

Department of Economic and Social Affairs
Division for Public Administration and Development Management

Advancing a Sustainable Information Society for All

Background Paper

Expert Group Meeting on Advancing a Sustainable Information Society for All

8-9 June 2015

New York



United Nations
New York, 2015

United Nations Department of Economic and Social Affairs

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Acknowledgments

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The purpose of the paper was to provide background information to the expert group meeting on “Advancing a Sustainable Information Society for All” organized by DPADM/UNDESA, in partnership with the International Telecommunication Union (ITU) at United Nations Headquarters in New York on 8-9 June 2015.

Introduction and Context

Information and communication technology (ICT) has been the fastest growing economic sector of the past 25 years. ICTs, including computing, telecommunications and the Internet, have changed the parameters for many aspects of economic and social development and offered new opportunities for development intervention. These were encapsulated in the World Summit on the Information Society (WSIS) in 2003 and in 2005, whose outcomes are to be reviewed at a special session of the General Assembly in December 2015.

Sustainable development has been a core objective of the United Nations (UN) and international development since the UN Conference on Environment and Development in 1992,¹ addressing the critical interfaces between economic prosperity, social welfare and environmental sustainability. A UN summit for the adoption of proposed Sustainable Development Goals (SDGs) will be held from 25 to 27 September 2015, in New York, and convened as a high-level plenary meeting of the General Assembly.

This background paper focuses on the interface and potential synergies between the Information Society and sustainable development. It outlines recent and likely future developments in both areas, draws attention to key issues arising for development policy and practice, and identifies questions for consideration. The first part of the paper focuses on the changing context of the Information Society and sustainable development. The second focuses on the implications of the issues identified for sustainable development policy and practice, including monitoring and implementation of the SDGs and the Post-2015 Development Agenda.

Part One – ICTs, Sustainability and their Inter-relationship

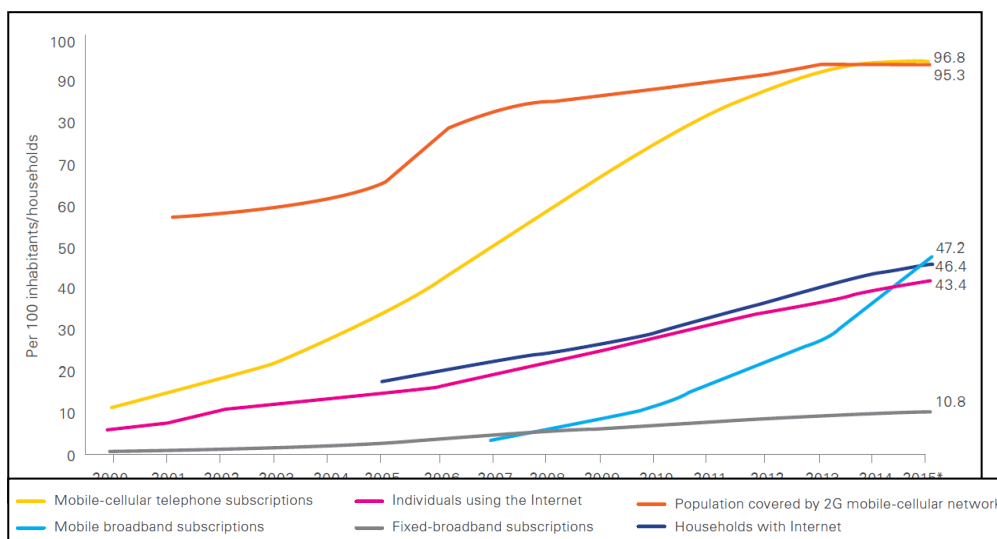
This paper is concerned with the interface between two critical agendas in international discourse – the Information Society and Sustainable Development. Its starting point is the expectation that integration between these will have positive impacts on achievement of the Post-2015 Development Agenda. This first part of the paper begins with brief introductions to recent developments concerning the Information Society and the Sustainable Development agenda, and considers the relationship between them. It then explores the impact of ICTs on economy, society and sustainability, and outlines the implications of ICTs for inclusiveness and the environment.

1. ICTs, ICT4D and the World Summit on the Information Society (WSIS)

ICTs can be defined as electronic means of capturing, processing, storing, and communicating information. This includes a rapidly growing range of increasingly sophisticated networks and resources with growing capabilities and more extensive reach

within societies. The most prominent ICTs in public use include radio and television broadcasting, fixed and mobile telephony, the Internet and Internet-enabled social media. ICTs have also become central to the functioning of business, government and other organisations during the past twenty years, in both developed and developing countries, though more extensively in some regions than in others. Their significance has grown rapidly because of continuous improvement in technological capabilities, network reach and service innovation. This has been led in almost all countries by the private sector. The growing reach of ICTs worldwide is illustrated in Figure 1.²

Figure 1: the global reach of ICTs, 2013



Source: ITU, Facts and Figures 2015

As a result of their growing reach and sophistication, ICTs have had increasing impact on economic and social life, and on development outcomes, in all countries. Most governments have sought to foster this by providing an enabling (usually competitive) environment for private sector investment and innovation, and by efforts (of varying success) to encourage inclusion of rural areas in network deployment.

Alongside the underlying impact of ICTs *on* development, most governments and many international agencies have undertaken interventions to leverage ICTs *for* development (or ICT4D). These have included the promotion of ICT-enabled economic sectors (such as business process outsourcing) as well as interventions in development sectors such as agriculture, health and education. The scope for such interventions has grown as ICT technologies and markets have become more sophisticated and pervasive. Some governments have adopted national strategies aimed at an holistic approach to ICT4D.

The World Summit on the Information Society, held in 2003/2005, played a catalytic role in developing awareness of ICT4D’s potential.³ WSIS identified ten targets for connectivity and established 18 Action Lines to monitor technological and developmental implementation of its core vision, ‘a people-centred, inclusive and development-oriented Information Society’;⁴ recommended processes, including the Internet Governance Forum (IGF), concerning Internet governance; and explored financial mechanisms for areas of ICT/ICT4D

which had proved less attractive to private sector investors. It urged UN agencies to implement WSIS outcomes within their mandates and competencies, to coordinate through a UN Group on the Information Society (UNGIS), and to integrate ICT4D in un UN Development Assistance Frameworks (UNDAFs).

The General Assembly will review the implementation of WSIS outcomes in December, ten years after the second WSIS summit. A comprehensive review of evidence has been prepared by the secretariat of the Commission on Science and Technology for Development (CSTD),⁵ building on reports by UN agencies and inputs from other stakeholders, an assessment of achievements against targets by the Partnership on Measuring ICT4D for Development,⁶ the outcome document from the conference *Towards Knowledge Societies for Peace and Sustainable Development* organised by UNESCO in 2013 (in conjunction with ITU, UNCTAD and UNDP),⁷ and the outcome documents from the WSIS+10 High Level Event organised by the ITU in 2014 (in conjunction with UNESCO, UNCTAD and UNDP).⁸

The Executive Summary of the CSTD report notes that:⁹

- ‘The years since [WSIS] have seen rapid growth in the reach of ICT throughout the world, particularly in wireless networks, which now cover almost all communities, and in the adoption and use of mobile phones, subscriptions to which are now almost as numerous as world population.’
- ‘Access to the Internet has grown less rapidly, but it is estimated that about 40 per cent of the world’s population now goes online, at least on occasion.’
- ‘Increased use of ICTs has led to changes in the underlying structure of societies, economic production, distribution and consumption, access to and use of information and knowledge, relationships between citizens, businesses and governments, patterns of work and leisure, and people’s participation in decisions that affect their lives.’
- ‘While increased connectivity and access to voice telephony have significantly reduced the digital divide in access to basic ICTs, other digital divides are still wide and may be widening.’
- Affordability, the availability of relevant content and the skills to make use of ICTs are as important as connectivity in enabling people to make use of them. ‘Network capabilities are generally poorer in rural than in urban areas. Relevant content and applications are less widely available in low-income countries and in local languages and to marginalized communities. The potential of ICTs remains unfulfilled for many people because they lack the financial resources or skills to access ICTs and information effectively, limiting the benefits that they can realize as individuals and those that could be reaped by their societies.’
- The enabling environment for investment, innovation and exploitation of ICTs (including online services) is therefore critical to the role of ICTs in development. ‘Broadband networks and services are now the benchmark against which progress towards an Information Society is measured.’¹⁰
- ‘Considerable growth and diversity in the volume of ICT-enabled development activity has occurred since WSIS.’ However, ‘experience ... suggests that developmental gains

have been easier to achieve in some countries and regions than in others. As well as connectivity, the skills and capabilities available within the population, the availability of finance for investment, and the availability of local content have been important.’

