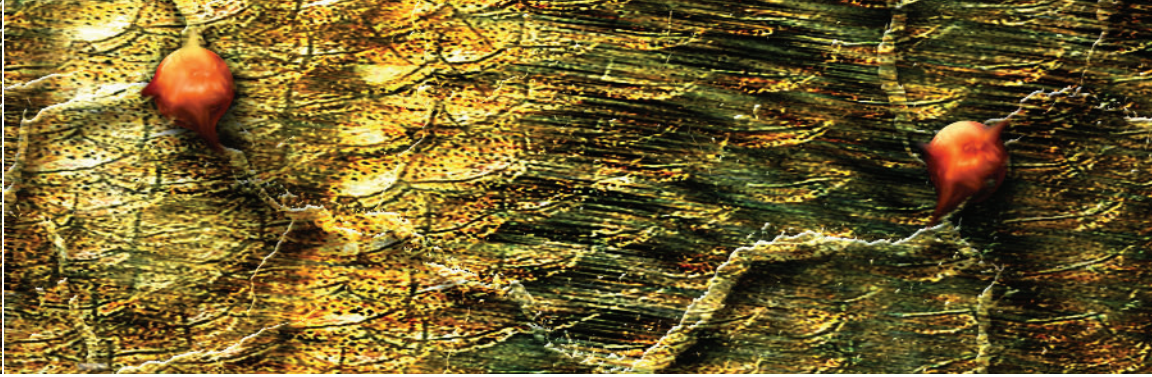
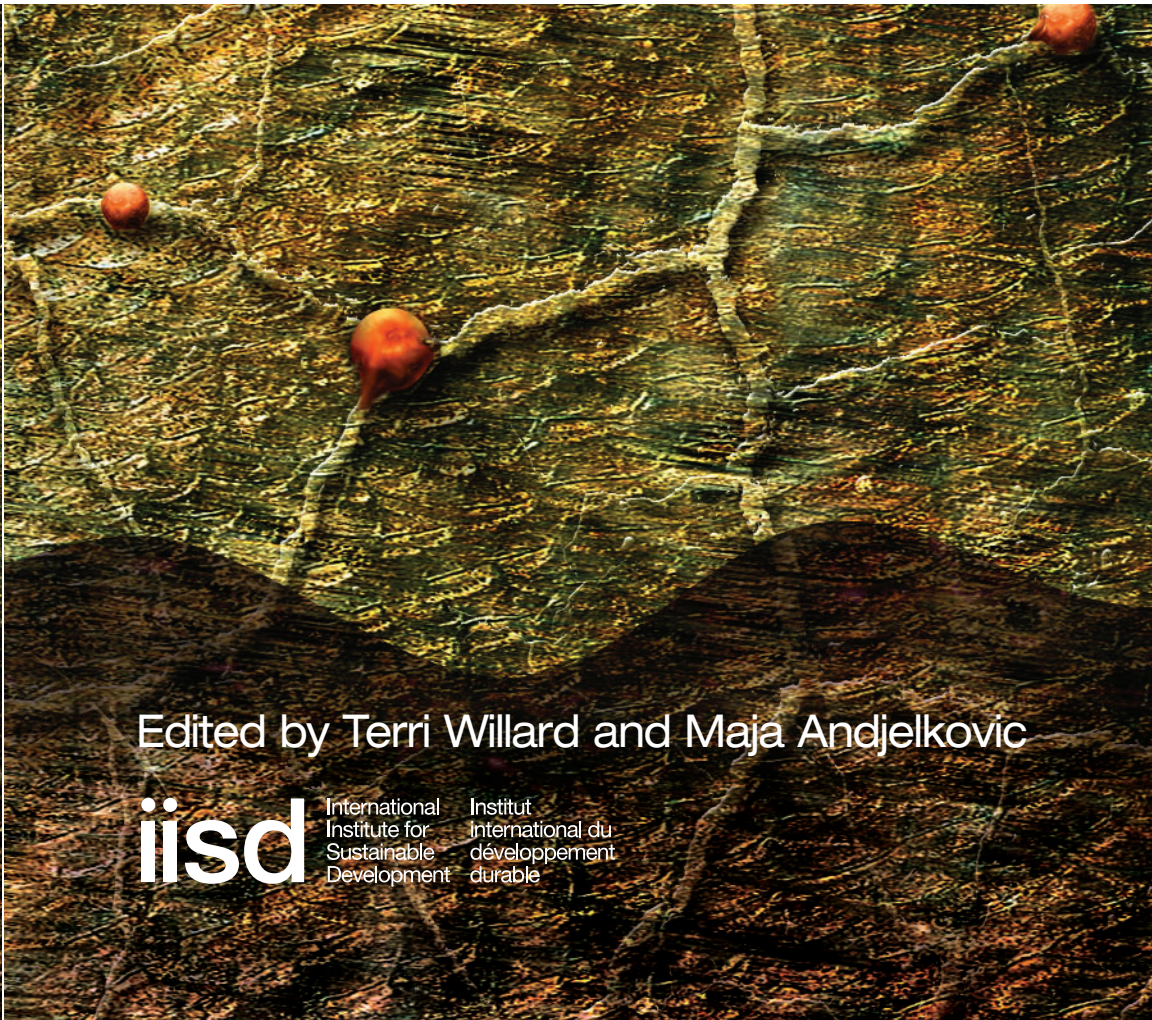


A Developing Connection

Bridging the Policy Gap between the Information Society and Sustainable Development



Edited by Terri Willard and Maja Andjelkovic

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A Developing Connection: Bridging the Policy Gap between the Information Society and Sustainable Development

Edited by Maja Andjelkovic and Terri Willard

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Contents

Introduction

Today, more than ever, we have the ability to collect, share and process information of all kinds, thanks, in no small part, to technological advancement and innovation. Due to their wide application potential, information and communications technologies (ICTs), are having profound and pervasive social, environmental and economic impacts on the world. Indeed, the global society is said to be undergoing a transformation from the industrial, to the "information society" (IS), one in which the most valuable resources are information and knowledge.

In 2003, participants in the largest international effort to direct the use and development of ICTs, the World Summit on the Information Society (WSIS), declared a common, global desire and commitment to building a people-centred, inclusive and development-oriented society, one where everyone can create, access, utilize and share information and knowledge, enabling sustainable development and improving the quality of people's lives.[1] The commitment to sustainable development has been reiterated throughout the official Summit documents, as well as through other publications and initiatives. The research presented in this book adds to the ongoing dialogue among academics, development practitioners, business leaders and government officials, aimed at pinpointing the ways in which ICTs can help make the transition to sustainable development easier, quicker and economically viable.

From January to July 2003, IISD led a scoping study with support from Canada's International Development Research Centre (IDRC)[2] to assess the potential for engaging researchers under 30 years of age to link policy-makers in the areas of the information society and sustainable development, and to catalyze changes in policy and practice in developing countries around the convergence of the two communities. The literature review conducted revealed that while considerable research on the information society and sustainable development existed, it was primarily focused on applications and policy frameworks within Europe and North America. Key areas of convergence identified in these regions include policies and practices regarding environmental information systems; eco-efficiency and innovation; negative environmental consequences of the information society; modifying consumer demand and values; access to information and public participation; and poverty reduction.

While the World Summit on Sustainable Development (WSSD) and WSIS Phase I brought these issues to international attention, Southern voices and visions are still largely absent from the debate. Seeking to enrich the dialogue, IISD coordinated a national policy research project in Costa Rica, Kenya, South Africa, Brazil, India and Egypt, with the hope of introducing new approaches based on the more

1 WSIS Declaration.

2 *The Next Generation Policy Directions: Scoping Study on National Information Society and Sustainable Development Capacity Building* was submitted to IDRC in July 2003. It is available online through the scoping study working site at http://projects.takingitglobal.org/issd

mature state of national dialogues around sustainable development. Tapping into the vast diversity of Southern interpretations of the information society and sustainable development, seven young researchers from these countries endeavoured to connect policy-makers, practitioners and academics from the two communities, via national consultations and workshops.

We felt that the interaction between researchers and decision-makers was as important to the project as the research findings. This strategy builds on IISD's understanding that the process of developing and discussing national case studies is frequently of greater value than the final case studies themselves. Changes in policy and practice require the establishment of networks of relationships, which facilitate the management of change-related risks and increase individual and institutional capacities to navigate the change process. However, networks can neither come into being nor sustain themselves without focal activities and outputs around which their value to members and non-members can be demonstrated. As noted in *Strategic Intentions: Managing Knowledge Networks for Sustainable Development*,[3] collaborative projects and publications can serve as focal points around which innovative teams can gather, share their knowledge and advance the area of practice.

Based on the premise that researchers would strengthen their capacities for analysis, writing and policy engagement through practice, IISD also sought to "create the space" for research, which many young researchers lack, and to build the capacity of the young researchers to conduct this type of investigation and get involved in policy processes in the future. *A Developing Connection* is the outcome of their research to identify intersections between information society and sustainable development policy areas in their countries. The scope, approach and focus of discussion across the papers presented in this collection varies according to the interests and background of each author, as well as to the national policy context in each country.

In "Towards a Sustainable Development View of Local Content using ICTs in South Africa," Steve Vosloo discusses the intersections of sustainable development and the information society in his country. Vosloo describes the ongoing process of the creation of South Africa's Information Society and Development Plan and Implementation Strategy. He finds a strong area of convergence in local content—the locally-owned or adapted knowledge of a community—which is essential for integrated sustainable development, and a key priority in the forthcoming national IS strategy. The paper proposes the need for a broader definition of local content in the IS strategy: one that is framed within sustainable development principles rather than the current context of arts, culture and heritage.

In Kenya, Wainaina Mungai recommends a more significant consideration of environmental issues in the regional and national "Poverty Reduction and ICT"

3 Creech, Heather and Terri Willard. *Strategic Intentions: Managing knowledge networks for sustainable development*. Winnipeg: IISD, 2001.

discussions. In his paper, "Using ICTs for Poverty Reduction and Environmental Protection in Kenya: The M-vironment Framework," Mungai recommends addressing poverty reduction as proposed in the Millennium Development Goals and resolutions of the World Summit on Sustainable Development. He says that Kenya's opportunities for quick gains lie in e-environment and e-agriculture initiatives, and provides an illustration of a potentially beneficial application of new technologies in mobile telephony. The author presents the "M-vironment Framework," a mobile telephony platform which can help enable financial sustainability for environmental protection efforts, facilitate awareness-raising and exchange of information, strengthen early warning systems, raise environmental consciousness among ICT solutions providers, create employment and protect livelihoods.

Margarita Salas Guzmán's piece, "Professional Women in Information Technology in Costa Rica: Exploring the Relationship between Sustainable Development and Gender Gaps in the Information Society," highlights the importance of diversity in the IT sector for economic and social sustainability. ICTs are generating more than $2 billion dollars annually for Costa Rica, and the industry is one of the fastest growing in the country. Yet, women continue to constitute a minority in the IT professional sector and their participation seems to be decreasing. Since Costa Rica considers IT to be an important opportunity for development, the continued gender imbalance within the sector creates unfavourable conditions for women's socio-economic future. The author suggests some tools for improving the current gender imbalance in Costa Rica's IT industry and calls for policy that will break away from stereotypical professional roles. Guzmán underlines the need for technical training institutes, as well as centres of higher education, to encourage women to enter and remain in science and technology careers.

Given that agriculture has long been the mainstay of the Indian economy and thus a prime concern of Indian policy-makers (and the association of agriculture within the sustainable development framework), Anusha Lall and Atanu Garai focus on "Capturing Grassroots Voices in the IS and SD Policy Dialogue in India" to express environmental concerns in the rural development context. The paper discusses how grassroots views can be collected in the national policy formulation processes using mechanisms from the domain of the information society. Among others, the authors analyze the use of the "village Panchayat" model, which has been modified and integrated into the structure of the Indian government. They note that, while in theory, grassroots voices can be heard and included in the policy debate, in practice, peoples' participation remains affected by political considerations and realities of marginalization on the basis of caste, gender, class, and so on.

In "Socialization of Knowledge and Reduction of Regional Inequalities in Brazil," Diogo André de Assumpção starts from the widely accepted assumption that knowledge is an essential factor in stimulating social and economic development, and offers a useful definition of "socialization of knowledge" as the process of

making specific knowledge accessible and available where it can be useful and necessary. The author recommends that greater stimuli for academic research and greater civil society involvement should be put in place in Brazil. He calls for the corporate community to recognize and accept that good business can not exist in a failed society, that sustainability brings benefits to all and that it must be one of the directing principles of investment. The use of free software, de Assumpção says, can reduce expenses and contribute to the spreading of knowledge which would otherwise be too costly for many.

Amira Sobeih points to Egypt's recent advances in ICTs as the beginning of a momentum for using Geographic Information Systems (GIS) to support natural resource management and local development. In her piece, Sobeih provides an historical context for modern technological advancements: since the eighteenth century, the irrigation authorities in Egypt have collected data on the Nile basin. Owing to recent population pressure, the land available for cultivation has become limited and irrigation problems have consequently increased. Recently, Egypt has become one of the technological leaders across the Arab region, with advances in computer programming; ambitious plans to computerize schools; the establishment of public Internet access centres and provision of free Internet access; and the general promotion of technological development. Recognizing the issues of limited access, training and capacity building, the paper offers a model that can help meet a real demand for the use of Global Information Systems (GIS) to support local development in Egypt.

In their recently published book, *Information and Communications Technology for Sustainable Development – Defining a Global Research Agenda*, Rahul Tongia, Eswaran Subrahmanian and V. S. Arunachalam rightly point out that there exists a general tendency to define the connection between ICTs and sustainable development by degree of access, especially to the Internet. As they note, the intersections instead lie among the diverse links across technology, science, policy and other fields.

Not surprisingly, the diversity of the issues uncovered by the researchers in this exercise points to the fact that each country's opportunity to advance SD goals through careful planning of IS policy may be different. What remains true across all of the national contexts presented here is the need for decision-makers from the two policy arenas to consult academics, practitioners and civil society members from both fields, and—perhaps most important—each other.

Towards a Sustainable Development View of Local Content using ICTs in South Africa

A Key Priority in the National Information Society Strategy

Steve Vosloo
Empowerment for African Sustainable Development (EASD)

Abstract

South Africa (SA) has a history of strong commitment to sustainable development. It is a signatory to the major international agreements such as *Agenda 21* and the *Johannesburg Declaration on Sustainable Development*, and has entrenched the attendant themes and goals into its own policy frameworks. It is also home to an emerging information society (IS), and already there are a number of information and communication technology (ICT) policies in place to improve the penetration of ICTs in the country. As part of the drive to successfully build an IS in SA, the government is currently working on a national *Information Society and Development Plan and Implementation Strategy*.

The intersections of sustainable development and the IS are clear, hence the prevalence of references to each other in many policies and laws. A strong area of convergence is local content—the locally-owned or adapted knowledge of a community—which is shown by the paper to be essential for integrated sustainable development, as well as being a key priority in the national IS strategy. By exploring the links between sustainable development and the IS, and describing projects that create and disseminate local content with the support of ICTs in this area of convergence, the paper proposes the need for a broader definition of local content in the IS strategy, one that is framed within sustainable development principles rather than the current context of arts, culture and heritage. This move towards a sustainable development view of local content supports a further recommendation made by the paper, which is that government should portray ICTs not as an end unto themselves, but rather as powerful new tools that can be used to support SA's existing efforts towards sustainably meeting its development goals.

▼

The national and provincial governments have recognized the strategic importance of ICTs and the ICT sector in "enhancing the country's competitiveness and meeting development challenges"

▲

1
Introduction

Since the first democratic elections in 1994, the South African government has passed many laws and policies designed to achieve sustainable development. South Africa hosted the World Summit on Sustainable Development (WSSD) in 2002 and is a signatory to key international agreements. While there is no holistic national sustainable development policy in place, the government is working towards developing one as a way to integrate the various sectoral sustainable development efforts and policies (Zuma 2004).

Technology has long been a crucial element in measuring and achieving sustainable development. From satellite imagery, environmental information systems and, today, the use of mobile phones to share health information, there has been a key dependence on ICTs in the creation, dissemination and consumption of relevant, local information. But "even after the first United Nations (UN) World Summit on the Information Society (WSIS) in Geneva 2003, the relationship between issues of the global information systems and of sustainable development is not being discussed adequately. It seems that the interdisciplinary and international research in this field is just beginning" (Hilty, Seifert and Treiber 2005). Thus there is a need to integrate these fields and focus on their areas of convergence. Currently, sustainable development policy and IS policy are developing along separate tracks in the North, but in South Africa there is now a window of opportunity to link and integrate these realms to achieve better policy coherence.

Since 1996, the now President Thabo Mbeki has voiced his belief in the importance of ICTs in helping SA to meet its development challenges. In response to the emerging global knowledge economy, at his behest, the Department of Communications is currently drafting the country's first national Information Society and Development Plan and Implementation Strategy (hereafter referred to as the "national IS strategy") to create a clear vision for the building of an ICT-enabled IS within SA. The national IS strategy certainly recognizes that an aspect of poverty is "deprivation in knowledge and communication" (UNDP 1997), and that "with ICTs at their disposal, poor and isolated communities will in principle be able to gain rapid access to information on, for instance, education, health, business and democracy" (Boldt 1997 in Sundén and Wicander 2003).

ICTs are tools that augment the ability to codify information as well as enable the wide dissemination thereof, both locally and globally (NACI 2004). Because developed countries are more ICT-enabled than developing countries, they have published much more of their "local content," resulting in the danger that until developing countries produce more of their own local content, "easier access to globalized knowledge is fast turning us [developing countries] into 'consumers' of distant and potentially irrelevant information … that may undermine or overwhelm local cultural heritage and economic livelihoods" (Ballantyne 2002). There is a strong call from governments and international development agencies

for more content from developing countries in local languages, about local and global issues, and expressing local viewpoints.

The national IS strategy has made local content with the support of ICTs a key priority area. The strategy is still a work in progress, but so far its focus has been very much on arts, culture and heritage-based local content. While this is an extremely important focus area for SA, given that the Apartheid regime ridiculed and dismissed the local knowledge and practices of indigenous people, it is not consistent with the tradition of a holistic, developmental approach underpinning many policy frameworks in the country. If this tradition is followed, then the focus should be broader. The paper thus suggests that a more cross-cutting description of local content be adopted, one which accommodates the sectors of sustainable development, such as the environment, health and education as well as the arts, culture, heritage and indigenous knowledge (IK). By positioning the IS strategy within the broader sustainable development principles of SA, and basing it on the international agreements to which SA is a signatory, the government can leverage the efforts of the last 10 years to advance the development of an integrated IS, while simultaneously using new technologies to meet existing sustainable development goals.

1.1 Roadmap of this paper

The first part of this paper sets the context with key definitions, an introduction to SA, a discussion of the history of sustainable development in SA and its prevalence in various laws and policies, and an examination of the emerging IS. This includes ICT policy, the penetration of ICTs and a discussion of the forthcoming national IS strategy.

The issue of local content is then explored, including its definition and importance globally and locally, its current prevalence in SA, and the reasons for associating it with arts, culture and heritage.

Projects of three organizations that use ICTs to create and disseminate local content are described as examples of initiatives that support sustainable development principles and goals.

The conclusion offers recommendations on how local content using ICTs should be positioned in the national IS strategy.

1.2 Research approach

The aim of this paper is to explore the influence of sustainable development on the positioning of local content with the support of ICTs in a South African IS strategy context. The research involved an extensive literature survey and workshops in Cape Town (May 31, 2005) and Johannesburg (June 24, 2005) with participants from government, civil society and academia. The following organizations were represented at the workshops: Cape Peninsula University of Technology; Presidential National Commission (PNC) on Information Society

and Development (Department of Communications); Centre for e-Innovation and Department of Environmental Affairs and Development Planning (both Provincial Government of the Western Cape); Empowerment for African Sustainable Development; Environmental Justice Network Forum; Open Knowledge Network; and Bridges.org. Probably the attendant with the most power to influence the national IS strategy was Ntombi Masakazi, who heads up the Local Content unit in the PNC.

The key points raised in the workshops are integrated in the paper, but can be summarized as follows: the agreement that technology is crucial to sustainable development; local information is fundamental to many sustainable development activities, such as monitoring and raising awareness; local content is pervasive in many sectors of sustainable development; it is difficult to define "local content"; techno-optimism, which holds that technology alone is the solution to many developmental problems, is common in IS policies and strategies; and the national IS strategy should focus on creating an enabling environment for the organic development of an IS in South Africa.

This paper was written at a time when the PNC was drafting the national IS strategy. The author was able to contribute to the process through a formal agreement with the PNC to share information and resources.

The scope of this paper makes it impossible to fully examine the convergence of two very broad fields, i.e., sustainable development and the IS.

Therefore, the research focuses at the effect of sustainable development on IS in SA, and not the other way around.

It must be stressed that many of the topics and definitions used here are the focus of critiques, e.g., the concept of the digital divide, the many views of exactly what sustainable development is, and the role of WSIS and the accuracy of statements made in its Geneva texts. It is not within the scope of this paper to discuss these differing arguments, but rather to take a face-value approach in the name of piecing together—and exploring the convergence of—a number of issues and actors in the sustainable development, IS and local content space.

Lastly, the topic of local content with the support of ICTs is a complex one, located within many broader online and offline issues. While it is also not within the scope of this paper to delve into the broader context, its existence is acknowledged. Examples of relevant issues include: ownership of content; freedom of expression; privacy; regulatory issues surrounding content, particularly on issues of child pornography, and hate and violent speech; Internet service providers' liability; setting of local content standards and quotas; etc.

2
Setting the Context

2.1 Definitions

2.1.1 Information and communications technology

Information and Communications Technology is an umbrella term that includes computer hardware and software; digital broadcast and telecommunications technologies as well as electronic information repositories such as the World Wide Web or those found on CD-ROMs (Selwyn 2002). It represents a broad and continually evolving range of elements that further includes television (TV), radio, mobile phones, and the policies and laws that govern these media and devices.

2.1.2. Information society

Information and communication technologies are the tools that underpin the emerging "information society." While no universally accepted definition for IS exists, it can be described as a society in which "the creation, distribution, and manipulation of information has become the most significant economic and cultural activity. An IS may be contrasted with societies in which the economic underpinning is primarily Industrial or Agrarian" (TechTarget 1999). Information exchange between people and through networks of people has always taken place. But the ICT-enablement of information exchange has radically changed the magnitude of this exchange, and thus factors such as timeliness of information and information dissemination patterns have become more important than ever.

2.1.3. Local content

One definition of local content is "the expression of the locally owned and adapted knowledge of a community—where the community is defined by its location, culture, language, or area of interest" (Ballantyne 2002).

2.1.4. Sustainable development

The definition of sustainable development used in this paper, taken from SA's *National Environmental Management Act* (No. 107 of 1998), is "the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations." It thus draws together sociologists, economists and environmentalists, working together to foster social cohesion, protect the environment and stimulate appropriate economic activities. It is an integrated and holistic (not primarily environmental) approach that draws on the cumulative agreements and commitments of Agenda 21, the Millennium Development Goals and WSSD, among others.

3
Introduction to South Africa

South Africa is a country that exists both in the developed and developing world. On the one hand, it is the economic powerhouse of Africa; on the other, it is beset by developmental challenges such as unemployment, poverty and severe inequalities, largely along the lines of race—a legacy of Apartheid—and location. Urban centres are home to some educated and technologically sophisticated groups, while many rural areas lack access to even the most basic facilities, like water and electricity.

Since 1994, the state has "set out to dismantle Apartheid social relations and create a democratic society based on equity, non-racialism and non-sexism" (GCIS 2005). The government, made up of national, provincial and local levels, has made major strides, but the enormous developmental challenges have also kept many South Africans in dire circumstances.

The 2001 census (Stats SA 2003) revealed that of a population of 44 million (79 per cent of which were Black), 53 per cent were under the age of 25; 33 per cent were aged 20 and older with no schooling or only primary school education; and 30 per cent were unemployed. Thirty per cent of households had no electricity and one in every seven households did not have access to a toilet facility.

While there was an average of only one per cent per capita growth since 1994—"a mediocre performance" (GCIS 2005)—by 2004, SA had achieved the best level of macro-economic stability in 40 years. Inflation fell from over 15 per cent in the early 1990s to four per cent in 2004. Unfortunately, a stable economy has not led to an adequate and much-needed increase in jobs. Since 1995, the number of jobs has grown by 20 per cent, but the economically active population has grown by double that figure (GCIS 2005). Black women still bear the brunt of workplace inequality, on all levels: only three per cent of Black women are directors of public companies (GCIS 2005). Black women also form a large part of the "Second Economy," which is mainly informal, marginalized and unskilled. This is in contrast to the emergent "First Economy," made up of advanced, skilled and globally competitive people who largely work in the business and financial services sectors.

South Africa has 11 official languages, English being only the sixth most spoken home language (Stats SA 2003). Zulu is more than twice as prevalent as English, despite the latter being recognized as the language of commerce and science.

The *South Africa Yearbook 2004/2005* (GCIS 2005) also revealed that the urban rural divide is prevalent across the board: just over half (52 per cent) of rural households had electricity in 2001, compared with 80 per cent of urban households. Limpopo, a rural province where 60 per cent of households were using wood as the main source of energy for cooking, was the worst performing province in terms of education with exactly one-third of its population aged 20

and above having no formal education whatsoever. Despite these statistics, national literacy was at 89 per cent in 2001 and, today, tertiary institutions are producing a much more racially mixed group of graduates. However, unemployment is a problem even for the educated: "the percentage of unemployed graduates of tertiary institutions grew from six per cent in 1995 to 15 per cent in 2002" (GCIS 2005).

Despite the impressive achievements of the democratically-elected government, the *South Africa Human Development Report 2003* (UNDP) revealed that just under half of the population (49 per cent) lived below the official South African poverty line (ZAR354.00/month or approximately US$54/month per adult). Chronic income and wealth inequality—which continue to exhibit strong racial and spatial biases—was reflected in the high Gini coefficient of 0.635 in 2001.

4
Sustainable Development and South Africa

4.1 South Africa's international commitment to sustainable development

"The concept of sustainable development is now widely accepted in planning and development arenas both internationally and in South Africa" (O'Riordan *et al.* 2000; Sowman 2002; Scott *et al.* 2001; all cited in DEAT 2002). How did SA arrive at this point?

