadership Benchmark, launched by GeSI in October 2011, has mapped to what degree countries with national broadband plans are crosslinking these plans to their climate strategies. The Benchmark tracks governments' performance in integrating transformative ICT solutions in climate change strategies and other policy areas. The overall objective is to identify best practices and leadership that can inspire a "race to the top" among governments. Countries which ranked top were Japan, Germany and Denmark. All three scored 60 points or more on a scale of 1 to 100 for integrating low-carbon ICT solutions in their broadband strategies. The findings show growing recognition of the business case for low-carbon ICT solutions.

Towards Integration

In addition to a national broadband plan, an effective ICT-based climate strategy relies on taking a horizontal, integrated approach. Connectivity, integration and collaboration are the bywords of the 21st century Networked Society. This is because the challenges of transforming our economy and tackling climate change are far too big for any one organization, department or industry to handle by itself. Moreover it is only with more effective coordination among all the players that the interlinkages between broadband and reducing GHGs become fully evident.

Integrating broadband and climate strategies requires trans-sector collaboration and cross-ministry coordination. Indeed, in some cases, it may require the creation of entirely new ministerial portfolios, advisory councils, task forces and consortia that reach across sectors such as transportation, utilities, energy, health, education and government services. In the US, for example, the National Broadband Plan[38] unveiled in March 2010 by the Federal Communications Commission, included analysis of how creating and funding a national network through public-private trans-sectoral partnership could meet the need for accessibility, reliability and affordability of public safety communications, while saving the nation approximately USD 18 billion or more in capital and operating expenditures over a 10-year period.

35 Kelly et al.,What role should governments play in broadband development?,infoDev/OECD, Sept 2009, www.infodev.org/en/Document.732.pdf

36 Broadband, a platform for progress, Broadband Commission, ITU, UNESCO, 2011, http://www.broadbandcommission.org/Reports/Report_2.pdf

37 The world in 2011. ICT facts and figures, ITU, 2011, http://www.itu.int/ITU-D/ict/facts/2011/material/ICTFactsFigures2011.pdf

38 Further information at www.broadband.gov (Nov 2011)

"We need open innovation for low-carbon solutions and the incentives in place to allow the private sector to develop and deploy innovative technology to help achieve society's low-carbon goals. By integrating climate change and ICT policy, you change the incentive models, so that investments with the greatest benefit for the climate are rewarded. For this to happen, accessibility, equity and transparency are key—transparency of results, of investments, of the decision-making process. With a solutions-driven approach to climate change, governments show leadership now, and for future generations."

Hans Vestberg,
CEO, Ericsson

In Singapore—often held up as one of the world's smart cities—the telecoms regulator, Infocomm Development Authority (IDA) is a major player in the planning and building of the smart city, working with the Energy Market Authority and private partners to design and implement an Intelligent Energy System pilot project. As testimony to Singapore's standing as a smart city, car manufacturer Daimler AG selected it as the only comprehensive field test site in the world for its Smart 'Fortwo' city vehicles. Daimler chose the city for its infrastructure, government support and its comprehensive green initiatives and commitment to support green technologies.[39]

By integrating energy, broadband and climate change strategies, governments like these are breaking down the conventional silo mentalities that hinder systemic change.

From push to pull

Traditionally governments have played a 'push' role in stimulating provision of ICT structure and growth of the sector. Now, in order to accelerate progress towards the low-carbon economy, they need to move to 'pull' strategies aimed at stimulating demand for broadband services and applications by changing mindsets, promoting digital literacy, establishing an enabling environment, and fostering the development of applications.

Rwanda for example—one of the few African countries that developed an integrated ICT policy in the late 1990s—has a universal access fund aimed at balancing urban and rural usage and enhancing community access to ICT. Given the exceptionally young population—42 percent are under the age of 15—the government is engaging youth in the development of ICT policies and discussions and funding training of youth IT skills. As a result, young people are now calling for affordable and enhanced broadband services to make it easier for them to develop applications within m-health, m-education and other areas. The government is now considering offering incentives such as grants to boost innovation.

There is enormous opportunity for governments—often the largest employer, landlord and fleet operator in any given country—to create the pull factor through leading by example at all levels. This provides a unique opportunity to demonstrate the benefits of smart, energy-efficient buildings, telecommuting, smart building technologies, teleconferencing and other solutions that can help drive better private sector understanding of the benefits that could be tapped with broadband.

In South Korea, for example, in New Songdo City, the government is creating a master-planned 'Ubiquitous City' on a 1500-acre manmade island off South Korea's Incheon coast, 40 miles from Seoul. When completed in 2015, New Songdo City will include 350 buildings, housing 65,000 residents and a workforce of 300,000 people. In support of alternative transportation, ICT will enable a single smart card for residents that can be used on the subway, to pay a parking meter, see a movie, or borrow a free public bicycle. Broadband applications will also support municipal services such as a water re-use network, pneumatic waste collection and the energy network.

Similarly in India, The National e-Governance Plan[40] is 'dematerializing' administration around the country by transferring an increasing proportion of government services online, creating nation-wide demand for ICT. An m-governance policy[41] has been drafted to provide services via mobile phone, including basic banking. Services from school or college admission to pension payments and primary health services will all be accessible online. Key social sector ministries like Education, Health and Rural Development also have ambitious digitization, content creation and e-service delivery programs and projects underway.[42] All of this will serve to increase uptake of broadband-based services, while reducing CO_2 footprint and enhancing social inclusion.

39 Broadband, a platform for progress, Broadband Commission, ITU, UNESCO, 2011, http://www.broadbandcommission.org/Reports/Report_2.pdf

40 Further information at http://india.gov.in/govt/national_egov_plan.php (Nov 2011)

41 Draft Consultation Paper on Mobile Governance Policy Framework, Ministry of Communications and Information Technology, Government of India, March 2011 http://www.mit.gov.in/sites/upload_files/dit/files/Draft_Consultation_Paper_on_Mobile_Governance_110411.pdf

42 Further information at http://www.indg.in/e-governance/e-governance/ict-initiatives-in-states-uts/ict-initiatives-in-states-uts/ (Nov 2011)

"In a country like India where growth has taken precedence over infrastructure, we can only deliver through broadband. We are still nation building, and our Infrastructure system is still archaic. With its sheer scope and size, India can benefit immensely from the low-carbon economy. It can bring about absolutely powerful transformation, and the gains are bigger than for developed countries."

Sunil Mittal,
Founder, Chairman and Group CEO, Bharti Enterprises

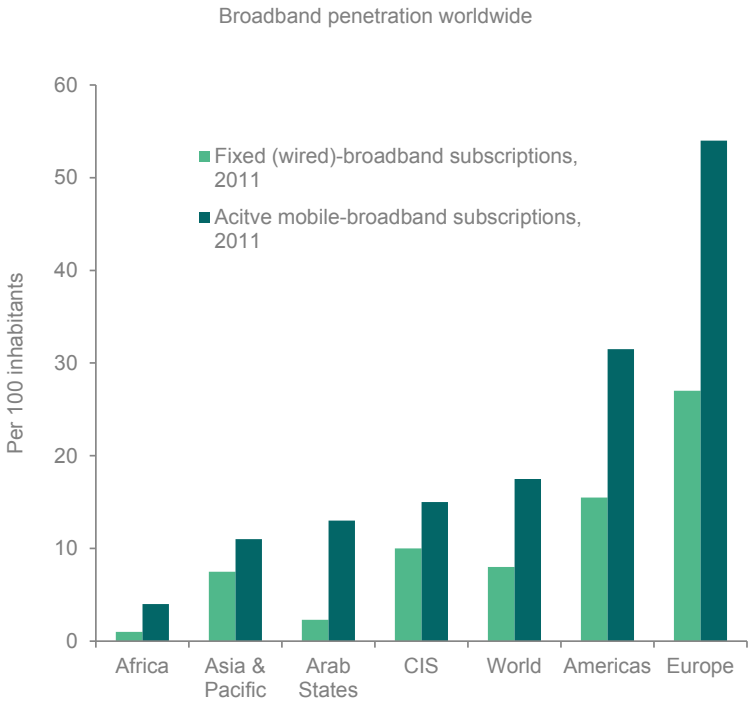
Stable yet flexible

An appropriate regulatory framework to foster broadband access must include policies that encourage open innovation and competition. By focusing on performance-based (outcome) rather than technology-specific (delivery mechanism) approaches, industry-wide innovation is fostered.

The ICT market is just nascent—energy management systems for buildings are still first or second generation—and another round of development is needed for such systems to become truly robust. Any framework therefore needs to be stable and predictable over the long term to provide incentives for the private sector to invest in sustainable low-energy sources and technologies, yet flexible enough to allow for experimentation.