- ‘The spread of ICT adoption and the development of technology and services have led to new patterns of behaviour and relationships emerging between people, businesses and governments, which have had profound impacts on economic and social change, human rights, privacy and sustainable development.’
- ‘The capabilities of ICT networks and services today are some thirty times what they were at the time of WSIS. Very rapid growth in the capabilities of both computing and communications resources has enabled powerful new ICT modalities, including cloud computing, and new forms of data storage and analysis, such as ‘big data’. The capabilities of IT networks and services are continuing to grow rapidly. This ... is changing the parameters for the implementation of WSIS outcomes.’
- ICTs pose challenges as well as opportunities for development, in areas including cybersecurity, data protection and human rights as well as in inclusiveness and in environmental impact.
- Experience since WSIS has emphasised the importance of financial investment, enabling legal and regulatory frameworks for investment and innovation, and the participation of all stakeholders in the development of the Information Society, responding to the different circumstances of different countries.
- ‘The potential role of ICTs and their underlying significance for social and economic change are of particular importance in the context of the post-2015 development agenda, which will underpin international development policies at a time of further rapid growth in the reach and scope of ICTs.’

The CSTD report identified five major challenges requiring renewed effort by the international community:

- inclusiveness and the ‘digital divide’ which, if unaddressed, could exacerbate other development divides;
- the unpredictability of the changes taking place in ICT technology and services, which requires adaptable policy and programme responses;
- the mainstreaming of ICTs into wider social and economic development policies and programmes, including the sustainable development agenda;
- the importance of education and capacity-building to ensure that ICTs contribute effectively to development; and
- the monitoring and measurement of WSIS outcomes and the wider impact of ICTs on economic growth and social development.

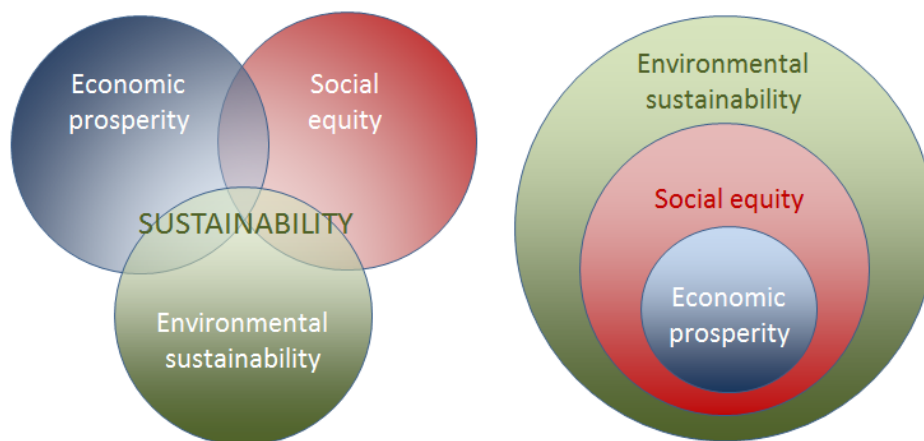
2. Sustainable development and the Sustainable Development Goals (SDGs)

The framework for sustainable development which emerged from the Brundtland Commission (1987)¹¹ and the Rio Summit (1992)¹² declared the centrality of integrating economic prosperity, social equity and environmental sustainability. For development to be

sustainable, it emphasised, it must be inclusive, eradicating poverty and enabling individuals, communities and societies to achieve continuing improvements in economic and social welfare. Equally, it emphasised, today’s development should not compromise that of future generations by damaging the environment, depleting natural resources or crossing ‘planetary boundaries’ from which it would be difficult or impossible to recover.¹³

The three pillars of sustainable development are often illustrated as a Venn diagram. An alternative view, proposed by Hilty and Aebischer, sees them more integrally, as nested components of sustainability.¹⁴ These alternative visualisations are illustrated in Figure 2.

Figure 2 – Visualisations of sustainable development



Source: DESA, derived from sources identified in footnote 14

The Millennium Declaration and Millennium Development Goals (MDGs), agreed at the Millennium Summit in 2000, concentrated international development attention to 2015 on poverty reduction and basic needs.¹⁵ MDG7, concerned with ‘ensuring environmental sustainability,’ included targets to ‘integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources,’ reduce loss of biodiversity, and improve water and housing conditions. Particular attention has been paid in international efforts to achieve the MDGs to the problems of LDCs and small island developing states (SIDS). The final target of MDG8 referred to making available ‘benefits of new technologies, especially information and communications.’

Progress towards sustainable development was reviewed at the Rio+20 summit in 2012. This recognised that progress since 1992 has been uneven and insufficient, emphasising the continued centrality of poverty eradication in a context of economic uncertainty and population growth. Achievements in some areas have been counterbalanced by continued depletion of natural resources and the threat of climate change, which is now much better understood than it was in 1992. The summit outcome document recognised ‘the critical role of technology as well as the importance of promoting innovation, in particular in developing countries,’ but paid only limited attention to the specific role of ICTs.¹⁶

Progress towards the MDGs will be reviewed by the General Assembly in September. The Secretary-General's 2014 report on MDG implementation noted that the objective of halving global poverty has been achieved within the timeframe, and that major improvements have occurred in education, health and water supply, but that more effort is still needed to fulfil the Goals, particularly in relation to hunger and environmental sustainability. In the latter context, global CO₂ emissions have grown by almost 50% since 1990, while there has been continued loss of biodiversity and increased water scarcity.¹⁷

The Rio+20 Summit, in 2012, recommended the development of Sustainable Development Goals (SDGs) to build on experience with MDGs. An Open Working Group, established by the General Assembly, has proposed a framework including 17 goals with 169 proposed targets, covering a wider range of economic and social objectives than the MDGs, including areas such as climate change, ecosystem management and social justice. These proposed goals and targets have target dates up to 2030.¹⁸ The final framework for SDGs will be agreed at the UN Summit on the Post-2015 Development Agenda in September. It will be necessary to establish indicators and modalities for monitoring and measuring the targets which are then adopted. A process towards preparing indicators, initiated following an Expert Group Meeting organised by the UN Statistical Commission in February 2015, is scheduled to complete its work in March 2016.

3. The relationship between SDGs, the Post-2015 Development Agenda and the WSIS review

The relationship between ICT4D and mainstream development has varied over time. While ICT4D advocates have strongly advocated its potential across development sectors, ICT4D has not featured prominently in the outcomes of UN summits other than WSIS, or in the annual reports of international agencies primarily concerned with other development sectors. Some commentators have suggested that this reflects a 'paradigm gap' between ICT4D and mainstream development communities.¹⁹

While there is a widespread view, particularly within the ICT and ICT4D communities, that ICTs – as general purpose technologies – will be important enabling and cross-cutting resources in implementing the Post-2015 Development Agenda, concern has been expressed within those communities about the extent to which the significance and development potential of ICTs have been recognised in discussions concerning SDGs and the Agenda.²⁰ At the same time, academic analysis has suggested that environment and sustainability issues have received less attention in WSIS+10 documentation than might have been expected.²¹

As noted above, the final target of MDG8 called for 'the benefits of new technologies, especially information and communications' to become available in developing countries. No indicators were established for this in 2000, but the Secretary-General's 2014 MDG report assessed it through recent data on the growth of mobile telephone, Internet and broadband access.²² Targets for connectivity and access, including some related to development sectors such as health and education, were adopted at WSIS, but no indicators

were agreed for these until 2010, and it has proved difficult to gather extensive data on many of those chosen.²³

There is no specific Goal addressing ICTs in the Open Working Group's proposed SDGs. However, Target 9.c in the OWG proposal calls on the international community to 'significantly increase access to ICT and strive to provide universal and affordable access to internet in LDCs by 2020.' Three other targets proposed by the OWG refer explicitly to ICTs. These are concerned with higher education (4.b), women's empowerment (5.b) and the diffusion of technology (17.8).²⁴ A significant number of other targets refer to the importance of information and information-sharing without making explicit reference to ICTs.

More attention has been paid in the SDG and Post-2015 Agenda literature to the potential of ICTs and ICT-enabled analysis in monitoring and measurement of SDG outcomes. The potential of big data analysis was emphasised, in particular, in the 2012 report of the Secretary-General's High-Level Panel of Eminent Persons²⁵ and the Secretary-General's 2014 synthesis report to the General Assembly.²⁶ Drawing on a report by the Secretary-General's Independent Expert Advisory Group on the Data Revolution for Sustainable Development,²⁷ the latter emphasised the importance of good-quality data and sophisticated data analysis, making use of the much greater computing power now available, to improve understanding of development contexts and the quality of development decision-making.

Work to establish indicators for the Post-2015 Development Agenda is at an early stage, and will only be finalised once the SDGs have been agreed.²⁸ The Partnership on Measuring ICT for Development has begun to identify ICT-related indicators for some of the targets proposed by the OWG.²⁹ Action Line facilitators from UNGIS agencies have built a provisional matrix of relationships between the OWG's proposals and WSIS Action Lines, which was presented at the 2015 WSIS Forum.³⁰ This preliminary work is described further in the second part of this paper.

The General Assembly's review of WSIS outcomes will take place in December 2015, three months after the Summit on the Post-2015 Development Agenda. It is not clear at present how the findings of the WSIS review will feed into the Post-2015 Summit and subsequent implementation of the Post-2015 Agenda, or how the outcomes of the Post-2015 Summit will feed into the WSIS+10 review.