The world first started to publicly acknowledge and discuss the impact of social and economic development on the environment at the UN Conference on the Human Environment held in Stockholm in 1972. By 1987, the term sustainable development was introduced as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987). The focus was on development that did not unnecessarily have a negative impact on the environment, peoples' health, etc. This was further explored in the 1992 UN Conference on the Environment and Development in Rio de Janeiro (the "Rio Earth Summit"), out of which came Agenda 21, a proposal to achieve sustainable development on a global scale. As a UN member nation, SA signed this proposal and thereby also undertook to localize its efforts through Local Agenda 21 (LA21) programs. LA21 is the process used by participating countries to incorporate sustainable development into local-level planning and implementation activities; it has been adopted by many local authorities in SA (DEAT 2002).

In September 2000, SA signed the *Millennium Declaration* pledging to meet the Millennium Development Goals (MDGs) by 2015. The key objectives of the goals included eradicating poverty; promoting human dignity; and achieving peace, democracy and environmental sustainability. The Department of Foreign Affairs is the official overseer of the MDG process in SA; the lead agency that reports the information required to measure progress is Statistics South Africa (Stats SA).

South Africa's greatest involvement in the global sustainable development community was when it hosted the WSSD in Johannesburg in 2002. Naturally it is a signatory to the Johannesburg Declaration on Sustainable Development and *Plan of Implementation*. WSSD turned the UN Millennium Declaration into a concrete set of programs; its implementation plan includes, among other things, programs to sustainably deliver water, energy, healthcare, agricultural development, a better environment for the world's poor, and targets for the reduction of poverty and protection of the environment. It built upon the progress of previous UN summits, offered an integrated and holistic view of development that went beyond a primary focus on the environment, sought to use modern technology to bring about development, and, on a social level, put the spotlight on the most marginalized sectors of society, including women, the youth, indigenous people and people with disabilities.

In 2004, the Johannesburg +2 Sustainable Development Conference was held in Johannesburg, the first two-year cycle follow-up to the WSSD.

In addition to the aforementioned conferences and summits, SA is also signatory to a number of multilateral environmental agreements, namely the UN Framework Convention on Climate Change, the UN Convention on Biological Diversity and the UN Convention to Combat Desertification. These all place monitoring and reporting obligations on the country. SA is a member of the African Union (launched in 2002), which aims to, among other things, "promote sustainable development at economic, social and cultural levels" (GCIS 2005).

4.2 Sustainable development in South Africa

In 1994, the first democratically elected government initiated the Reconstruction and Development Programme (RDP) as a socio-economic policy framework, looking to, among other things, create a "prosperous society, having embarked upon a sustainable and environmentally-friendly growth and development path" (GCIS 2005). Although now superseded by other policies, the RDP underpinned and framed the government's social and economic development programs for a number of years. The African National Congress (ANC), SA's ruling party, has acknowledged that "Agenda 21 served to encourage and inspire our own democratic movement in SA to draft the RDP" and that, therefore, "many of the policies and programs that we have put in place since 1994 are directly inspired by the outcomes of the Rio Earth Summit" (ANC 2002).

Underpinning these principles is the *Constitution of the Republic of South Africa* (Act 108 of 1996), which states that:

- "Everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations."
- "Everyone has the right to health care services; sufficient food and water; social security"; to "enjoy their culture, practise their religion and use their language"; and to "basic education, including adult basic education."
- "Every person has the right of access to all information held by the state or any of its organs in any sphere of government in so far as that information is required for the exercise or protection of any of their rights."
- "Transparency must be fostered by providing the public with timely, accessible and accurate information."
- "Public administration must be accountable."
- "People's needs must be responded to, and the public must be encouraged to participate in policy-making."

South Africa's national governance and policy framework to promote sustainable development can be introduced as follows (DEADP 2005):

The Bill of Rights, the National Environmental Management Act, the Local Government Municipal Systems Act, the Biodiversity Act, the National Government's draft Medium Term Strategic Framework, the Extended Public Works Programme, the National Skills Development Strategy, and the various relevant sector policies that are specifically aimed at poverty eradication with special reference to job creation, housing and infrastructure provision, health, welfare and education.

Sustainable development is incorporated into policies in all three spheres (national, provincial and local) of government. All local governments must follow an Integrated Development Planning (IDP) process to develop a strategic development plan for a five-year period. The IDP plan "gives an overall framework for development" in terms of "how land should be used, what infrastructure and services are needed and how the environment should be protected" (Education and Training Unit 2003) and must be drafted according to the principles of sustainability (DEAT 2002). The Department of Environmental Affairs and Tourism (DEAT) proposes that the LA21 principles can be used in the IDP process to promote sustainable development.

At the Western Cape Sustainable Development Conference in Cape Town, June 2005, delegates signed a *Declaration of Intent* to develop a Sustainable Development Implementation Plan for the Western Cape province within one year—a first for any South African province. In the meanwhile, the policy vacuum at a national level means that SA's sustainable development goals are collectively inferred from the numerous documents available. Below is a selection of these principles taken from a longer list provided by DEAT (2002):

- satisfaction of basic human needs such as food, shelter, water and energy;
- participation of individuals and communities in activities and decisions affecting them;
- support for the development of partnerships: government, community and private sector partnerships;
- accountability;
- use of local knowledge and skills; and
- commitment to training and capacity building at all levels.

These principles support the wider sustainable development goals that SA has ratified, e.g., the MDGs, and demonstrate the integrated and holistic approach that characterizes sustainable development in SA. Taking a broader view of the various rights and principles that are to be upheld by national, provincial and local governments, the following conclusions can be made:

i) there is a need to measure whether sustainable development goals are being met, for example through environmental indicators;

ii) government wants to raise awareness of environmental issues among its citizens, as well as communicate sustainable development information;

iii) government wants citizens to participate in decision-making, using their local knowledge and skills; and

iv) government acknowledges that training and capacity building are necessary to the success of the desired outcomes.

All of these activities are very much related to local content in that information that is specific to a given community, is being generated, disseminated and consumed through the processes that foster transparency, greater access to information, public participation, training, etc. The activities are all based on information and communication and, in theory, can happen with or without the support of ICTs. But increasingly, ICTs are being used somewhere in the information-chain. For example, the final product of a study on the impact of an oil refinery on air quality in Cape Town might be a printed report, but ICTs will have been used in the compiling of the report, from capturing information on air quality readings and conducting statistical analysis on the data, to actually setting the layout of the report with desktop-publishing software.

4.3 Political convergence of sustainable development and ICTs/the information society in South Africa

The following points and views illustrate the acknowledgement of the relationship between sustainable development and ICTs in SA:

- "In order for sustainable development to take place, rural and urban communities should have access to innovations that accelerate development and provide new and more effective solutions than those utilized previously" (Government of the Republic of South Africa 2002).
- There must be "sufficient funding to promote research, technology development and diffusion, as well as dissemination of knowledge" to implement sustainable development (Government of the Republic of South Africa & European Commission 2002).
- Research, technology and innovation are indispensable and fundamental engines of sustainable development (Government of the Republic of South Africa & European Commission 2002; Ngubane 2002).
- "An important new paradigm for sustainable development is the emergence of the knowledge based economy and society" (Government of the Republic of South Africa & European Commission 2003).
- Technology was a theme of the Johannesburg +2 Sustainable Development Conference.
- Technology has a key role to play in poverty alleviation (Government of the Republic of South Africa 2002; Government of the Republic of South Africa & European Commission 2002).

Furthermore, the Department of Science and Technology's (DST) aims include "harnessing the benefits of ICT for sustainable development, nurturing an appropriate

ICT capacity for South Africa, and using ICT tools to preserve and promote cultural diversity" (DST 2003).

An important influence on South African government policies and programmes is the New Partnership for Africa's Development (NEPAD). NEPAD is a pan-African vision and strategic framework for Africa's renewal, initiated in part by SA, with the following objectives: "To eradicate poverty; to place African countries, both individually and collectively, on a path of sustainable growth and development"; to accelerate Africa's "full and beneficial integration into the global economy; and to accelerate the empowerment of women" (Department of Foreign Affairs 2003). NEPAD has identified ICTs as a major contributor to achieving its goals; there is a clear link between its vision for broad ICT-enablement and sustainable development. The African Forum on Science and Technology for Development, created by NEPAD, is tasked to promote the application of science and technology for economic growth and poverty reduction. This is another example of the connections being made between sustainable development and ICTs.

While not strictly sustainable development-focused, the *ICT Charter* is applicable in that some of its goals are the same as those of sustainable development. The charter was drawn up in a consultative process by stakeholders from government, business and civil society and sets targets for the transformation (through Black economic empowerment) of the South African ICT sector. The charter recognizes the "cross cutting nature of ICT, and its role in the social and economic development of our country" and places a responsibility on all individuals and organizations in the sector to contribute towards the reduction of unemployment and poverty alleviation and "support skills development and training initiatives" (ICT Empowerment Charter Working Group 2005).

A number of common themes are found in the convergence of the many sustainable development-related publications in SA and those related to ICTs and the IS. These are generally echoed in the WSSD and WSIS principles and plans. The common themes are:

- raising awareness about sustainable development;
- information availability and thus transparency;
- public participation in governance;
- empowerment of citizens, especially women;
- fostering of cultural diversity; and
- building capacity.

The themes underpin the common goals of poverty alleviation, increased education for all, improved healthcare, etc.

What is interesting to note is that the texts that cover the convergence of the two fields, describe ICTs and the IS in relation to sustainable development, using sustainable development terms.

4.4 An environmental view of sustainable development in South Africa

While the environment is only one aspect of sustainable development, much has been written and legislated around it, and it provides a useful example as a lead-in to a discussion of the IS in SA and how the issue of local content is just as fundamental to the IS as it is to sustainable development.

The country is a natural wonderland that includes an abundance of wildlife and plant species, a coastline that is home to 3,700 marine species that occur nowhere else, and rich mineral wealth. It has the third-highest level of biodiversity in the world (GCIS 2005) and an impressive environmental heritage; for example, the Table Mountain National Park around Cape Town has more plant species than the whole of the British Isles or New Zealand. Environmental management is thus obviously important in the country.

A number of key policies and laws recognize that everyone must have access to information to enable them to: protect their health, protect the environment and to participate effectively in environmental governance. The government needs this information to measure progress in achieving sustainable development goals and monitor environmental quality. To enable public participation and empower citizens to protect the environment, government must disseminate this information through formal and informal channels in accessible formats (DEAT 1998). In fact, it is legally bound to periodically publish State of the Environment (SOE) Reports—nationally, provincially and locally.

As with the relationship between SA's sustainable development principles and local content, environmental management also drives, as well as relies upon, local content creation, dissemination and consumption by various parties. For example, the *2002 City of Cape Town SOE Report*[1] includes information on air quality, inland waters, coastal waters, etc., obtained from various stakeholders such as government and civil society. This report then feeds into the Western Cape provincial SOE report, which will be disseminated widely in various formats, e.g., as a printed report, as a file that is downloadable from a Web site (e.g., a PDF), on a CD-ROM, etc. The process thus results in information flows between many different parties who gather, aggregate, analyze, generate, disseminate and consume local content.

1 http://www.capetown.gov.za/soe

5
The Information Society in South Africa

As the discussion now turns to the IS, the role of ICTs to support these local content dynamics is explored. But first, as with the topic of sustainable development in the preceding chapters, it is necessary to begin with a broad view of the IS landscape in SA.

The national and provincial governments have recognized the strategic importance of ICTs and the ICT sector in "enhancing the country's competitiveness and meeting development challenges" (CITI 2003). President Mbeki, referring specifically to ICTs, has said that we must "ensure that as many of our people as possible master modern technologies and integrate them in their social activities" (Government of the Republic of South Africa 2002). Furthermore, he has also highlighted the policy responsibility of government to ensure that the IS "supports and enhances the objectives of development, empowerment, economic development and preserves the constitutional values on which the whole national edifice is built" (Mbeki 1996).

5.1 ICT policy in South Africa

In SA, all public, commercial and community broadcasting is regulated by law. The South African Broadcasting Corporation (SABC) is the country's public broadcaster, mandated by the *Broadcasting Act* (No. 4 of 1999) to broadcast South African content programming in languages reflecting the country's cultural diversity; educational programming to advance lifelong learning; and programming targeted at children, women and people with disabilities.

For over a decade the telecommunications sector has been undergoing a process of "managed liberalization," whereby Telkom, the incumbent fixed-line operator, has ostensibly and slowly released its monopolistic grip. Through the *Telecommunications Act* (No. 103 of 1996) and the *Telecommunications Amendment Act* (No. 64 of 2001) a sector regulator was established, a third mobile network operator was licensed, the value added network services (VANS) and private telecommunication networks (PTNs) were partially liberalized, and a new category of under-serviced area licences was issued to increase the roll-out of services into areas with low teledensity. Further policy directives in September 2004 and February 2005 from the Ministry of Communications allow mobile operators, VANS and PTNs to resell their excess bandwidth and voice over IP services for the first time, and introduce a 50 per cent "e-rate" discount to all public schools for Internet connectivity. The directives have been welcomed by industry and will hopefully result in improved bandwidth and reduced prices for consumers.

However, these reform initiatives have not nearly addressed the telecommunications sector in SA that is "characterized by relatively high retail prices, super prof-

its, job losses, licensing delays and deadlocks and minimal new foreign investment in the sector" (Gillwald *et al*. 2005). The telecommunications regulator is often criticized for being powerless against Telkom and the licensing of the third mobile operator has not seen a reduction in costs for consumers. The draft report of the *South African 2004 e-Index Survey* (Gillwald *et al*. 2005) found "considerable evidence to suggest that the protectionist policies that accompanied the privatization of the national telecom operator have not served the country well and while they allowed for the maximization of state assets this occurred at the expense of the ICT sector and indeed the national economy."

In terms of ICT-focused legislation, the *Electronic Communications and Transactions Act* (No. 25 of 2002) recognizes "the importance of the information economy for the economic and social prosperity of the Republic." It calls for a national e-strategy, universal access to "electronic communications and transactions," and legalizes electronic transactions, among other things.

Legislation relevant to this is the *Promotion of Access to Information Act* (No. 2 of 2000), which "gives effect to the constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights." This very information-focused law centres on greater transparency and accountability, both important themes of sustainable development.

5.2 ICT penetration in South Africa

As of July 2004, the SABC's operations included (GCIS 2005):

- 18 national radio stations broadcasting in 13 languages, reaching an average audience of 19 million adults every day;
- 101 community radio stations; and
- four full-spectrum free-to-air TV channels, which, when combined, broadcast in 11 languages and reach a daily adult audience of almost 18 million people. (SA has the largest TV audience in Africa.) News is broadcast in all 11 official languages.

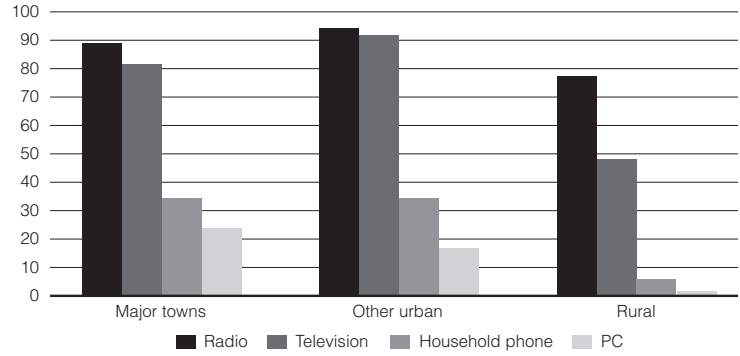
There is also one privately-owned digital satellite broadcaster (DStv) and one privately-owned free-to-air TV licensee (e.TV).

Despite the telecommunications policy constraints that exist, for a developing country, SA is generally well placed in global e-readiness indexes. For example, the World Economic Forum's *Global Information Technology Report* ranked SA 34th out of 104 countries in terms of e-readiness (Dutta, Lanvin & Paua 2005). South Africa is often compared to India and Brazil, which ranked 39th and 46th respectively.

In 2001, while some urban centres had strong computer-based ICT capabilities, national ICT adoption was best contextualized by the fact that only two per cent of Black African, Coloured, Asian or Indian households had a computer, as

opposed to 46 per cent of White-headed households (Stats SA 2003). Much more prolific were radios, TVs and mobile phones: nearly three-quarters of households in the country had a radio and well over half had a television (in terms of other household appliances, just over half had a refrigerator). These figures concur with the results of the South African 2004 e-Index Survey (Gillwald *et al.* 2005), which segmented its sample into metropolitan areas, other urban areas and rural areas; as anticipated, ICT penetration was skewed towards urban areas (see Figure 1).

Figure 1: Penetration of various forms of communications in South Africa



(Gillwald et al. 2005)

While the boom of mobile telephony has been impressive, it is interesting to note that of the "32 per cent of the population with mobile phones, 14 per cent also have access to a fixed-line phone, suggesting that while mobile telephony offers convenience and additional utility it has only extended access to a further 18 per cent of the population" (68 per cent of the population continue not to own phones) (Gillwald *et al.* 2005). South Africa rates poorly against comparable countries in this regard, e.g., Turkey has 39 per cent mobile and fixed-line penetration and Poland has 45 per cent. Only 3.5 per cent of households have Internet access and, of that number, 80 per cent are in metropolitan areas, 20 per cent in other urban areas and none in rural areas. This clearly shows the urban-rural digital divide in SA.

It is clear from the various sources that communications penetration within SA is heavily influenced by race and spatial factors. Perhaps the greatest constraint is cost. More than two-thirds (68 per cent) of respondents earned less than ZAR500.00 per month (approximately US$76). The problem of these painfully low incomes is compounded by high telecommunications costs; out of a survey of 15 comparable countries, SA's local call rates (peak) were 199 per cent more expensive than the average rate (South Africa Foundation 2005 in Gillwald *et al.* 2005).

Given the severe inequalities and financial and resource limitations for a large part of the population, shared access is the only viable option for many. In 2004,

there were 981 collective Internet access points such as cybercafés, government Multi-Purpose Community Centres, post offices, digital villages and telecentres (Thomas 2004 in Gillwald *et al.* 2005). Other shared-access venues include schools and universities. In the Western Cape, there are 569 schools that are at various stages of having computer labs and Internet access infrastructure installed, thanks to the Western Cape Education Department's Khanya project.[2] In 2012, Khanya aims to have every school in the province connected. The project integrates and delivers the curriculum through ICTs. Many of the schools open their labs up to the wider community after hours.

5.3 National Information Society and Development Plan and implementation strategy

The strategy aims to provide a clear national IS vision to which all spheres of government should align their own ICT strategies and programs. For example, local governments' IS plans and projects should be in line with, or feed into, their IDP plans.

5.4 Focus areas in the national IS strategy

The government has acknowledged that one of the only ways to fully realize the potential of ICTs in SA, and bridge the local digital divide, is through local content. For this reason, it is a priority focus area in the strategy, which was released in October 2005, along with e-health, e-education, e-government and small, micro and medium enterprises (SMMEs). These five priority areas are based upon four cross-cutting pillars: ICT infrastructure development; human resources development; applications; and policy environment.

The Local Content unit within the PNC is focusing on a number of related areas, including: research and development in the local economic environment; open-source software; intellectual property rights; local content financing models; and e-literacy programs. While it is currently in the process of developing a working definition of local content that will be reflective of a number of areas, it was initially focused on arts, culture and heritage. In South Africa, a large part of this includes IK and indigenous knowledge systems (IKSs).

5.5 Influences on national IS strategy

5.5.1 Existing ICT initiatives and policies

Because of the IS strategy vacuum that has existed for many years, many government ICT projects—in all three spheres—have already been implemented. These range from nationwide enterprise systems to small community ICT projects. The PNC has recognized the need for its forthcoming strategy to take these existing efforts and investments into account and be careful not to position them outside of its vision.

2 http://www.khanya.co.za

Furthermore, national and provincial government bodies have drafted their own sectoral ICT strategies. The only national-level sectoral strategy is in education, namely the 2001 *Strategy for Information and Communication Technologies in Education* published by the Department of Education and the Department of Communications. The *White Paper on e-Education* (Department of Education 2004) explains how to reach the Department of Education's policy goal, which is for every South African learner in the general and further education and training bands to be ICT capable by 2013. This document, while high-level, shows maturity in its vision. Bridges.org (Vlachos 2004), an ICT for development non-profit organization, provided the following input to the preceding draft white paper: "It is paramount that any further sectoral legislation fits into the national e-strategy to allow for an integrated ICT policy" (Vlachos 2004). This poses a particular challenge for the national IS strategy, as it comes into being amidst existing texts.

5.5.2 WSIS

South Africa maintained a substantial presence in the run-up preparatory meetings and actual WSIS in 2003, continually sending the largest delegation among African countries (Souter 2004). A number of ICT-based initiatives from SA, such as Cape Gateway (discussed later in the paper), were invited to exhibit at the Summit's ICT for Development platform. As a signatory to the Summit texts, SA is bound to develop a national e-strategy.

In summary, South Africa has relatively poor computer and telephony penetration levels. The national IS strategy has a number of influences, predominantly SA's development policies and existing sectoral IS strategies and initiatives. Overall, ICTs have been acknowledged as crucial to the development of SA and, indeed, of Africa.

6
Local Content

6.1 Towards a definition of local content

So far, this paper has explored the history, principles and goals of sustainable development in SA, as well as ICT policies and penetration. Local content is clearly an underlying aspect of sustainable development. The ability of ICTs to enhance the generation, dissemination and consumption of content for local people, means that the convergence of sustainable development and the IS around local content is inevitable and mutually beneficial. But what exactly is meant by local content? Berger (2000) and panellists at an ICT conference in Johannesburg grappled with this question: "Thanks to technology, is all cultural production nowadays to be homogenized under this bland term—a term that conceals more than it reveals? Are museum display producers, radio dramatists, newspaper journalists and Web site designers all to become 'content-producers'?"

A definition of local content is difficult to find. This is perhaps due to the fact that "the concept of 'local' is vague" (Hampton 2003). Depending on the context, "local" could refer to a country, a village, a language or a cultural or special interest group. Furthermore, depending on the perspective taken, one person's local could be another person's global. A study commissioned by the United Kingdom Department for International Development in 2002 (Ballantyne) arrived at the definition used in this paper: that "local" refers to a community, which is defined by "its location, culture, language, or area of interest." Furthermore, the study considered local content as content coming from a community; this content was either created by the community, or taken from external sources and then adapted by the community to meet its needs. Once adapted and "assimilated into the knowledge base of the community" (Ballantyne 2002), it is considered content local to that community, which can then be "exchanged and shared, locally or globally, in various formats, packages and media."

It is useful to understand that content has expression and application (Ballantyne's terms for "creation and consumption") on a local and/or global level. For example, a community radio station is a content source of local expression and local application, in other words, locally-produced content for a local audience. The opposite end of the scale is global expression and global application, such as international news agencies that "draw on local content from all sources to address global issues" (Ballantyne 2002).

While the National Advisory Council on Innovation (NACI) (2004) describes content as "all and any types of creative human made material (whether text, pictures, audio, video, etc., and usually digitized)," Ballantyne (2002) believes that it is important to make the distinction between local content and "eContent" (digital content), and therefore "just because little eContent from developing countries is found on the Internet, it is wrong to conclude that there is a 'local content'

problem." (Note that in this paper local content is the same as "eContent," therefore it is qualified with "with the support of ICTs.") Developing countries are usually very rich in local content; it has just not yet been digitized or disseminated with the support of ICTs.

6.2 The importance of and political will for more local content with the support of ICTs

An inevitable question that has arisen out of the many debates and initiatives around increasing ICT access is: "Access to what?" Is there locally relevant content for South African citizens to access, given that "most content initiatives using ICTs tend to 'push' external content towards local people", "in other words, they mainly provide 'access' to other people's knowledge" (Ballantyne 2002)? In recent years there has been a growing recognition that a key success factor for the building of a healthy IS is when people fully appropriate ICTs and use them to create their own local electronic content (Surman and Reilly 2003).

6.2.1 On a global level

The "'digital divide' is, in effect, a reflection of existing broader socio-economic inequalities and can be characterized by ... lack of locally created content" (among other things) (G8 Information Centre 2001). This local content deficiency is the product of a number of barriers such as lack of access to ICTs, lack of ICT skills, not appreciating the benefits of local content, cultural constraints, etc. The complex set of interdependencies related to local content and ICTs is outside the scope of this paper; only directly relevant factors will be discussed here.

Almost every major ICT body—such as the UN ICT Task Force (2001) and the G8 governments' Digital Opportunities Task Force (G8 Information Centre 2001)—and ICT-related event raises the need for greater local content, especially as most content on the Web is in English. In 2000, 68 per cent of all Web sites were in English (Pastore 2000 in Warschauer 2003) but a year before that only a quarter of the world's population could speak English as a first, second or foreign language (Graddol 1999 in Warschauer 2003). "Language is one of the pillars of culture; it reflects not only the ways in which reality is captured and communicated but also the ways in which its meaning is understood and appropriated" (Morales-Gómez and Melesse 1998). Because culture is embedded in language, the prevalence of English content means that the views and context are inherently "Western." Castells (1999 in Williamson 2004) says that "language and culture are key elements and the online environment is immersed in the culture of the community that it serves." Thus existing content cannot necessarily be made locally relevant just by translation into a local language; it must be adapted within the local context.

The issue of local content has received attention most notably by its inclusion in the *Plan of Action* and *Declaration of Principles* signed at WSIS in Geneva in 2003 by all UN member states (191 countries). Both of these documents speak of the

need for ICTs to be used to preserve and foster cultural identity and linguistic diversity through the creation and dissemination of content in local languages and formats, not only for an equitable IS but also for sustainable development.

The Declaration of Principles states that the "development of local content suited to domestic or regional needs will encourage social and economic development and will stimulate participation of all stakeholders, including people living in rural, remote and marginal areas" (ITU 2003). The Plan of Action urges that local communities should be empowered to produce this content themselves using ICTs.

There are many benefits cited for local content with the support of ICTs. For example, people more easily embrace ICTs when tutorials, training materials and software interfaces are presented in local languages. These learning aids are more effective when they present appropriate day-to-day examples (Marcelle 2001), e.g., using culturally sensitive metaphors that are more relevant to rural African women than well educated, middle income, urban professionals in America.

Perhaps the most important benefit is that local content is relevant; locals must be the ones who create or adapt it so the final product has real value to local consumers. Local people are empowered in and through the process of content creation or adaptation with the support of ICTs, and the content that they produce holds great potential value for them (if they know how to best use it). Through effective partnerships among sectors and communities, knowledge networks can be established to share or sell similar content and create rich and potentially profitable bodies of knowledge.