The most effective policies will be those that drive increasing efficiency, expand incentives for research, encourage the next generation of innovators, enable scaling up and allow best practice to be shared. For example, Singapore has ensured effective open access to its all-fiber next-generation National Broadband Network by requiring full structural separation of the passive infrastructure business, in the expectation this will drive a more competitive market. Australia, Italy, and New Zealand also promote openness at the network infrastructure level to enhance competition and innovation.[43]

Clearly, different policies suit each market and context. As the Smart 2020 report has noted, smart grids in India are needed to prevent theft and losses, whereas in California they are more crucial in encouraging efficient use of energy by consumers. But while there may be no silver bullet approach, it is certain all countries can benefit by fostering innovation.



Courtesy of ITU

"Seizing the opportunities requires change, and change requires leadership."

"The opportunities of the mobile revolution are huge. With mobile broadband, children can replace fifty-pound backpacks with interactive digital textbooks that personalize lessons to their skill set. Mobile broadband can enable remote medical monitoring –wireless devices that can help diabetes patients track their glucose levels, or help heart disease patients monitor cardiovascular data. Each of these areas – education and health care, as well as energy – has enormous potential to provide new broadband-fueled market opportunities. And as large as these can be, they can be part of an even larger economic opportunity. Working together, we can drive improvements in education, savings in health care costs, and greater energy efficiency."

Julius Genachowski,
Chairman of the US Federal Communications Commission, excerpted from speech at GSMA Mobile Congress, Hong Kong, Nov 16, 2011

43 Broadband, a platform for progress, Broadband Commission, ITU, UNESCO, 2011, http://www.broadbandcommission.org/Reports/Report_2.pdf

2.3 THE RIGHT POLICY AND MARKET CONDITIONS

For broadband uptake to thrive and fulfill its low-carbon enabling potential, the right market and policy conditions need to be in place. With sound leadership, open and competitive markets that recognize broadband as essential infrastructure and encourage the development and scaling up of solutions will deliver the greatest impact.

As well as horizontal approaches that engage all relevant parties from government departments to affected industry sectors and residential users, an enabling regulatory and policy framework is needed to build a solid business case for investing in broadband for sustainability.

Fiscal and market mechanisms

To help to build a viable market, a variety of measures and fiscal incentives will be needed to encourage consumers and businesses to choose low-carbon solutions over traditional ones.

This can involve a mix of formal and informal measures, such as tax and other incentives for businesses and consumers to accelerate their purchase and deployment of broadband solutions. Other informal measures could include targets, voluntary agreements, guidelines, industry labels, best practice information, public consultation and education. Active promotion of broadband infrastructure, for example through subsidies or lower taxes, is a way to ensure maximization of spin-off benefits to the economy.

Fiscal incentives for mass scale-up of ICT will help remove constraints and encourage further investment. One idea promoted by the Digital Energy Solutions Campaign (DESC)[44] is to change electricity utility regulation to permit utilities to earn money from energy-efficiency ("negawatts"), not just from the sale of electricity.

Demonstrating the business case

It is also essential to conduct research into new technologies and business models and fund pilot projects. Governments can assist in the financing of basic research underpinning development of new infrastructure, new business clusters, models and technologies. Conducting pilot studies helps to demonstrate feasibility, build a solid business case and map out best practice. In turn, disseminating the knowledge gained through pilot projects and research can help strengthen the business case for private investment in transitional technologies for the 21st century.

Cloud Computing: The IT Solution for the 21st Century, commissioned by the Carbon Disclosure Project[45] and supported by AT&T, examines the impact of cloud computing adoption, energy savings, carbon emission reductions and economic impact through 2020. The report finds that large US companies that use cloud computing can achieve annual energy savings of USD12.3 billion and annual carbon reductions equivalent to 200 million barrels of oil—enough to power 5.7 million cars for one year. Additionally the study reveals that by 2020, large US companies plan to accelerate their adoption of cloud computing, from 10 to 69 percent of their IT spending. The data is culled from interviews with global firms including Boeing, Citigroup and AT&T.[46]

A further study, carried out by Enabling Technology for Europe 2020[47] a Microsoft sponsored, multi-national research project co-ordinated by John Hopkins University, concluded that cloud computing has the potential to abate at least 1.5 million tonnes of CO_2e within France, Germany, Sweden and the UK.

44 DESC, Policy Priorities, retrieved Nov 2011, http://www.digitalenergysolutions.org

45 Further information at https://www.cdproject.net (Nov 2011)

46 Carbon Disclosure Project Study 2011Cloud Computing –The IT Solution for the 21st Century, GeSI, 2011, http://www.gesi.org/ReportsPublications/AssessmentMethodology/CaseStudies/tabid/216/Default.aspx

47 Dr Peter Thomond et al, The Enabling Technologies of a Low Carbon Economy: From Information Technology to Enabling Technology: Can Cloud Computing enable Carbon Abatement?, a summary report, May 2011, http://www.enablingtechnology.eu/content/environment/resources/it2et.pdf

This equates to a 90% reduction in the energy required to provide email, Customer Relationship Management (CRM) and groupware compared to existing on-premise infrastructure and a 5% reduction of the ICT sector's total carbon footprint in the four focus countries.

A Smart 2020 initiative of the Climate Group and Cisco is the Connected Urban Development initiative (CUD), whose global pilots are designed to demonstrate transformational smart buildings, smart transportation and smart grid. In one pilot, a Personal Travel Assistant allows residents in Seoul and Amsterdam to make on-the-go travel decisions based on time, cost and carbon impact, via a Web-enabled device, from any location. A methodology has been developed to measure the results in terms of reduced emissions, decreased demand for transport and increased energy efficiency of buildings, among other things. A CUD toolkit scaled the lessons learned and best practices identified as the project wrapped up at the end of 2011, after five years of pilots. A total of 10 smart tech pilots are envisioned by 2012.[48]

Raising awareness and knowledge-sharing

Since 2008, ITU has been conducting a series of global events to raise awareness on the role of ICT to address the causes and effects of climate change, as well as to promote environmental protection. See section 3.7.

In India, the Confederation of Indian Industries has been working with the Digital Energy Solutions Campaign[49] to study the potential for ICT to contribute to the National Action Plan on Climate Change[50]. Their research identified GHG emission savings of up to 450 million tonnes of CO_2 per annum from ICT solutions by 2030—which is approximately 10 percent of estimated GHG emissions in 2030 for the sectors covered in the study—and energy cost savings equivalent to 2.5 percent of India's current GDP. Educating individual consumers and citizens on the need to act and change is vital to effectively decouple CO_2 emissions from increased GDP. As pointed out by The World Bank, "The debate about changing individual behavior has focused on market mechanisms. Better pricing of energy and costing of scarce resources can steer individuals away from carbon-intensive consumption and encourage them to preserve endangered habitats and manage ecosystems better. But the drivers of consumption by individuals and groups go beyond prices. Many cost-effective energy-efficient technologies have been available for years. So why haven't they been adopted? Because concern does not mean understanding, and understanding does not necessarily lead to action."[51] Fostering this desire to act is a key part of the transition to a low-carbon future.

Finally, another most important knowledge-sharing step is that of building up capacity in developing countries to use broadband in addressing climate change. This is an area where the Broadband Commission can play a role. A relevant example of this is the implementation of the Broadband Commission Sharehouse, a dynamic online repository that aims to promote broadband implementation. The Sharehouse is open to all and features case studies, best practice, analytical reports and policy recommendations.[52]

48 Connected Urban Development, Programme overview, 2010, http://www.connectedurbandevelopment.org/pdf/CUD_Program_Overview_2010.pdf

49 Forging Energy, Economic, and Environmental Solutions: The Case of India, The digital energy solutions consortium (DESC India) http://www.digitalenergysolutions.org/clientuploads/DESC%20India/White%20Paper.pdf

50 National Action Plan on Climate Change, Government of India, June 2008, pmindia.nic.in/Climate%20Change.doc

51 GSR 2010 discussion paper, ITU, 2010, http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/GSR10-paper5.pdf

52 The Broadband Commission, retrieved Nov 2001, http://www.broadbandcommission.org/Sharehouse/

"If policy-makers are taking steps to subsidize efficiency gains, like changing light bulbs, or boilers, or thermostats, why not include a menu of info-based retrofits, which have been shown in multiple examples to save as much if not more than these other more standard, government-subsidized solutions. There are already substitution models for retrofits. For example, you can deploy rapidly ICT solutions that require no workflow disruption with gains of 20 percent to 30 percent in energy efficiency. If a government has the appetite to accelerate efficiency gains, than these are solutions they need to consider."