4. The impact of ICTs on economy, society and sustainable development

The remainder of this part of the paper considers available frameworks for discussing the impact of ICTs on sustainable development. It draws, first, on work published by the International Institute for Sustainable Development (IISD),³¹ reports published by the CSTD secretariat³² and forthcoming work by David Souter,³³ to describe the systemic impact which ICTs have had and are expected to have on sustainable economic and social development. It then draws on work by Richard Heeks and others to consider the role of ICT4D policies, tools and interventions,³⁴ and on work by Lorenz Hilty, the Forum for the Future and others to describe an approach to analysing these impacts against the main elements of sustainability

established by the Rio outcome documents.³⁵ Finally, brief discussions summarise the implications of ICTs and ICT4D for inclusiveness (the ‘digital divide’) and environmental aspects of sustainable development.

IISD’s work in this area builds on the distinction made between:

- ICTs in development, *i.e.* the impact made by the ways in which ICTs are used by citizens, businesses and others on their own initiative; and
- ICTs for development, *i.e.* programmes and other interventions led by governments and development agencies.

Both of these are enabled by the spread in geographic reach of ICT networks and devices, and by innovations in technology which enable new services to be deployed and existing services to gain additional functionality. All of these result largely from investment by private sector companies, within legal and regulatory frameworks established by national governments.

IISD’s analysis explores the extent to which adoption and use of ICTs has led to systemic changes in society, economy and culture since the Rio summit defined sustainability, how these are likely to continue, and how far they affect the meaning of sustainability. While the extent to which changes in economic and social structures have occurred varies substantially between societies, IISD argues that a consistent trend can be discerned in both developed and developing countries. Critical aspects of this include changes in:

- patterns of economic production, distribution and consumption, including globalisation of product development and manufacturing, and the emergence of global businesses focused on data and communications management;
- the diversity and range of sources of information and knowledge available to individuals and communities resulting from access to the Internet;
- relationships between individuals, within families and social groups as a result of continuous accessibility and social media;
- the ability to exercise rights such as freedom of expression and challenges to rights such as privacy;
- relationships between citizens and governments, as a result of digitalisation of public services, increased opportunities for public participation in decision-making, and potential surveillance of citizen behaviour; and
- patterns of work, leisure and even human settlement.

It is these systemic changes in economy, society and culture, IISD argues, that amount to an emerging Information Society.³⁶ Their impact is intensifying in all countries because of the rapid pace of change in ICTs, encapsulated in what is widely known as Moore’s Law, the observation that the capabilities of ICT networks and devices (and, now, the amount of data arising from them) have been doubling approximately every two years for the past five decades.³⁷ While it should not be applied simplistically, Moore’s Law suggests, if it continues, that these capabilities could grow a further hundredfold or more within the fifteen

year period for implementation of the SDGs. Some commentators are concerned that this will outstrip the ability of human actors and institutions to adapt.

The CSTD secretariat's report emphasised the importance of this pace of change in its review of ICT developments since WSIS, a period which has seen the emergence, widespread deployment and use of innovations in ICT products and services that were not anticipated ten years ago.³⁸ These developments include mass market mobile telephony; the emergence of mobile Internet; the development of smartphones, tablets and mobile apps; the rapid deployment of broadband networks, particularly wireless broadband; the exceptionally rapid growth in social media and user-generated content; and increasing transition from device-based data and applications towards data and applications held in the cloud. The secretariat report also identifies a number of trends which will have comparable, and perhaps greater, impacts on economic and social life, and sustainability, over the next ten to fifteen years, during which the SDGs are to be implemented. These include:

- the growth of a cloud economy that is increasingly reliant on the centralisation of data and applications and on broadband infrastructure;
- the accumulation of data, big data analysis and social media analytics, which can help improve understanding of society and enable evidence-based developmental planning but also pose challenges of data privacy and sovereignty;
- the emergence of the Internet of Things, greatly increasing the scope and volume of data gathered and enabling closer control of devices by individuals and organisations;
- the deployment of smart systems to improve the productive and energy efficiency of economic sectors including manufacturing, power and transport; and
- the development of minituarised, wearable and other devices which will further alter the relationship between people and technology.

Other innovations which are underway or can be anticipated from current research include the semantic Web, artificial intelligence and organic computing.

The systemic impact of this continual growth in the capacity of networks and of the range and scope of ICT services on economy, society and development will be profound, but, as experience since WSIS has shown, it is difficult to predict specific impacts. The implications for ICTs in development strategies and programmes are discussed immediately below. Those for inclusiveness and environmental sustainability are addressed towards the end of this part of the paper.

5. The impact of ICT4D policies and interventions

Most literature concerned with ICTs and development has focused not on systemic impacts but on development interventions by governments, multilateral agencies and other actors. Four main aspects can be identified:

- **ICT and ICT4D strategies** have been adopted by many governments. These have focused, to varying degrees, on the enabling framework for ICT investment and deployment, inclusiveness (addressing 'digital divides'), the potential for ICTs to

facilitate overall economic and social change, and ICT4D applications in areas such as governance, agriculture, health and education. Experience suggests that these have not always been well integrated with overall national development strategies, and emphasises the importance of adaptation as ICT technologies and markets evolve.

- **ICT4D programmes** have also been widely adopted in specific development sectors. WSIS established Action Lines for eight of these: government, business, education, health, employment, environment, agriculture and science.³⁹ While there have been substantial achievements in these areas, programme interventions have also suffered from what have been called ‘design:reality gaps’, which have overestimated the potential of ICTs and underestimated the challenges of deploying them in contexts with limited power, skills and financial resources. As ICTs have become more widespread, some commentators have suggested that programme design should move from top-down approaches towards approaches built around ways in which target beneficiaries have appropriated technology for their own purposes.⁴⁰
- **ICT4D applications** are concerned with the use of specific ICT tools (networks, devices and services) to fulfil particular developmental goals – for example, mobile-enabled information services for farmers, distance learning for university students, or early warning systems to protect vulnerable communities against environmental risks. In addition to such overt applications, ICTs have been increasingly mainstreamed in the management and delivery of services across the board. Experience has shown that the appropriateness of different tools depends substantially on contextual factors such as available resources, and that it changes rapidly as these resources change. For example, the potential role of telecentres has been radically altered by widespread use of mobile phones, while social media have come to offer an alternative to traditional websites for disseminating information. Experience has also shown the importance of affordability, content and capabilities in enabling people to make effective use of ICTs. As a result, ICTs can prove more valuable to more prosperous and more educated members of the community than to the poor.
- Finally, ICTs facilitate new approaches to **development administration**. They can (but do not always) enable improved data gathering and analysis, which can (but does not always) improve understanding of development contexts and the responsiveness of development planning. Remote sensors and satellite-based ICTs, for example, have enabled improvements in meteorology and epidemiology which may help to reduce the vulnerability of marginal communities. More comprehensive data analysis can enable development planners to build more systemic understanding of developing environments and model potential impacts and interventions. ICTs should also enable greater coordination between governments and donors, though experience suggests this has been relatively limited to date: few UNDAFs take significant account of ICTs.⁴¹

The potential of ICTs as cross-cutting enablers of development was emphasised in the WSIS outcome documents and has been strongly supported by ICT4D advocates including ITU, UNESCO and the Broadband Commission for Digital Development. ICT-enabled applications have become increasingly important in development planning over the past ten years, and are increasingly mainstreamed in development practice and service delivery. They will become more important still during the implementation period for the SDGs because of the pace of change in their technology and adoption. The implications of this for delivering the sustainable development agenda are therefore likely to be substantial and to grow during the period of SDG implementation.

6. Assessing the relationship between ICTs and sustainable development: a methodology

The ‘people-centred, inclusive and development-oriented Information Society’ envisaged at WSIS is concerned with both human and technological development. As WSIS recognised, ICTs are enablers of sustainable development rather than its goal. How can their impact on sustainability be best assessed?

One widely-used approach juxtaposes the direct, indirect and long-term societal impacts of ICTs against the three pillars of sustainable development: economic prosperity, social equity and environmental sustainability.⁴² This model provides a framework for assessing both the overall impact of ICTs on sustainability and the impact of specific ICTs such as mobile telephones, the Internet or cloud computing. ICTs are seen within it as having three main types of impact:

- *Direct impacts* are those which are directly related to the manufacture, use and disposal of ICTs – for example in economic cost and savings to users, and in energy consumption.
- *Indirect impacts* are those which result from real-time use and application of ICTs – for example micro-coordination of social relationships, acquisition of knowledge through access to the Internet, and increased efficiency from ICT use in productive processes.
- *Societal impacts* are those which result from the cumulative use of ICTs by many people over time – for example, in changing work and leisure patterns, family relationships and human settlements.

This framework can be used to generate a scorecard for the impact of ICTs on each of the three pillars of sustainability, though assessments are hard to quantify and often quite subjective. Figure 3 illustrates one set of overall conclusions that could be derived from this model. The implications of these different types of impact on environmental aspects of sustainability are outlined later in this part of the paper.