Viewed from a sustainable development perspective, people who are empowered through ICTs to generate, disseminate or consume local content are well placed to use these high-speed communication channels to effectively report on issues, quickly mobilize resources and respond to sustainable development challenges. As stated above, local content is a fundamental building block of sustainable development.

6.2.2 In South Africa

> "The creation, production and formulation of content must be encouraged at all levels, not only at the national level of all developing countries but, within the same nation, at the local and community levels, to ensure that developing nations do not remain information consumers of a content conceived by others" (Mbeki 1996).

For SA, which is rich in heritage, cultural diversity and languages, ICTs offer many opportunities to harness and share local knowledge. Of course, diversity also poses challenges, e.g., the fact that there are 11 official languages in SA. In 2001, the National Research Foundation made local content with regard to ICTs one of its research priorities. It wanted to know more about the role of ICTs in local content and language, and the dissemination of local knowledge.

6.3 Lack of local content

"While the importance of local content has often been raised in international meetings, concrete initiatives and expertise on this topic are scarce" (Ballantyne 2002). For example, concerning material for education, Unwin (2004) notes that there is currently "very little multimedia content being developed by and for African people, let alone in local African languages." There is a distinct lack of depth within discussions on how to realize the promised benefits of local content. High-level plans don't seem to be able to move beyond the political rhetoric and thoroughly examine the key issues to make it happen or why there isn't more of it.

Among Americans with low incomes, limited-literacy or language skills, or disabilities, the greatest content barriers are lack of content related to local needs, content at inappropriate literacy levels, lack of local language content and lack of content about local culture (Lazarus and Mora 2002). These seem to represent the well-known and critical issues around local content.

6.4 Local content quotas in SA

The *Broadcasting Amendments Act* (No. 64 of 2002) requires the setting of local content quotas for radio, TV, film and video in order to grow these industries; "develop talent; invest in high quality technology; improve the quality and variety of South African music and television programming; and redress historical imbalances in the cultural and broadcast industries" (Jackson and Eksteen 2001). In the act, local content is loosely defined as non-imported content.

Since 2003, quotas are as follows (GCIS 2005): 40 per cent local content for public and community radio stations, and 25 per cent for private and public commercial stations. For TV the quotas are 55 per cent for public broadcasters, 30 per cent for commercial private and public free-to-air stations, and eight per cent for pay stations.

There are no local content quotas set for the Internet and other non-broadcast media.

6.5 The importance of arts, cultural, heritage and indigenous knowledge local content

Given the national IS strategy's hitherto focus of local content on arts, culture and heritage, it is necessary to contextualize their relevance and importance in SA.

South Africa has a diverse artistic, cultural and linguistic heritage. The Department of Arts and Culture aims to develop and preserve these national assets to "ensure social cohesion and nation-building" (GCIS 2005). The literature, theatre, dance and visual arts scene is strong, with many festivals held annually. Music is an important industry for both cultural and economic reasons. While global music sales dropped by seven per cent from 2002 to 2003 (International Federation of Phonographic Industries 2004 in GCSI 2005),

turnover in SA remained unchanged. Of particular interest was the marked increase in the amount of local material as a percentage of all music sold: a 17 per cent rise from 2002 to 2003 (GCIS 2005).

For centuries, SA's rich oral tradition has been a way to share advice, remember history, tell stories and pass reflections on contemporary society from generation to generation. The government promotes oral history, music and indigenous dance by funding research on these at three historically-disadvantaged universities. There are also many innovative preservation and promotion projects in the areas of crafts, rock art, SA legacy and heritage, and cultural tourism.

In the South Africa Human Development Report, UNDP (2003) suggests the importance of SA to capitalize "on strong capacities and knowledge systems (including regional, continental and global indigenous knowledge systems)" to ultimately "develop innovative solutions from within" and "adapt existing solutions creatively." The developmental and economic potential, especially in the Second Economy, of these areas is strong and is exploited by the government in various ways. For example, the Cultural Development and International Cooperation Programme, Investing in Culture, provides training in arts and culture; by mid-2004, over 12,000 jobs had been created and over 22,000 people had been trained (GCIS 2005).

Indigenous knowledge, also known as traditional or local knowledge, refers to the "knowledge developed by and within distinctive indigenous communities" as opposed to that from the "international knowledge system generated through universities, government research centres and private industry" (DST 2004b). Indigenous knowledge includes arts, culture, heritage, oral knowledge, traditional medicine, folklore, cultural and religious ceremonies, and indigenous games (SA's Indigenous Games Project promotes eight African and Afrikaans games). The connection between IK and sustainable development is highlighted by the DST (2004a): "IK can contribute to a sustainable development strategy that accounts for the potential of the local environment and the experience and wisdom of the indigenous population."

An IKS is any mechanism that preserves IK, such as a tribal oral tradition or database of local alternative medicines. The *Indigenous Knowledge Systems Policy* (DST 2004b) acknowledges SA's rich IK assets and their role in building national identity, preserving culture for current and future generations, and increasing tourism for those interested in indigenous peoples and practices. The commercial, medicinal and agricultural benefits of IK have warranted government funding and research.

In light of colonialism and Apartheid's brutal dismissal of all things indigenous, it is interesting to note that only in 2002 in the WSSD's Johannesburg Declaration on Sustainable Development was the term "indigenous" used by the UN without a qualifier for the first time. The rights and values of indigenous peoples and practices are thus finally beginning to be widely recognized.

6.6 Reasons for the PNC's view of local content

There appear to be a number of reasons for the PNC's decision to focus local content on arts, culture, heritage and IK:

- The PNC has recognized the need to promote IKSs for posterity and for sharing with other societies.
- The IKS "developed and maintained by South Africa's indigenous peoples pervades the lives and the belief systems of a large proportion of the country's population" (DST 2004b).
- Under Apartheid, indigenous knowledge systems were marginalized, suppressed and ridiculed (Jackson and Eksteen 2001; DST 2004b). There is therefore a strong feeling that IKSs must now finally enjoy the recognition and place they deserve.
- IKSs promote a "positive African identity" (DST 2004b) and help the diverse population groups of SA to develop a sense of identity and self-esteem.
- Both the WSIS Declaration of Principles and Plan of Action deal with local content under the heading "Cultural diversity and identity, linguistic diversity and local content"; the PNC wants to be aligned with WSIS thinking.

Because "cultural and linguistic diversity is an essential dimension of people-centred information and communication societies" (WSIS Civil Society Plenary 2003), it is commendable that the national IS strategy encourages efforts that promote local values, traditions, languages and resources through IKSs and arts, culture and heritage.

7
Examples of Sustainable Development Local Content using ICTs

The importance of local content using ICTs is widely recognized and, therefore, the lack of it in developing countries has received much political attention, including from the president of SA. While cultural content and IK are essential aspects of local content, it comprises far more than that. The PNC has acknowledged that local content should have a broader definition than culture and IK, and is currently working on this. As a way of input to that process, it is suggested that it adopts a sustainable development view, one that is more appropriate given the position of the national IS strategy with regards to SA's development history.

To illustrate the cross-sectoral nature of local content, three organizations that implement local content projects with the support of ICTs are briefly described below. Each of these projects creates or disseminates content that is local and relevant to sustainable development.

7.1 Open Knowledge Network Mobile

The Open Knowledge Network (OKN) is an international initiative that supports local content creation in local languages with the support of ICTs. In Kenya, the OKN Mobile project[3] was set up to exploit the potential of short-message-service (SMS) messages; in a country with "40 per cent unemployment and over 60 per cent of the population living on less than US$2 per day" (Open Knowledge Network Mobile 2005), a booming mobile market provides the means by which most people communicate.

The project aim is to "provide timely, appropriate and relevant information which can help transform peoples' lives in the developing world as set out by the MDGs" (Open Knowledge Network Mobile 2005). It involves "end-users in the product development process to ensure community information needs are met." Since 2003, OKN Mobile has launched the following SMS services:

- job alerts aimed at blue-collar workers and employers, currently with over 10,000 subscribers;
- tips on pertinent health issues such as Breast Cancer and HIV/AIDS;
- MyQuestion, an SMS2Email service that allows people to anonymously ask HIV/AIDS and breast cancer related questions and receive answers; and
- the Community News service distributed for free to over 5,000 subscribers in Kibera.

3 http://www.oknmobile.com. OKN Mobile is discussed in greater detail in "Using ICTs for Poverty Reduction and Environmental Protection in Kenya," starting on page 43.

Based on the success of these products the following additional services will be launched later in 2005: a medication reminder service, an entrepreneurial support channel and an IT Q&A service.

OKN Mobile generates and disseminates local content using ICTs to support sustainable development in the following ways: it stimulates job seeking activities as well as educates its subscriber base on health issues; it provides content specifically for women; and fosters local culture through its community news service.

7.2 Mindset Network

Mindset Network[4] is a South African educational non-profit organization, operating there and in other African countries, that generates and disseminates relevant, contextually-based, multimedia content with the support of ICTs. It currently has two channels, Learn and Health, and will launch two more, Primary School and Livelihood, later in 2005. Each channel offers content in video, Web and print formats.

Mindset Learn provides infrastructure, equipment and training to educators so that they can effectively use and integrate ICTs into teaching and learning. Video content is broadcast to 2,000 high schools and over a million homes in Southern Africa via the DStv satellite platform. Content is also available on their Web site.

The Health Channel targets HIV/AIDS and tuberculosis content at healthcare workers and patients in five South African languages: English, Afrikaans, Zulu, Xhosa and Sotho. Mindset Health shows video content at more than 100 clinics in SA. According to preliminary research, there was "a visible increase in Voluntary Counselling and Testing (VCT) in clinics where Mindset Network content is used, and that patients were more responsive and interacted more with healthcare workers after viewing Mindset Network content" (Wentzel 2005).

Through a holistic solution, which offers quality ICT-based local content at no cost to the end user, Mindset Network supports the MDGs in the following ways (Wentzel 2005): promotes gender equality and empowers women by "creating content that addresses gender stereotypes found in African society" through "the portrayal of men and women as equal in all areas, for example by focusing on women in mathematics and science fields and the father's role in child survival"; and helps to combat HIV/AIDS and other diseases.

Furthermore, Mindset Network supports sustainable development by educating learners, building capacity among teachers and healthcare workers, and fostering cultural diversity through linguistic diversity.

7.3 Centre for e-Innovation

The Centre for e-Innovation (CeI) is the main e-government body in the Provincial Government of the Western Cape. Its Cape Gateway project provides

4 http://www.mindset.co.za

access to government information and services through a call-centre, walk-in centre and portal.[5] The portal has over 30,000 pages of information. Content on the site has either been digitized from original sources, e.g., from printed acts, rewritten from existing sources into plain language, or specifically created. The content team has translated key sections of content like government services into Afrikaans and Xhosa, where those translations didn't already exist. The portal includes government publications and policies, services, projects, facilities, jobs and tenders covering topics from education, health and tourism to the environment, arts and culture.

Cape Access is a pilot project that provides ICT access and e-literacy training at rural sites in the Western Cape. The CeI is sponsoring an exhibition of the six pilot sites at the Internet Society Week in Cape Town in August 2005. As part of the exhibition, a Wiki[6] will be provided for people from the six geographically dispersed sites to share lessons learned from the project at their own site, in their own language. This is a good opportunity for local content creation by rural people; lessons drawn afterwards will help to increase understanding of the complex issues of ICT-enabled content creation and telecentre sustainability.

The CeI generates and disseminates local content using ICTs to support sustainable development in the following ways: it provides an accessible resource of information on the delivery of basic services (water, electricity, etc.) and on SMMEs, thereby promoting economic development and poverty alleviation; provides information specifically aimed at women, the youth and people with disabilities; fosters transparency; builds capacity; and promotes cultural and linguistic diversity.

While all of these projects don't directly enable public participation in governance, they lay the foundation for this by providing information that empowers people, raises awareness and encourages transparency. Ultimately, an empowered populace can demand more from its authorities, hold them to deliver on promises and services, and offer informed input regarding activities that affect them.

A local content project that is entirely based on arts, culture, heritage or IK, e.g., the training of indigenous peoples to publish their indigenous stories on a Web site, also contributes to sustainable development. But the important point to note is that the projects described above do not fit into a culture-focused view of local content, even though they are good examples of ICT-based local content projects.

5 http://www.capegateway.gov.za

6 A Wiki is a Web site that allows users to easily add content to the site, but also allows anyone to edit the content. It is a popular collaborative content management tool.

8
Towards a Broader Definition of Local Content

While there is a genuine need in SA for a restoration and celebration of IK, for reasons of posterity, rebuilding of national identity and even, according to the DST (2004b), its role "in employment and wealth creation," there are dangers in having a limited definition of local content. The way concepts are defined, and the words used in the definitions, can easily make people draw incorrect assumptions or limit the way people think about those concepts (Kvasny and Truex 2001). Thus to promote local content as primarily cultural and traditional content can undermine the power of local content in other key areas, e.g., e-government, SMMEs, modern medicine, etc. All thinking around local content, including its monetary value, will be somewhat influenced by a limited view, and that can be problematic, especially for communities who are not primarily concerned with IK.

Another concern is that global ICT networks can turn knowledge—indigenous or otherwise—and culture into commodities, which "can be controlled and sold often without attention to cultural preservation considerations" (Jackson and Eksteen 2001). Furthermore, because IK is "dynamic and based on innovation, adaptation and experimentation," it is not easy to codify and doing so "may lead to the loss of some of its properties" (DST 2004a). This poses a risk of actually reinforcing the marginalization of indigenous people if the digitization of content does not show the necessary sensitivity to the historical and human systems within which that content exists (Jackson and Eksteen 2001). This is a real challenge for ICT-based IKSs.

While these risks are only potential ones, they should be borne in mind. In the light of the strong convergence of sustainable development and the IS around local content, it is recommended that a sustainable development paradigm be applied to the definition of local content, that is, that a more holistic view be taken.

8.1 Recommendations for the national IS strategy

Zhu *et al.* (2003 in Williamson 2004) observe that, in considering the adoption of ICTs, "it is important to consider the micro-level motivators, both societal and personal. They suggest that individuals need to first be aware of and then motivated to want to use ICTs and, subsequently, that it is important that individuals and groups are able to identify value in its ongoing use."

Thus on a general level the national IS strategy should promote ICTs so that people are aware of them and their benefits. This exercise should also serve to demystify ICTs; people need to move beyond seeing ICTs as computers and realize that their mobile phones, TVs and radios are also ICTs. It will probably come as a surprise to many people that ICTs are already entrenched in their lives. Furthermore, awareness-raising must be cognisant of the negative perception that some people

have of ICTs, e.g., individuals who have been made redundant in factories due to new technologies, or lack of ICT skills meaning that someone does not get a particular job. The awareness exercise must be an educational one that realistically demonstrates the potential of ICTs for people in real, tangible ways, e.g., an SMS job alert service, or the use of satellite imagery in weather predictions, which informs agricultural practices that have a direct impact on GDP for a country like SA.

Ultimately, regarding local content, communities should be helped to express their information needs, then be provided access to that information and finally empowered to create it themselves. At the Cape Town workshop, Dave MacDevette of Empowerment for African Sustainable Development suggested that the government needs to create an enabling environment for local content in SA. But how can it do this? How can it create an environment that promotes the full and equal participation of all South Africans in sustainably growing the body of local content?

The following are recommendations to the PNC as it drafts the national IS strategy, which is a key element of the desired enabling environment.

- Given the government's strong commitment to sustainable development, it would seem important for government to portray ICTs not as an end unto themselves, but rather as powerful tools that need to be managed and integrated into society along the principles of sustainable development. Government must convey that its vision of the IS is not something with entirely new goals and values, but is a "connected" society that uses ICTs to support SA's existing efforts towards sustainably meeting its development goals.
- In order to help the national IS strategy couch the IS within sustainable development, it should provide tangible benefits to using ICTs to achieve sustainable development goals, for example, demonstrate how ICTs help a girl leaving school to find employment.
- The national IS strategy should define local content as something bigger than arts, culture and heritage. Because local content runs right through the other four priority areas—e-health, e-education, e-government and SMMEs—local content should rather become an underlying "pillar," or a sub-component of each of the other four areas. Taking a broad view of local content, one that can work when applied to any sector, will help people to make the connection between their needs, their personal and wider community motivators, and how ICTs can meet these. This is an important step for increased ICT adoption.

9
Looking Ahead

Broadly speaking, the work of the PNC is to create a framework for the building of an IS in SA. It is currently consulting with key departments to ensure that their sectoral interests are promoted in the IS strategy. After the strategy is released there will be more prescriptive policies and sector-specific ICT strategies created by stakeholders within all three spheres of government. The mandate of the PNC is to inform and guide the work of these "line function" departments, for example, the way it collaborated with the Department of Communications on its e-education strategy.

The fact that each department will ultimately drive its own IS strategy is potentially good news for sustainable development. As long as there is a broad sustainable development focus within a department there is scope for it to be cognisant of drafting IS strategies that support this. Still, the PNC would do well to keep pushing a sustainable development agenda as it assists departments to apply ICTs in their specific sectors. In fact, this applies to all country governments if there is to be the desired convergence of sustainable development and IS policy efforts in the world.

10
Conclusion

Local content is a major area of convergence between sustainable development and the IS, cutting across many sectors. It is relevant in that it is the product of a move towards greater access to information, transparency, accountability, cultural diversity and the empowerment of people to participate in decision-making that affects them. It can be seen as the currency of a community in the IS. The national IS strategy should, therefore, not limit local content using ICTs to arts, culture, heritage and IK, but rather give it a broader definition that allows it to play its important role as a contributing factor to achieving sustainable development.

In conclusion, the national IS strategy must make ICTs real to the citizens of SA. It is easy to make certain sustainable development issues real when they are clearly visible, e.g., the need to address the problem of an upstream factory that dumps its waste products into a river on which a local community relies for fishing. But motivating for an IS can be difficult, especially in the context of developing countries where more urgent needs characterize daily existence. In order to demonstrate the importance of local content using ICTs in this regard, it is necessary to apply it to the needs of people, which aren't always arts, culture or heritage based. Again, this supports the call for a broader definition of local content that is more cross-sectoral.

This paper has shown how real and strong the influence of sustainable development is on the positioning of local content with the support of ICTs in a South African IS strategy context. South Africa has waited a long time for a national IS strategy, even while "the centrality of ICT to economic growth and poverty alleviation has been widely articulated" (Gillwald *et al.* 2005). As the country continues to grow out of the Apartheid legacy and deals with its major developmental challenges, the IS strategy should continue the tradition of commitment to sustainable development as evident in SA's existing policies.

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"All our efforts to defeat poverty and pursue sustainable development will be in vain if environmental degradation and natural resource depletion continue unabated."

United Nations Secretary-General, Kofi Annan

Using ICTs for Poverty Reduction and Environmental Protection in Kenya

The "M-vironment" Approach

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Abstract

Mungai recommends a more significant consideration of environmental issues in the regional and national poverty reduction and ICT discussions in Kenya. Specifically, he recommends addressing poverty reduction as proposed in the MDGs and resolutions of the WSSD. Opportunities for quick gains for Kenya lie in e-environment and e-agriculture initiatives. An illustration of a potentially beneficial application of new technologies is found in mobile telephony. The author presents the "M-vironment Framework," a mobile telephony platform which can help enable financial sustainability for environmental protection efforts; facilitate awareness-raising and exchange of information; strengthen early warning systems; raise environmental consciousness among ICT solutions providers; create employment; and protect livelihoods.

This paper is dedicated to my son, Jesse—the first of the next generation that will, as a result of aggressive national m-vironment initiatives, inherit a more sustainable world.

▼

"Nations are like the traditional African three-legged stool. When the three legs of peace, democracy and equitable sharing of environmental resources are firm, there is a seat for sustainable, productive development to take place. Wobbly legs, make for wobbly nations."[1]

Professor Wangari Maathai, Kenya's Environment Assistant Minister and winner of the Nobel Peace Prize in 2004

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1 Prof. Wangari Maathai, during a visit to the Women's Edge Coalition, Washington DC, USA. http://www.womensedge.org/pages/newsandevents/news.jsp?id=402

1
Introduction

In 2005, the United Nations organized separate global summits to set the agenda and review the status of the emerging information society and sustainable development issues. The two events were The 2005 World Summit in New York and the World Summit on the Information Society (WSIS) in Tunisia. According to discussions, it has become apparent that the sustainable development and information society communities continue to work in isolation from each other leading to a lack of policy coherence at the national level. There is a need to ensure that the separation of information society issues and sustainable development concerns does not result in incoherent policy approaches.

This paper seeks to identify the policy implications of the development of the information society on the attainment of sustainable development goals in Kenya. The paper is premised on the belief that "sustainable development can best be advanced in the Information Society when ICT-related efforts and programs are fully integrated in national and regional development strategies"[2] and informed by existing research on the linkages between sustainable development and the information society. In relation to national development priorities in Kenya, the paper seeks to clarify the implications of the Millennium Development Goal (MDG) that aims to "make available the benefits of new technologies, especially information and communications technologies"[3] and forms the basis for the new ICTs for development approach anchored on MDG-based poverty reduction strategies.

A review of literature on the national sustainable development priorities in relation to the global trends led to a focus on the potential implications of the information society on poverty and environmental protection in Kenya. In appreciation of the need to include environmental protection as a factor in the design of solutions, products and lifestyles,[4] this paper explores the opportunities for inclusion of this principle in future information society policy in Kenya. To achieve this, the author further reviews recommendations in the WSIS Declaration of Principles on E-environment[5] and E-agriculture as well as national case studies that provide a guide for policy recommendations.

Apart from contributing to the global, national and sectoral IS and SD policy debates, the paper seeks to specifically recommend a more significant consideration of environmental issues in the regional and national Poverty Reduction and ICT discussions facilitated by the International Development Research Centre (IDRC) and partner organizations.

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2 ITU 2004, *Helping the World Communicate*, World Summit on the Information Society (WSIS), Geneva, 2004.

3 UN, MDG 8, Target 17, *Millennium Declaration*, 2000, United Nations, New York, USA.

4 See: Shauer, Thomas, Proceedings of Southern E-Forum, http://lists.iisd.ca:81/read/?forum=issd

5 ITU 2004, WSIS Declaration of Principles, Helping the World Communicate, World Summit on the Information Society (WSIS), Geneva, 2004.

2
Organization of the Paper

The paper begins by discussing the information society and sustainable development policy situation in Kenya. After reviewing the ICT policy development process since the 1980s, the paper outlines the development of sustainable development policies since the 1992 United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil. It goes further to detail the national position at the World Summit on Sustainable Development in 2002. The review of policy development is followed by suggestions on ways to address the challenges in prioritizing environmental protection and ICT issues.

Based on the *Millennium Development Goals Report for Kenya 2003*, a discussion of the current status in fulfilment of the MDGs is presented. Case studies of projects that use SMS, satellites and geographical information systems are used to demonstrate the linkages between the information society and sustainable development in Kenya.

Analysis of the case studies forms the basis for the emerging *m-vironment* approach—a framework for environmental sustainability initiatives using mobile telephony—to propose implementation of an aggressive environmental sustainability initiative using mobile phones, while detailing how it advances IS and SD linkages.

The paper concludes with a discussion of opportunities that exist for better linkages between IS and SD within sectoral and overarching policies.

Finally, several policy changes are recommended, including the implementation of the national *m-vironment initiative* and increased interaction between IS and SD practitioners.

3
Methodology

This paper was developed after a desk review of literature, interviews with national advisors and stakeholders as well as material gathered during information society and sustainable development events.

The first phase of the study involved a review of literature on global sustainable development and information society issues. The separation of issues at the global level became apparent and the various priorities for different countries were revealed. The literature review then focused on national priorities of sustainable development and information society. This involved an exploration of the history of IS and SD policy development in Kenya.

The next phase of the study involved identifying the national priority issues according to stakeholders. The priority issues for Kenya were based on feedback received from about 30 respondents interviewed by the author and via e-mail interviews on IS and SD issues. Respondents included scholars, researchers, business people, students, heads of NGOs in Kenya and representatives of the National Environment Management Authority (NEMA). The feedback was used to develop an overall picture of IS and SD priorities. To build the case for SD and IS interplay in Kenya, the study also relied on comments submitted by participants in the *KICTANet Online Discussions on the Draft ICT Policy*. Several ideas were presented and weekly summaries circulated. Discussions were held with National Advisors at different stages of the project—during events and through the position papers they made available to clarify their perceptions.

4
Country Overview for Kenya

Kenya has a population of over 32 million people living on a total surface area of about 587,000 km^2 out of which 576,000 km^2 is land area and 11,000 km^2 is water. This eastern African country has been undergoing economic, social and political transition with positive indicators in many of the sectors. The changes are propelled by the political transition that began after the change of government in December 2002—10 years after the introduction of multi-party democracy—that saw the exit from power of the Kenya African National Union (KANU) that had ruled the nation for 40 years. The ascent to power of the National Rainbow Coalition (NARC) led to unprecedented optimism about the future of the nation leading to Kenyans being rated as the most[6] optimistic people in the world in 2003. The result has been an expanded democratic space with Kenyans enjoying freedoms such as political expression and multistakeholder consultations with the government.[7] The country is also in the process of constitutional review, which is scheduled to result in the adoption of a new constitution in December 2005 and has contributed to the open multistakeholder discussions on issues of governance and politics.

Economic indicators have also been positive with the country achieving record economic growth in real Gross Domestic Product (GDP) that expanded by 4.3 per cent in 2004 compared to a growth of 2.8 per cent in 2003.[8] The tourism and hotels sector expanded by 15.1 per cent while the communications sector grew by 10.1 per cent. It is estimated that the country generated about 500,000 jobs annually in 2003 and 2004. The rate of growth in the agricultural sector, which contributes 24 per cent of the GDP, declined to 1.4 per cent in 2004 from the more significant 2.6 per cent growth in 2003. An indicator of confidence in Kenya's economic progress is demonstrated in the *Kenya Business Leaders Confidence Index for 2005* that indicated that 73 per cent of business leaders are confident that the economy would grow by 5.3 per cent.[9]

Several significant challenges exist for the majority of Kenya's 32 million people. The challenges may be seen in the fact that over 57 per cent of the population

6 Republic of Kenya 2005, *Kenya's Experience With the Peer Review Process Under Partnership for African Development and Its Relevance for Poverty Reduction*, Speech by Prof. Anyang' Nyong'o to the Kenya Conference of Catholic Bishops, St Thomas Aquinas Seminary, Lang'ata, May 6, 2005. http://www.planning.go.ke/Speaches_Min_Catholic_Bishops_on_APRM_6_May_2005.htm

7 Munyua, Alice Wanjira 2005, *New Generation of Policy Development: The Case of Multi-stakeholder ICT Policy Process in Kenya, CATIA* (Catalysing Access to ICTs in Africa), Association for Progressive Communications, Nairobi, Kenya. http://www.catia.ws/Documents/New%20Generation%20of%20Policy%20Development%20in%20Kenya%20Version%202.doc

8 Nyong'o, Hon. Prof. Peter Anyang', *The Economic Survey 2005*, Ministry of Planning and National Development, Republic of Kenya, May 25, 2005.