Rob Bernard,
Chief Environmental Strategist at
Microsoft, on behalf of Orlando Ayala

Assessing and standardizing

Being able to demonstrate and compare the effectiveness of ICT solutions is an important part of building a vibrant, transparent market. A number of initiatives are underway to agree on universal standards for energy efficiency, both within the ICT sector and in relation to its enabling potential.

ITU has developed a set of new standardized methodologies for assessing the GHG emissions and energy consumption of ICT, as well as the savings in emissions that it can deliver in other sectors. This new single, set of global methodologies, consented in September 2011, will reinforce the role of ICT by providing an accurate, reliable tool for assessing their environmental impact. It will generate figures upon which businesses can model future revenues, costs and efficiency gains provided by green ICT; figures that will enable governments and regulators to identify the gains in social and economic welfare that green ICT can achieve.

Through standardized methodologies[53] to assess the environmental impact of ICT, we move closer to international consensus on standards for climate change mitigation and adaption; environmentally friendly, energy saving technologies; and accurate energy efficiency and GHG emission accounting and verification.

The ITU set of methodologies form a key building block for green ICT strategies, and will undoubtedly provide a firm foundation for designers, architects, engineers, developers and government authorities seeking to create eco-efficient, sustainable living environments.

ITU has also been instrumental in getting a new universal global standard approved for mobile phone chargers. The universal charger facilitates re-use of power adapters, thus reducing waste and providing improved convenience to users. It will save up to 82,000 tonnes of redundant chargers a year and at least 13.6 million tonnes CO_2 annually. Manufacturers including Apple, Nokia, Samsung, Sony Ericsson among others are already introducing phones and other devices which use the new universal charger.

In another such effort, GeSI is developing and seeking agreement on an industry-wide methodology for the carbon footprinting of ICT products and services, working with the World Resources Institute, the Carbon Trust, and the World Business Council for Sustainable Development. It has also developed the ICT Enablement Methodology, which identifies and quantifies the CO_2 effects of implementing an ICT solution. This methodology was used by the Carbon Disclosure Project in a recent study on the carbon-reducing impact of cloud computing. See Section 2.3

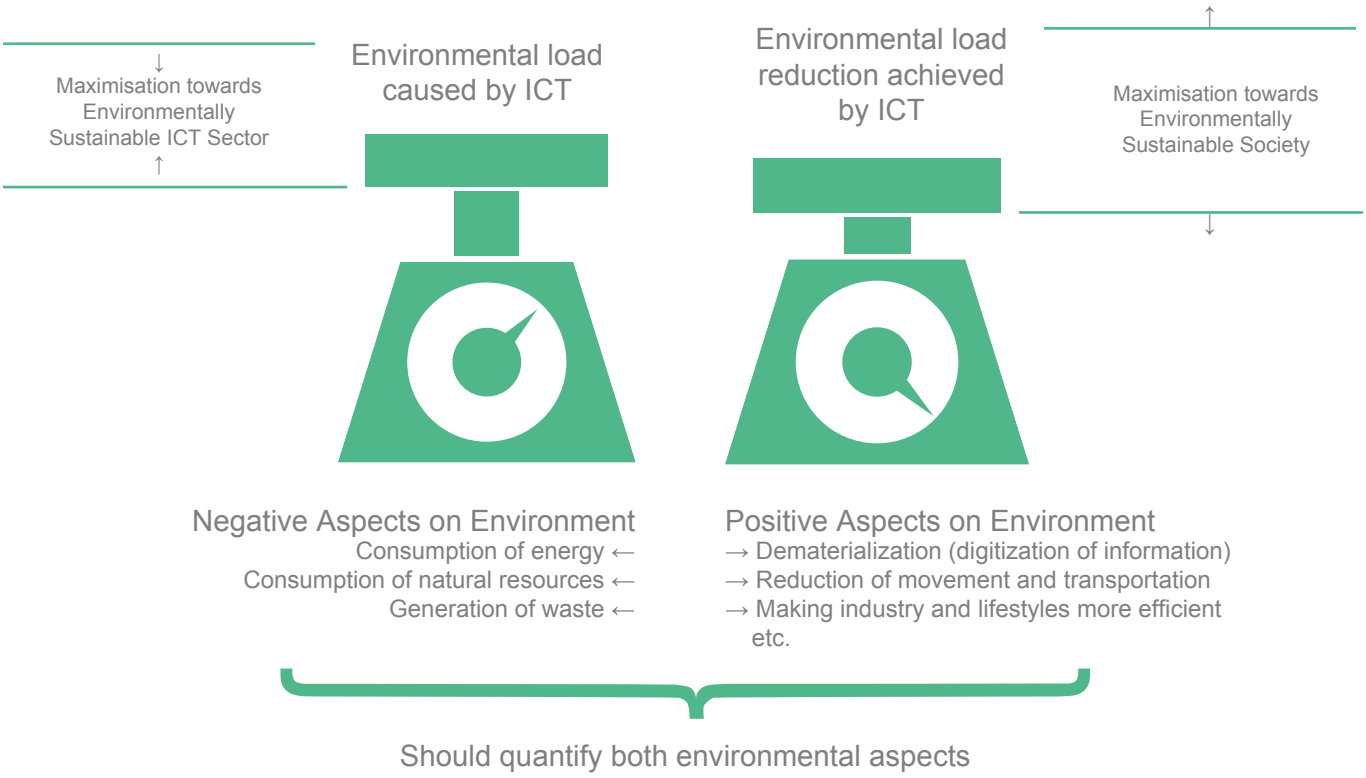
Finally, the National Institute of Standards and Technology (NIST) of the US Department of Commerce is developing a worldwide set of standards to allow vendors to ship equipment ready to be plugged into smart grid networks.

"The role of governments is to lead and enable: to use ICT in its own procurement, and to develop a comprehensive policy approach that promotes ICT adoption and doesn't impede innovation and adoption. As a catalyst, governments have huge potential to drive the market and gain direct productivity and sustainability benefits. If governments can put together a visionary plan for broadband connectivity, then the solutions and applications from the private sector will follow."

Peter Gibson,
Wireless Standards and Regulations
Manager, Global Public Policy, Intel

53 Further information at www.itu.int/ITU-T/studygroups/com05/index.asp (Nov 2011)

Schematic model for environmental assessment of ICT goods, networks and services



Source: ITU-T Recommendation L.1410

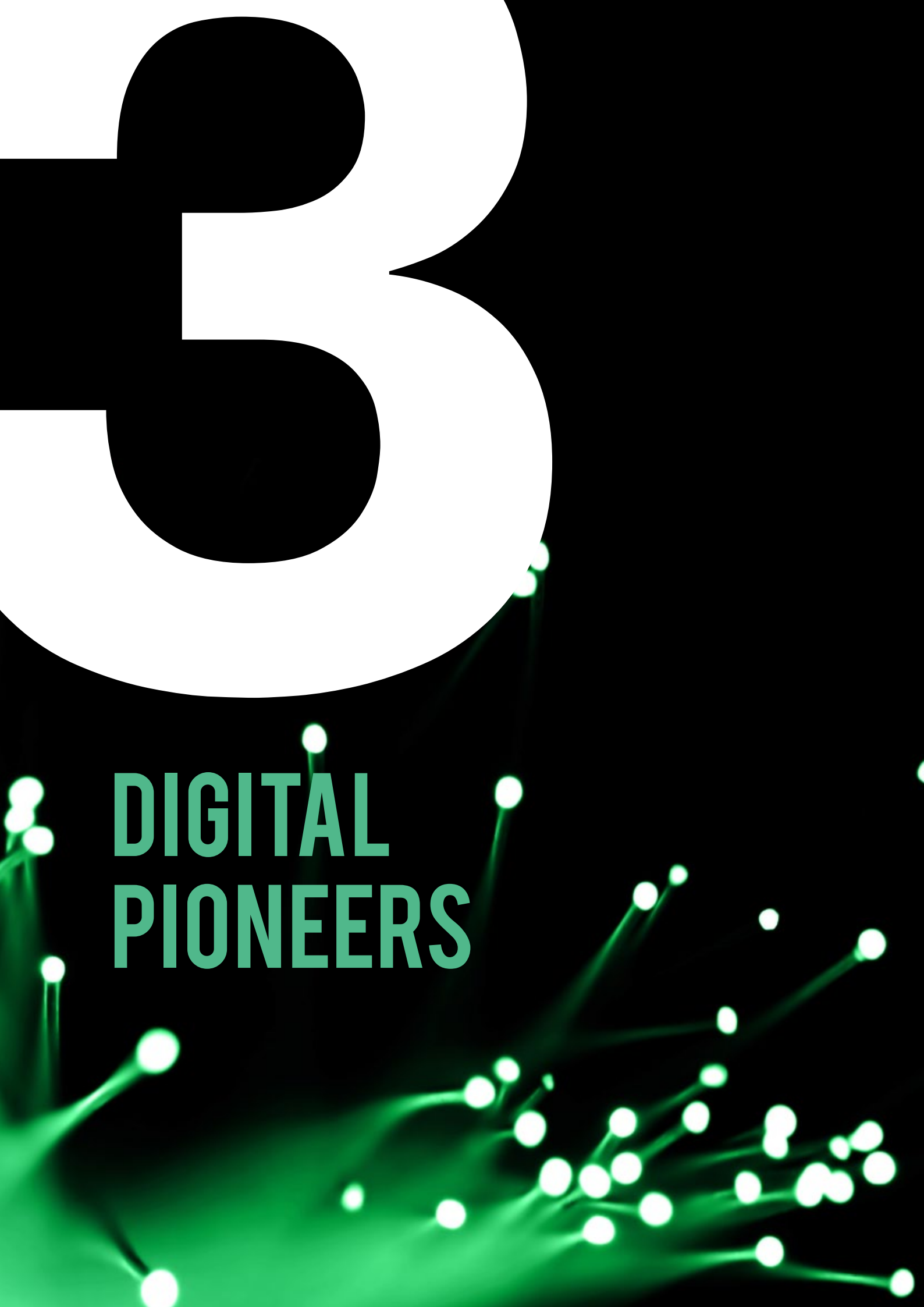
"Scaling up the positive effects of the low-carbon economy, requires a greater penetration rate of broadband particularly in the least-developed countries where all the issues associated with the adoption of a low-carbon economy are magnified. These challenges must be addressed in a smart way, with substantial investment in infrastructure that will help these countries catch up quickly to boost economic, development and to help cope with impacts of climate change."