Figure 3 – An illustrative scorecard of ICT impacts

	Economic prosperity	Social equity	Environmental sustainability
Direct effects	Mostly positive	Mixed	Mostly negative
Indirect effects	Mostly positive	Mostly positive	Mixed
Societal effects	Uncertain	Uncertain	Uncertain

Source: derived from Forum for the Future, The Impact of ICT on Sustainable Development, 2003, and D. Souter, ‘The enabling environment for ICT4D’, forthcoming

In a recent paper following the first International Conference on ICT and Sustainability, Hilty and Aebischer have sought to develop this model by redesignating and disaggregating the three main areas of impact (direct impact = ‘life-cycle impact’, including production, use and disposal of ICTs; indirect impact = ‘enabling impact’, including organisational change on the supply side and behavioural change on the demand side; societal impact = ‘structural impact’, including structural change and institutional change).⁴³

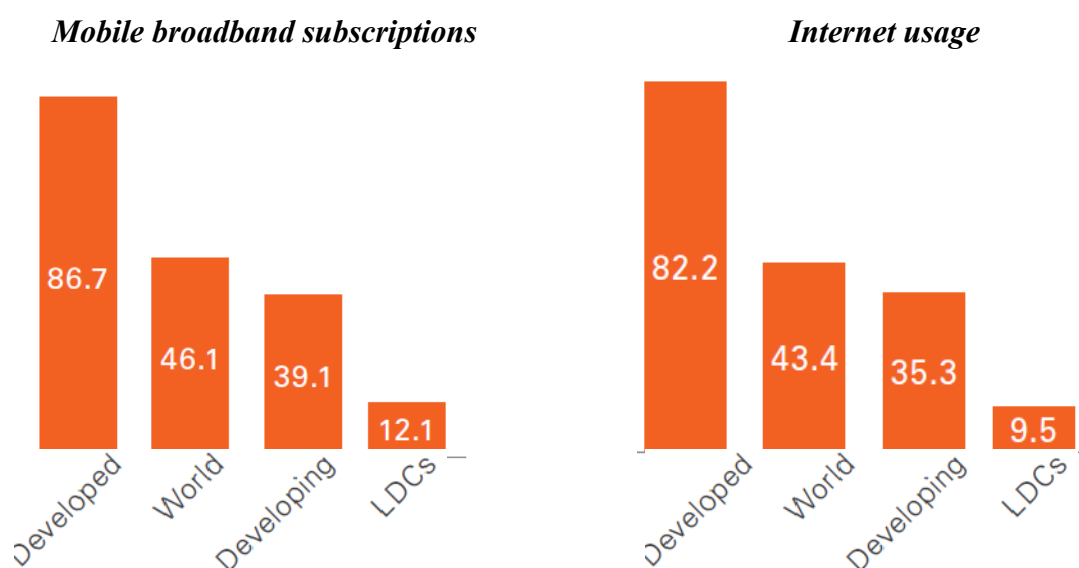
7. ICTs, sustainable development and the digital divide

The challenge of ‘bridging the digital divide’ has preoccupied ICT4D advocates since before WSIS. It represents the difference in ICT adoption and use between countries, particularly between developed and developing regions; within countries, particularly between urban and rural areas; and within societies, particularly between those with more or less financial and educational resources (including men and women). ICT4D advocates consider digital divides particularly important because they believe ICT access and use facilitate access to other development resources. If so, differential access to ICTs could exacerbate economic and social disparities, rather than facilitating economic prosperity and social equity.

Evidence from the WSIS review process suggests that digital divides in basic ICTs, such as mobile telephony, are declining, but that divides in more advanced ICTs, particularly those dependent on broadband networks, are persistent and may be growing.⁴⁴

The quality of available data for these indicators is relatively poor. The number of mobile phone subscriptions now exceeds the global population, for example, but, because of dual subscriptions, only around 50% of people are unique subscribers.⁴⁵ Mobile phone networks now cover around 90% of the world’s people, but 3G networks, which enable Internet access, are still unavailable in most of rural Africa. As indicated in Figure 4, more than 40% of the world’s people are estimated to have used the Internet at least once in the last three months, but the proportion of people in this category in LDCs is estimated to be less than 10%. Broadband Internet access is just as divided, particularly fixed broadband: the proportion of fixed broadband subscriptions was only 0.3% of population in LDCs in 2014, compared with 27.5% in developed countries and 6.1% in developing countries as a whole.⁴⁶ The gaps in access between LDCs and most developing countries that year may well be growing. They are particularly acute for those living in rural areas.⁴⁷

Fig. 4 – Broadband access and Internet usage per 100 citizens, 2015 estimates



Source: ITU, *Facts and Figures 2015*⁴⁸

Access to ICTs should, also, not be measured solely by connectivity. The cost of access to telephone and Internet services is much higher, as a proportion of average national income, in developing than developed countries. Non-essential access remains unaffordable for many people in developing countries.⁴⁹ Those who are most marginalized are also less likely to have the language, literacy and other skills required to make effective use of online services.

These digital divides are relevant to sustainable development for two reasons. Firstly, they imply that many people will be unable to take advantage of the potential benefits of ICTs, either by using them on their own terms or through developmental programmes. Secondly, they imply that the economic and social benefits of ICTs may accrue more to those who already have more resources, potentially increasing rather than decreasing inequality. If ICTs are to form part of a sustainable development agenda, policy and regulatory interventions are likely to be required which increase inclusiveness and affordability.

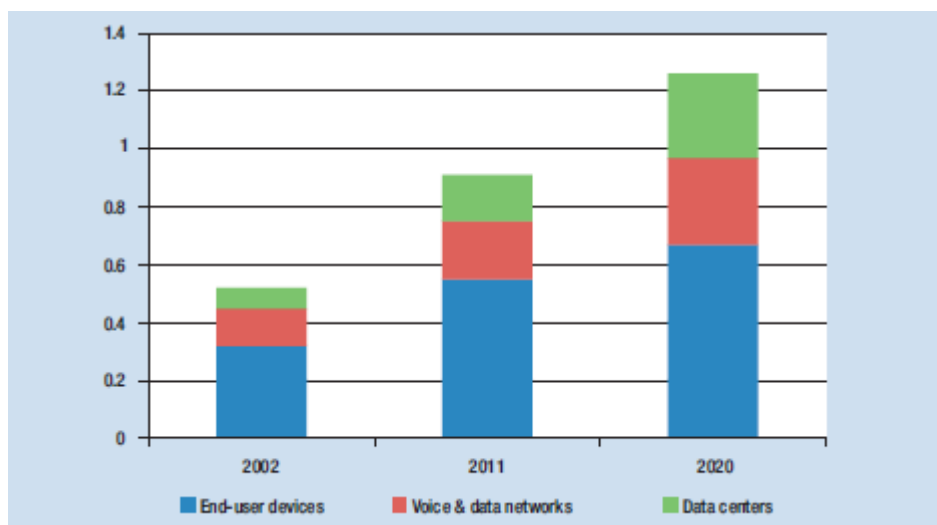
8. ICTs, sustainability and the environment

The analytical framework of direct, indirect and societal impacts, outlined above, has been used specifically to assess the impact of ICTs on environmental sustainability.

ICTs are generally considered to have significantly negative direct environmental impacts through waste generation and greenhouse gas emissions. These result from the very rapid growth which is taking place in the reach of networks; in the number of people making use of ICTs; in the number of devices and services available to users; and in the amount of time for which each device or service is used. Growth is particularly rapid, but from a much lower base, in developing countries. The likely impact of transition from decentralised to cloud computing on these direct impacts is unclear, but the Internet of Things seems likely to increase them.

- The United Nations Environment Programme (UNEP) estimates that e-waste is growing faster than any other source of solid waste, and will increase by 500% between 2007 and 2020. This growth is driven by increasing numbers of users and devices, and the very rapid rate of churn in devices resulting from technological improvements. There are significant problems of unregulated waste disposal and toxicity.⁵⁰
- The Global e-Sustainability Initiative (GeSI) estimates that GHG emissions from the ICT sector grew at 6.1% p.a. from 2002 to 2011 and will grow at 3.8% p.a. from 2011 to 2020. As a result, the sector's contribution to total emissions will rise from 1.3% in 2002 to 2.3% in 2020. As shown in Figure 5, the highest growth rate arises from data centres associated with cloud computing.⁵¹

Figure 5 – Estimated growth in GHG emissions from the ICT sector



Source: GeSI, SMARTer 2020

ICTs are considered to have more positive potential indirect effects. Some of these are expected to arise from the virtualisation of goods and services, others from technology-enabled improvements in the efficiency of productive processes. GeSI emphasises the potential role of ICT-enabled smart systems in improving energy use in power, transport, manufacturing and logistics, which it believes could generate savings, if fully realised, up to seven times the GHG emissions growth from direct effects described above.⁵² However, while the growth in emissions illustrated in Figure 5 is all but certain to occur, these potential indirect emission savings are dependent on decisions taken in other economic sectors, and are far from guaranteed. Nor are they directly comparable with direct impacts as they derive from different types of application. Analysts are unclear about the potential environmental outcome of societal impacts, including rebound effects (such as increased use of energy resulting from increased leisure time or lower energy prices following ICT-enabled efficiency savings).