9 Nation Media Group 2005, New Survey Shows CEOs Hopeful About Economy, *Daily Nation*, September 14, 2005, Nairobi, Kenya.

lives below the national poverty line,[10] an HIV prevalence level of up to seven per cent[11] of the population, and a life expectancy at birth of 44.6[12] years. Other issues include landlessness that has led to conflict over land, official corruption and decreasing support by development partners. The tourism industry has also been adversely affected by travel advisories imposed on Kenya by the United States after two terrorism-related attacks on the country since 1998.

On environmental issues, the country is experiencing a strain on resources; for example, only 17 per cent of the land is arable, yet 64 per cent of the economically active population depends on agriculture. Further, over 75 per cent of Kenyans live in rural areas, yet 57 per cent of the population lacks sustainable access to an improved water source. Due to landlessness and the need for fuel, the depletion of forest cover has continued unabated with traditional fuel (timber) making up 70.6 per cent[13] of the total energy requirements. The situation is aggravated by the fact that forests cover only two per cent of the land in Kenya,[14] most of which is made up of indigenous forest.

With the growth in cities, pollution is a great concern with 62 per cent[15] of pollution originating from urban domestic waste. This trend needs to be reviewed in consideration of the high poverty levels in urban centres. Up to 70 per cent[16] of the people in Nairobi live in slums that lack waste management systems and are, in some cases, located next to the city's dumping sites.

10 Republic of Kenya 2003, *State of the Environment Report for Kenya 2003*, National Environmental Management Authority, Kenya. http://www.NEMA.go.ke

11 Nyong'o, Hon. Prof. Peter Anyang', *The Economic Survey 2005*, Ministry of Planning and National Development, Republic of Kenya, May 25, 2005.

12 UNDP 2004, *Human Development Report for Kenya*, UNDP, Nairobi. Kenya.

13 UNDP 2004, Energy and environment Indicators, Traditional fuel consumption (% of total energy requirements), 2001, *Human Development Report*, NY, USA. http://hdr.undp.org/statistics/data/cty/cty_f_KEN.html

14 UNDP 2003.

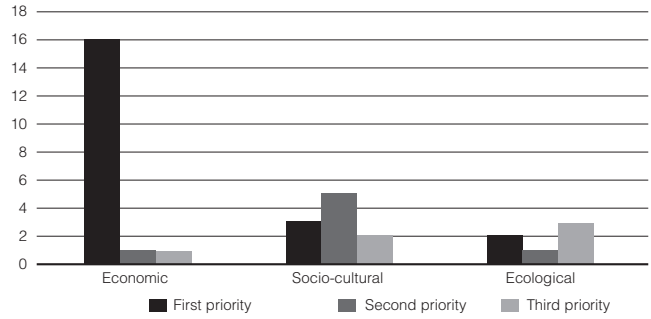
15 NEMA 2003.

16 Government of Kenya and the United Nations Kenya Country Team (2003), *Millennium Development Goals Progress Report for Kenya*, Ministry of Planning and National Development, April 2003, Nairobi, Kenya.

5
Poverty, ICTs and the Environment: The Links

An analysis of literature and feedback from stakeholders resulted in a focus on the interplay between poverty, ICTs and environmental protection in Kenya. It sought to identify innovative approaches in the area of ICTs for environmental protection and poverty reduction. In relation to the MDG framework, the poverty reduction and environmental protection study provides an ICT link between Goal 1 on elimination of extreme poverty and Goal 7 on environmental sustainability.

Figure1: SD priorities for Kenya based on 26 respondents interviewed 06/2005



The ICT, poverty reduction and environmental protection study was verified by responses from 26 of 40 stakeholders interviewed via e-mail. Feedback received from 26 respondents (see Figure 1) familiar with Kenya's ICT and sustainable development efforts indicates that economic issues should remain the principal concern for policy-makers. Social cultural dimensions such as political participation, youth and gender issues came second while only two respondents felt that the environment should be the first priority. Only three respondents explicitly stated that there should be interplay of the three sustainable development pillars. Some respondents only mentioned one area of priority—poverty reduction—with several urging that the adoption of ICTs should be done cautiously. According to the respondents, the main link between environmental protection and poverty reduction was in economic activities such as agriculture and tourism. Although tourism may be viewed as having minimal destructive impact on the environment, it has great implications on increased energy consumption and global warming especially when tourists travel by air. In a country where woodfuel makes up 70.6 per cent of energy consumption with only two per cent forest cover, it is imperative that environmental protection be prioritized in all development policies while encouraging Kenyans to adopt economic activities that have minimal adverse effects on the environment.

As evidenced in the above responses, the "environment tends to come late and superficially into the agenda of critical development initiatives due to its low priority in development contexts."[17] On the other hand, a key conclusion of the *World Employment Report 2004: Life at Work in the Information Society*[18] is that the ability of ICTs to reduce poverty and spur development will be determined by their impact on employment, as well as economic growth. Therefore, to elevate environmental issues in national IS and SD policy, the economic gains must be emphasized especially at the grassroots level.

A review of IS policy in Kenya[19] reveals an unfortunate case of a country dependent on natural resources yet without clear policy guidelines and strategies on how ICTs can facilitate the protection of the environment. This is despite being a signatory to the Millennium Declaration that, among other goals, seeks to integrate the principles of sustainable development into country policies and programs while reversing the loss of environmental resources.[20]

The prioritization of poverty reduction can be explained by a review of the poverty dynamics in Kenya. More than half of the population lives below the national poverty line with a high dependency on rain-fed agriculture. This has resulted in excessive pressure on natural resources, which at times has led to conflict between communities over water and grazing grounds. Only about 1.8 per cent of the country is covered by water. Efforts to reduce poverty are usually inhibited by adverse climatic conditions such as drought and floods that result in low economic productivity. Poverty reduction is, therefore, the main national sustainable development priority.[21] Four or five times in a decade, drought and/or heavy rainfall are likely to cause increased morbidity and mortality rates[22] among people and livestock in the arid and semi-arid lands.

Inequality in the distribution of the nation's scarce natural resources is a problem as significant as the high levels of poverty as it breeds counterproductive social tension and in some cases, conflict over resources. The socio-political stability of the country is therefore dependent on sustainable use and distribution of resources and the protection of the environment.

The National Environmental Management Authority admits that the relationship between poverty and environment is complex.[23] The poor are often the victims

17 Statement From the African Civil Society Forum to the 23rd Session of UNEP Governing Council//Global Ministerial Environment, *4. (d) International Environmental Governance (IEG)*.

18 "World Employment Report 2004: Life at Work in the Information Society."

19 Government of Kenya 2004, Draft National Information and Communication Technology (ICT) Policy, Ministry of Information and Communications, Kenya. http://www.information.go.ke

20 Goal 7 (MDGs): Ensure environmental sustainability: United Nations 2000, *Millennium Development Goals*, New York. http://www.millenniumgoals.org

21 Government of Kenya 2002, *National Sustainable Development Priorities*, National Assessment Report to the WSSD, Ministry of Environment, Natural Resources and Wildlife, Nairobi.

22 UNDP-Kenya 2002, *Crisis Prevention & Recovery in Kenya*, UNDP Disaster Reduction Unit. http://www.undp.org/bcpr/disred/index.htm

23 Government of Kenya 2003, *State of the Environment Report for Kenya 2003*, National Environmental Management Authority, Kenya. http://www.NEMA.go.ke

of environmental degradation caused by other members of the society. At the same time, the poor often engage in livelihood activities that result in environmental degradation. Poverty leads to overuse and destruction of natural resources where short-term development goals are pursued at the expense of long-term environmental sustainability. Policy-makers cannot, therefore, ignore the interplay between environmental protection and poverty reduction. Several initiatives such as the Lake Victoria Environmental Management Project, *Eco-Schools* by Kenya Organization for Environmental Education (KOEE) and the work of the UNEP Poverty and Environment Unit demonstrate this interplay.

In exploring the links between poverty and environment in Kenya, the story of Kieran Cooke[24] in Maasai provides an enlightening anecdote. According to Cooke, "The Maasai have come to know all about climate change. 'Normally we have two rainfalls a year,'" says Wilson, "'the long rains from March to May and the short rains from October to November. This year the long rains failed and the short rains have come late—it's the worst drought we've ever had.'" Other anecdotes include the displacement of 60,000 people by floods in Budalangi division of Kenya's Busia District in 2003 as well as the loss of about 2,000 lives during the El Niño floods of 1997–1998,[25] which were disasters resulting from climate change and are direct causes of poverty. The impact of climate change, one of the main topics of the 2005 G8 Summit[26] in Gleneagles, Scotland is, therefore, felt beyond the developed nations that together contribute 47 per cent of global greenhouse gas emissions that have led to global warming. It is little wonder that the G8 has commissioned a study to look into Africa and climate change.

According to the WSIS Action Plan, *governments, in cooperation with other stakeholders, are encouraged to use and promote ICTs as an instrument for environmental protection*[27] *and the sustainable use of natural resources*. On the other hand, research by IDRC and others has shown that "there is a positive correlation between ICT[28] access and income levels." The poverty, ICT and environmental protection linkage is, therefore, in line with a call to governments to "review economic production and growth models and make adjustments to existing strategies and tools that are inclusive of the environment and technology with an emphasis on poverty eradication."[29]

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24 Cooke, Kieran 2004, "People are going hungry. Our cattle are dying. What can we do?", World Report, *Environment Times*, UNEP/GRID-Arendal.

25 Maathai, Prof. Wangari and Grace Akumu 2004, in speeches during the workshop on Dialogue with East African Legislators on Climate Change and Sustainable Development Issues, Nairobi, Kenya. http://www.sarpn.org.za/documents/d0000889/P985-CNA_Climate-Change_April2004.pdf.

26 2005 G8 Summit in Gleneagles. http://www.g8.gov.uk/

27 ITU 2004, *Helping the World Communicate: WSIS Geneva, 10-12 December 2003*; Action line C7: ICT applications, Benefits for all, Action 20. E-environment (a): WSIS Plan of Action.

28 Adeya, Nyaki 2005, *Regional Workshop on ICTs and Poverty Reduction*, January 17–19, 2005, Nairobi. Kenya.

29 UNEP 2003, Environment and Poverty: Outcomes from the Fourth Global Civil Society Forum, Kenya, UNEP Headquarters, Nairobi, February 2003.

6
The IS and SD Policy Situations in Kenya

6.1 Kenya's progress in the development of information society policies

The development of the information society in Kenya can be reviewed in terms of the development of ICTs, informatics, e-government or telecommunications reform policies, which have been actively pursued since the early 1980s. During that period, reforms have been influenced by private sector and civil society organizations[30] with significant efforts by the Computer Society of Kenya (CSK); Telecommunication Service Providers of Kenya (TESPOK); Africa Regional Centre for Computing (ARCC);[31] IT Standards Association (ITSA); Kenya Community Media Network (KCOMNET); Kenya Information Society (KIS); ABANTU for Development; Africa Technology Policy Studies Network (ATPS); Kenya ICT Policy Project; and, most recently, by a multisectoral consultative forum[32] known as the Kenya ICT Action Network[33] (KICTANet). UNECA's Africa Information Society Initiative (AISI); National Information and Communication Infrastructure (NICI); the COMESA Model ICT Policy; World Trade Organization agreements; ITU and UNCTAD resolutions; as well as the WSIS process are some of the regional and global factors that have influenced debate on ICT policy in Kenya over the years. A unique aspect was the year 2000 millennium bug scare that led to the Y2K Taskforce, supported by government.

The first Draft National Information Policy was developed in the 1980s with a Draft National Informatics Policy following suit in 1993. There were several reforms in the media sector in the 1990s that saw the licensing of commercial radio and television broadcasters. The reforms, however, remained incomplete because of the failure by government to create a framework for community broadcasting[34] and amend the Kenya Broadcasting Corporation (KBC) Act, which established the public broadcaster as a regulator and monopoly service provider.

One of the most significant developments in Kenya's IS policy was the telecommunications sector reform that culminated in the enactment of the Kenya

30 Mureithi, Muriuki 2002, *Africa ICT Policy Monitor Project: Kenya*, Association of Progressive Communication (APC).

31 ARCC introduced the first Internet services in Kenya in the form of FidoNet before commercial ISPs were established.

32 Munyua, Alice Wanjira 2005, *New Generation of Policy Development: The Case of Multi-stakeholder ICT Policy Process in Kenya, CATIA* (Catalysing Access to ICTs in Africa), Association for Progressive Communications, Nairobi, Kenya.

33 Banks, Ms. Karen 2005, *The Priority Issues for Civil Society, Civil Society Session, Tokyo Ubiquitous Network Conference*, Association for Progressive Communications (APC), USA, May 2005.

34 Githaiga, G. 2000, *Rural Community Broadcasting and the Role of National Networks*, MISA, a presentation in Windhoek Namibia.

Communications Act in 1998. This new legal framework, informed by the World Bank Telecommunications Reform theories, sought to separate the regulatory, postal and telecommunications service provision functions of the then national service provider, the Kenya Post and Telecommunications Corporation (KPTC). As a result, the Communications Commission of Kenya (CCK) was established as a regulator while Telkom Kenya Limited and the Postal Corporation of Kenya (PCK) were set up as the telecommunications and postal service providers. The Act also established the National Communications Commission that was to play a policy advisory role within the communications ministry. A Communications Appeals Tribunal was also established to arbitrate any disputes in the industry.

The impact of the progressive Kenya Communications Act was limited by the Telecommunications and Postal Sector Policy (TPSP) of 1999, which restricted the commercialization of several telecommunications services and allocated Telkom Kenya a five-year exclusivity period for provision of services such as international calling, Internet backbone and telecommunications in the capital city. The policy set out a market structure that was to lead to the failed establishment of Regional Telecommunications Operators (RTOs) in rural areas and restricted mobile phone network services to only two providers. The latter provision was in conflict with the legal requirement that abolished monopolies and duopolies.[35] The market structure was revised in 2001 when the TPSP was changed to allow for the licensing of new players such as equipment re-sellers and courier service providers. The restrictive nature of the TPSPS did not, however, limit the explosive adoption of mobile telephony that resulted from the licensing of the second GSM network service provider in 2000. The competition between Safaricom Limited and Kencell Communications Limited (now Celtel Kenya Limited) provided most of the telecommunication benefits that Kenyans lacked when they depended on Telkom Kenya for inefficient provision of landlines. The mobile phone subscription has grown from 200,000 in 2000 to over 4.2 million in June 2005.[36] Since 2000, Safaricom Limited has registered six million subscriptions but only three million remained active by mid-September 2005. It is expected that the licensing of the third mobile network provider would result in increased access to ICTs and a more competitive and customer-conscious operating environment. However, the licensing process has remained controversial with the winner of the tender, Econet Wireless Kenya Limited, taking the government to court for cancellation of a licence already issued by the Communications Commission of Kenya.

Although there have been three different draft ICT policy documents since 2002,[37] there has been a demonstrated focus and growing trust in the ICT policy development process. The invitation of civil society and private sector to an open

35 Section 5 (5), *Kenya Communications Act* (1998).

36 Wandera, Noel 2005, Battle for the Numbers: Cellphone companies' competition turns to quality products, *Financial Standard, The Standard*, Tuesday, July 5, 2005. http://www.eastandard.net

37 Government of Kenya, The First National Information and Communications Technology (ICT) Policy Conference, FINAL COMMUNIQUE, (March 23–28, 2003).

debate on ICT policy issues may have resulted from lessons learned in the development of the Poverty Reduction Strategy Paper (PRSP) that was launched in 2000. The government has since held three National ICT Policy Conferences with the active involvement of civil society and the private sector. In early 2004, the government launched the first-ever E-government Strategy that set out immediate, medium-term and long-term e-government targets. The establishment of an e-government secretariat under the leadership of a cabinet-level ICT secretary was another positive structural step in the adoption of ICTs in the development planning process.

Despite the various reform efforts, development has been hindered partly by the lack of a coordinated approach to ICT issues in government. There is a multiplicity of government departments and institutions that have for long lacked centralized coordination.[38] For many years, government information technology functions have been coordinated from the Government IT Services (GITS) within the then Ministry of Finance. This was due to the history of data processing functions in government that initially focused on payroll systems and statistical analysis. On the other hand, the policy issues had been divided between the Ministry of Information and Tourism and the Ministry of Transport and Communications that handled broadcasting and telecommunications functions, respectively. The latter conflict was, however, resolved with the establishment of the Ministry of Information and Communication in late 2004. The establishment of the new *converged* ministry was a positive development coming as it did after the exclusivity period[39] of Telkom Kenya had lapsed in June 2004 resulting in an open market environment. The opening up of the telecommunications and information technology market as well as the convergence of various technologies has put pressure on the industry regulator, CCK, to develop a new regulatory[40] framework.

There have been several attempts to achieve understanding and trust between stakeholders in the ICT policy development process. Such efforts have included the hosting of the National ICT Vision Workshop in November 2004, annual National ICT Conventions and other forums that have included media and community organizations in the process. The WSIS process has resulted in the establishment of a Kenya Civil Society Caucus on WSIS, WSIS Youth Caucus (Kenya) and the government-led National WSIS Taskforce whose secretariat is at the CCK. The CCK has led the government's participation in the WSIS process due to the structural relationship with the International Telecommunications Union (ITU). The process has resulted in the active participation of Kenyan representatives in the Working

38 Mungai, Wainaina 2003, *Linking the Information Society to Sustainable Development in Kenya*, a presentation at the WSIS/ICT4D Platform, Geneva, December 11, 2003.

39 Government of Kenya 2001, *Telecommunications and Postal Sector Policy Statement*, Ministry of Transport and Communication.

40 Kemei, Christopher K. 2004, *Post Exclusivity Licensing & Regulatory Strategy In a Liberalized Communications Industry, Communications Commission of Kenya*, October 2004.

Group on Internet Governance,[41] Gender Caucus and Internet Consortium on Assigned Names and Numbers[42] (ICANN).

In June 2005, the Ministry of Information and Communication hosted a National ICT Stakeholders Conference that was viewed as the most inclusive multistakeholder ICT policy discussion aimed at finalizing the adoption of the Draft National ICT Policy. The conference applied an open debate system that was informed by the comments on the Draft National ICT Policy (2004) from, among others, the Kenya ICT Action Network, and adopted resolutions of the various topical working groups. The consultative nature of the conference can also be credited to the lessons learned from participation of government and civil society players in the WSIS process, the development of the PRSP and the constitutional review process that involved multisectoral input. An indicator of the inclusion of civil society in the policy process is in the recent appointment of a civil society representative[43] as director of the reconstituted board of the CCK.

There were, however, some challenges such as the difference in perspective between the two schools—one that was influenced by the global ICTs for development agenda; while the other is founded in the telecommunications reform approach that has historically influenced policy, legal and regulatory frameworks in the broadcasting and telecommunications industry. Such challenges in the process were overcome by the focus on the conference theme that centred on *Harnessing ICTs for National Development*. The challenge may have been resolved by the adoption of cross-cutting issues[44] such as vision and mission, content issues, universal access service, human capacity, innovation, legal and regulatory frameworks, institutional frameworks and e-governance. Many of the participants from civil society had previously taken part in the multisectoral *Poverty and ICT Roundtable discussions* that attempted to identify ways in which poverty can be reduced through the application of ICTs in Kenya.

The final National ICT Policy in 2005 will result in the development of sectoral policies, enactment of relevant legislation such as the Draft Freedom of Information Act (2005), repeal of the Kenya Broadcasting Corporation Act, as well as the establishment and restructuring of relevant institutions. It is hoped that the final policy will aggressively pursue the agenda of the Economic Recovery Strategy for Wealth and Employment Creation[45] (ERSWEC) that seeks "to make Kenya a less agricultural-dependent country by diversifying to other sectors while still recognizing the strategic position of agriculture in fighting poverty. The

41 Waudo Siganga, Chairman of Computer Society of Kenya, was appointed to the WGIG by the UN Secretary General, Kofi Annan.

42 Njeri Rionge, CEO of Wananchi Online is active in ICANN board.

43 Alice Munyua, National Coordinator for the APC/CATIA project and KICTANet.

44 Presentation of findings by the Cross Cutting Issues Group at the National ICT Stakeholders Conference, May 2005.

45 Magana, Owino 2005, *ICT Policy & Implementing Kenya's ERS*, a presentation at the Second National ICT Convention, March 8–9, 2005, Nairobi.

agricultural sector share of GDP will consequently decline from 24.0 per cent in 2002 to 22.2 per cent in 2007."[46]

According to the proposed National ICT Policy awaiting approval by the cabinet,[47] Kenya had 240,000 fixed telephone line subscribers and 2.8 million cellular mobile subscribers by September 2004, translating into fixed teledensity of 0.75 per 100 inhabitants for fixed and 9.75 per 100 inhabitants for mobile against the world average of 19 and 21 respectively. This growth in ICT coverage is complemented by the 73 registered ISPs, 16 of which are active and reaching approximately 1,030,000 Internet users. Most Kenyans access the Internet through the over 1,000 cyber cafés and telephone bureaus identified by April 2004. There were an estimated 520,000 personal computers at the beginning of 2004 giving the number of computers per 100 inhabitants as 1.6. There are also more than 16 operational television stations and 24 FM radio stations reaching an estimated 60 per cent and 90 per cent of the population, respectively. It is on this ICT infrastructural background that the policy intends to catalyze faster overall national development. Fortunately for Kenya, the rapid adoption of mobile telephony and other ICTs has resulted in almost five million active mobile phone users.

6.2 Kenya's progress in the development of sustainable development policies

The development of sustainable development policies shares several similarities with the development of IS policies in Kenya. For decades, government policymakers have advocated for proper environmental management. However, it was not until 1994—two years after the launch of Agenda 21—that the government adopted the National Environmental Action Plan (NEAP).[48] In 1995, Kenya became a signatory to the resolutions of the World Summit on Social Development (WSSD) held in Denmark. This was followed in 1999 by the parliamentary adoption of Sessional Paper No. 6 on Environment and Development and the resulting enactment of the Environmental Management and Coordination Act (EMCA). The EMCA established an autonomous National Environment Management Authority (NEMA); the Standards Review and Enforcement Committee; the Public Complaints Committee; and the National Environment Tribunal. The Act also calls for the review of all policies and laws touching on environmental management as well as the development of Environmental Standards and Environmental Impact Assessment (EIA) Guidelines and Regulations. The launch of the PRSP in 2000 signalled the government's increasing commitment to participatory policy development processes for poverty eradication. The launch of the PRSP in the same year as the

46 Government of Kenya 2003, *Economic Recovery Action Plan, Economic Recovery Strategy for Wealth and Employment Creation 2003–2007*, Ministry of Planning and National Development, Nairobi, Kenya.

47 ICT policy was still awaiting Cabinet approval in September 2005.

48 Government of Kenya 2003, *State of the Environment Report for Kenya 2003*, National Environmental Management Authority, Kenya. http://www.NEMA.go.ke

Millennium Declaration has resulted in a continued process of integrating[49] the local PRSP framework with the MDG targets.

The PRSP process led to the establishment of the Poverty Eradication Commission (PEC) at the Office of the President to implement a 15-year National Poverty Eradication Plan (NPEP) whose mandate includes achievement of the MDG-related poverty reduction goal by 2015. However, the actual implementation is in the form of three-year rolling Poverty Eradication Plans.[50]

In 2001, with the launch of New Partnership for African Development (NEPAD), Kenya became signatory to a multilateral environmental agreement within the framework of the African Union (AU). As a result, Kenya is the focal point for the marine and coastal sub-program of NEPAD with a secretariat at NEMA.

The World Summit on Sustainable Development (WSSD), held in 2002, provided an opportunity for government to review the progress in development and implementation of SD policies. The review resulted in the submission of a National Assessment Report for WSSD. With Kenya being the headquarters of the United Nations Environmental Programme (UNEP), a lot of assistance was available in the development of the report. However, the contributions by civil society organizations and non-governmental organizations were late or otherwise not included despite their active participation at different levels of the WSSD preparatory process, commenting on the national position, especially in the PrepCom 3. Unlike in the case of the delegation to the WSIS in 2003, the WSSD delegation failed to include civil society as official representatives. There were, therefore, separate groups from Kenya participating.

In 2003, the launch of the ERSWEC created an opportunity for sustainable development policies to be clearly articulated in the government planning process. There were positive indications in the language of the ERSWEC of a plan to strengthen SD policies, especially on environmental degradation issues. However, there was little mention of the environmental issues in the implementation plan as revealed in the excerpt from the *Implementation Matrix of the ERSWEC 2003–2007* in Table 1.