"International and civil society organizations can help build capacity by raising public awareness and providing training and skills for local populations to use the technology. To make it sustainable, you need to develop ICT skills locally.

Cheik Sidi Diarra,
United Nations Special Advisor on Africa and High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States

3

DIGITAL PIONEERS



The Power of Partnership

Around the world, organizations and trans-sector partnerships are pushing ahead with pioneering projects and innovation that will shape our digital future. Addressing climate change effectively will take the collective will and combined effort of the private sector, policymakers, international organizations, academia, NGOs and citizens alike. No single sector of society has all the answers. For this reason, public-private partnerships will be critical in ensuring broadband is properly leveraged to tackle climate change. Here are some of the initiatives and movers and shakers who are shaping the debate.

3.1 GUADALAJARA DECLARATION

A significant milestone for public-private partnership was the 2010 Guadalajara Declaration for Transformative Low-Carbon Solutions[54] presented at COP-16 and signed by over 40 companies and global organizations representing more than USD 1 trillion of revenue. The Declaration sets out recommendations to governments urging for the use of ICT solutions to reach emissions targets. It also calls on companies to step up their efforts to make solutions such as digital health and education, smart grids, remote working and intelligent transport systems available, harness mobile and broadband connectivity to deliver energy conservation and efficiency and to continue to work on reducing internal emissions.

54 Guadalajara ICT declaration for transformative low-carbon solutions, GeSI, 2010, http://www.gesi.org/LinkClick.aspx?fileticket=5j52dDBfUZQ%3D&tabid=130

3.2 INTELLIGENT COMMUNITIES

The Intelligent Community Forum is a think-tank that studies 21st Century community economic and social development and shares best practices relating to the Broadband Economy. It represents government, industry, academic and regional and international organizations. Each year a community is recognized: in 2011 the winner was the city of Eindhoven (the Netherlands), which brought together employers, research institutes, the Chamber of Commerce, leading universities and the governments of the region's three largest cities in a public-private partnership called Brainport Development. Its staff meets regularly with stakeholders and looks for opportunities for them to collaborate on business, social or cultural goals. Its range of projects includes broadband deployment and applications, workforce development, digital inclusion, marketing and advocacy for the region and innovation.[55]

55 Intelligent Communities: Platforms for Innovation, Intelligent Community Forum, 2011, https://www.intelligentcommunity.org/clientuploads/PDFs/WP-Platforms-for-Innovation.pdf

3.3 ROYAL AMBITIONS

By engaging the private sector from the outset in the design of low-carbon policies, governments can attract the long term investment and support needed to deliver the infrastructure of a new low-carbon economy. One example of this vision is Stockholm's Royal Seaport, a new urban district being developed in east central Stockholm near the Royal National Urban Park. Between 2012 and 2030 about 10,000 homes and 30,000 workspaces will be created. One of the aims of the new district is to reduce GHG emissions and change consumption patterns. By 2030, the goals are to be free of fossil fuels, adapted to climate change and have high environmental and sustainability standards. An urban smart grid is a central part of the project. Stockholm Royal Seaport is a close collaboration between government, the municipality, developers, policy makers and industry, including companies like Ericsson, energy utility Fortum and appliance manufacturer Electrolux. It is one of 18 Climate Positive projects in the world and part of the Climate Positive Development Program launched in May 2009—a joint initiative of the Clinton Climate Initiative and the US Green Building Council aimed at creating a new global benchmark for sustainable urban development.[56]

56 Stockholm Royal Seaport: Vision 2030, The City of Stockholm, http://en.calameo.com/read/00019176230d2b062abdc

3.4 SMART BUILDINGS

"Energy-smart buildings: Demonstrating how information technology can cut energy use and costs of real estate portfolios", is a report authored by Microsoft, Accenture and the Lawrence Berkeley National Laboratory. It examines how building-owners, operators and occupants can achieve significant energy and cost savings through the use of smart building solutions. It is based on insights from a detailed case study of a smart building pilot program being conducted by Microsoft at its corporate headquarters' campus. The pilot shows that aggregated data and powerful analytics that add 'intelligence' to existing building infrastructure have the potential to transform the way in which companies manage energy across their real estate portfolio. One of the biggest impacts of the program has been the ability to identify building faults and inefficiencies in real-time by analyzing the data streams extracted from building systems. Most importantly, the software is able to quantify wasted energy from each identified fault in terms of dollars per year. Microsoft expects that interventions equivalent to a full five-year retro-commissioning cycle for the entire campus can now be accomplished in just one year. Annual energy cost savings from continuous commissioning enabled by automated fault detection alone may thus exceed USD one million[57].

57 Energy-Smart Buildings: Demonstrating how information technology can cut energy use and costs of real estate portfolios, 11-2061 / 11-3867, Accenture, 2011, http://download.microsoft.com/download/4/8/8/4885BBB9-2675-42CB-9CF2-F11B69C3C2FB/energy-smart-buildings-whitepaper-1.pdf

3.5 EMPOWERING SMART CUSTOMERS

Hermiston Energy Services (HES) is a small, municipality-owned electric utility from Eastern Oregon (USA). It faces looming Bonneville Power Administration Tier II rate charges; increased consumer demand; concerns about news of consumer resistance to some utilities' Demand Response proposals; and has no plans to install 'smart meters.' Instead, HES decided to create 'smart customers' by leveraging a combination of Broadband and Intel-based Computing technologies. HES worked with Intel and OnSmart Technologies, a Home Energy Management company, to administer their "Power-to-the-People" program for a small qualitative HES customer sample. OnSmart believes 'smart customers' enabled by Internet and computing technologies are the key to the success of future load management and sustained conservation. Its approach: 1. Engage, empower, educate and embrace 'smart customers' to establish trust and cooperation with the utility for peak demand; and 2. Encourage and educate consumers to actively "monitor & manage" their own energy use choices and devices.

The participants access their own web-portal to monitor and manage their Wi-Fi enabled programmable thermostat and water heater. They can see how much their energy consumption costs, including graphical displays of their consumption in relation to others. Most importantly, they can control their thermostats and water heaters from any web-enabled device, using a desktop PC, laptop, netbook, tablet, or smart phone—anywhere, any time. Using broadband connections and their computing device, to date most participants have experienced 10-15 percent savings on their energy bills, with one participant reporting a consistent 30 percent savings.

Other more surprising outcomes include: using broadband connections and their computing device, nearly 90 percent control their thermostat and more than 50 percent control their water heater remotely when they are out-of-town. Over half regularly control their water heaters on a daily basis and many are competing to see how long they can keep it off. The current personal best is held by a young family of four which keeps its water heater off nearly 22 hours a day.

In summary, the combination of broadband technology, in combination with home Wi-Fi networks and everyday computing devices such as PC's and smartphones, can help consumers view and actively manage their energy use—whether or not a smart meter is installed.