The complex relationship between ICTs and the environment suggests three areas in which policy and practice could be reviewed by international agencies, governments and business.

- Firstly, smart systems and other applications have potential to mitigate the growth of greenhouse gas emissions in other (non-ICT) sectors, which could form part of a broader sustainable development or green economy agenda.
- Secondly, ICT businesses can seek to mitigate the environmental impact of their own devices and services, for example by reducing power requirements and improving environmental tolerances of devices and data centres, through more efficient use of communications networks, and by adopting design standards that reduce rates of churn.⁵³
- Thirdly, sensor, monitoring and early warning systems can support adaptation to climate change and should play an important part in sustainable development strategies, particularly in vulnerable countries and communities, as the sustainable development agenda is implemented.

Part 2 – The Role of ICTs in Implementing the Sustainable Development Agenda

The second part of this paper is concerned with implications of the issues discussed above for sustainable development policy and practice, including monitoring and implementation of the SDGs and the Post-2015 Development Agenda. It looks in turn at:

1. issues concerned with policy development and coordination;
2. the contribution of ICTs to monitoring and measurement of SDGs; and
3. their practical role in delivering SDG targets, including capacity-building.

A concluding section summarises the implications of these issues in the context of the forthcoming Summit and General Assembly reviews, and draws attention to questions which need to be addressed in discussions concerning the Information Society and sustainable development.

1. ICTs and sustainable development policy and coordination

It was suggested in the first part of the paper that there has been something of a gap in understanding the relationship between ICTs and sustainable development between ICT sector and ICT4D specialists, on one hand, and mainstream development professionals on the other. It has been suggested that this may be partly because the significance of ICTs has emerged since international consensus developed around the concept of sustainable development in 1987/1992. ICTs have been underemphasised in subsequent discussions because they did not play a significant part in the initial model of sustainable development.⁵⁴

One way of addressing this challenge would be to establish an overarching concept of the relationship between ICTs and sustainable development: a theory of change. The 2013 International Conference on ICT for Sustainability, which brought together academics and

practitioners with relevant expertise, offered one approach to this by outlining its concept of ICT for Sustainability (ICT4S).⁵⁵ This built on a belief that ‘the transformational power of ICT can be used to make our patterns of production and consumption more sustainable.’ It identified two principal ways in which that outcome might be achieved (which are comparable to the distinction between ICTs in development and ICT4D outlined in the first part of the paper):

- *Sustainability in ICT: Making ICT goods and services more sustainable over their whole life cycle, mainly by reducing the energy and material flows they invoke.*
- *Sustainability by ICT: Creating, enabling, and encouraging sustainable patterns of production and consumption by means of ICT.*⁵⁶

Any overarching concept of ICT for Sustainability will need to build on both sustainable development and ICT4D perspectives. ICT4D advocacy has sometimes been criticised for emphasising the potential of technology rather than the priorities and challenges of human development. The International Conference’s approach also, arguably, takes the potential of ICTs as its starting point, rather than the requirements of sustainability. An alternative approach would begin from the requirements of sustainability, as identified through the SDGs which are to be agreed in September, looking at the potential of ICTs for contributing to these both individually and holistically.

A number of issues arise from existing policy frameworks and experience which are relevant to thinking about such a concept or theory of change.

It is clear from experience that ICTs have growing potential to act as cross-cutting enablers of development. This is rooted in their capacity to improve efficiency, enhance cooperation and disseminate information more widely than was previously possible. This capacity is growing rapidly and will continue to grow post-2015. This suggests that more policy attention should be paid to ways in which ICTs are changing the context for sustainable development and to ways in which they can contribute to implementing the sustainable development agenda; and that attention to this should become more intensive as the SDG implementation period proceeds.

The experience of ICTs in development has negative as well as positive dimensions. Inequalities in access to ICTs can exacerbate rather than diminish other inequalities. Automation can reduce employment as well as increase productivity. ICTs are used by criminals as well as by legitimate businesses; to foster hatred as well as to build understanding. They pose significant challenges to privacy, including surveillance, as well as enhancing freedoms of expression and association. They have negative as well as potentially positive environmental impacts. Policy approaches to ICTs and sustainable development need to consider ICTs’ overall impact on economic prosperity, social equity and environmental sustainability, including these negative impacts. An analytical framework such as that described towards the end of the first part of this paper should help development stakeholders to assess how to maximise the benefits and minimise the risks of ICTs to sustainable development. Particular attention should be paid to inclusiveness (addressing

evolving digital divides), to environmental impacts, and to the building of confidence and trust in the use of ICTs (the cybersecurity agenda).

The deployment of ICT networks and services relies more than other development domains on the private sector and the enabling environment for investment and innovation established by governments. The WSIS outcome documents, accordingly, emphasised the value of multistakeholder cooperation and dialogue – including international agencies, governments, businesses and civil society – in progressing towards its vision of ‘a people-centred, inclusive and development-oriented Information Society.’ The value of multistakeholder partnership has also been advocated in sustainable development, for example in the preamble to the OWG proposal for SDGs.⁵⁷ Both WSIS and SDG processes have emphasised the need for enhanced cooperation within the UN family, to maximise the cross-cutting potential of development enablers and ensure effective coordination of policies and programmes. This suggests that more attention should be paid to institutional and multistakeholder cooperation for ICTs and sustainable development.

The last decade has shown how difficult it is to predict the development of ICT technology and markets, to anticipate their impacts on economic and social behaviour, and to address the implications of these for ICT4D and sustainable development interventions. IISD has argued that this suggests the importance of adaptive strategies, policies and programmes which are sufficiently agile to adjust to contextual changes in what ICTs can and cannot contribute to SDG and other development goals.⁵⁸ Adaptive policymaking and service delivery require deeper understanding of development and information systems than is presently available in many developing countries. International agencies and governments may need to subject development planning and implementation processes to more regular review in order to leverage opportunities arising from innovations like social media and cloud computing.

2. Monitoring and measurement

The most prominent references to ICTs within the SDG and Post-2015 Development literature concern their potential to improve data gathering and analysis, thereby enabling more evidence-based development planning and implementation. The following paragraphs look first at the current state of ICT and development data, then at requirements for monitoring and measurement of the SDGs, including initial work on this by the Partnership on Measuring ICT for Development, and finally at the potential and limitations of big data analysis.

Effective development planning and implementation require thorough quantitative and qualitative understanding of underlying economic and social conditions. Development-related data are, however, generally poor, particularly in LDCs, making it difficult to achieve evidence-based decision-making and to monitor implementation. Data concerning national ICT environments and the impact of ICTs on other development sectors are also poor. There are significant problems, in particular, with using subscription data as indicators of adoption and usage. Few countries could supply the *Final WSIS Targets Review* with data for agreed

indicators concerning ICTs in health or education, while little attention has been paid in most countries to disaggregating data by gender and other demographic factors. The pace of change in ICT markets is, in any case, so rapid that it is difficult to gain early warning of significant changes in patterns of usage or behaviour.⁵⁹

The experience of monitoring and measuring MDG outcomes has built stronger understanding of statistical requirements, emphasising the importance of benchmarks and indicators that are focused on critical development outcomes, straightforward to gather and analyse in most development contexts, capable of enabling comparisons between countries and over time, forward-looking, and associated with targets which are aspirational but achievable. The majority of the 18 MDG targets included quantitative indicators along these lines. While some of the 169 SDG targets proposed by the Open Working Group are quantitative, for example those concerned with levels of income poverty and health, others are more qualitative, such as those concerned with women's empowerment and infrastructure development. Experience with the targets for connectivity agreed at WSIS in 2003, described in the *Final WSIS Targets Review*, shows how difficult it is to identify and monitor these indicators, even in the ICT environment.⁶⁰

A useful starting point for thinking about ICT contributions towards approaches for the future is the OWG's proposed target 9.c, to 'significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020.' Developing indicators for this target requires a number of crucial definitions - of the ICTs to which access is anticipated, for example; of the level of Internet access proposed (broadband? and, if so, at what bandwidth?⁶¹); and of affordability. Interpretation of these terms will change substantially during the fifteen-year implementation period for the SDGs, as it did during the ten-year period following WSIS.

The ITU has made an early attempt to identify potential indicators in its Connect 2020 Agenda, adopted at its Plenipotentiary Conference in 2014.⁶² This has proposed 17, largely quantitative, indicators for ongoing progress towards an Information Society by 2020. An initial assessment of these will be made in its 2015 *Measuring the Information Society* report, which should be published before the General Assembly WSIS+10 review.