The implementation matrix mentions only one project, the Lake Victoria Environmental Management Project (LVEMP), which is a program co-funded by the World Bank and the Global Environment Facility (GEF). According to the World Bank Group,[51] LVEMP is a comprehensive program aimed at maximizing the benefits to communities living around the Lake Victoria basin by using resources within the basin to supply safe water and ensure a disease-free environment; conserving biodiversity and genetic resources; and integrating national

49 Government of Kenya, *Press Release – Government to Launch 'MDGs' Planning Process*, Ministry of Planning and National Development, http://www.planning.go.ke/mdg.html

50 Government of Kenya 2002, Ministry of Foreign Affairs, *Kenya's Perspective on Selected Global Issues, 2002*. http://www.mfa.go.ke/kenyas_perspective.html

51 World Bank Group 2005, *ICT and Environmental Sustainability*, Selected World Bank Group Funded projects.

and regional management programs to reverse—to the greatest extent possible—environmental degradation of Lake Victoria. The main concern for the lake is pollution and the encroachment by reduced lake wood (hyacinth). The project provides one of the cases linking the use of ICT for poverty reduction and environmental protection as shall be reviewed in sections that follow. Another link between the information society and sustainable development is the planned implementation of a Land and Environmental Information System (EIS) that will improve the performance of sectors that use GIS in the ongoing development of the Web site for the Ministry of Environment, Natural Resources and Wildlife at http://www.environment.go.ke under the E-Government Strategy.[52]

Table 1: Excerpt from Implementation Matrix of the ERSWEC 2003–2007

8. Cross-cutting issues

Sub-sector Objectives	2003/2004	Proposed Action	Expected Outcome	Implementing Agency	Time frame
Environment	Environmental protection	Implementation of National Environment Action Plan (NEAP) and Environmental Management and Coordination Act (1999), Implementation of WSSD and Millennium Development Goals, Implementation of Lake Victoria Environmental Management Project	Sustainable environmental management, Domestication of Agenda 21, Improvement of fish output from Lake Victoria as a result of reduced lake wood (hyacinth)	MOENRW	2003 to 2007

Source: GoK, ERS Implementation Matrix 2003–2007

During the 12th Session of the Commission on Sustainable Development (CSD) in April 2004, two ministers from the Ministry of Environment and National Resources and the Ministry of Water Resource Management and Development represented Kenya. The two made enlightening presentations that revealed that Kenya's SD focus remained anchored in poverty reduction. In his statement, the Minister for Environment stated that poverty and unemployment were the biggest challenges facing Kenya[53] and that the challenge was being addressed by the development of the ERSWEC in relation to the Millennium Declaration and the Johannesburg Plan of Implementation. In her submission, the Minister for Water Resource Management and Development revealed that the government's

52 Republic of Kenya 2004, *E-Government Strategy: The Strategic Framework, Structure, Training Requirements and Standardization Framework*, Cabinet Office, March 2004.

53 Republic of Kenya 2004, Statement on "Meeting Targets, Goals and Timetables," By Head of Delegation to CDS 12, Hon. Dr. Newton Kulundu, Minister for Environment, Natural Resources and Wildlife, New York, April 28, 2004.

efforts recognize the link between proper sanitation[54] and poverty. She also emphasized that sanitation had a rural dimension. This was in line with the national SD priorities for water and sanitation set out in the report to WSSD on the central role played by water in food production, public health, industrial and power production, recreation, and overall poverty alleviation. It was estimated that only about 60 per cent and 34 per cent of the country's urban and rural populations, respectively, have access to safe drinking water.

To address these challenges, the key priority actions had been set out as follows:

i) improving poor people's access to productive resources;

ii) integrating natural resource and environmental conservation into the national planning process; and

iii) paying particular attention to the provision of safe drinking water, adequate sanitation and shelter to Kenyans.

The launch in 2004 of the *State of Environment Report 2003* was a sign of positive progress in the implementation of the Environmental Management and Coordination Act of 1999. The EMCA had set a requirement for the preparation of a State of Environment (SoE) report every year. Progress can be credited to the autonomous nature of the National Environmental Management Authority (NEMA).

Sustainable development issues received a significant elevation from the announcement of the winner of the 2004 Nobel Peace Prize as the Assistant Minister for Environment, Natural Resources and Wildlife, Hon. Prof. Wangari Maathai. Prof. Maathai is a long-time environmental protection activist and founder of the Green Belt Movement. She has since been quoted making statements such as, "If we did a better job of managing our resources sustainably, conflicts over them would be reduced. So, protecting the global environment is directly related to securing peace." According to Prof. Ali Mazrui, "the sense of peace for which (Maathai) won the Nobel Prize was not conflict resolution or the absence of war. For the first time, in the one hundred years of the Nobel Prize, peace was defined in environmental terms."[55] To demonstrate the gains for environmental protection, Kenya signed the Kyoto Protocol only days before it's launch, which was graced by the presence of the Nobel Laureate. Failure to ratify the protocol before it came to force in February 2005 would have been an embarrassment for the country, which is the headquarters of UNEP and is the home of the globally respected sustainable development activist.

54 Republic of Kenya 2004, *Statement on Meeting Basic Needs in Water, Sanitation and Human Settlements With Particular Focus on Sanitation*, by Hon. Martha W. Karua, MP, Minister for Water Resources Management & Development, New York, April 30, 2004.

55 Mazrui, Prof. Ali 2005, "Green Eyes on the Prize: From Softy Westernisation to Hard Modernisation," July 22, 2005, JKUAT, Thika, Kenya.

The envisaged review of the National Environmental Action Plan (NEAP) presents an opportunity for linkages between the ICT policy development process and the sustainable development policy development. According to comments submitted to the Ministry of Information and Communication on the draft ICT policy,[56] environmental issues had only received cursory mention. The National ICT Policy, however, states that one of the objectives shall be *to achieve sustainable conservation of natural resources*. There is no explicit mention of sustainable development unlike the case in the draft ICT policy.

6.3 National WSSD position and sustainable development priorities for Kenya

The National Assessment Report to the WSSD stated that the critical SD challenges were poverty, agriculture and food, infrastructure, health, energy, water and sanitation, trade, and market and regional integration.

At the WSSD, Kenya held the position that sustainable development challenges were surmountable if national efforts received adequate capacity development, technology transfer and financial assistance. Capacity development priorities lay in the strengthening of human resources as well as institutional and managerial capacity. Further, there was a stated need to mobilize domestic and external resources including additional official development assistance (ODA), foreign development investment (FDI) and forging of genuine partnerships for development financing. The call for increased ODA and FDI financial support was based on the reduction of multilateral and bilateral funding for environmental projects in Kenya by 30 per cent[57] over the previous 10 years.

In the same breath, Kenya held a position that inadvertently offered a solution for its sustainable development challenges. It acknowledged that the ICT sector the world over had facilitated growth in creating jobs, raising productivity, increasing incomes and opening up opportunities for increased trade. Kenya also acknowledged that it was necessary to integrate ICTs in all sectors of the economy in order to ensure its access by both rural and urban communities in pursuit of sustainable development. The challenge thus lay in creating and diffusing the technologies needed to eradicate[58] poverty.

It is noteworthy, however, that during a multistakeholder *ICT Visioning Workshop*[59] held in Nairobi two years after the WSSD, the national development priorities identified to guide ICTs for development discussions did not match

56 Comments by Joseph Masinde (NEMA) who had consulted with the author on Kenya ICT Policy Comments: http://www.information.go.ke/policy/comments/Jmasinde.htm

57 See: *Financing for Environment in Republic of Kenya* 2003, State of the Environment Report for Kenya 2003, National Environmental Management Authority, Kenya. http://www.NEMA.go.ke

58 *5.5 Information and Communication Technology (ICT) in Republic of Kenya* 2002, National Assessment Report for the World Summit on Sustainable Development (Rio+10), Johannesburg, South Africa, Ministry of Environment and Natural Resources, Kenya. p. 53.

59 ICT Visioning Workshop, November 18, 2004, Norfolk Hotel, Nairobi.

priorities stated by government at the WSSD. The resulting sector visions outlined the role of ICTs in education, health, government, trade and industry, small and medium enterprises (SMEs) and agriculture. The difference in approach between IS and SD policy groups was evident in the fact that presenters during the workshop were mainly from the information society policy community.

6.3.1 Challenges in prioritizing environmental conservation and ICT adoption

From the preceding review, it can be concluded that environmental protection is mentioned as a priority in general statements on sustainable development. Despite this, it still receives low priority in implementation. This is clear from the Implementation Matrix of the ERSWEC 2003–2007; the shrinking domestic, multilateral and bilateral financing; and cursory mention in the draft national ICT policy, as well as in project design and implementation.

A case in point is the draft ICT policy, which mentions environmental issues[60] as those related to telecommunications and broadcasting masts. Although it is not included in the draft ICT policy, the issue of "public perception" of the effects of radioactivity from telecommunications equipment is an environmental issue that the Communication Commission Kenya sought to address in a workshop organized with support from the NEMA.

Further, ICT experts and development practitioners at a *Poverty Reduction and ICT Workshop* in Kenya in January 2005 identified remote sensing as a means of using ICTs for environmental protection while addressing poverty. However, as seen in Table 2, the connection between poverty and ICT-enabled environmental protection systems becomes unclear as the details are reviewed.

The tendency in most policy discussions observed during the study was to view environmental issues as marginal factors under agriculture or tourism. The environmental link was deemed relevant only to the extent that it affected the economic activities.

Dependency on agriculture forms the basis of the dilemma on whether to develop an agriculture-based economy or a knowledge-based society in Kenya. As stated by Kenya at the WSSD, "agriculture is the mainstay of the Kenyan economy." As such, farmers and pastoralists play a central role in agricultural production and ensuring food security. Agriculture currently contributes 24 per cent of GDP and supports about 64 per cent of Kenya's employed population, most of whom live in rural areas. With the effects of climate change and the limited availability of arable land, the continued reliance on agriculture is environmentally and economically unsustainable. National policies must, therefore, develop new opportunities for a significant number of the rural population for sustainable development to be achieved. As admitted at the WSSD, agriculture in Kenya faces many

60 Republic of Kenya 2004, *Draft National ICT Policy*, Ministry of Information and Communication, October 2004, Nairobi, Kenya. http://www.information.go.ke

challenges that include rain-fed production; increasing climate variability; high costs of inputs; inadequate market and institutional infrastructure; and limited access to financial resources and appropriate technology. Competing land use practices and enterprise result in the mixing of pests and diseases; poor breed and seed quality; poor extension services; and other unsustainable practices also adversely affect agriculture.

Table 2: The potential role of ICTs in poverty reduction efforts

Level		Potential Impact	Barriers	Actions	Examples
Macro	Foster more efficient and transparent markets, more participatory processes of governance and new forms of economic and social innovation that benefit the poor	• Remote sensing technologies for more effective monitoring, resource management and mitigation of environmental risks • Facilitate knowledge exchange, networking and policy-making	• Unequal access to ICTs • Lack of a supportive policy environment – absence of a national ICT vision, policy, or strategy	• Positive measures to meet the ICT needs of the poor • Pro-poor policy and regulatory environment	• Implementation of the E-Government Strategy • Development of a land information system

Source: Poverty and ICT Workshop report, January 2005

The stated dilemma caused by agriculture may be solved if environmental protection were to be made a priority objective in the development of new opportunities for rural population. The ERSWEC has, in principle, begun to address the issue by resolving to apply ICTs for increased productivity in agriculture while expanding the economic opportunities so that fewer Kenyans remain dependent on farming. However, if environmental protection is lacking at the core of the strategy, the new economic opportunities may lead to unsustainable activities such as pollution or depletion of forest cover to facilitate the setting-up of telecommunication equipment.

To achieve prioritization of environmental issues in the information society, it is important to have policies that explicitly state the commitment to environmental protection and extend the same clarity to project design and implementation. Advocacy in this area of work may be based on the WSIS, WSSD, PRSP and the MDGs but would require a high level of detail as well as continued interaction between information society and sustainable development practitioners. In the case of Kenya's draft ICT policy, the cursory mention of environmental issues may be due to the low-level participation of sustainable development practitioners in ICT policy processes. For instance, junior IT officers represented the Ministry of Environment, Natural Resources and Wildlife, and the Ministry of Energy at the National ICT Stakeholders Conference. The IT officers, originally from the Government IT Services of the Ministry of Finance, had been seconded to the respective ministries to facilitate the implementation of the E-government

Strategy. The issue of high-level representation in policy discussions may be resolved with the enactment of the new constitution by the end of 2005 because it proposes the establishment of a high-level National Environment Commission.[61]

Participants at the *Regional Workshop on ICTs and Poverty Reduction* made similar observations on the need for poverty reduction and ICT[62] practitioners to interact and share knowledge. This approach may be applied in the ongoing review of the National Environment Action Plan by having stakeholders who had been active in the ICT policy process contribute to the ICT-related aspects of the action plan. The converse is true of the implementation strategy for the National ICT Policy, which will also result in the development of sectoral ICT policies. There is need for environment practitioners to ensure prioritization of the environment in overarching policies so that the principles of ecological sustainability may trickle down to the other sectoral policies.

However, as shall be seen later in this paper, an aggressive campaign may be more successful in raising environmental protection issues in the information society. By implementing projects that tie in with ICT systems such as mobile phones—known to have had positive impacts—the national profile of environmental issues will be elevated while providing awareness and fundraising and early warning systems.

6.3.2 Implementation status of MDGs in Kenya

According to the MDG Progress Report for Kenya 2003, poverty remains a major impediment to the fulfillment of basic needs of Kenyans, especially women and children. The report recommends that only rapid economic growth can lift the country out of this vicious cycle of poverty. Failure to aggressively grow the economy will result in increased levels of poverty from the current 57 to 65.9[63] per cent in 2015. However, there has been significant progress in some areas such as provision of free education for all primary school children, increased representation of women in parliament, reduced HIV prevalence rates, increased access to ICTs and reduction in per capital energy consumption, as well as the emission of greenhouse gases. The report commends the government's launch of the ERSWEC that focuses attention on specific deliverable poverty reduction targets.

To improve their participation and performance in schools for children in arid and semi-arid areas, the school feeding program has been implemented and has also supplemented dietary needs of those children. Kenya has also been

61 CKRC 2004, *Draft Constitution of Kenya 2004, Chapter Eight: Environment and Natural Resources*, Nairobi, Kenya. http://www.kenyaconstitution.org/docs/chapter8.htm

62 Adeya, Nyaki – Rapporteur General, *Regional Workshop on ICTs and Poverty Reduction*, January 2005.

63 Government of Kenya and the United Nations Kenya Country Team 2003, *Millennium Development Goals Progress Report for Kenya*, Ministry of Planning and National Development, April 2003, Nairobi, Kenya.

commended for systematic implementation of environmental impact assessments prior to road works and industrial projects to ensure sustainability of livelihoods and ecosystem management.

Further, there has been increased access to ICTs, as seen in the teledensity, computer and Internet usage statistics. However, the impact of gains in environmental management are countered by the fact that forests in Kenya cover only 1.64 million hectares—about two per cent of the land area of Kenya—of which 1.24 million hectares constitute indigenous forest. The forest cover continues to be depleted for human settlement, subsistence agriculture, and by an illegal timber and charcoal burning industry.

The MDG campaign aimed at raising awareness about the importance of the different dimensions of development is coordinated by a *National MDG Taskforce* comprising representatives of the Ministry of Finance, the UN system, donors, NGOs, CSOs and the private sector. The MDG Report for Kenya in 2003 was developed with support from the UNDP in conjunction with the government. Several stakeholder consultative meetings set up to discuss the draft report, sensitize stakeholders and ensure a participatory approach in the reporting process preceded the launch of the MDG report. The stakeholder meetings were preceded by a regional conference for eastern African policy-makers held in June 2002, an NGO Forum on MDGs in July 2002 and a Technical Seminar on MDGs held on September 2002. In 2003, a *CSO Forum on MDGs* and *MDG Report Validation Workshop* ensured that issues such as the PRSP and emerging concerns of civil society were discussed under the stewardship of the government and UNDP. The CSO forum was led by ActionAid, which has remained active in the *Make Poverty History* campaign. These events have resulted in the prioritization of MDG-based poverty reduction strategies in many policy documents such as the draft national ICT policy 2004.

The *Launch of the MDGs Planning Process* by the Minister for Planning and National Development at the MDG Stakeholders Workshop in March 2004 resulted in a communiqué committing the government, donors, the UN System and the Millennium Project to act aggressively to achieve the MDGs. There is apparent political will in the pursuit of MDGs. Although the commitment by government is evident in the policies being developed, the benefits of the process require aggressive action towards rapid economic growth.

On environmental issues, the attainment of increased forest coverage in Kenya will require very active and aggressive support for the tree-planting campaign led by Nobel Laureate, Prof. Wangari Maathai. There exists an opportunity for an aggressive campaign presented by the diffusion of ICTs, especially mobile phones which are expected to grow in use. The MDG adoption process in Kenya has also provided an avenue for increased advocacy on IS and SD linkages as the various goals require interaction between stakeholders from both policy communities.

7
IS and SD Policy and Program Analysis

Several initiatives in Kenya are already providing linkages between ICTs and sustainable livelihoods in activities such as agriculture, pastoralism, entrepreneurship and provision of employment vacancy information. The initiatives covered by this research apply technologies that have a wide reach and focus on national sustainable development priorities. The examples include the use of mobile phone text messaging to provide market prices to farmers, employment vacancy alerts to the unemployed and local news to disadvantaged communities and slum dwellers. Other initiatives apply WorldSpace satellite radio receivers to disseminate locally relevant content in audio and data formats to pastoralists in arid areas. These, along with the use of geographical information systems in the protection of the environment in the Lake Victoria basin, are initiatives that are exploiting the information dissemination capacity of ICTs to address national sustainable development priorities.

7.1 SokoniSMS: Empowering farmers through SMS market price service

The Kenya Agricultural Commodity Exchange (KACE) is a private-sector firm launched in 1997 to facilitate linkage between sellers and buyers of agricultural commodities; provide relevant and timely marketing information and intelligence; provide a transparent and competitive market price discovery mechanism; and harness ICTs for rural value addition and empowerment. KACE launched an SMS-based information service—*SokoniSMS*[64]—for farmers. The SokoniSMS service enables farmers to receive market prices in various market centres around the country through their mobile phones. Equipped with this information, the farmers are able to determine the most profitable market centre to transport products to and circumvent middlemen who usually offer to buy the products at much lower prices.

KACE has several market information points around the country, from which they send price information to a headquarters in Nairobi. In turn, the team at the KACE headquarters uses a simple application that offers a Web-based interface to update market prices onto the servers at the mobile phone network (in this case Safaricom). As a result, mobile phone users can send a short text message to retrieve the market price they are interested in. The SMS-based service offers farmers a timely source of information, as they no longer have to wait for newspapers to publish the information a day after the prices are reported.

The farmers are automatically charged seven shillings for each final market price message delivered to their phones. The menu surfing process is free to the users.

64 "Sokoni" is a Swahili word for "market."

Step 1: The farmer types a message to retrieve market price information for MAIZE

Step 2: The farmer sends the word MAIZE to the number 411 on the Safaricom mobile network

Step 3: The farmer receives a menu of market centres from which to choose (main centres where KACE has MIPs—market information points)

Step 4: The farmer replies back with the chosen market centre choice to the number 412

Step 5: The farmer receives price details

By providing farmers with the opportunity to increase profit margins from agriculture, the service addresses the issues of poverty reduction for the majority of Kenyans who rely on agriculture. The service is a commendable linkage between ICTs and poverty reduction. Indirectly, by increasing the profitability of farming, the service enables farmers to earn more money without necessarily increasing output. It is, therefore, easier for a farmer to appreciate the benefits of protecting his land from pollution or unsustainable use that may in future deny him the returns on investment. A similar initiative by Drum Net in the rural town of Karatina uses the Internet to get pricing information from Nairobi on a variety of agricultural goods. The information on current pricing and market analysis is published to help farmers avoid middlemen.

7.2 ALIN: An information network for pastoralists and farmers

The Arid Lands Information Network (ALIN) provides farmers and pastoralists in drought prone areas with information for sustainable livelihoods. Through a network of Community Development Workers (CDW) ALIN encourages people in the dry lands to share experiences and ideas on good and bad development practices in agriculture or pastoralism and the use of ICTs. ALIN also publishes newsletters that are distributed to CDWs and partner organizations.

As part of the Open Knowledge Network (OKN) in Kenya, ALIN has set up access points in dry lands around the country where CDWs and community members can access information on sustainable farming practices. Each access point has a computer, printer and a WorldSpace satellite radio receiver with a multimedia adaptor that enables users to download specific content via satellite.

The radio receiver is aligned to a satellite beam that allows users to access up to 68 audio channels and four data channels. When the radio is tuned to the data channel and connected to a computer via an adaptor card, users are able to download Web-based text and images from the satellite without the use of a phone line. This access point set-up is appropriate for arid and semi-arid areas that lack tele-

phone, Internet and electricity coverage. Some access points use solar power to meet the energy needs of the set-up.

Community members and CDWs converge at the access point for relevant information, which may include farming practices, veterinary advice and accessing the national newspapers, including the *Daily Nation*. Newspapers do not have a significant reach in remote areas covered by the ALIN access points. This barrier is, however, overcome by the use of satellite downloads. CDWs also access information on behalf of community members and share the information during their focus group meetings.

By partnering with other organizations in the OKN, ALIN has enabled the geographically dispersed communities to share information via ICTs. CDWs collect information in the community, save it onto a diskette and send it to the ALIN head office or via e-mail at the office of the nearest partner organization. At ALIN, the information is edited and formatted for relay via satellite through a central OKN syndication centre in London. The syndication centre also receives information from many other "hubs" similar to ALIN in India, southern and western Africa. A review of information shared ranges from health issues, proper care of livestock, employment opportunities and others. Most of the information shared is also available from the Web site of the OKN at http://www.openknowledge.net.

From the information obtained at the access point, community members are able to make decisions that improve their farming, health and other livelihood practices. Such initiatives would benefit significantly if their impact would be reinforced by a universal access fund as proposed by many stakeholders throughout the ICT policy development process in Kenya.

One of the access points with a similar set-up is the field office of World Vision in Budalangi Division[65] where environmental disasters such as flooding have resulted in loss of lives, displacement of community members and destruction of crops. Such an access point would have greater impact if the ICT policy provides incentives for projects focused on environmental protection and early warning systems.

7.3 Lake Victoria Environmental Management Project (LVEMP)

As indicated earlier, the Lake Victoria Environmental Management Project (LVEMP) is a comprehensive program aimed at maximizing the benefits to communities living around the Lake Victoria basin by reversing the environmental degradation of the lake. The main concerns for the lake are pollution and the previously untamed encroachment by water hyacinth. Nyanza province, which is served by the lake, also has the highest incidence of poverty of the eight provinces in Kenya.

65 Government of Kenya 2003, *State of the Environment Report for Kenya 2003*, *Emerging and Cross-cutting Issues*, National Environmental Management Authority, Kenya. http://www.NEMA.go.ke

The project uses ICTs in the form of geographical information systems (GIS)[66] to create and update scientific and socio-economic baseline data on the current status of Lake Victoria's forest growth, land-use practices, pollution and water quality, among others. The government is thus able to make informed decisions on improvement of conditions in and around the lake. A significant gain from this has been the 80 per cent reduction in water surface coverage of water hyacinth leading to resumption of fish exports to the European Union. Fish exports from Kenya to the EU had been banned under stringent pollution and processing standards of the European Commission. The ICT-enabled gains in income due to improved environmental protection has resulted in increased consciousness of the direct linkages between the information society and sustainable development. After learning more about the water hyacinth, many enterprising people around the lake have learned to earn a living from the infamous weed by drying it and making mats and baskets for sale. Similar initiatives would have significant benefits for other lakes and dams in Kenya if tax and other incentives were provided for in the ICT policy in order to encourage private sector and civil society to supplement government efforts.

7.4 Empowering community members to solve their problems

There are several other initiatives that demonstrate strong linkages between challenges of sustainable development and the information society as an enabler in solving the problems.

Simu ya Jamii Community Phone Service

One such initiative is the *Simu Ya Jamii* (Community Phone) service that involves small-scale businesses running mobile telephone kiosks. Safaricom Limited, in partnership with local micro-finance organizations, has facilitated the ownership of branded mobile phone kiosks through a credit arrangement for small-scale entrepreneurs and continues to aggressively market the franchise. This has resulted in improved access to telecommunications services for many Kenyans who do not already own mobile phones while providing employment and business opportunities to many unemployed Kenyans. Being based on wireless technology, mobile phones also have fewer adverse impacts on the environment, as only a few masts are required.

Kazi560 vacancy alert service

The twin problems of poverty and unemployment are also addressed through the *Kazi560* service, an SMS-based employment vacancy alert service run by OneWorld International. Realizing that the demand for jobs far outweighs the supply of jobs, *Kazi560* enables employers to advertise vacancies for free. In turn, mobile phone users can subscribe to receive vacancy information within a

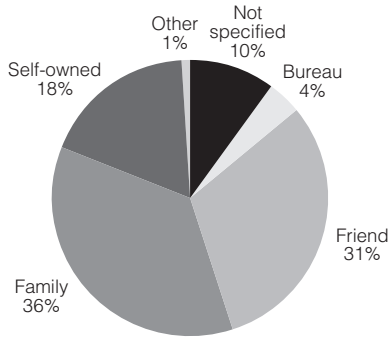
66 World Bank Group 2005, *ICT and Environmental Sustainability*, Selected World Bank Group Funded Projects, New York.

specific line of work. For instance, by sending an SMS with the words "ACCOUNTANT ON" to the number 560 on the Safaricom mobile network, the job-seeker will receive vacancy details of all accounting vacancies availed to OneWorld International by employers. The job-seeker is automatically charged for each text message received with a vacancy. If successful, the job-seeker could decide to stop receiving the vacancy alerts by sending the words "ACCOUNTANT OFF" to the number 560. By removing the advertising cost for employers, the service has resulted in a simplified job-seeking process in Kenya where estimates show that only 20 per cent of the already few vacancies are advertised. In the first seven months since the launch of *Kazi560*, a significant number of people have reported being employed through the service that advertised over 150 vacancies per week in June 2005. The service—also known as OKN Mobile—was also nominated as a finalist for the APC Hafkin Communication Prize 2004–2005, and had a subscriber base of over 30,000 regular users by August 2005.

CommunityNews service in slum areas

Finally, OneWorld International runs a similar SMS-based CommunityNews service, which sends regular text messages on health, sanitation, business advice and scholarship opportunities to over 3,000 residents of Kenya's largest informal settlement. Up to 70 per cent of Nairobi's population lives in informal settlements, with Kibera accounting for the majority.

Figure 2: Mobile phone access in Kibera



Source: OneWorld

Unlike posters or word of mouth, the service is not prone to effects of weather or distortion as evidenced in the analogy of the *Broken Telephone*. SMS messages are personalized, immediate, reliable and can be easily shared.