3.6 TRANSFORMATIVE STEPS

The Global e-Sustainability Initiative (GeSI) is a strategic partnership of the ICT sector and organizations committed to creating and promoting technologies and practices that foster economic, environmental and social sustainability. GeSI's vision is a sustainable world through responsible, ICT-enabled change[64]. Through studies, tools and initiatives to spur collaboration, GeSI is promoting a solutions agenda and the kinds of policies that support this process.

GeSI's landmark Smart2020 Report[65] presented the case for a future-oriented ICT industry to respond quickly to the challenge of climate change. It showed that the ICT sector could reduce global emissions from all sectors 15 percent by 2020, representing savings of USD 946.5 billion annually. This report has been instrumental in spearheading and inspiring several of the initiatives listed in this section.

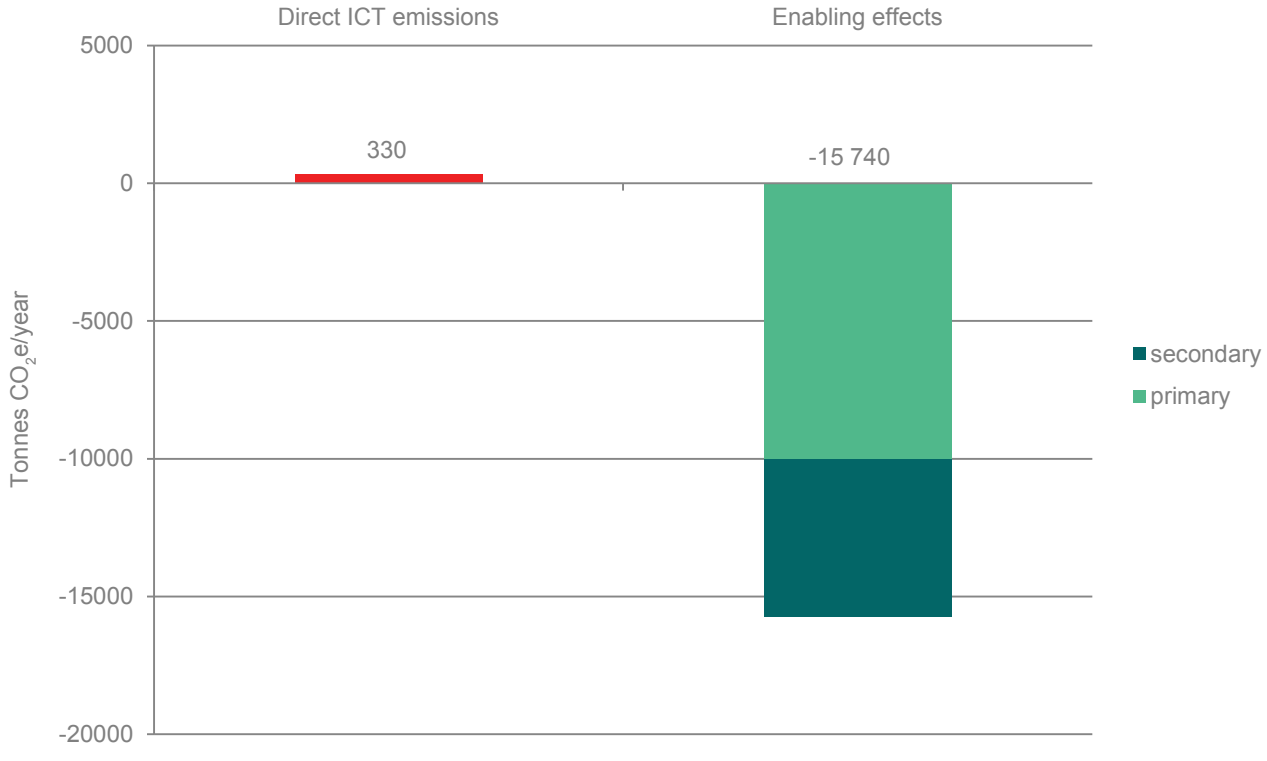
To highlight the innovation already underway, COP-17 saw the launch of GeSI's "Transformative Step of the Day" award[66]. Each day, a wide variety of stakeholders, using a mobile application and web platform, nominated government initiatives that support transformative low-carbon solutions. The aim was to spark dialogue and highlight synergies among solutions providers and policymakers.

GeSI also developed "Evaluating the Carbon Reducing Impacts of ICT" – An enablement methodology, used by many GeSI members for assessing low-carbon enablement capacity. The ultimate aim of GeSI's work is to shift thinking from a problems-oriented to a solutions perspective and to urge all players to seize the opportunities inherent in ICT for a low-carbon future economy and society.

65 Smart 2020: Enabling the low carbon economy in the informationage, The Climate Group on behalf of the Global eSustainability Initiative (GeSI), 2008, http://www.gesi.org/LinkClick.aspx?fileticket=tbp5WRTHUoY%3d&tabid=60

66 Transformative Step of the Day, Gesi, 2011, http://www.transformative-step.net/

The enabling effects of ICT to reduce carbon-intensive activities while improving quality of healthcare services.



Courtesy of Ericsson

During COP17 in Durban a multi-stakeholder coalition in cooperation with the UNFCCC secretariat launched the "Transformative Step of the Day" award as a way to increase focus on transformative low-carbon solutions during the negotiations.

The three winners of the Transformative Step were:

Green Commuting: CANGO Green commuting fund. This initiative bought together government, business and NGOs for events such as the Beijing Olympic and the Shanghai Expo to encourage the use of smart ICT technology to reduce carbon emissions. The initiative also created China's first online platform, "5iGreen", for personal voluntary offset carbon emissions reductions.

3GF: Public Private Partnerships for green growth. This initiative promotes the setting up of public private partnerships with a focus on delivering a zero carbon economy by approaching leading countries as solution providers and linking the need for a strong binding global framework with leadership in smaller groups.

China's Policies and Actions for Addressing Climate Change: This initiative highlights the need to balance economic growth with sustainability. The initiative promotes innovation in areas such as buildings, transport and industry, highlighting the need for collaboration between stakeholders both national and international, as well as engaging local citizens.

3.7 SMART STAKEHOLDER PARTNERSHIPS

Momentum around smart grids has been building for years. Many governments have earmarked significant funding programs to support smart grids (US, EU, Germany, and Australia) — as a way to boost the economy as well as meet climate goals. The rationale for smart grids is compelling: by shaving just one percent off peak demand, it is possible to reduce grid capacity, requiring less infrastructure. Sensors in the network and analytics through broadband capacity make it possible to better navigate peaks and troughs in demand, as well as benefit from real-time usage information and the added functionality of intelligent appliances.

Because total transformation of the energy business will be required to maximize the full potential of smart grid, high-level industry leadership is needed, as well as at national government level. Without clear government direction, processes will be slow and the smart grids developed might not be the most efficient and effective.

To address some of these issues, the ITU Smart Grids standards initiative is a broad stakeholder group creating global specifications for future utilities networks. Other initiatives[58] capitalizing on public-private partnerships to advance the development of smart grids include the Digital Energy Solutions Campaign (DESC), Gridwise, Smart Grid Europe, Smart Grid Australia, Gridwise Alliance and others. Some of the smart grid alliances around the world (Australia, USA, UK, South Korea, Japan, India, Canada, the Netherlands and Ireland) are excellent examples of a trans-sectoral approach geared towards energy-efficiency, renewable energy, electric cars, home automation gateways and more[59].

53. Activities in Smart Grid Standardization: Repository, Version 2.0, ITU, April 2011http://www.itu.int/en/ITU-T/focusgroups/smart/Documents/smartgrid_repository-V2.pdf

59 Industry data, 2011, www.budde.com, retrieved Nov. 2011

3.8 CAIRO ROADMAP AND ACCRA CALL TO ACTION

ITU has been conducting since 2008 a series of global events to raise awareness on the role of ICT to address the causes and effects of climate change, as well as to promote environmental protection. This series of "ITU Symposia on ICT, the environment and climate change"[60] has promoted the creation of a network of leading specialists in the area of ICT and climate change, from top policy-makers to engineers, designers, planners, government officials, regulators and standards experts. Topics presented and discussed include the adaptation and mitigation of the effects of climate change in the ICT sector and in other sectors, 'green' ICT policy frameworks, green ICT standards, green applications, and the use of ICT in climate change science and in emergency situations.

Key deliverables from these series of symposia, which included events in Kyoto (Japan), London (UK), Seoul (Korea), Quito (Ecuador), Cairo (Egypt) and Accra (Ghana), have been the definition of the "Cairo Roadmap"[61], which provides a framework of six steps to assist countries in their efforts to integrate the use of ICT into their environmental policies and the endorsement of the "Accra Call to Action"[62], which, inter alia, called the global community to recognize the role of ICT to reduce GHG emissions and invited county delegations to make specific mention of ICT in the outcomes of the 2011 United Nations Climate Change Conference and of the 2012 United Nations Conference on sustainable Development (Rio+20).