The Partnership on Measuring ICT for Development submitted an initial proposal of ICT indicators for the SDGs at a UN Statistical Commission Expert Group Meeting in February this year. This proposal, which was also presented at the WSIS Forum, suggested ICT-specific indicators for 32 of the 169 OWG proposed targets, almost all derived from existing data sets. These suggestions address ICT-specific aspects of the targets concerned, rather than primary target objectives – for example, the indicator proposed for target 9.2 (to 'promote inclusive and sustainable industrialisation, and ... raise industry's share of employment and GDP') is the e-waste collection rate, while those proposed in connection with the target for climate change resilience concern broadband coverage and mobile phone ownership. No indicators have yet been identified against any targets in some of the 19 Goals, including those concerned with health, water and terrestrial ecosystems.⁶³

The preliminary work undertaken by the Partnership on Measuring ICT for Development will be further developed as the SDG process proceeds, and will require joint analysis by ICT specialists and those concerned with each of the policy domains covered by specific SDGs. Experience since WSIS suggests that it will be easier to develop indicators and gather data concerning ICT supply and access than ICT use and impact; that it will be difficult to establish substantive indicators for which data can reliably be measured in all countries (including LDCs); and that it will be challenging to integrate those ICT indicators that can be gathered with data sets related to other development domains. In the case of ICT indicators, particular attention will need to be paid to the pace of change, and therefore to the ways in which trends, as well as numbers, alter over time.

Similar challenges of monitoring and measurement will arise in relation to each of the SDGs which emerge from the September summit, and ICT-enabled data-gathering and analysis will play an important part in addressing these across the SDG framework as a whole. As noted above, a Working Group on indicators for the SDGs has been established by the UN Statistical Commission, and will continue its work until early 2016. It should explore the potential of ICT enabled data-gathering and analysis as part of its approach in general and for each specific SDG.

Great expectations have been raised, in this context, by the growth in data-gathering associated with ICTs, particularly cloud computing, and by big data analysis which enables automated assessment of very large data sets, including the conjunction of multiple data sets.

The 2012 report of the Secretary-General's High Level Panel of Eminent Persons called for 'a data revolution for sustainable development,' supported by a Global Partnership on Development Data which would 'develop a global strategy to fill critical gaps, expand data accessibility, and galvanise international efforts to ensure a baseline for post-2015 targets' It will be important, it argued, to make use of both existing and new sources of data, including crowdsourcing; to disaggregate data 'by gender, geography, income, disability and other categories;' and to make data openly available so that they can be used by citizens and others to monitor development outcomes and contribute to policymaking.⁶⁴ This emphasis on a data revolution was explored further by the Secretary-General's Independent Expert Advisory Group on a Data Revolution for Sustainable Development in 2014,⁶⁵ and endorsed in the Secretary-General's synthesis report for the Post-2015 Agenda.⁶⁶

The potential of 'big data' is therefore an important dimension of ICTs' contribution to the monitoring and measurement of SDGs. Relevant data sets are drawn from formal sources such as national ID schemes, health and education records, from the data and metadata gathered by communications companies and online service (including social media) providers, and from other sources. Volumes of data gathered and stored through ICT networks are estimated to be doubling every two years or so. This growth has been facilitated by the growth of cloud computing and the computing power located in massive estates of data centres, and its growth will accelerate as the Internet of Things comes onstream. Automated analysis of both formal and informal records, including social media analytics,⁶⁷ can give a more detailed and disaggregated picture of target populations,

behavioural trends and development needs, which can be used to identify problems at an early stage and to target resources.

The resulting data gathering and analytical capacity should add substantially to development actors' ability to monitor and implement goals such as the SDGs. Recent and forthcoming studies, however, have identified challenges and limitations which need to be addressed if the value of big data is to be maximised.⁶⁸

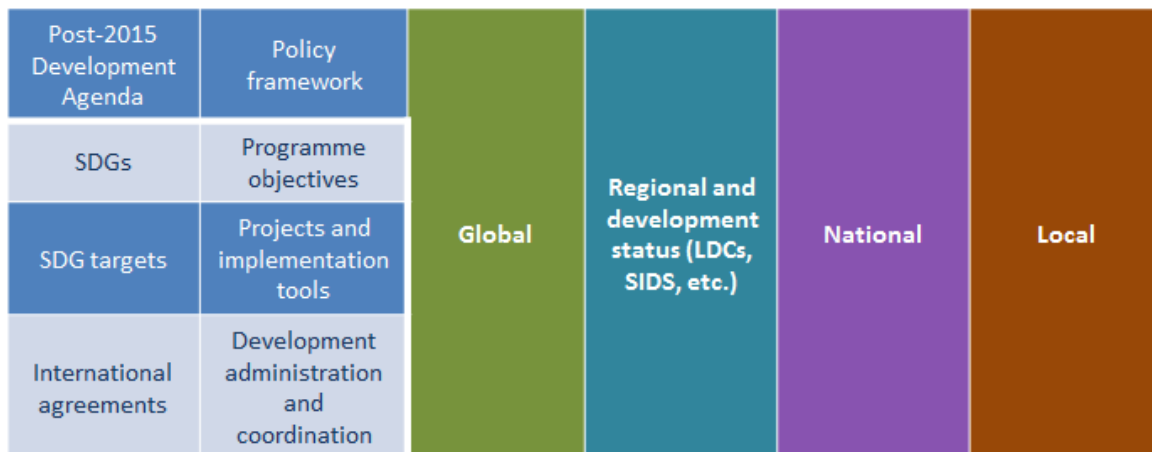
- Widespread concerns have been raised about the implications of big data gathering and analysis for privacy and data sovereignty. Extensive data gathering about individuals and behaviour carries obvious surveillance risks, while some governments fear that reliance on global networks of data centres, managed by private enterprises, will diminish national sovereignty.
- The potential of big data depends on the quality of available data and interpretative expertise. Many data sets will be less reliable in developing country contexts – where the recording of personal identity is often less exact, migration more widespread, and health and education records less precise than in developed countries. The understanding derived from big data analysis also depends on the capacity to interpret findings in the complex development environments to which they relate. Leveraging the value of big data analysis will require sustained attention to building the capacity of National Statistical Offices and other relevant government departments.
- Big data's potential derives from growth in the data storage capacity and computational capabilities of ICT resources, and in the data transfer capabilities and reliability of communications networks. It therefore depends on the availability of reliable, affordable broadband networks. These are less available in developing than developed countries, and generally least available in LDCs where monitoring and measurement of SDGs will be most crucial. Leveraging the value of big data analysis will therefore require continued attention to ICT infrastructure, affordability and inclusiveness.
- Greater understanding of development environments which can be derived from big data analysis will only translate into developmental impact if governments and other stakeholders can make effective use of findings. It cannot overcome shortages of other development resources such as finance, institutional capacity and human skills. Political will is also an essential factor. Big data's potential needs to be located within this wider framework of sustainable development policy and practice.

3. ICTs and SDG implementation

While it is important to establish a clear relationship between ICTs and SDG monitoring and measurement from the start, the relationship between ICTs and SDG implementation will be an ongoing and developing one through the fifteen-year period for SDG implementation. As described in the first part of this paper, this can be divided into four main areas of activity: policy/strategy, programmes, ICT tools, and development administration. It will be

important in this context to locate policy and programme interventions within a thorough understanding of the broader development of an Information Society in the specific global, regional, national and local contexts for which interventions are intended. One way of looking at this framework is illustrated in Figure 6.

Figure 6 – A framework for relating ICTs and SDGs



There are two, equally important, dimensions to the relationship between ICTs and the SDGs which need to be considered:

- The Post-2015 Agenda and the preamble to the SDGs will establish an overall framework for policy intervention at international and national levels. This provides the context for thinking about the holistic, cross-cutting impact and potential of enabling factors such as ICTs.
- The individual SDGs themselves will provide a framework for sectoral programmes, at global, regional and national levels, addressing development objectives in particular areas such as education and climate change. This provides the context for thinking about sector-specific applications of ICTs to support Goal implementation, in each and every Goal, for each and every target.

A useful starting point for considering sector-level relationships between ICTs and SDGs has been developed by the ITU and the Partnership on Measuring ICT for Development, in the form of a matrix juxtaposing SDGs against WSIS Action Lines, which was presented at this year’s WSIS Forum. This is illustrated in Figure 7.⁶⁹ Cells in grey within this matrix represent areas of greatest synergy. The role of ICTs within it will vary according to the circumstances of different regions, countries and localities, and will grow over time as the reach of ICT markets and capabilities of ICT technology evolve.