As seen in Figure 2, which developed from the Information Needs Assessment conducted before the establishment of the service, 67 per cent of the respondents access mobile phones from their family and friends while 18 per cent own the

phones. Further, according to information collected at the Community Based Clinic operated by the Africa Medical Research Foundation (AMREF) in Laini Saba, Kibera, and at the Christ the King Church during their free medical clinics, four per cent of the patients attending clinics had learned about the clinics through the SMS-based *CommunityNews* service while 18 per cent and 31 per cent had learned from friends and neighbours respectively. From the above and findings of other organizations working in Kibera, it is evident that most of the information flows through infomediaries. The *CommunityNews* service has, therefore, improved the effectiveness of the existing community communications channel by equipping the infomediaries with reliable information. By sending information directly to mobile phones of intended recipients, the service also reduces the chances of distortion and doubt as the residents have a trusted source.

It is evident from the above initiatives that the lack of aggressive policies on ICTs for development is denying Kenyans opportunities to improve the livelihoods of slum dwellers, create employment, improve agriculture and other livelihood activities. The national ICT policy and related sectoral strategies must, therefore, provide incentives such as tax waivers and universal access and service funding for initiatives that promote poverty reduction and environmental protection.

8
Emerging Framework for IS and SD Linkages

The global debate on the use of ICTs for human development has resulted in some observers urging caution[67] while others have assumed distinct optimistic and pessimistic approaches. ICTs may be considered as potential enablers and catalysts for strengthening existing initiatives except where there is significant evidence that an optimistic approach will yield positive results. As observed in the initiatives discussed above, ICTs can have far-reaching positive impacts on environmental protection and poverty eradication. The similarities between the initiatives are as follows:

They are scalable projects that:

- aggressively use the most effective technology;
- address the challenges that have high priority to the target audience; and
- reach as many people as possible.

They do this through community-based and multistakeholder partnerships, by breaking down the communication and attitude barriers, yet appreciating the existing communication networks and cultural realities.

This emerging framework is also influenced by the fact that mobile phone subscriptions in Kenya have grown from 200,000 in 2000 to about five million in September 2005[68] while, according to the draft national ICT policy, Internet users grew from about 200,000 to one million in the same period. The rate of subscription for fixed-line telephones has declined in the same period with indications that mobile telephony will continue to undermine future growth in fixed-line telephony. This has led the national telecommunications operator—Telkom Kenya—to offer wireless digital fixed-line solutions in order to increase its subscriptions.

Based on the lessons learned, mobile telephony has significant potential for environmental protection[69] in Kenya. As observed, it has been successful in substituting transportation of information on physical material with the more efficient and ecologically sustainable electronic form such as SMS. If used to complement geographical information systems, remote sensing, and disaster preparedness systems, mobile phone telephony can be effective in awareness creation and disaster

67 Mungai, Wainaina 2001, The African Internet: Impact, Winners and Losers in *The Digital Pulse: The Current and Future Applications of Information and Communication Technologies for Developmental Health Priorities 2003*, A Report Published by The Communication Initiative. http://www.comminit.com p53

68 Wandera, Noel 2005, Battle for the Numbers: Cellphone companies' competition turns to quality products, *Financial Standard, The Standard*, Tuesday, July 5, 2005. http://www.eastandard.net

69 ITU 2002, *Telecommunications as a tool for Environmental Protection and Sustainable Development*, ITU Policy and Framework Action Plan, Geneva, Switzerland.

warning. Mobile telephony is the most potent technology in *promoting the use of science and technology for environmental sustainability*[70] and for overall sustainable development. This forms the foundation of this emerging *m-vironment approach* that recommends the use of mobile phones for environmental protection and early warning systems while addressing poverty reduction in Kenya.

The approach is in line with the recommendations of the Millennium Project Task Force on Environmental Sustainability, to build environmental sustainability into all development strategies across sectors. It recommends the adoption of quantified and time-bound environmental objectives, incorporating environmental sustainability into poverty reduction strategies, increasing funding for national environmental programs and in support of implementation of existing multilateral environmental agreements.

8.1 The M-vironment Approach: Using mobile phones to achieve environmental sustainability

The existence of five million mobile phones versus one million Internet users in a country of 32 million people implies that the mobile network should be the channel of choice for interactive communication in Kenya. Unfortunately, the e-government strategy does not include the use of mobile telephony as a channel to communicate internally or with the citizens. The tide may be turning with the launch in June 2005 of an SMS service that allows Kenyans to send information to a government spokesperson. The service, provided by the private sector, is simple, as users are only required to send a simple text message to the number 2888. This has increased the citizen-to-government (C2G) communication and sensitized the government spokesperson to the priorities of Kenyans. Mobile phones, therefore, provide a platform for increased advocacy and debate on environmental protection in a country that so urgently requires it. The solution lies in an ambitious mobile phone-based environment initiative. With reference to the features of initiatives reviewed earlier, the *M-vironment Approach* for Kenya would entail the use of mobile telephony for:

- fundraising for national and community-based environmental protection efforts;
- awareness creation campaigns and exchange of information;
- strengthening early warning systems;
- environmental consciousness among ICT solutions providers;
- employment creation and protection of livelihoods;
- advocacy for policy integration of environmental protection; and
- pollution reporting and collection of feedback on EIA studies.

70 UN Millennium Project 2005, *Environment and Human Well-being: A Practical Strategy. Summary version of the report of the Task Force on Environmental Sustainability*, The Earth Institute at Columbia University, New York, USA.

During the tsunami that led to unprecedented loss of lives and property in Asia, the Swedish[71] government used SMS to contact their citizens who had used their mobile phones in Thailand in order to determine their status after the disaster. Many lives were saved in Nallavadu, India, after they received a warning obtained by a volunteer in an OKN access point similar to the one in the flood-prone area of Budalangi in Kenya. If the access point in Budalangi were to become part of a nationwide disaster-warning infrastructure reinforced by the automated alerts to mobile phones, many lives would be saved.

The *m-vironment* initiatives in Kenya may also be used to raise awareness on conservation[72] and create a community of interest. A similar initiative by Flora and Fauna in the United Kingdom uses mobile phone games and images of gorillas and other animals as mobile phone logos and screen savers. Other than awareness creation, the initiative uses the profits from the sale of the mobile content to finance conservation efforts. In Kenya, a similar initiative would address the fundraising challenges currently faced by environmental protection projects. In partnership with mobile network operators, environment awareness projects would achieve financial sustainability. This approach would begin to provide answers to one of the questions asked during the poverty reduction and ICT discussions thus: *Are there any ideas about where the resources for poverty alleviation will or can come from since donor agencies cannot do all the work?*[73] It would also address the funding concerns raised in the State of the Environment Report 2003.

In the Kibera slum of Nairobi, the SMS-based *CommunityNews* service has been successfully used to send alerts in cases of fire outbreaks and mobilizing the residents to take part in environmental clean-up activities. SMS may also be used as early warning systems in times of natural disasters. For instance, the UNDP Kenya Country Office runs a *Disaster Preparedness and Management Project*. The goal of the project is to strengthen the working relationships through increased common understanding and establishment of a central database to provide opportunity for prioritization of needs and intervention strategies that ensure preventive, rehabilitative and mitigation initiatives are integrated into development plans at national and district levels. It seeks to involve all programs within the UN system in Kenya, government, NGOs, private sector and development partners. By building on such existing networks and the initiatives already supported by NEMA and the UNEP headquarters in Nairobi, it would be possible to ensure multistakeholder participation in the *m-vironment* initiatives.

As observed in the cases of market price information service *SokoniSMS* and the success of the Lake Victoria Environmental Management project in employment

71 Carvin, Andy 2005, *Knowledge, Awareness and the use of ICST*, UNESCAP. http://www.andycarvin.com, http://www.unescap.org/icstd/dmp.asp#knowledge

72 Srivastava, Lara 2005, *Social and Human Considerations for a More Mobile World*, Telecom Policy Unit, International Telecommunications Union, Geneva, Switzerland.

73 Adeya, Nyaki – Rapporteur General 2005, *Regional Workshop on ICTs and Poverty Reduction*, IDRC, January 2005, Nairobi, Kenya.

creation and protection of livelihoods, mobile phones may be used to create a channel for strategic market information for products that promote environmental sustainability.

The national m-vironment initiative will be instrumental in integrating environmental protection in policy and raising its profile in Kenya's national psyche. The initiative should involve a multistakeholder partnership that will integrate environmental protection and early warning components in the poverty reduction agenda. The initiative may be piloted in a specific community but must be scalable. The national m-vironment initiative should work to break down the communication and attitude barriers in specific communities while learning from and strengthening the existing communication networks.

By involving mobile network operators as well as radio, television and Internet service providers in a national environmental awareness project through limited tax incentives, the m-vironment initiative would build a community of ICT practitioners who consciously support sustainable development. The mobile phone service sector has been the fastest growing sector in Kenya since the last quarter of 2000 with Safaricom Limited being the top taxpayer for two consecutive years. Fortunately, over the same period, Safaricom has supported several environmental conservation projects such as fencing off the forest around Mount Kenya and elephant tracking via sensors on the mobile networks. However, opportunity exists in the use of the mobile network infrastructure for strengthening early warning systems in cases of natural disaster. For an initiative involving the government, all network operators should ideally be involved to extend the reach of the project. In the period between disasters, the m-vironment initiative would form a fundraising channel for environmental protection initiatives that are in tune with poverty reduction efforts.

8.2 Advancing existing IS and SD linkages through the m-vironment approach

The initiatives reviewed earlier, as well as the emerging m-vironment framework, are possible because of the existence of sustainable development policies. Nonetheless, the impact of these policies has remained limited because of the absence of corresponding information society policies. A case in point is the low priority given to the development of a Land and Environmental Information System, which is the only environment project mentioned in the E-government Strategy. The National Environment Action Plan had foreseen the need and recommended the implementation of an EIS in 1994 but the same has remained a low priority project. Eleven years later, and a year after Kenya's Prof. Wangari Maathai of the Green Belt Movement won the Nobel Prize, the draft ICT policy and industry regulation developed by CCK, Kenya has a weak or non-existent framework for licensing and environmental issues. In turn, the NEAP and related environment laws and policies maintain a weak reference to ICT aspects of environmental sustainability.

At the WSSD, the government attributed the low levels of achievement to the lack of funding, relevant technology and human capacity in national sustainable development efforts. The m-vironment framework would provide the required technology and create a channel for fundraising. By creating awareness and a community of supportive ICT practitioners, m-vironment would contribute significantly to the first stage of capacity building. The gains to the nation would be greater if environmental sustainability efforts integrate poverty reduction.

Further, the m-vironment initiative as well as scaled-up versions of initiatives reviewed earlier, would address a gap in the current E-government Strategy by significantly incorporating mobile telephony into the country's e-government plans. By raising the profile of mobile technology in the government, the initiative would simultaneously raise the consciousness of environmental protection among policy-makers. Increased consciousness would result in a more significant inclusion of environmental issues in draft ICT policy and industry regulation by CCK. The formation of a National Environment Commission as proposed in the draft national constitution would reinforce the gains that would be brought about by m-vironment initiatives.

Opportunity also exists for the ICT aspects of the m-vironment approach to be incorporated in the envisaged review of the NEAP and related environmental laws and policies. A review of other opportunities for influencing policy follows.

9
Opportunities for Better IS and SD Linkages in Various Policies

9.1 Overarching policies

After the finalization of the National ICT Policy, discussions have shifted to focus on an ICT Policy Action Plan. An example is the *Youth Declaration on the Implementation of the ICT policy* developed at the first *Kenya Youth and ICT Convention* in August 2005. Such discussions present an opportunity for integrating lessons learned into the implementation process and increase the government's budgetary allocations for ICT programs and environmental protection programs. However, the likelihood that the desired changes would take place during the review of the ERSWEC and National Development Plan in 2007, through reporting process of the MDGs with respect to the PRSP.

Advocacy at the community and national government level will increasingly focus attention on the roles of environmental protection in national development. Initiatives within the m-vironment framework are likely to have significant implications on the success of advocacy and public awareness in Kenya.

Since poverty reduction is the main development concern, it is necessary to present a sustainable development model that defines the returns on investment by both ICT adoption and environmental protection. The involvement of policy-makers in the ongoing discussions on poverty reduction and ICTs in Kenya would create opportunity for the two policy communities to strengthen linkages between the rapid growth of the information society and sustainable development.

To achieve the desired quick gains, national level initiatives should encourage partnerships between the civil society, public and private sectors. Further, the policies developed should be in appreciation of the theory that states that "sustainable development equals modernization minus dependency."[74] The theory proposed by Prof. Ali Mazrui calls for African nations to apply technology in addressing sustainable development challenges while preserving the cultural realities of the society in question. Multistakeholder initiatives must take such factors into account to ensure economically, culturally and ecologically sustainable development.

9.2 Sectoral policies

The launch of the National ICT Policy will trigger the development of sectoral ICT strategies with government ministries leading the process in each sector. The Ministry of Health has already started discussions on the e-health strategy while

74 Mazrui, Prof. Ali A. 2005, *Is Development Sustainable Without Modernization?* The Dunstan M. Wai Memorial Lecture (1947–2005), June 16, 2005, New York.

the Ministry of Education has developed a sessional paper outlining the role of ICTs in education. This presents an opportunity for the Ministry of Environment, Natural Resources and Wildlife to develop an aggressive e-environment strategy that ties in aggressive m-vironment initiatives with indications of how they would play a role in economic empowerment. The process has started with the review of the NEAP, which has provisions on the use of ICTs in environmental information systems and early warning systems. However, to achieve the desired results in future policy, increased interaction between IS and SD practitioners at a higher level will be necessary.

Another opportunity exists in the impending repeal of the Kenya Broadcasting Corporation Act, which will result in a new policy environment for the broadcasting sector. Environmental protection issues that may be included range from the effect of broadcasting masts, responsibility and incentives for public and private broadcasters who use their infrastructure for environmental sustainability. The broadcasting and telecommunication sectors are regulated by the Communications Commission of Kenya, which has the capacity to integrate environmental protection and early warning system issues into the industry regulation. Discussions on e-environment issues have begun between the CCK and the National Environment Management Authority.

Finally, Constituency Development Committees in the 210 parliamentary electoral constituencies present an opportunity to influence policy at the community level with expected impact on the awareness levels of Members of Parliament. By demonstrating the value of ICTs in environmental protection and its far-reaching impacts on poverty reduction in each parliamentary constituency, sustainable development activists would reap greater value in the form of the desired legislative changes. Legislators are more likely to support legal and policy recommendations that promise positive returns on investments to their constituents.

10
Recommendations

As observed in the review of Kenya's information society and sustainable development policy development and the initiatives that seek to strengthen linkages between the two groups of policy, opportunities exist for future policy development to promote existing and emerging linkages.

A strong case exists for environmental protection efforts that especially address poverty reduction as proposed in the MDGs and resolutions of the WSSD. Opportunities for quick gains lie in the recommendations of WSIS on the need for e-environment and e-agriculture initiatives. Kenya must, therefore, learn from the proposals of these and other international policy instruments as it develops sustainable development solutions and in efforts to ensure that environmental issues are given the deserved priority in national policies.

The draft constitution in its preamble declares that it is founded on the people's respect for the natural environment "that is our heritage, and determined to sustain it for the benefit of future generations." Once the new constitution for Kenya comes into force, the government must constitute the National Environment Commission and ensure that it has a multisectoral participation that appreciates the linkages between the information society and sustainable development.

Although the proposed constitution provides a sound foundation for future environmental stewardship, it lacks clear guidelines on the approaches that may be used in ensuring high-level appreciation of environmental issues among policy makers. The government must, therefore, work with all stakeholders to ensure an appreciation of the economic benefits of environmental protection especially for the majority of Kenyans who are poor. This may be achieved through increased interaction between IS and SD policy-makers and other stakeholders.

To achieve prioritization of environmental issues in the information society, it is important to have policies that explicitly state the commitment to environmental protection and extend the same clarity to project design and implementation.

Environmental consciousness by policy-makers and experts is not enough to resolve the environmental crisis that Kenyans face as they continue to deplete scarce resources, which they continue to rely on as a source of livelihood. Awareness must be reinforced at the community level with Kenyans being made to appreciate the risks associated with the continued encroachment on the indigenous forest and unsustainable use of limited arable land. The use of indicators such as forest cover, available arable land and their implications for poverty, hunger, lack of water, agriculture and sanitation may go a long way in improving stewardship.

The appreciation of risks associated with continued ecological degradation will not resolve the problem unless Kenyans are made aware of alternative ways to

earn a living. ICTs and other development policies must increase opportunities in information and communication services and apply ICTs to increase efficiency in agriculture while educating Kenyans on non-wood fuel sources of energy. There is also an urgent need for the scaling up of projects that teach pastoralists and farmers in arid areas how to increase productivity, thus reducing dependency on the limited arable land for communities that may not easily take advantage of non-agricultural opportunities. The government must be aggressive in implementing the proposal in the Economic Recovery Strategy that aims to use ICTs to increase efficiency in agriculture while creating new income opportunities that reduce the overall dependency on agriculture. The efforts must be demonstrated in both policy and projects that appreciate the environmental risks of unsustainable dependency on agriculture.

ICTs such as mobile telephony are used mostly by youth who constitute the single demographic grouping who will benefit from environmental protection and poverty reduction. Involvement of youth as equal players at all stages of policy and project development should be a minimum condition for any initiative that seeks to address the challenges of sustainable development.

Finally, Kenya should seize the opportunity presented by mobile telephony to implement an ambitious multistakeholder m-vironment initiative that will address many of its sustainable development concerns. The project would be based on existing multistakeholder networks and will focus on awareness creation, fundraising, networking, data collection and as an early warning system. The m-vironment initiative would also provide a foundation for the inclusion of mobile telephony in the provision of e-government services and improved environmental stewardship. Mobile phone networks have already provided a means of fundraising for development initiatives in Kenya and would provide a means for raising funds for environmental protection through simple text messaging. The m-vironment network would also be a ready network of over four million Kenyans who can receive personalized information on environmental issues such as the shifting climatic conditions, disaster preparedness and early warning in times of environmental and other disasters. The network would include existing and planned initiatives such as the Lake Victoria Environmental Management Project and the development of the Land and Environmental Information System that are the two priorities stated in ERSWEC and E-government Strategy, respectively. An opportunity exists for this concept to be adopted in the ICT aspects of environmental sustainability during the envisaged review of the National Environmental Action Plan and in the ICT Policy Implementation Plans.

The network would use text messages that ensure high communication speeds and a high level of response to any call to action. In a secure installation, the m-vironment network could be interconnected with the geographical information systems or famine and flood early warning systems and the information relayed to radio and television networks to ensure maximum coverage. It will, however, be necessary to involve all stakeholders in a win-win relationship by providing incentives to mobile networks and other ICT services that use their infrastructure

for environmental protection efforts. Incentives may include tax waivers for the private sector and funding from the universal access and service fund for initiatives by civil society.

The aggressive implementation of the m-vironment initiative in Kenya provides an opportunity to avert the environmental and economic disaster that Kenyans have been courting through unsustainable dependence on limited natural resources as a source of livelihood. It offers Kenya an opportunity to enjoy the economic, social-political benefits of ecological sustainability.

These requirements for changes at the national level should in time be translated into regional and international commitments through their adoption within the framework of WSIS, MDGs and other multilateral instruments on sustainable development and the information society.

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Based on the success of the WSIS Youth Caucus, IISD led a scoping study to assess the potential for engaging young researchers to catalyze changes in policy and practice in developing countries around the convergence of the information society and sustainable development.

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Women as Professionals in the Costa Rican Information Technology Sector

Exploring the Relationship Between Sustainable Development and Gender Gaps in the Information Society

Margarita Salas
Fundación Acceso

Abstract

ICTs are generating more than $2 billion dollars annually for Costa Rica, and the industry is one of the fastest growing in the country. Yet, women continue to constitute a minority in the IT professional sector and their participation seems to be decreasing. Since Costa Rica considers IT to be an important opportunity for development, the continued gender imbalance within the sector creates unfavourable conditions for women's socio-economic future. Salas suggests some tools for improving the current gender imbalance in Costa Rica's IT industry and calls for policy that will break away from stereotypical professional roles. She underlines the need for technical training institutes, as well as centres of higher education, to encourage women to enter and remain in science and technology careers.

This paper consists of seven sections. The first three are meant to give the reader the broader context in which this research takes place. Hence, the introduction provides general information regarding the Next Generations Policy Directions Project, which is the starting point for this study. The thematic justification (Section 2) explains how the research views the relationship between gender and sustainable development, as well as the connection to the information society agenda. Section 3 outlines the methodology used to produce and organize the contents.

Sections 4 and 5 present results from documentation as well as fieldwork. They represent the new data that were either gathered from census and statistical institutions or generated through interviews with local key stakeholders. Section 6 highlights five case studies that illustrate some of the national experiences that are being developed in gender and information technologies. Section 7 offers research conclusions and recommendations.

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At the state level, the National Commission for Information and Communication Technologies has been formed as a coordinating body with representation from a large number of ministries and state organizations from the information and communication technologies sector to boost sustainable and competitive development internationally, as well as socio-economic progress at the regional level.

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1
Introduction

2005 is the year of two critical events for the international development community. The first, the five-year review of the United Nations Millennium Development Goals (MDGs +5), took place in September; and the second, the World Summit on Information Society (WSIS) second phase, in November. Although both initiatives seek to improve livelihoods and promote development, each one has emerged from a different community and reflects different priorities.

According to the International Institute for Sustainable Development (IISD)[1] "*few discussions have focused on harmonizing the visions of the emerging information society with the principles and priorities articulated by the United Nations Millennium Development Goals (MDGs) and the World Summit on Sustainable Development (WSSD)*". It´s very important to build bridges between these paradigms to foster collaboration as well as knowledge and resource sharing within the international development community and among key stakeholders in each country.

Based on the success of the WSIS Youth Caucus, IISD led a scoping study to assess the potential for engaging young researchers to catalyze changes in policy and practice in developing countries around the convergence of the information society and sustainable development. The scoping study revealed, among others, three important findings:

1. Young people might serve as powerful catalysts for building a southern dialogue on sustainable development and the information society.
2. While there is considerable research on the information society and sustainable development, it is primarily focused on applications and policy frameworks within Europe and North America.
3. There may be other visions of the convergence between sustainable development and the information society growing out of developing country priorities which have not yet been introduced to the international debate.[2]

Based on these findings and the above-stated concern regarding dialogue between paradigms, IISD launched the Information Society and Sustainable Development: Next Generation Policy Directions research study. The project engaged a team of young researchers from southern-based organizations to develop national case studies on cross-cutting and nationally relevant themes that would be a meeting point for information society and sustainable development issues.

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1 International Institute for Sustainable Development, *Information Society and Sustainable Development: Next Generation Policy Directions Project*, 2004, p. 2.

2 Idem, p. 3.

In Costa Rica, the participating organization is Bellanet's office for Latin America and the Caribbean (http://www.bellanet.org) hosted in Fundación Acceso, a local NGO. Bellanet is a non-profit development organization, a recognized member of the information and communication technologies for development (ICT4D) community and with broad experience in research and implementation within the areas of information and communication technologies as well as knowledge sharing and collaboration processes.

For the purposes of this initiative Bellanet LAC identified that in Costa Rica gender is a key area in which to build bridges between the information society and development issues, with a specific focus on the under-representation of women as professionals in the information and technology sector. Hence, Bellanet LAC conducted research exploring the dimensions of this problem, as well as the perceptions of local key stakeholders around it. The study also showcases five local initiatives that illustrate different approaches to the subject of women and ICTs and collects concrete recommendations on how to promote ICT use among women in the Costa Rican context.

2
Thematic Justification

According to the Tenth State of the Nation Project Report, in Costa Rica:[3] "Human sustainable development is a continuous and integral process which brings together components and dimensions of the development of societies and people in which an important focus is building capacity and providing resources, by and for the people, so that equity grows for current and future generations."

This definition of sustainable development reintroduces two elements that are crucial in framing this research: creating opportunities; and developing equity. A society that does not achieve an adequate balance of the well-being of all groups of its people cannot call itself developed or sustainable. Likewise, a country that seeks to generate well-being for its people must put in place mechanisms to create opportunities for those whom the prevailing socio-economic system does not benefit. Undoubtedly, women are one of those groups that experience discrimination.

2.1 Gender equality is an essential building block in achieving sustainable development

Gender inequality is an obstacle for sustainable development, not only in its economic dimension, but in all its areas. In fact, Hemmati and Gardiner[4] state that gender equality is an essential building block in achieving sustainable development, in that none of the three pillars necessary for sustainable development (environmental protection, economic well-being and social equality) can be achieved without resolving the current problem of gender inequality. The fundamental role of equality between the sexes can be emphasized in each of these pillars.

In order to achieve effective *environmental protection*, it is important to adequately understand the relationship between women and natural resources, as well as women's rights and their role in resource planning and administration. Also, the recognition and incorporation of women's knowledge in the environmental realm is important, as is a clear understanding of the specific gender impacts of environmental degradation and abuse.

Attaining *economic well-being* also requires the use of gender-inclusive strategies. According to Hemmati & Gardiner: "*70% of the world's estimated 1.3 billion people living in absolute poverty are women*."[5] A healthy economy cannot be achieved if the contributions and skills of all members of society are not taken into account.

3 Programa Estado de la Nación, 2004.

4 Minu Hemmati and Rosalie Gardiner, 2001.

5 Idem, p. 1.

Finally, *social equality* is inextricably linked to gender equality; sexism, racism and discrimination based on ethnicity, faith, political opinions, social status or sexual orientation are clear indicators of social inequality. No society can live sustainably, nor can its members lead dignified lives, if discrimination against any social group exists.

As this relates to the information society, those of us who live in developing countries face an enormous challenge in generating conditions in our communities so that the digital revolution does not create new marginalization for us, a process that has already started. Various studies have pointed out how digital gaps have come to expand and strengthen the current social gaps, including the gender gaps.

Among the poor of the world, women are the poorest: we perform a large amount of unpaid, unaccounted work. Traditionally, the relationship between women and technology has been one of fear and distance. Since technology belongs to the public realm, it has been out of women's reach for many years. It's easy to foresee that if, as women, we don't build our capacity or gain access to the resources that are so highly valued in the information society, the feminization of poverty and the exclusion of women from important areas of decision-making will grow deeper.

2.2 New inequalities, to a large extent, will be structured around the ability to use ICTs in the processes of creating knowledge

Elisabeth Kelan[6] believes that new inequalities, to a large extent, will be structured around the ability to use ICTs in the processes of creating knowledge. "Those who come out ahead in the new economy usually work with organizations typical of the new economy: organizations which produce and sell information and communication technologies."

That is why it is important that beyond merely using ICTs, women must gain access to them professionally so that we can occupy positions of great added value and build capacity in order to transform technologies to meet our own needs.