60 ITU, retrieved Nov 2011, http://www.itu.int/ITU-T/worksem/climatechange/

61 Cairo Roadmap: ICT and Environmental Sustainability ,ITU, Nov 2010, http://www.itu.int/dms_pub/itu-t/oth/06/0F/T060F0060160001PDFE.pdf

62 Accra call to action on ICT, the environment and climate change, ITU, 2011, http://www.itu.int/dms_pub/itu-t/oth/06/0F/T060F00601E0070MSWE.doc

3.9 TAKING ON THE PEAK

The US Department of Energy's Pacific Northwest National Laboratory Olympic Peninsula Project demonstrates how consumers can use information technology to adjust their energy consumption based on real-time fluctuations in price. Automated control technology was installed to allow industrial, municipal and residential customers to reduce their electricity consumption during peak demand or when prices were high. Smart appliances, including thermostats, water heaters and clothes dryers were installed in 112 homes. Residential customers could choose their balance between comfort and economy. A virtual, real-time, two-way market with real cash incentives was established to reflect the actual cost of producing and delivering electricity, and motivated consumers to reduce their demand during peak periods.

The PNNL Olympic Peninsula project proved that an Internet-based network coordinating demand response can reduce peak loads on the grid by approximately 15 percent over the course of a year. A combination of demand response and distributed generation reduced peak distribution loads by 50 percent for days. On average, consumers also saved approximately 10 percent on electricity bills from the prior year. As the Pacific Northwest region has installed significant commercial wind generation capacity, the same Internet-based demand response technology demonstrated in the Olympic peninsula could be used to stabilize the intermittency of wind generation on the Bonneville Power Administration grid.[63]

63 Pacific Northwest GridWise Testbed Demonstration Projects: Part I Olympic Peninsula Project, Pacific Northwest National Laboratory, Oct 2007, http://cleanefficientenergy.org/sites/default/files/op_project_final_report_pnnl17167.pdf

4

GOVERNMENT CASE STUDIES

Investing in the Future

In a number of countries, governments are integrating climate change and energy policy with ICT and broadband development to help achieve national carbon emissions reductions. In this chapter we showcase initiatives from Australia, India, Mexico, South Africa and Sweden and South Korea, present their approaches, key learnings to be shared and potential for scaling up.

4.1 AUSTRALIA: A CRITICAL INFRASTRUCTURE

Australia has the dubious honor of producing more carbon pollution per head than any other country, thanks to its small population and dependence on coal-fired electricity generation[67].

Following its 2007 ratification of the Kyoto Protocol, in 2009 the Australian government announced a Mandatory Renewable Energy Target of 45,000 MW—20 percent of Australia's electricity supply—to come from renewable energy sources by 2020. As of 8th November 2011—Clean Energy Future[68] legislation commits Australia to cutting GHG emissions by at least five percent compared with 2000 levels by 2020, and 80 percent below 2000 levels by 2050. A carbon price will be introduced from 1st July 2012, innovation and investment in renewable energy will be promoted and energy efficiency encouraged.

Smart grid policy is integral to Australia's overall energy strategy. The National Framework for Energy Efficiency includes developing standards, educating the public and industry about ways to reduce usage—and tackling regulatory hurdles that impede adoption of smart grid technologies.

Following a period of multi-stakeholder consultation, the government kick-started an AUD$100 million (USD 100 million) Smart Grid, Smart City program[69] as part of its National Energy Efficiency Initiative. A trans-sector consortium led by Ausgrid is piloting Australia's first commercial-scale smart grid. With a completion date of 2013, the aim is to investigate demand-side solutions for achieving carbon emission reductions, demonstrate concepts, test the business case and—through six-monthly Monitoring and Measurement Reports—share learnings with industry to inform policy, standards and debate.

The five-site demonstration project will be a blueprint for smart grid roll-out across Australia. Already, some AUD$300-400 million (USD 300-400 million) in private investment has been committed on the back of the pilot.[70]

A significant potential platform for future smart grid implementation in Australia is the National Broadband Network (NBN)[71]. The Australian Government is investing AUD27.5 billion (USD27.5 billion) in a high-speed, wholesale-only, open-access network to reach 93 percent of Australian premises by 2021 with fibre to the premises technology, with the remaining 7 percent to be connected with next generation fixed wireless and satellite technologies. The NBN will underpin the National Digital Economy Strategy. This sets eight Digital Economy Goals, two of which target climate change—to extend national access to smart technology by 2020 to better manage energy use; and double the level of teleworking to at least 12 percent of Australian employees. The NBN can enable more Australians to telework more easily. Access Economics has estimated that if 10% of Australian employees were to telework 50% of the time, total annual gains of AUD1.4-1.9 billion (USD 1.4-1.9 billion) could be delivered, including savings of 120 million litres of fuel.[72]

67 Securing a clean energy future: The Australian Government's Climate Change Plan, ISBN 978-0-642-74723-5, 2011, Australian Government, http://www.cleanenergyfuture.gov.au/wp-content/uploads/2011/07/Consolidated-Final.pdf

68 Clean Energy Australia: Investing in the Clean Energy Sources of the Future, ISBN 978-0-642-74721-1, 201, Australian Government, http://www.cleanenergyfuture.gov.au/wp-content/uploads/2011/07/clean-energy-australia.pdf

69 Further information at: Smart Grid, Smart City, http://www.smartgridsmartcity.com.au

70 Simshauser and Downer, Limited-form dynamic pricing: applying shock therapy to peak demand growth, February 2011, http://www.aglblog.com.au/wp-content/uploads/2011/03/No.24-Limited-Form-Dynamic-Pricing.pdf

71 National Broadband Network: Progress Update, 2010- 13537# 02 NBNI, Australian Government, Aug 2011, http://www.nbn.gov.au/wp-content/uploads/2011/05/august-update.pdf

72 Impacts of teleworking under the NBN, Report by Access Economics Pty Limited for the Department of Broadband, Communications and the Digital Economy', http://www.dbcde.gov.au/__data/assets/pdf_file/0018/130158/ImpactsofteleworkingundertheNBN.pdf

A hallmark of the Australian approach has been trans-sector cooperation, to extend the benefits of broadband (for which Australia is one of the top 10 economies in the world) to other sectors of the economy, such as environmental protection. As well as a new regulatory framework and extended ministerial portfolios, there has been unprecedented collaboration between ministries and affected industry sectors. In the words of Stephen Conroy, Minister for Broadband, Communications and the Digital Economy and Minister Assisting the Prime Minister on Digital Productivity: "Across all levels of government, collaboration is necessary to tackle climate change. The Government is committed to ensuring that all stakeholders are aware of initiatives that are underway and of their value. It has adopted a whole-of-government strategy to address climate change via the ICT Sustainability Plan and its environmental goal within the National Digital Economy Strategy."

This approach is carrying through to implementation, too: Smart Grid, Smart City will explore potential synergies with the Australian National Broadband Network. This includes:

- Traffic Flow Analysis on different traffic scenarios to test and demonstrate how the National Broadband Network could be used for the delivery of smart grid communication requirements; and
- A Smart Home Digital Gateway demonstration to test, analyse and report the synergies of a common smart meter and communications termination point at the customer premise.

National adoption of smart grids is expected to deliver minimum gross financial benefits of $5 billion annually, including environmental benefits."

Top ten broadband economies, early 2011

Economy	Fixed broadband subscriptions per 100 inhabitants	Economy	Active mobile-broadband subscriptions per 100 inhabitants *
Netherlands	38.1	Korea (Rep.)	91.0
Switzerland	37.9	Japan	87.8
Denmark	37.7	Sweden	84.0
Korea (Rep.)	35.7	Australia	82.7
Norway	35.3	Finland	78.1
Iceland	34.1	Hong Kong, China	74.5
France	33.9	Portugal	72.5
Luxembourg	33.2	Luxembourg	72.1
Sweden	31.8	Singapore	69.7
Germany	31.7	Austria	67.4
United Kingdom	31.6	New Zealand	66.2

Note: Excludes economies with populations below 100,000

Source: ITU World Telecommunication/ ICT Indicators database

* Data provided by Wireless Intelligence

4.2 INDIA: A KEY TO INCLUSIVE, LOW-CARBON GROWTH

Nowhere is broadband's vast potential for driving development and transforming the economy clearer than in India. Among the fastest growing telecommunications markets in the world, as of September 2011 there were over 850 million mobile subscribers and over 90 percent of villages had mobile coverage. Now India has a goal to connect every village in the country with high-speed broadband access under its National Broadband Plan (NBP)[73], taking connectivity to 1.2 billion people—a precondition for low carbon growth.