Figure 7 – A matrix representing SDGs and WSIS Action Lines

	C1	C2	C3	C4	C5	C6	e-gov	e-bus	e-lea	e-hea	e-emp	e-env	e-agr	e-sci	C8	C9	C10	C11
SDG 1																		
SDG 2																		
SDG 3																		
SDG 4																		
SDG 5																		
SDG 6																		
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SDG 16																		
SDG 17																		

Source: Partnership on Measuring ICT for Development, *WSIS-SDG Matrix, 2015*

The targets within each Goal identify specific areas of implementation, and it should therefore be possible, for each target, and each development context (region, country, locality) to identify which ICT tools can add value in which areas, at what times, and to consider what complementary resources (skills, content, power, affordability, etc.) are required in order to enable them to do so. Preliminary work associated with the matrix above has sought to identify areas within many of these targets where ICTs could play a significant role.⁷⁰

Experience since WSIS has shown how important it is to locate the potential contribution of ICTs within the broader context of development policies and programmes, and to distinguish between what ICTs can achieve in ideal circumstances and what they are likely to achieve in real development contexts which are constrained by resource limitations. Some efforts to associate ICTs with MDG delivery were unconvincing to many sectoral development specialists because they felt that they overestimated the potential impact of ICTs and/or underestimated these constraints. ICT-enabled programmes and applications are likely to be more successful in contributing to Goal implementation if they start from the challenges of sustainable development rather than the capabilities of technology, reflect the constraints of real development contexts, and emerge from collaborative work between sectoral development specialists and ICT experts committed to the WSIS vision of a people-centred, inclusive and development-oriented Information Society.

One of the most significant constraints in many development contexts concerns human and institutional capacity. Increased emphasis has been placed on the need to build capacity to

make effective use of the potential of ICTs in discussions of both ICT4D and sustainable development. This is relevant at all levels of ICT application and adoption – from basic and ICT literacy requirements of those first making use of mobile phones and ICT-enabled information resources; through the skills needed to maintain equipment, design services and applications, and build national ICT small business sectors; to the technical and policy skills needed to establish resilient networks, provide affordable services and establish enabling frameworks for innovation and investment.

Development administration and coordination will be addressed in the Post-2015 Agenda and in international agreements such as those resulting from July's Third International Conference on Financing for Development. As well as monitoring and implementation, ICTs provide new tools for development administration – for managing programmes and finances, modelling outcomes, enabling early warning systems, facilitating logistics, and communicating with target beneficiaries and other stakeholders. Their potential value for these purposes derives from their ability to improve efficiency, enhance coordination and improve the quality of information gathered, shared and analysed. However, as with measurement and implementation, these potential gains can only be realised if management and operational systems are adapted to make use of new technology. Coordination between development actors requires willingness on their part to share information, collaborate in programme design and delivery, and make use of compatible IT systems. More attention will need to be paid to these aspects of development administration, including partnership between public, private and non-commercial development actors.

4. Conclusion: advancing a sustainable Information Society for all

The discussion in this paper is intended to provide background information and analysis to facilitate discussion of critical issues at the interface between the Information Society and sustainable development. It is clear from its analysis that the emerging Information Society will have important impacts on implementation of the Sustainable Development Agenda; that ICTs provide valuable tools to support both measurement and implementation; and that these impacts and resources will become increasingly significant as the implementation period for the SDGs proceeds.

It is not the purpose of this paper to make recommendations concerning the opportunities and challenges raised by the discussion. However, this final section identifies a number of questions arising from it which it is hoped will be considered fully by stakeholders concerned to maximise the contribution that the Information Society can make to sustainable development over the next fifteen years. Two general points are relevant to these.

While the fundamentals of ICT-enabled policy, programmes, implementation and administrative tools will share many common characteristics across development environments, what they can achieve and how they are constrained will vary according to the development status, development challenges and ICT ecosystems (extent of connectivity including broadband, level and inclusiveness of use including rural areas, *etc.*) of different countries and localities. Particular attention will need to be paid to the special challenges of

disadvantaged groups of countries (such as LDCs, landlocked countries, SIDS, and countries emerging from conflict).

As indicated above, the success of ICT-facilitated approaches to sustainable development will require closer cooperation between the ICT sector, mainstream development policymakers and sectoral development specialists, including the development of a stronger common understanding of both ICTs' potential and development constraints. It will also require better understanding of the rapid changes taking place in ICT technology and markets, including more adaptive approaches to development policy and programmes.

Three sets of issues arise concerning the overall relationship between the Information Society and sustainable development.

The first concerns the impact of ICTs on the Information Society to date:

- What has been the overall impact of ICTs on economies, societies and development over the ten years since WSIS?
- What are today's priorities for the Information Society, including further implementation of WSIS outcomes?
- What contribution can the concept of the Information Society make to the Post-2015 Development Agenda?

The second concerns the impact of ICTs on sustainable development:

- What is the relationship between the Information Society and sustainable development?
- What evidence has emerged from the recent WSIS+10 reviews concerning the relationship between ICTs and development?
- How should the proposed Sustainable Development Goals and WSIS Action Lines be integrated?
- How can ICTs contribute to the monitoring, measurement and implementation of the SDGs?

The third concerns the implications of current trends in ICTs for implementation of the SDGs and the Post-2015 Development Agenda over the fifteen year period to 2030, including issues such as datafication, cloud computing, big data, smart systems and the Internet of Things.

- What impact will these and other new developments in ICT technology and markets have on sustainable development, in particular on achieving the objectives of the Post-2015 Agenda?
- How can ICTs support the development of a global partnership for sustainable development with the active engagement of Governments, civil society, the private sector and the United Nations system, as envisaged in the Open Working Group's proposal for SDGs, including issues such as data-sharing?
- How can the role of the private sector, in particular, be leveraged to strengthen development opportunities in this context?

Many issues arise from these concerning the integration of ICTs and the Information Society in sustainable development policy and practice. Here too, three sets of issues seem particularly significant.

The first of these concerns issues of digital inclusion.

- What policy interventions are required to ensure that digital divides in technology and human capacity do not widen, between and within countries, as technology and markets evolve?
- Can improvements be made in multistakeholder collaboration and governance to address current barriers in bridging digital divides?
- What can be done to make access to ICTs, and use of ICTs, more affordable?

The second concerns the implications of potential risks to sustainable development which are associated with ICTs, and how these can be mitigated.

- What are the principal risks to sustainable development which are posed by digitalisation, and what policy interventions are required to limit these?
- What can be done to mitigate the negative environmental impacts of ICTs?
- What can be done to enhance security and public trust in ICTs?

The third concerns the role of capacity-building in maximising the value of ICTs to sustainable development.

- What are the limits of using ICTs for sustainable development, taking into account governments' capacity to utilise them successfully, their accessibility to citizens and the infrastructure needed to support them?
- What capabilities and incentives are needed to encourage people and organisations in developing countries, particularly LDCs, to make more and more effective use of ICTs for development?
- What capacity-building is required amongst policy makers and development practitioners?
- What policy measures can support the development of ICT entrepreneurship, innovation and production, particularly in developing countries?

The final set of questions raised by the paper concerns the overall, holistic relationship between the Information Society and sustainable development – a relationship which it is clear will evolve rapidly, and in ways that may be highly unpredictable, between 2015 and the scheduled completion date for the Post-2015 Development Agenda in 2030. The following three questions are raised by this context.

- What implications does the next phase of development of the Information Society have for sustainable development and the implementation of the Post-2015 Development Agenda?
- How can we improve our ability to anticipate technological changes, measure their impacts, maximise their developmental value and minimise the risks they pose?

- What steps can be taken to strengthen global partnership, including better engagement with UN and other international agencies, governments, the private sector and other development actors, in support of these objectives?

The emerging Information Society and the need to achieve sustainable development are among the highest priorities for the international community during the next fifteen years. The answers reached to questions raised in this paper, and progress towards a sustainable Information Society for all, will be of critical importance to achieving the economic prosperity, social inclusion and environmental sustainability at the root of sustainable development and the Post-2015 Development Agenda.