The role of ICTs is growing in regards to development processes. According to Gloria Bonder,[7] each day the relationship between scientific and technological advances and political and economic decisions grows closer. The presence of scientists and/or science-based arguments in the power centres has been increasing, and their influence in decision-making is of fundamental importance.

2.3 ICTs are the new "coffee" for Costa Rica

In the case of Costa Rica, it is particularly important that we, as women, are able to fully participate in the information technology sector, because the country is

6 Elisabeth Kelan, 2004.

7 Gloria Bonder, 2003.

directing a growing quantity of resources toward transforming information technology, to spearhead the economic development of the country.

William Mora, advisor to the Ministry of Science and Technology, says: "currently, the ICTs are generating more than $2 billion annually for the country, which signals exponential growth in that sector. Some people believe that technology is the new 'coffee' for Costa Rica and would like to position the country as one in which a profitable investment can be made in the technological sector."

There are various initiatives that encourage the development of the country in that direction. At the state level, the National Commission for information and Communication Technologies has been formed as a coordinating body with representation from a large number of ministries and state organizations from the information and communication technologies sector to boost sustainable and competitive development internationally, as well as socio-economic progress at the regional level. As well, in the private sector, the long-standing promotional project to promote the software industry (CAPROSOFT) has broadened its horizons by transforming itself into the Costa Rican Chamber of Information and Communication Technologies (CAMTIC).[8]

2.4 The Costa Rican development model depends on full inclusion of women in ICTs

The venture into technology will bring changes to the Costa Rican development model—a model based on the export of agricultural products is no longer being considered. Human resources are being developed in areas of likely competition for the country, creating an economy with a skilled labour force specializing in non-traditional products backed by scientific and technological research.

Given this particular economic environment, it is very important to examine the level of inclusion of women as professionals in the information technology sector, as well as the strategies that can be adopted to overcome the current gap and allow Costa Rican women to become full participants in the economic development of their country, as active citizens in decision–making, and in defining policies and concrete initiatives in the area of science and technology so that this key sector can also respond to women's needs and priorities.

8 CAMTIC, 2004.

3
Methodological Aspects of the Research

In order to address the inclusion of women as professionals in the information technology sector, it's important to characterize the dimensions of the problem, as well as explore reasons that may explain, in the concrete Costa Rican context, why this distance between women and technology persists.

Bellanet LAC contributed to bridging this gap by developing this research study. An initial exploration focused on the following research question:

Why are women a minority within the information technology (IT) professional sector in Costa Rica, and what are some of the possible strategies that can overcome the conditions blocking their access?

A literature review revealed figures from various organizations which ascertain the level of professional women's participation in the information technology sector. The following organizations were consulted:

- National Council of State University Rectors (CONARE);
- National Council of Private University Education (CONESUP);
- Costa Rican Chamber of Information and Communication Technologies (CAMTIC);
- National Council of Science and Technology Research (CONICIT); and
- National Institute of Statistics and Censuses (INEC).

Seventeen interviews were conducted with key stakeholders[9] who work in information technology and/or gender issues in academia, civil society, government or private enterprise. All of the interviews were digitally recorded and their contents organized according to the following categories:

- relationship between women and information technology in Costa Rica;
- explanatory factors for the gap;
- level of relevance of the gap; and
- strategies to overcome the gap.

In-depth interviews were conducted with five organizations that have developed initiatives to involve women in information technology. These short cases discuss initiatives in this field that have been developed in Costa Rica, and include:

- organizations who work with ICTs and teenage women;
- oganizations advocating for the use of or using ICTs for the empowerment of women and political advocacy; and
- organizations advocating or using ICTs for entrepreneurship and employment.

9 Please see Appendix A for a list of interview respondents grouped according to sector.

After the first initial draft was ready, preliminary results were presented. The objective of this activity was to receive feedback from the country's stakeholders in order to verify if the research paper had been able to present an adequate picture on the topic of women as professionals in IT in Costa Rica. Hence, most of the people previously interviewed were invited as well as some new stakeholders that were recommended by them.

The exercise started with a presentation of the research, followed by questions, suggestions and recommendations, and included informal interaction during the coffee break, an important opportunity for networking among people from the different sectors. As people talked and relaxed, they were more flexible and open to share information that they had previously not made available. Since the approach of this research relates to advancing information society issues as a way to promote sustainable development, this gathering was a first step towards bringing these two groups of stakeholders together.

4
National Statistics on Professional Women in IT

Before presenting the results of the interviews and fieldwork, it's important to lay out the broader context by presenting some basic information on Costa Rica and characterizing the presence of women as professionals in the information technology field. The following information was gathered by reviewing documents, mainly from national economic reports, higher education councils and enterprise chambers.

4.1 National context

According to the Tenth State of the Nation Project Report,[10] Costa Rica has a population of 4,169,730, of which 50.9 per cent are men and 49.1 per cent are women. The human development index is .832 which puts Costa Rica in 42nd place out of the 175 countries evaluated worldwide. This national figure is very close to that of the gender-related development index of .824, putting the country in 41st place.

Despite the positive picture for women that these figures seem to reflect, Costa Rica has not achieved the same level of gender equality in all areas. In fact, Miguel Gutiérrez[11] affirms that "employment and remuneration are definitely the main source of gender inequality in Costa Rica." The results of an informal survey[12] conducted by the newspaper La Nación of female students, professionals and workers found that women agree that there are work opportunities but the problems lie in remuneration and in accessing positions higher up in the hierarchy.

The rate of open unemployment in Costa Rica is higher for women (8.2 per cent versus 5.8 per cent for men), as is the rate of underemployment (7.0 per cent versus 4.6 per cent for men). Likewise, the percentage of poor families with female heads of households has grown by 10 per cent in nine years. That is to say, poor Costa Rican families headed by women are ever increasing, which further intensifies the feminization of poverty in the country.

4.2 Educational figures

According to information provided by CONARE, the country has been successful in integrating a significant number of women at the university level and, in some cases, forming a wide majority among graduates. See Table 1 for the distribution of degrees conferred in the state university system for 2001–2003.

Clearly, there is a growing trend to incorporate women into the higher education system, at both the public and private levels. It is interesting to note that the only educational institution in which women are a minority is the Technological Institute of Costa Rica, which offers training predominantly in engineering and technology.

10 Programa Estado de la Nación, 2004.

11 http://www.nacion.com/ln_ee/2005/mayo/23/pais2.html

12 Idem.

Table 1: Degrees conferred in the public and private university system (2001–2003)

	2001		2002		2003	
	Men	Women	Men	Women	Men	Women
ITCR	70.6%	29.4%	68.1%	31.9%	63.1%	36.9%
UCR	44.5%	55.5%	44.4%	55.6%	42.6%	57.4%
UNA	38.9%	61.1%	35.5%	64.5%	33.5%	66.5%
UNED	23.4%	76.6%	22.6%	77.4%	24.5%	75.5%
Private Universities	37.0%	63.0%	36.0%	64.0%	39.0%	61.0%
Average	**42.9%**	**57.1%**	**41.3%**	**58.7%**	**40.5%**	**59.5%**

Source: State Universities, Registration Departments, CONESUP

The presence of a minority of women specifically in the area of information technology can be seen in all state and private universities. Even in institutions in which women form a wide majority at the general level, they constitute a minority in the particular area of technology.

Table 2: Degrees conferred in the IT field,* according to sex (2001–2003)

	2001		2002		2003	
	Men	Women	Men	Women	Men	Women
ITCR						
Computer science	84%	16%	75%	25%	71%	19%
Electronic engineering	91%	9%	91%	9%	90%	10%
UCR						
Computer science	77%	23%	78%	22%	73%	27%
Computers and business	65%	35%	62%	38%	67%	33%
UNA						
Computer science	65%	35%	69%	31%	67%	33%
Technology administration	63%	37%	69%	31%	70%	30%
UNED						
Computers and management	83%	17%	67%	33%	70%	30%
Private Universities°						
Systems engineering	68%	32%	69%	31%	67%	33%
Computer engineering	68%	32%	62%	38%	60%	40%
Average	**74%**	**26%**	**71%**	**29%**	**78%**	**22%**

**IT: information science, systems engineering, computer science, electronic engineering*
°This information was taken from private universities with at least 500 graduates
Source: State universities, Registration departments, CONESUP

The information collected does not signal a clear trend regarding the increase or decrease of female graduates in IT in Costa Rica. But what can be deduced is that women definitely constitute a minority of 30 per cent.

CONARE does not have a breakdown by sex regarding student registration in the state-owned or private systems. The only information that could be found regarding state institutions was from the Technological Institute of Costa Rica (ITCR) where the trend seems to be that female registration in computer-related

programs is decreasing: 20 per cent of students in 2003; 18.3 per cent in 2004.[13] Regarding private institutions specializing in computer training, Cenfotec provided us with information for the current year in which female registration comprises 14 per cent of the total.

Neither does CONARE have comparative data on drop-out rates. Some key people have pointed out that the education system discourages the enrolment of women in technological programs. This aspect will be dealt with qualitatively in the section on the vision of local stakeholders. Statistically, with the information currently available, it is not possible to confirm or refute this perception.

4.3 Work-related figures

First of all, it was important to estimate the number of women currently undertaking research in the area of information technology. A special query of the database of the National Council of Science and Technology Research (CONICIT) revealed that of the total number of projects related to this topic currently registered with the Council, 30 per cent are developed by women.

Regarding the private sector, according to the Costa Rican Chamber of Information and Communication Technologies (CAMTIC), of the total number of businesses registered with the chamber, only seven per cent of owners and/or managers are women.

Table 3: Population employed in IT in Costa Rica, according to sex (2002–2004)

Occupations	2002		2003		2004	
	Men	Women	Men	Women	Men	Women
Design and analysis of information systems	76%	24%	80%	20%	80%	20%
Computer programming	92%	8%	90%	10%	82%	18%
Electronic engineering and telecommunications	100%	0%	91%	9%	100%	0%
Computer programming technicians	79%	21%	90%	10%	81%	19%
Computer equipment control technicians	80%	20%	84%	16%	100%	0%
Electronics and telecommunications technicians and assistants	97%	3%	100%	0%	95%	5%
Average	**87%**	**13%**	**89%**	**11%**	**90%**	**10%**

Source: Special query of the National Multi-purpose Households Survey, INEC

In terms of professional careers in information technology, a special query of the National Multi-purpose Households Survey, undertaken on a yearly basis by the National Institute of Statistics and Censuses (INEC), also shows lower figures— even a downward trend—regarding women's participation as professionals in this sector.

13 CONARE, forthcoming.

It seems that the trend of a 70/30 ratio in the participation of women as professionals in information technology in Costa Rica, as reported by Láscaris *et al.*for the decade between 1990 and 1999 has, in some cases, remained steady but, in general, it has worsened.

There is no gender breakdown in data that affords an estimate of the number of women in Costa Rica who use the Internet. The National Institute of Statistics and Censuses has for many years included a special section on telecommunications in their Households Survey, but since the information is not broken down according to gender, it is not useful for the interests of this current study.

5
Vision of Local Stakeholders

Every issue's key stakeholders usually include those organizations or institutions—be they public or private—that have a very strong say in the area of interest. In order to influence such a group it's very important to know and understand how they see the subject. This research approached some local stakeholders and interviewed them regarding four sub-topics:

- how they saw the relationship between women and technology;
- which reasons could explain the gap between women and the IT professional field;
- how relevant they thought this gap to be; and
- which strategies they thought would be most effective in the country to bridge that gap.

Stakeholders from academia, private enterprises, NGOs and government were taken into account. A small workshop was carried out where preliminary results were presented in order to have feedback from the stakeholders that were interviewed, as well as from other relevant national players. The results of the interviews as well as the feedback received at the workshop were integrated and are presented in the four sub-topics previously mentioned.

Each sub-topic section notes whether consensus existed, and which type of organizations agreed or disagreed on specific matters. This does not mean that the point of view of the majority is more valid or valuable than those ideas stated by fewer organizations. This is a qualitative and exploratory study, and hence it is focused on presenting the variety of positions found among the organizations interviewed without making generalizations.

5.1 Relationship between women and technology

Regarding the relationship between women and information technology in Costa Rica, the interviewees stated that, to begin with, the situation must be framed within a broader context, since the country seems to reproduce the situation that prevails in the rest of Latin America. One of the NGOs interviewed pointed out that the gains achieved in primary and secondary education, as well as the broad coverage of telecommunication services, contribute to lessening the unbalance somewhat. However, they all agree that the low degree of participation of women in the science and technology sector in general is quite evident.

The interviewees from the private companies agree that there are very few women in the field. However, they feel that this is due, in part, to the fact that there aren't very many professional women in the sector to choose from, and they express their interest in incorporating more women into the labour force. In fact, they say that women have begun to fill positions of power because of their management

and administration skills, an impression that may be a result of socialization processes.

Another aspect that was pointed out by two NGOs and two academic stakeholders is the unequal value placed on the type of work performed. They explained that, for example, documentation is considered to be a female task, as is report editing and manual writing; these are tasks which are valued to a lesser degree and tend to be associated with secretarial work. "There are still very few women working in the area of computer hardware and cabling,"[14] stated a woman who is currently the network administrator for the faculty of engineering at the University of Costa Rica.

Regarding the approach to technology, two NGOs and one government interviewee pointed out that the presence of more women in the sector does not mean that there has been a female-based approach to technology. That is, there is a concern that the women who have been able to permeate the sector have had to do so in a very male-based environment. One of the NGOs summarized it thusly: "As long as women do not stand out as women and adjust themselves to the male pattern, they will have no problems."[15] This poses an important challenge because it reflects that many males still reject very much the presence of females and that the women working in the industry often enough have to "disguise" themselves as men, by following their relationship patterns and behaviours in order to be accepted in the workplace. That is, the women still have to comply with a male-based culture because the working environment does not seem to have become flexible enough to incorporate the values, views and positions of women.

5.2 Explaining the gap between women and the professional IT sector

Among the factors cited by all interviewees regarding the possible explanations for this gender gap are those which can be grouped within a macro-social context, such as the presence of a patriarchal system that divides behaviours according to sex and decides which duties are acceptable for men and which are appropriate for women. From this perspective, stakeholders consider that what is occurring in the technological sector is simply a reflection of society at large.

Another element of full consensus among the people interviewed is the relevance of considering the processes of early socialization, which are closely related to the formal education system. They stated that the primary and secondary school system is designed in such a way that girls lose their impetus to pursue science and technology, especially during adolescence, because stereotypes regarding gender differences are reinforced. For example, feelings of fear towards mathematics are reinforced in girls. Stakeholders also pointed out that girls are given encouragement in the areas of social sciences and health, which reproduce the gender roles related to protecting and taking care of others.

14 Fabiola Rodriguez, 2005.

15 Lena Zúñiga, 2005.

The IT image that is marketed is another factor that keeps women away from the field. As one of the academics explained: "it really isn't very clear what IT even means, nor the variety of areas in which one can work within the sector. As well, the interfaces and configurations are mainly directed at men, as they follow a very masculine logic."[16] This statement was supported by three other NGOs and two government interviewees, but found no agreement from the private sector.

The issue of double standards is also present within the IT sector. Two government stakeholders and two NGOs interviewed stated that proposals submitted by women are not valued as highly as those coming from men. At the same time, the areas where women have traditionally demonstrated greater skills, such as interaction with users and the adjustment of programs to meet users' needs, are not highly valued by companies.

The work environment is also a factor that sometimes has a bearing on this issue. One of the interviewees said that, "although you could not generalize for all companies and institutions, some workplaces where I've been with an exclusively male staff became very sexualized, and conversations and camaraderie were so laden with overt sexual content, that this created a very hostile environment."[17] Although this perception was supported by two other government stakeholders, it was also opposed by one of the private enterprises interviewed. Therefore, we should not assume consensus on the issue.

Another barrier pointed out by one of the government stakeholders is that when there are IT training opportunities in organizations, most of the time it is the men who are chosen to attend, which further perpetuates the male-only presence in the area and blocks women's access to the field. This unequal access to training opportunities occurs in the broader framework of a patriarchal system that has historically kept women from having the same opportunities as men, on the basis of attributing men a higher intellectual capacity, especially in the areas of mathematics and exact sciences. As the perception has been collectively internalized, this type of discrimination may come from either men or women who still believe that men are genetically more intelligent, and that, therefore, giving men training opportunities represents a better investment for the organization.

Finally, a majority believe that information technology training itself forces women to leave the field. In this respect, 10 of the interviewees from all sectors refer to the high drop-out rates of women in IT and stress that, to a large extent, IT educational programs are structured according to the assumption that the students will be men. The stakeholders point out that these programs require an enormous amount of time on the students' part to experiment and create, which is time that women, with their multiple societal roles, have less of than their male counterparts.

16 Ana Rosa Ruiz y Laura Queralt, 2005.

17 Kemly Camacho, 2005.

5.3 Relevance of the gender gap in the professional IT sector

Interview respondents all share the concern over the under-representation of women in the IT sector. However, there are important differences regarding why they believe the gender gap is a problem for the country.

In general, the interviewees place the significance of this gender gap within the more general framework of the division of labour by sex. That is, they are concerned in general about the fact that careers are divided by sex. However, they recognize that the digital gap opens the social gap even wider and they agree that gender gaps are deepened when professional gaps exist. Above all, they feel that if women are distanced from technology, it should be a choice, a result of reflective process or a decision, and not a result of the imposition of male standards.

A minority of the people interviewed (one NGO and one participant from government) believe that the participation of more women in the IT sector will bring a greater focus on social development; technological standards vary according to gender, and the current standards are predominantly male and individualistic. However, this is a point on which most of the interviewees disagreed. In fact, one of the NGOs stated that "the neo-liberal and individualistic perspective, as well as productivity at all costs, has affected men just as deeply as women."[18] The interviewee from the National Women's Institute added that the issue is not about women rescuing the IT sector and making ICTs more socially oriented, but rather that it is one of rights.

An issue thought by all stakeholders as becoming increasingly important was the potential for exponential exclusion of women, given the tendency to move towards an information society in which those with access to information and technology resources will have more power and better jobs. If there are obstacles in being able to access decision-making, political power and greater remuneration, this has a negative influence on the various aspects of well-being,"[19] said the advisor from the Ministry of Science and Technology. On the positive side, the private sector points out that the involvement of women in IT could help to address the problems of employability they face. On a related note, three of the NGOs stress that this can happen only if the strategies to promote the IT sector are accompanied by strategies to help the population in general gain access to them as a form of development, and not to continue strengthening an elite.

Some of the interviewees (two from government and four from NGOs) also felt that there is a growing phenomenon of "invisibilization" of women's work in IT, and that their tasks are more poorly remunerated because they are less valued. They explained that there are many women working in IT sectors on which little value is placed, including project management, interface creation and graphic design. This is unfortunate, because as one of the academics pointed out, "the IT

18 Lena Zúñiga, 2005.

19 William Mora, 2005.

sector could greatly gain from the incorporation of women, as their contributions are valuable and their intelligence and creativity could be better utilized."[20] In support of this perception, two private sector representatives and one academic stated that women are better able to establish caring relationships, they communicate more effectively and their analysis is more comprehensive, which is why they are preferred in some companies and institutions. This is also a point of disagreement among those interviewed because at least one person of each sector (government, NGOs, private and academics) had a strong stand against stating sex-disaggregated capacities. However, there is consensus in that if women are excluded from IT, there is no opportunity for knowledge to be used in a different way than the current male-based one.

5.4 Strategies to close the gap

The fourth issue this research asked the stakeholders has to do with stating where it would be more effective to put the efforts in order to overcome the gender gap in the professional IT sector. The responses are presented in order of consensus, that is, from those suggestions that met most agreement to those who had fewer supporters. The group offered the following recommendations as the most appropriate to tackle the gender gap:

a) Early Contact:

- provide girls the opportunity to use equipment and programs to create a closeness and familiarity with technology;
- develop summer camps for girls to promote science, with laboratories and games;
- improve vocational assistance and guidance;
- carry out science and technology promotional programs with a gender perspective; and
- review how gender roles are promoted in schools.

b) Pedagogical Changes:

- work in partnerships integrating technology and the empowerment of women from a pedagogical perspective;
- create specific methodologies taking into account that not all people can easily move from concrete processes to abstract ones; and
- provide non-sexist conditions in educational environments.

c) Turning the Focus Around:

- humanize technology and give it an emotional aspect;
- create software, right from the start, for men as well as for women;
- market the various development possibilities within the IT sector;

20 Ignacio Trejos, 2005.

- emphasize how access to technology can transform peoples' lives; and
- place young women in the media as role models related to technology.

d) Affirmative Action:

- incorporate programs specifically for women;
- establish obligatory guidelines for the private sector;
- establish IT quotas in the public university educational system;
- provide state-promoted ICT training in workplaces where women are employed;
- develop proposals from a women's perspective;
- reformulate science and technology curricula so they attract both sexes;
- develop local initiatives in the communities;
- make the women who already work in the IT sector more visible;
- identify the processes of women's knowledge-building;
- provide grants for technology-specific educational programs;
- conduct campaigns in high schools to promote the integration of women in the technology sector;
- promote gender equity guidelines in private companies;
- foster union and support among women; and
- conduct specific studies on women and technology.

e) Social Pressure:

- put pressure on the government to commit to an agenda of universal access regarding ICTs and the Internet;
- make use of the pressure from financial sources to establish political relationships and allies; and
- relaunch the Law of Social Equality, the various conventions, and, specifically, the Beijing Platform.

f) State Commitment:

- take into account the way women will use the technology, as well as more cooperative uses of it, collective creation, development of areas of interest to women, and ways of approaching the end users;
- create the economic conditions necessary for women's participation;
- incorporating the gender issue in the guidelines from CONATIC; and
- develop coordinated public policies in order to break away from stereotypical roles.

From the order of the above categories, it is clear that stakeholders point their fingers directly to the role of early educational and socialization experiences. This may also be partially influenced by the popular conception that early years play

such a key role in determining the directions of people's lives. Among the recommendations that were less "popular" are the ones regarding social pressure and state commitment. This is very worrisome since it's the role of the state to guarantee conditions for the promotion of well-being for its citizens, and to pay special attention to those groups who have been historically marginalized. However, this role of the state is not a fundamental part of the collective psyche of the organizations interviewed. Therefore, recommendations at the public policy level were not frequently heard in the interviews, case studies or feedback meetings.

Although, when asked directly, the interviewees felt that it is the responsibility of all the sectors to fight against gender disparity in the information technology sector, the recommendations to bridge the digital gender gap are not strongly targeted at the state. Among the stakeholders mentioned as institutions that should be directly involved are:

- Public institutions: MICIT, CONATIC, INAMU, Ministry of Commerce
- Universities: especially ITCR
- Educational bodies: MEP
- Civil Society: ICE, FOD, Fundación Acceso, FIRE, community organizations

6
Case Studies

The stakeholder interview process yielded the first information gathered in the research. The second piece of fieldwork comprised six in-depth interviews conducted with representatives of national initiatives that link women and the ICT sector. These short case studies were chosen after the interviews with the stakeholders where key factors were identified. The first two cases are related to the use of technology for employment and, due to its close relationship with the subject, it is a practical experience that gives a face to the issue of women working as professionals in Costa Rica's IT sector. Since early contact was a point of consensus among the interviewees, the second group of cases are examples of work carried out with teenagers. One of them is an initiative to train girls in the IT field and the other one is a study conducted to explore girls' perceptions of computer science.

Finally, two cases of ICTs for the empowerment of women are presented. They are seemingly more distant from the subject in study because in them, women, though they make strategic use of ICTs, are not professionals in IT nor do their projects attempt to bring women closer to the professional IT field. They have been showcased as examples of the type of work that women carry out in the IT field and that is often not visible. These examples stress the positive impact inclusion in ICT can have on women's full participation in political decision-making and advocacy processes.

Each case consists of two parts: the first one is a description of the initiative and the second one an account of each organization's view of the most successful elements of their experiences, and the challenges or difficulties they encountered along the way.

6.1 IT for the development of entrepreneurship and employment

This section includes two examples of approaching ICTs from the point of view of income generation and entrepreneurship. The Book Club is the first example. Despite the fact that it is a private company, their ultimate goal is not to generate profit. Instead, the priority of its members is to carry out a cultural promotion project, and to accomplish this, they work primarily with volunteers, staging large events with exceptionally few financial resources. This way of working is completely in line with the most traditional stereotypically female ideals, reflected by the adolescents in the CAMTIC study which is presented in the second grouping, regarding work with adolescents.

The second initiative is directly linked to income generation, as it constitutes a private enterprise. One interesting aspect is that the interviewee clearly expresses her thoughts about the double role women play: the disjunction between women as professionals and women as mothers. She even feels that this contradiction is more difficult to resolve in the private sector than in the public one, given that the latter provides more social security.

The Book Club Cultural Project

Organization: Book Club – http://www.clubdelibros.com

Implementation period: Commenced in 2003 and currently in progress

Objective: Promote literature among the Costa Rican population

The initiative arose as a Web page dedicated to promoting an appreciation for books among Costa Ricans. The initiative was launched when the founding team discovered that in Costa Rica there were no programs specifically aimed at promoting reading. It involves a group of women who are virtually all volunteers. This is not a public relations group, and the only income is obtained through specific projects and the sale of services.

Most of the volunteers find out about the initiative through the Web page (http://www.clubdelibros.com) or through the activities the group organizes. There is a core group of four volunteers, who are in charge of the ongoing work, and another 15 or so people who help out with special activities. For the Book Club team, it is important that the volunteers be people who love reading and feel strongly about promoting it. The project has also formed alliances with storytellers and people involved in cinema. According to the organizers, the Book Club has about 18,000 subscribers to their bulletin.

Legally, the Book Club is registered as a corporation, despite the fact that it is a non-profit initiative. This is due to the relative ease in registering a corporation, as opposed to the difficulty in forming an organization large enough to become a foundation or association. A few attempts have been made to register the corporation internationally, but they haven't been successful. Generally, the group works with local resources, such as networking with book stores or specific authors. For example, an activity was organized to commemorate the birthday of Hans Christian-Andersen; 500 people attended the event and it was funded through a partnership with a book store, which set up a stand and sold books. The Book Club works primarily through commemorative events, and there is little long-term planning. The Ministry of Culture, Youth and Sport has provided some support through workshop grants, but this is for the participants on an individual basis, and not as a cultural initiative *per se*.