High ICT penetration is seen as a low-carbon way of driving inclusive growth and meeting essential socioeconomic development goals. India is the third largest emitee of GHGs worldwide, but one of the lowest emitters on a per-capita basis, with emissions of 1.18 tonnes of CO_2 equivalent per capita in 2008—just a quarter of the corresponding global average of 4.38 tonnes. In 2009, the government announced a commitment to reduce the GHG emissions intensity of India's GDP by 20-25 percent of 2005 levels by 2020. A central pillar of its National Action Plan on Climate Change is to generate 'co-benefits'—namely to meet development objectives as well as achieving mitigation and greenhouse gas reduction.

Among India's key carbon reduction priorities is energy efficiency in critical sectors including power generation, transport, industry, buildings and forestry. With electricity generation responsible for about 38 percent of its gross emissions, and expected to grow annually by 5.8 percent, leapfrogging to best-in-class smart grid technologies that help reduce transmission and distribution losses could avoid India getting locked into high emissions generation for the next 30 years.

Low-carbon inclusive growth is a cornerstone of India's Twelfth Five Year Plan, due for launch on 1st April 2012. An Expert Group on Low Carbon Strategies for Inclusive Growth formed in 2010 by Prime Minister Manmohan Singh, is charged with mapping out a national strategy. The group's interim report, "Low Carbon Strategies for Inclusive Growth"[74], outlines options for reducing India's emission intensity. A follow up report will identify barriers to overcome, likely costs and the policies, measures and incentives needed to drive low carbon growth.

Cross-sectoral collaboration is being promoted through groups like the PM's Council on Climate Change, a cross-ministry committee tasked with evolving a coordinated response to climate change issues at national level and oversee action plans for assessment, adaptation and mitigation. An inter-departmental governmental task force known as the Smart Grid Task Force[75] has been set up comprising the Ministries of Power, New and Renewable Energy, Communications and Information Technology and the Department of Science and Technology. In addition, the public-private partnership India Smart Grid Forum has been formed to involve utilities, industry and academia.

India's NBP aims to connect all population centers of 500 and above through an open access optical fiber network, with a target of 160 million broadband connections by 2014, at a cost of some INR600 billion (USD13.2 billion). As anticipated in the 2011 draft National Telecom Policy, it will be a springboard for maximizing the multiplier and transformational impacts of ICT on the Indian economy.

73 A triad of policies to drive a national agenda for ICTE, India's National Telecom Policy, 2011, http://india.gov.in/allimpfrms/alldocs/16390.pdf

74 Low Carbon Strategies for Inclusive Growth, Interim report, Planning Commission Government of India, May 2011, http://planningcommission.nic.in/reports/genrep/Inter_Exp.pdf

75 Further information at: India Smart Grid Task Force, Ministry of Power, Government of India. http://www.isgtf.in/

4.3 MEXICO: DEMONSTRATING GLOBAL LEADERSHIP

One year ago all eyes were on Cancun, Mexico as host of the Sixteenth Conference of the Parties (COP-16) of the United Nations Framework Convention on Climate Change (UNFCCC). Its outcome was hailed as a success by many for getting the climate talks back on track.

Luis Alfonso de Alba, Mexican Special Representative on Climate Change and a co-negotiator at COP-16 was among those advocating a more transparent, inclusive process and an integrated approach in Cancun: "Climate change has mainly been a problem at the desk of the environment minister. Now it is part of the portfolio of the finance minister, the telecoms minister, the health minister, the education minister, and so on."

According to de Alba, climate negotiations are a step-by-step process, requiring increased openness and involvement of non-governmental actors. Private sector companies fall into a number of categories—those that will have to adjust due to the high-emissions nature of their business and those that will benefit from promoting new technologies. ICT, however, is "in its own category in being able to contribute solutions" as "a tool that will help very much in the fight for climate change." There is no silver bullet strategy: government approaches need to be effective in driving change on all these fronts.

With the Guadalajara Declaration for Transformative Low-Carbon Solutions (see Section 3.1), Mexico took a lead in recognizing the role ICT can play in achieving the low-carbon society. Now, with attention on, a solutions agenda is being pursued for the future, a recognition of best practices by governments in driving low-carbon ICT solutions.

In an era that will clearly require some dramatic adjustments to business as usual, governments will have to face some tough decisions, de Alba finds: "Some may want to see an emissions cap on certain industries, while others will recognize the opportunities for the private sector to contribute to solutions. There is no unified view on it."

"What we need to understand is that there are a number of activities that need to change," de Alba concludes. "We need to recognize that our consumption patterns must change, and the types of products we use might need to be adjusted. The private sector, including the ICT sector, needs to reduce its own emissions. But it also needs the right conditions to be able to contribute to the longer term objectives in a country, and facilitate transfer to a new model of development."

4.4 SOUTH AFRICA: BEYOND COP-17

Among the government of South Africa's ten strategic priorities for the 2009–2014 period, are building sustainable public service infrastructure and resource management, including the impacts of climate change. The country has identified a goal of a 34 percent reduction in carbon emissions by 2015. COP-17 in Durban further increased momentum and deepened engagement on climate issues at a national level.

Digital broadband technologies are an important tool for South Africa to achieve more sustainable development, and regulators recognize the need to create stronger links between ICT and national strategic climate policy. According to Stephen Mncube, Chairman of the Independent Communications Authority of South Africa (ICASA): "We are studying the impacts of climate change and we are studying our role. At this juncture, policies are forward-looking for climate change. Regulatory bodies must look towards the future. Things are happening so fast, especially within ICT where developments are so fluid and volatile."

Policy coordination by means of an integrated policy statement is part of the government's approach, Mncube explains: It is the responsibility of every department to align their respective areas and regulatory work with South Africa's strategic priorities. However, budgetary constraints have restricted scalability and effective regulation: "ICT is a big industry. It permeates all aspects of life, so the regulatory bodies must be endowed to tackle that."

Given the rapid urbanization, significant responsibility for implementing national GHG emission reduction goals lies with cities. Already Johannesburg is preparing for a low-carbon economy, launching in October 2011 its comprehensive 2040 Growth Development Strategy. Among its four desired outcomes: to achieve "a resilient, liveable, sustainable urban environment – underpinned by infrastructure supportive of a low-carbon economy."

Critically important, according to Mayor of Johannesburg, Clr Mpho Parks Tau, are smart infrastructure and services that are more efficient and environmentally sustainable, including smart meters, intelligent public lights, traffic management and surveillance systems. Across its eight regions, the city aims to achieve more sustainable use of its utilities management while giving households the opportunity to make decisions about the way they use their appliances, monitor and mitigate the use of energy and water.

The high-speed fiber optic network needed to deliver on the 2040 strategy has been under development since 2009 through the Johannesburg Broadband Network Project (JBNP)[76]. A key feature is public-private partnership: "We arrived at a fairly unique business model that utilizes our private telecom license and applications to reduce costs. At the same time our license allows us to extend services that are beyond municipal use to the communities."

Key lessons include avoiding duplication of effort at different levels of government, clearly defining implementation vehicles and business models, and breaking down silo mentalities by focusing on outcomes and getting stakeholders to agree desired objectives, before defining a long-term development path.

76 Johannesburg Broadband Network Project: JBF Update, Department of Economic Development, City of Johannesburg. http://www.joburg-archive.co.za/2010/pdfs/joburg_bbn1.pdf

4.5 SWEDEN: WORLD CLASS BROADBAND OPPORTUNITIES

With its ambitious target to cut carbon emissions by 40 percent by 2020, tackling climate change is a priority issue for Sweden. It is therefore among the challenges the European Green Capital 2010 is addressing head-on through its ICT strategy.

Published this year, the Digital Agenda[77] outlines the national strategy for leveraging broadband to create employment, development, democratic participation and growth. Its goal: to make Sweden the world's best at pursuing ICT-related opportunities. The Agenda underscores those areas where ICT can make a difference in meeting the 2020 climate target—among these building efficiency and smart grid solutions, streamlined energy use of ICT in public works, intelligent transport systems and climate research.

Dialogue, transparency and collaboration all feature prominently in the Swedish approach, both across ministries and with stakeholders along the ICT value chain. According to Anna-Karin Hatt, Minister for Information Technology and Energy: "Never before has a process for strategy work within the offices of government been so open and inclusive,"

Secretaries of state from every government ministry have participated in the process. Broader stakeholder engagement also informs the Agenda. The Digitalization Commission (comprises 27 experts from varied interest groups, including ICT and climate change, who convene four to six times annually. According to Minister Hatt: "The Commission will analyze how the goal develops and report findings back to the government.In the environment, as in all other areas, the Commission will make sure that Sweden is best in the world at leveraging the opportunities offered by digitalization."