Endnotes

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- ¹ often called the Rio Summit or the first Earth Summit.
- ² <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf>.
- ³ The WSIS outcome documents – the *Geneva Declaration of Principles* and *Geneva Action Plan*, from 2003, and the *Tunis Commitment* and the *Tunis Agenda for the Information Society*, from 2005, can be found in <https://www.itu.int/wsis/outcome/booklet/index.html>.
- ⁴ *Geneva Declaration of Principles*, para. 1.
- ⁵ UNCTAD/CSTD Secretariat, *Implementing WSIS Outcomes*, 2015, http://unctad.org/en/PublicationsLibrary/dtIstict2015d3_en.pdf.
- ⁶ Partnership on Measuring ICT for Development, *op. cit.* The Partnership brings together United Nations and other international agencies concerned with WSIS monitoring and measurement.
- ⁷ *Final Statement: Information and Knowledge For All – an expanded vision and a renewed commitment*, http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/wsis/WSIS_10_Event/wsis10_final_statement_en.pdf
- ⁸ *WSIS+10 Outcome Documents*, 2014, <http://www.itu.int/wsis/implementation/2014/forum/inc/doc/outcome/362828V2E.pdf>
- ⁹ Text in quotation marks in the following points consists of direct quotations from the Executive Summary of *Implementing WSIS Outcomes*, *loc. cit.* These do not form a single continuous quotation, and have been resequenced for the purpose of this paper.
- ¹⁰ This is particularly emphasised by the Broadband Commission for Digital Development, which brings together UN agencies, ICT sector leaders and others.
- ¹¹ *Our Common Future*, 1987, <http://www.un-documents.net/our-common-future.pdf>.
- ¹² *Agenda 21*, 1992, <https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf>.
- ¹³ Relevant United Nations documents can be accessed through <http://www.un.org/en/ga/president/65/issues/sustdev.shtml>
- ¹⁴ Visualisations by DESA, derived from E. Barbier, ‘The concept of sustainable economic development’, *Environmental Conservation* 14/2, 1987, and others; and L. Hilty & B. Aebischer, ‘ICT for Sustainable Development: an emerging research field’, 2015, http://publicationslist.org/data/lorenz.hilty/ref-221/2014_Hilty_Aebischer_ICT_for_Sustainability_AAM.pdf.
- ¹⁵ The Declaration is at <http://www.un.org/millennium/declaration/ares552e.htm>. The MDGs are at <http://www.un.org/millenniumgoals/>.
- ¹⁶ *The Future We Want*, 2012, <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N11/476/10/PDF/N1147610.pdf?OpenElement>.
- ¹⁷ *Millennium Development Goals Report 2014*, <http://www.un.org/millenniumgoals/2014%20MDG%20report/MDG%202014%20English%20web.pdf>
- ¹⁸ *Open Working Group Proposal for Sustainable Development Goals*, <https://sustainabledevelopment.un.org/content/documents/1579SDGs%20Proposal.pdf>.
- ¹⁹ See e.g. D. Souter in G. Milward-Oliver, ed., *Maitland+20: Fixing the Missing Link*, 2005, and ‘The enabling environment for ICT4D’, forthcoming.
- ²⁰ See e.g. *Information and communications technologies for inclusive social and economic development: Report of the United Nations Secretary-General*, CSTD, 2014, http://unctad.org/meetings/en/SessionalDocuments/ecn162014d3_en.pdf.
- ²¹ Richard Heeks, *ICT4D 2016: New Priorities for ICT4D Policy, Practice and WSIS in a Post-2015 World*, 2014, http://www.seed.manchester.ac.uk/medialibrary/IDPM/working_papers/di/di_wp59.pdf.
- ²² <http://www.un.org/millenniumgoals/>; *Millennium Development Goals Report 2014*, *loc. cit.*
- ²³ See Partnership on Measuring ICT for Development, *Final WSIS Targets Review*, http://www.itu.int/en/ITU-D/Statistics/Documents/publications/wsisreview2014/WSIS2014_review.pdf.
- ²⁴ Open Working Group, *op. cit.*
- ²⁵ *A New Global Partnership*, 2012, <http://www.un.org/sg/management/beyond2015.shtml>
- ²⁶ *The Road to Dignity by 2030*, 2014, http://www.un.org/disabilities/documents/reports/SG_Synthesis_Report_Road_to_Dignity_by_2030.pdf.

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- ²⁷ A *World That Counts*, 2014, <http://www.undatarevolution.org/wp-content/uploads/2014/12/A-World-That-Counts2.pdf>.
- ²⁸ An EGM on the Indicator Framework was organised in New York in February 2015 by the UN Statistics Division: <http://unstats.un.org/unsd/post-2015/activities/egm-on-indicator-framework/default.html>. A Working Group has now been constituted and will continue its work until March 2016.
- ²⁹ A background note on this work was presented to the February EGM.
- ³⁰ A matrix derived from this work was presented at the WSIS Forum in Geneva during the week of 25-29 May: Partnership on Measuring ICT for Development, *WSIS-SDG Matrix*, 2015, http://www.itu.int/net4/wsis/sdg/Content/wsis-sdg_matrix_document.pdf.
- ³¹ See IISD, *ICTs, the Internet and Sustainable Development: Towards a new paradigm*, 2010, http://www.iisd.org/sites/default/files/pdf/2010/icts_internet_sd_new_paradigm.pdf and IISD, *Changing our Understanding of Sustainability: The impact of ICTs and the Internet*, 2012, https://www.iisd.org/pdf/2012/changing_our_understanding_of_sustainability.pdf.
- ³² *Implementing WSIS Outcomes: Experience to Date*, 2010, http://www.unic.pt/images/stories/publicacoes5/dt/stict2011d3_en.pdf; *Report of the Secretary General, 2014, op. cit.*; *Implementing WSIS Outcomes*, 2015, *loc. cit.*
- ³³ D. Souter, 'The enabling environment for ICT4D', forthcoming.
- ³⁴ Richard Heeks, *ICT4D 2.0: The Next Phase of Applying ICT for International Development*, 2008, <http://research.microsoft.com/en-us/um/people/cutrell/papers/heels-ictd%20two-point-zero.pdf>.
- ³⁵ Forum for the Future, *The Impact of ICT on Sustainable Development*, 2003, http://readinglists.lse.ac.uk/link?url=http%3A%2F%2Fhomepage.cs.latrobe.edu.au%2Fsloke%2FgreenIT%2Feito_forum_2002.pdf; L Erdmann, L Hilty, J Goodman, P. Arnfalk, *The future impact of ICTs on Environmental Sustainability*, 2004, <http://readinglists.lse.ac.uk/link?url=http%3A%2F%2Fftp.jrc.es%2FEURdoc%2Feur21384en.pdf>; Hilty & Aebischer, *op. cit.*
- ³⁶ See IISD, 2012, *op. cit.*
- ³⁷ Moore's Law, which originally referred to growth in the number of transistors in an integrated circuit, has been widely used more extensively to reflect the growth in ICT capabilities more generally. While some argue that this rapid evolution cannot continue at its current pace indefinitely, the rate of growth in capabilities does not yet appear to be slowing.
- ³⁸ *Implementing WSIS Outcomes*, 2015, Chapter 4.
- ³⁹ For a brief summary of developments in these, see *Implementing WSIS Outcomes*, Chapter 5.
- ⁴⁰ R Heeks, 'Why eGov Projects Succeed or Fail: The Design-Reality Gap Model,' <http://www.egov4dev.org/success/evaluation/>; *ICT4D 2.0, loc. cit.*
- ⁴¹ UNGIS has urged UN agencies to increase the extent to which ICTs are integrated into UNDAFs.
- ⁴² This is elaborated in Forum for the Future, *op. cit.* and other sources.
- ⁴³ Hilty and Aebischer, *op. cit.*
- ⁴⁴ See *Implementing WSIS Outcomes*, Chapter 3.
- ⁴⁵ The numbers of unique subscribers are assessed in GSM Association, *The Mobile Economy 2014*, http://www.gsmamobileeconomy.com/GSMA_ME_Report_2014_R2_WEB.pdf.
- ⁴⁶ *Implementing WSIS Outcomes*, p. 50.
- ⁴⁷ The issues concerning these data are discussed in *ibid.* and in the *Final WSIS Targets Review*.
- ⁴⁸ <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf>
- ⁴⁹ See *Implementing WSIS Outcomes*, Chapter 3, section C.
- ⁵⁰ See *Implementing WSIS Outcomes*, Chapter 5; UNEP, *Policy Brief on E-Waste*, http://www.unep.org/ietc/Portals/136/Other%20documents/PolicyBriefs/13052013_E-Waste%20Policy%20brief.pdf.
- ⁵¹ GeSI, *SMARTer 2020*, 2012, http://gesi.org/assets/js/lib/tinymce/jscripts/tiny_mce/plugins/ajaxfilemanager/uploaded/SMARTer%202020-%20The%20Role%20of%20ICT%20in%20Driving%20a%20Sustainable%20Future%20-%20December%202012.pdf.
- ⁵² *ibid.*
- ⁵³ ITU work in this area is reported at <http://www.itu.int/en/ITU-T/climatechange/Pages/default.aspx>.
- ⁵⁴ IISD, *op. cit.*
- ⁵⁵ <http://2013.ict4s.org/documentation/>.
- ⁵⁶ quoted in Hilty and Aebischer, *op. cit.*

⁵⁷ Open Working Group, *op. cit.*

⁵⁸ IISD, *op. cit.*; IISD, *Designing Policies in a World of Uncertainty, Change and Surprise*, 2006, https://www.iisd.org/pdf/2006/climate_designing_policies.pdf explores the value of adaptive policy approaches in other contexts.

⁵⁹ See the analysis by the UN University in *Final WSIS Targets Review*, Chapter 12.

⁶⁰ *ibid.*

⁶¹ The standard measure still uses a floor of 256 kb/s to define broadband, though this is insufficient to access more than basic applications.

⁶² <http://www.itu.int/en/connect2020/Pages/default.aspx>.

⁶³ See Partnership on Measuring ICT for Development, *WSIS-SDG Matrix*, 2015, *loc. cit.*

⁶⁴ *A New Global Partnership*, *loc. cit.*

⁶⁵ *A World That Counts*, *loc. cit.*

⁶⁶ *The Road to Dignity by 2030*, *loc. cit.*

⁶⁷ the analysis of the content of posts on social media.

⁶⁸ The following points are taken from D. Souter, 'Big data and development: opportunities and limitations,' forthcoming.

⁶⁹ Partnership on Measuring ICT for Development, *WSIS-SDG Matrix*, 2015, *loc. cit.*.

⁷⁰ *ibid.*