This will be easier now that the Energy Ministry is part of Minister Hatt's portfolio of responsibilities, further strengthening the connection between ICT, energy use and carbon mitigation. Christina Henryson, Head of Broadband, Ministry for Information Technology and Energy explains: "There are a number of synergies within our organizations. Smart grids for example, require close cooperation between our two organizations. Although we already have a working relationship, it will become more seamless."

The Digital Agenda builds on ongoing initiatives such as the country's broadband strategy, launched in 1999. Between 2001 and 2007 Sweden invested SEK 5.2 billion (USD 748 million) to roll out broadband. Between 2012 and 2014 an additional SEK 500 million (USD 72 million) will be allocated through incentives and grants to connect low-populated areas. According to Henryson the 2015 goal of connecting 40 percent of all households and businesses with high speed broadband (minimum 100 Mbps) has already been achieved.

This 'can do' mentality has seen Sweden ranked by The World Economic Forum as the most digitally connected economy in the world. Already it has decoupled carbon emission rates from economic growth: between 1990 and 2008, the country reduced its carbon emissions by 12 percent while the economy grew by 50 percent—much of this thanks to connectivity.

77 IT in human services - A Digital Agenda for Sweden, N2011.12, Government Offices of Sweden, Oct 2011, http://www.regeringen.se/content/1/c6/17/72/56/99284160.pdf

4.6 SOUTH KOREA: AIMING HIGH, ACTING SMART

South Korea has set an ambitious goal to reduce GHGs by 30 percent by 2020—particularly challenging since between 1990 and 2005 its greenhouse gas emissions doubled—the fastest growth in the OECD.

In South Korea's shift towards a low-carbon economy, broadband and ICT are seen as a key enabling infrastructure for the 'Green Growth, Low-Carbon' national vision. A major national 'u-Korea' or ubiquitous South Korea initiative aims to develop strategic ICT to deliver universal communications. High-speed broadband will enable connection to green power sources, high-definition video conferencing for remote medical diagnoses and even remote-controlled home robots to clean or perform other tasks, smart-grid for higher electricity efficiency and intelligent transport system.

A Green Growth Committee is tasked with creating an 'Advanced Green Country' with smart grids as a central feature. The Korea Smart Grid Institute is implementing a Smart Grid roadmap, including test-beds, pilot cities and other policy support. Ten pilots are currently underway.

Key to the South Korean approach is collaboration and inclusiveness. Government ministries work together to create coherent policies and, according to the Ministry of Knowledge Economy, the emission-cutting targets reflect the concerns of civic groups and companies. All relevant government agencies cooperate in drawing up action plans and monitoring implementation of goals. The Ministry has worked closely with the Presidential Committee on Green Growth, while the Green Growth Committee ensured the views of experts from industry, academia, and research institutions were sought in outlining the national roadmap for a green economy.

This unified, inclusive approach is evident in Seoul, where holistic city planning includes ICT as a key component. In 2004, Seoul launched a conversion program involving digital, physical and institutional integration to 'smartify' its public transportation system using advanced ICT technology and public-private partnership. The result: improved availability, utilization and timeliness of city public transportation, citizens highly inclined to use public transportation, and progress towards the city's goal of reducing total energy consumption by almost 20 percent by 2020.

Further plans are underway that harness ICT to drive change in work and life patterns, including Smart Mobile Work Centers (converted municipality buildings) to enable teleworking, smart pricing systems for transportation demand management, connected buses for improved citizen experience, and a personal travel assistant for improved transportation planning. Given the tech-friendly culture of Seoul, the chances of success are high—offering a valuable example for other ICT-rich cities to follow.

Sources:

Networked Society City Index: Triple bottom line effects of accelerated ICT maturity in worldwide cities, Ericsson, 2011, http://hugin.info/1061/R/1514402/450437.pdf

Paul Budde Communication Pty Ltd, 2011 http://www.budde.com.au/

Korea Smart Grid Institute, retrieved Nov 2011, http://www.smartgrid.or.kr/eng

Business Green, South Korea details 2012 emission reduction plan, retrieved Nov 2011, http://www.businessgreen.com/bg/news/2116317/south-korea-details-2012-emission-reduction-plan

Electric Power Systems information System, Korea Power Statisitics, retrieved Nov. 2011,http://epsis.kpx.or.kr/epsis/servlet/epsis/EECU/EECUController_BBS?cmd=view&cd_upper=&cd_bbs=004001&leftPos=004001&no_index=2425BBS?cmd=view&cd_upper=&cd_bbs=004001&leftPos=004001&no_index=2454

5

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The next steps will require a concerted effort by all stakeholders to take measures, at times bold, at times challenging, that will lead to real and lasting change. The right policies will have to be in place, those which promote innovation, eliminate barriers to low-carbon technologies and encourage private sector investment in broadband over the long term. Standardized ways of measuring energy efficiency and broadband's enabling effect as well as harmonized standards of smart grids and other new technologies are important parts of the puzzle. By closing the gap between policy and technology, broadband gains even greater momentum as an engine for change.

Strategies within governments, across regions, and in global forums that prioritize connectivity, collaboration and cross-sector partnership in all its myriad forms is essential for integrated policy and decision-making. With dialogue and engagement among diverse groups of stakeholders, silos are broken down and a common language around solutions begins to emerge.

A lack of awareness about ICT and broadband's enabling role is a key challenge going forward. Policies and strategies will need to consider how to influence individual behavior and raise awareness to enhance the uptake of broadband-enabled low-carbon solutions among consumers worldwide.

By taking action now, broadband's potential as a transformational technology will more rapidly move from ideal to reality. The following recommendations from the Broadband Commission's Working Group on Climate Change are intended to spur the kind of change that will result in a strong, integrated and bold approach to unleashing broadband's role in the networked, low-carbon society of the future.

RECOMMENDATIONS

1. **Lead with vision:** adopt a long-term National Broadband Plan/Strategy based on universal affordability and accessibility, open markets and innovation, and consciously connect this to your climate goals.

2. **Bring convergence :** Bring convergence to ICT policy formulation so that it aligns with other policy areas such as energy, health, education and climate in order to maximize impact.

3. **Ensure regulatory certainty :** Ensure regulatory certainty with regards to policy and regulations on climate and broadband to create a framework of investment certainty.

4. **Be an example:** drive cross-ministry collaboration and integrated decision-making to align climate and digital goals and use government procurement to send the right market signals.

5. **Foster flexibility:** identify and remove the regulatory and policy barriers currently hindering research and investment in 21st century ICT-based broadband-enabled infrastructure and low carbon solutions.

6 **Provide incentives:** encourage uptake of low-carbon solutions and support market change by rewarding or incentivizing desired consumer behaviors. Spur innovation among individuals, companies and sectors.

7 **Build the market:** fund and facilitate scalable pilots to demonstrate feasibility and effectiveness of broadband as an enabler of low-carbon solutions and build a strong business case to attract private investment.

8 **Form partnerships:** cultivate 'connectivity' and 'co-creativity' across public, private and non-governmental sectors and industries to help develop a collaborative mindset, shared goals, common language and break down silos.

9 **Measure & standardize:** develop harmonized metrics and measurements and common standards for calculating both ICT's environmental impacts and the positive contribution it can make to other sectors—from individual products to systems, and from individual households to city or national levels.

10 **Share knowledge & raise awareness:** actively disseminate project findings, share best practice and learn from mistakes to identify success factors and facilitate leapfrogging, especially among lesser developed markets. Communicate the opportunities and synergies that can be achieved through an integrated, trans-sector approach to digital development. infrastructure and low carbon solutions.

BROADBAND TARGETS FOR 2015

The Broadband Commission has set four clear targets for making broadband policy universal and for boosting affordability and broadband uptake:

- Target 1: Making broadband policy universal. By 2015, all countries should have a national broadband plan or strategy or include broadband in their Universal Access / Service Definitions.
- Target 2: Making broadband affordable. By 2015, entry-level broadband services should be made affordable in developing countries through adequate regulation and market forces (amounting to less than 5% of average monthly income).
- Target 3: Connecting homes to broadband. By 2015, 40% of households in developing countries should have Internet access.
- Target 4: Getting people online. By 2015, Internet user penetration should reach 60% worldwide, 50% in developing countries and 15% in LDCs.


BROADBAND
COMMISSION
FOR DIGITAL DEVELOPMENT
WWW.BROADBANDCOMMISSION.ORG