The activities of the Book Club are aimed at encouraging people to read books, and they take place mainly at events such as flea markets, book presentations, book store literary gatherings, children's events, movie and literature events, activities in schools, visits to Aboriginal reservations, and book donations to prisons and schools. One of the projects they are hoping to get funding for is the compilation of narrations by senior citizens in the communities.

Currently, a Book Council is being formed in Costa Rica, in which it is hoped that a book policy can be developed. Facing this process, the members feel that they have invested in creating confidence in their work with the Book Chamber and other organizations. The initiative has been able to support its activities through

exchanges and swaps, but has received very little concrete funding, despite the potential it has shown in attracting people to its events. The Book Club would like to obtain more funding in order to increase its schedule of activities and operate within a wider geographical area.

ICTs have allowed the project to survive. The technological aspect is fundamental, as it is the means by which the organization communicates with people and publicizes its activities. Each week there are over 30 new subscribers through the Web. The Book Club has a database of 18,000 readers, grouped according to the types of books in which they are interested. The members consider it a live electronic list, because their subscribers communicate with them. For example, when they hold book raffles, sometimes 200 people participate, and when they send out their newsletter, they receive up to 500 e-mails a week from people giving their feedback. The Web page allows for a great amount of interactivity, as the sections are modified according to public requests, and it functions like a literary portal. Some requests for modernization have gone unheeded, due to the technological limitations of the Costa Rican population. It is an initiative that has grown immensely; it is very innovative and has changed how book stores promote books.

Despite the fact that the Book Club is run by women, it is not thought of as a women's group; the members feel that the absence of men is by chance only. In fact, they state that when it comes to their work, the most important thing is the promotion of literature, and they have the support and collaboration of various men. Nevertheless, when they look at their daily work, the members recognize that, as women, they are used to being communicative, to forming alliances and maximizing resources. Despite the fact that they have organized gender exhibitions, they don't feel they have one particular emphasis, but rather deal with a wide array of topics. They do consider gender an important element and have developed close ties with many women's organizations, but they do not have a specific agenda in this area.

Regarding technological training, they state that they have learned what they have needed to. They have not studied public relations or customer service, but experience itself has given them the skills they need. Furthermore, they often receive suggestions and offers for technological support from the readers themselves. Their audience is made up of people who read, although some older people do not access the Internet, so they would like to develop some print material. The Book Club feels that through its efforts, it is promoting the traditional activity of reading through digital means.

Successful Aspects	Challenges and Obstacles
• Public satisfaction which they receive daily through e-mails and activity attendance	• Administrative resources and legal counsel
• Growing support for the initiative by book stores	• Planning and resource generation

A closer look at the elements pointed out as successful and/or challenging by this initiative produces interesting results from a gender perspective. Even though this project is an entrepreneurial activity and after some time has been able to provide one of its members with a full-time paid job, what´s highlighted is the satisfaction participants receive from the approval and support of their public. Also, the challenges are precisely the turning point that could unleash the economic growth of this initiative. Problems with planning and income generation are very common in female-based organizations. Hence, although the participants were able to harness ICTs into an enterprise that could potentially become an important source of economic revenue, gender aspects come into the field and render it an initiative that shares more characteristics with other female voluntary organizations than with IT-related enterprises.

Electromática S.A.

Organization: Electromática Full Computer Solutions
http://www.electromatica.net

Objective: Develop, implement, design and maintain comprehensive computer-based solutions, which are highly professional and adapted to the economic reality of the environment.

Six years ago: Electromática was born: a company that develops customized software. When it began, the company decided to form alliances with two initiatives: the Oracle creator groups, and the incubation centre from the Technological Institute of Costa Rica. It turned out that the latter was not a fruitful experience due to a negative impact on the company's image: being associated with an incubation initiative made people think the company was not experienced enough. However, this bad decision also led the company to strengthen its sales and marketing department.

Electromática considers that the alliance with Oracle was the best decision they made, because currently the company develops specifically tailored products, using the Oracle platform, and it also provides support and training for this system. The enterprise has solid experience in handling quality control systems, stock management and financial accounting programs.

One of the two owners of this company is a woman named Flor Obando, who had worked nine years for the Customs Laboratory, and took part in the process to create a technology platform for that organization. After that, she was transferred to the Housing Ministry as a programmer. She decided to make a move from the public to the private sector, although in the public sector there is more equality than in the private sector, as well as more stability and social security. She commented that procreation implies a discriminatory workplace disadvantage, so the majority of contractors see this as a risk factor which negatively affects their interests.

Apart from continuing to work in the area of computer technology, she began to work in middle management in private companies, in managerial positions. To

explain her development as a businesswoman in the technological field, she refers to her childhood and to the influence of her parents, who instilled certain values in her, as well as a competitive way of thinking, which was far from the traditional cultural stereotypes of a woman's role.

Flor Obando feels that her work in the technical area was a natural fit, and was related to what the workplace expected of her. Since her early days in the laboratory, she has had to acquire technological skills in order to do her job, and discovered that she had an affinity for it. Her rise in the field, starting out with very little technological knowledge, first as a plant worker, then in management positions, and finally forming her own company, is the result of her competitive personality and the fact that she has set professional goals for herself during the last 27 years of work.

Owning a company has been a big change, and it influences the way this woman deals with her colleagues and her capacity to fulfil her personal goals. She is sure that the fact that she is a woman has never been a problem for her clients. However, she experienced various problems in her former management positions, above all in the private sector. One of the reasons for her success in her business is the good relationship she has with her current partner, who is very open-minded and not prejudiced.

Successful Aspects	Challenges and Obstacles
• Oracle linkage • Good relationship with partners • Joining CAMTIC has brought more support	• Bad experience with ITCR's incubation centre • The market in Costa Rica is difficult. There are ephemeral software companies and there is little confidence in investors

6.2 Information technologies and adolescent women

One of the focuses of the study on women and IT in Costa Rica that it's important to highlight are the initiatives that have been directed at work with adolescents. They are of particular interest, as the period of adolescence seems to be a key moment in time in which women experience alienation from technology. One of the local stakeholders pointed out that "during adolescence there is a hypersexualization that happens during women's identity building that distances them from science and technology, as society in general does not value the fact that girls can be as intelligent as boys."[21]

These two examples from initiatives developed in Costa Rica showcase the impact that bringing teenagers closer to technology can have. The first initiative is a participatory study conducted by the Chamber of Software with rural adolescents to determine their own perceptions regarding technology. The reproduction of a patriarchal ideology in which women are tied to privacy is clearly reflected.

21 Maria Suarez, 2005

The other experience is developed by the gender program within the country's technological state university. It's a computer training program aimed at adolescent mothers, in which the important aspect of taking into account the particular characteristics of adolescents is exemplified.

Study on strengthening gender equity in the information technologies field at the higher education level

Organization: Software Sector Support Program (BID-CAPROSOFT-CENAT-PROCOMER)

Implementation period: 2003

Objective: To discover some of the factors which contribute to the low rate of women's participation in the technology sector.

In June of 2001, PROSOFTWARE developed a Human Resources Supply and Demand Study to find out which educational programs have a high ratio of men, which are relatively balanced, and which are predominantly female-dominated. The information technologies area can be classified within the programs in Costa Rica which are predominantly male-dominated. This same study revealed that only 7–17% of the staff working in this area are women.

The PROSOFTWARE study makes reference to some factors related to the socialization process that could have an influence on gender inequality in that sector. Taking that study as an important precedent, the initiative to undertake a study with a gender focus arose, which would systematize the influence of some of the factors that could have a bearing on the unbalance regarding women entering this field.

In addition, based on this systematized process from a gender perspective, the intention was to design a survey that could be conducted at the national level in order to discover the interference of the various factors and develop a strategy that would increase the percentage of women entering the information technology field. This, in turn, would help to establish equality among the sexes and increase the specialized human resources in this area.

The study was set up as a workshop as a part of the qualitative research, from a participatory action research framework. The research process involved reproducing the workshop in four sessions of approximately six hours each. The participant groups were made up of 20 middle class adolescent women, 16 and 17 years old, who were in their fourth or fifth year of high school. They came from urban and rural areas, as well as areas categorized as marginally urban. The participants were mainly from public and academic high schools of Hatillo, Cot de Cartago and Puntarenas; it was only a group of participants from Limón who attended the Scientific High School.

The results reflect an understanding of gender that incorporates new elements, such as access to the public sphere, but also maintains and upholds traditional positions that undeniably associate women with motherhood. The adolescents felt that

looking after others is intrinsic to women's nature, and that women should have access to an education only if it does not interfere with their duties at home.

When the girls were asked why they hadn't chosen the computer field, they pointed out that "through this career you can't help others and you can't have a direct relationship with people: the relationship is through a machine and tends to be cold." Also, the maternal role is very significant; they expressed the fact that a career in computers is one that never ends, that requires constant upgrading of expertise, and that "no mother would be willing to exchange her child for a profession or to earn more money."

Another influential aspect is the perception about the capacity of women to participate in non-traditional areas, as well as their self-perception about their own capacity to perform in these areas. The young women expressed their feelings that women are afraid to choose a career that is not familiar to them and one that does not afford them a traditional role.

A third factor is that of the mediating factors in the socialization process: the family and the educational system. The girls pointed out that right from childhood they are associated with traditional roles, and that women are brought up to be passive, submissive and to serve others.

Fourth, the lack of knowledge means that many of the participants have a very basic understanding of computer science, and the computer is considered to be complementary to other fields or used as a support to carry out a task (such as a receptionist or secretary would do), and is limited to the use of Microsoft programs.

The following recommendations were developed, based on the findings:

- Develop programs that involve companies excelling in the technological field. Have the companies give talks and involve the young women in the workplace in such a way that they learn through modelling and participatory observation.
- Develop activities to raise awareness among heads of companies and commercial producers so that they make positions available to women in the area of technology and reject stereotypes.
- Develop a comparative study with women who are attending higher education and enrolled in technological programs, in order to determine the factors that led to their integration.

Successful Aspects	Challenges and Obstacles
• A process of learning exchange was facilitated, in which the required information was obtained and the participants felt that they learned new things at an interpersonal level. • The session allowed the participants to change their way of thinking, which demystified the computer field.	• There was no follow-up on the recommendations.

Technical training for adolescent mothers in non-traditional and competitive technical areas

Organization: Gender Equity Program of the Technological Institute of Costa Rica (PEG-ITCR)

Implementation period: Commenced in 2000, currently ongoing

Objective: To provide technical training in non-traditional careers to pregnant teens or adolescent mothers, in order to facilitate their reintegration or continuation in the formal education systems, as well as to facilitate their preparation for, and access to, real employment or income generation opportunities.

The initiative to provide training in non-traditional areas to women at social risk has important roots in the project currently underway in the Gender Equity Program of the Technological Institute of Costa Rica (PEG-ITCR). In 1998, a project aimed at young women was undertaken, with the financial support of the European Union, which provided training to 120 adolescents. In 2000, the project continued with the same population, this time with the financial assistance of UNESCO. Subsequently, this training initiative was linked to a national program to assist adolescent mothers, which is why the population specifically revolves around teenagers who are pregnant or have children. The latter is the project that is still currently underway; the participants are adolescents who are pregnant or already mothers and under 18 years of age, which are the requirements for accessing funding from the Fund for Children and Adolescents, the current financial support for the project.

A real challenge in the training project was achieving class dynamics that would be permanent. A great effort was made to make sure each participant had her own computer to use. A teacher and an assistant were made available to each group. Effort was also made to make the groups homogeneous, which presented difficulties given the fact that the participants are adolescents with a low level of education.

One aspect of this population is that the girls are very young, which means that university methodologies cannot be used. The majority are girls who had dropped out of the formal educational system, not only because of their pregnancy, but also due to socio-economic conditions and social risk. They come from family situations where domestic violence is prevalent and great control is exercised. They often lack family support for their studies. In their homes, education is not considered important, and aggression is rampant; they are often pressured to quit.

The most innovative aspect of the initiative has been to have a customized educational program. Taking the concrete profile of the participants into account, specific pedagogical modules have been designed. The national education system has missed the opportunity to meet the needs of a diverse student population. The Gender Equity Program has developed an academic program specifically for

pregnant teens and adolescent mothers. This program has taken into account their particularities, adjusting the schedule to make it convenient for them, making the educational materials comprehensible for them and making sure that the classes meet their needs. The program also provides other aspects to encourage completion, such as childcare, bus passes and snacks.

Successful Aspects	Challenges and Obstacles
• Creation of a customized methodology developed specifically for the population	• Make more efforts to link to the Building Opportunities program
• Awareness raising and training for teams of teachers involved in the project	• Discontinuation of funding presents an obstacle to program coordination
• The participants are empowered and feel respected	• Availability of institutional infrastructure was reduced
• Myths are quashed regarding technological areas	• Course accreditation in other educational institutions in the country
• The institution has become more aware of the issue of women's access to technology	• Increase the training time to one or two years, to achieve a greater impact

6.3 IT to empower women and develop political advocacy

Within this category are two initiatives developed by civil society organizations that advocate for women's rights. In both cases, technology is a strategic medium that helps women attain their ultimate goals. One of the very interesting aspects of these initiatives is the strategies these women employ to make collective use of technology. In both cases, the individualistic relationship with the machine is transcended, and whether for the purposes of learning in pairs or through media pools, the values of cooperation and common good prevail.

It is also important to reiterate that these initiatives were chosen to highlight one of the important uses of technology that women in Costa Rica are making: political advocacy. Electronic lists, Web sites and virtual groups have given many women's organizations an important opportunity to express themselves, as well as the possibility to participate and exert pressure in the political sphere, even though there are great geographical distances. Likewise, they have used ICTs in order to create alliances with women's movements around the world.

Women's media pool

Organization: International Feminist Radio – http://www.fire.or.cr

Implementation period: Commenced in 2004 and currently in progress

Objective: Produce information from communication and informative media and initiatives by women who have had access to media interested in covering the Beijing + 10 event.

The initiative to create a women's media pool arose from a practical necessity, as the most recent members of the Feminist Radio felt quite insecure about covering Beijing

+ 10, due to their lack of information. Added to this was the bewilderment felt by other members of the organization at the lack of coordination among women's media organizations for this event in particular. There was also a certain void regarding articulated initiatives, and there was no meeting called due to the lack of resources.

FIRE decided to call a meeting, which they wanted to be quick and easy to coordinate, smoothly run, and would not require resources on top of those that the organizations had already budgeted for covering the event. Often, having resources available implies an excessive amount of paper from each organization due to the fact that each must be accountable. Furthermore, the journalists and broadcasters attending for the first time would feel more supported.

The initiative was widely received, and more than 70 organizations met. This was due to the tradition of working together, as well as the confidence in FIRE because of its transparency and relevance. The needs and expectations of the other organizations turned out to be similar. The feminist and women's movement has changed the way it functions internationally: there is now more interest in building bridges among regions. The media pool would make information available to many other media organizations and, at the same time, would give each organization input for their articles and reports.

The media pool was an initiative of FIRE, but this did not mean that the organization would dominate it. Rather, it was decided that a coordinating body would be elected, and FIRE was chosen to coordinate for two years. Nevertheless, it was explicitly decided that the pool coordination would rotate and be run smoothly. Three events were chosen to be covered during this year.

More than half of the members of the media pool were not physically in New York for the Beijing + 10 event, but still wanted to cover the event: the pool allowed them to do this. The members of the media pool were on an electronic discussion list, and they would immediately receive information and photos. FIRE would place this information on the Web page created for that purpose (http://www.womensmediapool.org), and to which the public also had access.

Three types of media, which had not participated before, joined the Pool: media journalists, communicators and public relations representatives.

The initiative was developed to address the need for communication and information. Any organization willing to communicate through the platform in its totality, and who was committed to addressing all of the issues in the action platform without censure, was able to take part, without worrying about author credits. That is to say, the Pool had an agenda and had content, but did not value the work of one sector over another.

The project was an opportunity to demonstrate what can be done with coordinated efforts that are not dominated by one organization. The initiative also modelled the possibility of providing vital coordination without additional resources. The organizations involved were very enthusiastic about the possibility of finding new ways to communicate information. Nevertheless, an important

lobby effort made by the pool was to highlight the lack of resources for women's media.

Not only did the organizations use ICTs for communication purposes, but they also came up with innovative ways to use them in new combinations. For example, it was decided that the Web page should emphasize the presence of many languages and should communicate multilingualism, which is why it did not contain tracks in each language. Despite being very simple, there was a high level of interactivity on the page.

Reflections were made regarding the absence of additional resources. These usually come hand in hand with pressure from funding bodies which involve control by one organization, externally defined agendas and pressure to personalize the results. The Media Pool, embryonically, reflected an alternative way.

Successful Aspects	Challenges and Obstacles
• The electronic list offered an opportune flow of inputs and outputs in various languages. • Organizations that were not present at the Beijing + 10 event could report on it. • 60,978 Web page hits in two weeks during and after the event. • The Pool lobbied regarding the evaluation of Section "J" of the Women and Media Platform.	• Reaching a consensus regarding the minimum amount of information to be made available for each event • Resources to guarantee a sub-regional balance for those attending the events. • Translation. • Competition among organizations who work in the same types of media. • Mapping out the expertise of the members in order to use it to better advantage.

New technologies to empower and encourage leadership in young women

Organization: Francisca "Pancha" Carrasco Jiménez Feminist Centre
pancha@racsa.co.cr

Implementation Period: 1999–2000

Objective: Develop personal and collective empowerment, leadership and knowledge output of young women by providing information technology communication tools.

In earlier projects developed with young women, the members of this feminist centre, known as "Las Panchas," detected a low rate of technology use, which encouraged them to implement an initiative specifically aimed at the technological empowerment of young women. It was also considered an important element in capacity building for entering the labour market, as well as a way to promote and disseminate the work and thoughts of young feminists. Historically, Las Panchas had worked mainly in the cultural and artistic spheres, such as theatre, poetry and art. In searching for a way to build on this, the project focused on learning to create Web pages, which could reflect their artistic talents.

In order to implement the project, Las Panchas obtained funding from the Gender Equality Fund of ACDI. The members of the centre with the most skills in computer technology coordinated and facilitated the process: 12 young women between the ages of 17 and 27 participated. Three of them worked with the organization and the other nine had participated in former projects. Each one was trained in a specific program to contribute to the project: Dreamweaver, Photo Shop, Illustrator, Home Site and FTP. Nevertheless, there was a skill transfer that developed, and the 12 participants improved their computer skills in the specific programs as well as in the use of e-mail and the Internet. Training in the programs was delivered through peer support and work in pairs.

The Web page was called "Despertando Embrujos" (evoking spells) and was related to the promotion and information dissemination of Las Panchas, linking it to the print bulletin that the organization produced. One of the follow-up strategies of the project was to request a Canadian volunteer from CUSO's NetCorps program so that the young women could continue to post information on their "Despertando Embrujos" Web page.

The impact of the project was limited due to its short duration, although it was very meaningful for the participants. It had various components, one of which was a reflection on gender and age. Another was technical computer training, and a third was planning, designing and creating the Web page. The latter required contacting other women who wanted to promote their artistic work, from a gender perspective, through the Web page.

The most interesting aspect of working in ICTs with this group of young women was the conception of the use of technology, as they had a strong tendency towards expressing themselves in a face-to-face or non-technological mediated way. They formed groups, one editing and analyzing the messages of the artistic works, and others working on the graphic interface. The women tended to be afraid of the technology and of making mistakes, so overcoming those fears was added to the project goals in order to promote empowerment and resolving difficulties collectively.

The training that took place through peer support was achieved by the collaboration of one person interested in the program and another person who had overcome certain fears of technology. Also, there was reflection on the work in pairs. This is related to the way feminist knowledge is transmitted, because feminist trends were discussed, and learning took place at an intergenerational level. Those who knew more about technology were the young women who were a little older than the others, and who were better off financially and/or had a higher level of education. Half of the members were in high school and the other half in university. Space was made in the office so that the members could use the computer. The methodology of the project was to demonstrate technology in a very concrete manner, in the beginning, such as the creation of physical files, before introducing virtual processes.

Successful Aspects	Challenges and Obstacles
• Being the first initiative to create a Web page, where young feminists could express themselves through their art, was innovative. • Two years later, one of the participants, who came from a low socio-economic background, enrolled in a technology program. • The project encouraged artistic and conceptual production from a gender perspective.	• There was no ongoing funding to continue the project. • There were no links with other organizations which could have maintained or reproduced the initiative with their groups. • Some members lacked teaching experience in order to transfer technical knowledge.

7
Conclusions and Recommendations

Conclusions

7.1 Sex disaggregated data regarding ICTs are not fully available

It is important to point out that through the National Institute of Statistics and Censuses (INEC), there is information available on the level of Internet use, as well as the level of computer access and use in the home. However, because this is a special section of the survey, the data is not broken down according to gender. To obtain data broken down by sex, researchers have to request special data processing and in some cases use indirect indicators.

7.2 The available female participation numbers show a decreasing trend

According to the information and statistics uncovered by the research, as well as the perception of the local stakeholders, in Costa Rica women continue to constitute a minority in the information technology professional sector. Furthermore, the participation of women in this sector seems to be decreasing, which coincides with global trends, where fewer and fewer women are entering the field as professionals.

7.3 IT female exclusion may translate into gendered lower income

Given that Costa Rica is currently promoting information technology as an important development option, if Costa Rican women don't manage to enter the IT sector equitably, they may be faced with less favourable conditions regarding their socio-economic well-being in the future. Therefore, it is important for technical training institutes, as well as centres of higher education, to develop initiatives that encourage women to enter science and technology careers, as well as to create the conditions necessary for women to remain in them.

7.3 The main conditions that exclude women are stereotyped gender roles, male-based approach to technology and lack of policies

Based on the perception of the stakeholders interviewed as well as the in-depth interviews from the case studies, the main reasons to explain the digital gender gap in Costa Rica are related to the reinforcement of traditionally stereotyped gender roles in the formal education system; the male-based approach to technology that undermines those aspects of information technology that are more socially related; and the lack of specific policies to address the issue.

7.4 International agreements in this matter are not being fully enforced

Costa Rica subscribed to the Beijing platform of Action, in which article J of the declaration alludes to women's rights, not only in having access to the media and technology, but also in producing them. Likewise, the country is participating in the Millennium Development Goals process, the third objective of which mentions promoting gender equality and the autonomy of women. However, Costa Rica currently lacks the public policies or coordinated intersectoral initiatives directed at promoting the incorporation of women in the information technology sector as professionals.

7.5 Insufficient interaction between gender equity and information society agendas

It seems that the topic of information technology occupies very little space in the women's movement agenda, as well as in the institutions and organizations that fight for gender equity. This is crucial since gender equity is a key aspect of sustainable development and the stakeholders interviewed coincide in stating that digital gaps may further broaden the existing gender gap, hence undermining sustainable development.

Recommendations

The study recommends that the gender conceptions being promoted within the education system be reviewed, specifically those related to science and gender. Likewise, it would be very helpful to formulate specific initiatives that encourage women to enter the area of science and technology during their adolescence.

This study is an initial attempt to approach the gender gap in information technology and it would be helpful that further research be undertaken on the specific topic of women as professionals in the information technology sector. We suggest that exploration is needed regarding which roles are being undertaken by women within the sector. This study covered the professions that are traditionally associated with information technology (systems engineering and computer science), but a broader analysis would allow for a wider mapping out of the different technological professions that women enter.

It would be very beneficial for research purposes that the National Institute of Statistics and Censuses, or any other national institution that does polling of homes or does statistical field studies, would always incorporate the sex variable in the demographic data so that the information can be analyzed differentially.

It would be advisable for the National Commission for Information and Communication Technologies to incorporate into their strategic objectives and work plan specific and detailed objectives that promote gender equity and the incorporation of women into the sector, under equitable conditions.

It is important that institutions and organizations that promote gender equity incorporate the equitable access of women to information technology in their strategic objectives, because this issue is not only about technology, but also development and well-being.

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Rodríguez, Fabiola, Personal interview, April 18, 2005.
Salas, Maricel, Personal interview, April 22, 2005.
Sancho, Lilliana, Personal interview, April 12, 2005.
Serrano, Ester, Personal interview, April 13, 2005.
Suárez, María, Personal interview, April 25, 2005.
Trejos, Ignacio, Personal interview, April 18, 2005.
Zúñiga, Lena, Personal interview, April 26, 2005.

Appendix A

List of organizational interview respondents

Academia

- CENFOTEC
- University of Costa Rica (UCR)
- Technological Institute of Costa Rica (ITCR)

Civil Society

- Francisca Carrasco Jiménez, Feminist Centre
- Bellanet´s Regional Office in Latinamerica and the Caribbean
- Feminist International Radio Endeavour (FIRE)
- Fundación Acceso
- Linux User Group in Costa Rica (GLUCR)

Private Enterprises

- Advansys S.A.
- Club de Libros S.A.
- Electromática
- SEFISA S.A.

State/Government

- Costa Rican Institute of Electricity (ICE)
- National Council of Science and Technology Research (CONICIT)
- National Women's Institute (INAMU)
- Ministry of Science and Technology (MICIT)

Appendix B

List of personal interviews

Name	Organization	Sector
1. Guiselle Bustos	National Council of Private University Education	State
3. Kemly Camacho	Bellanet LAC/Access Foundation	Civil Society
4. Mariana Castillo	Book Club	Private company
5. Andrea Hernández	Linux User Group (GLUCR)	Civil Society
6. Tanya Lockwood	Francisca Carrasco Feminist Centre	Civil Society
7. William Mora	Ministry of Science and Technology	State
8. Flor Obando	Electromática	Private company
9. Laura Queralt	Technological Institute of Costa Rica	Academic
10. Sonia Recinos	SEFISA S.A.	Private
11. Fabiola Rodríguez	University of Costa Rica	Academic
12. Ana Rosa Ruiz	Technological Institute of Costa Rica	Academic
13. Maricel Salas	Costa Rican Institute of Electricity	State
14. Lilliana Sancho	Advansys	Private company
15. Ester Serrano	National Institute of Women	State
16. María Suárez	Feminist Radio	Civil Society
17. Ignacio Trejos	CENFOTEC	Academic
18. Evelyn Ugalde	Book Club	Private company
19. Lena Zúñiga	Bellanet LAC/Access Foundation	Civil Society

Glossary

Spanish	Spanish acronym	English translation
Asociación Costarricense de Derecho Informático	ACDI	Costa Rican Association for Cyber Law
Cámara Costarricense de Tecnologías de Información y Comunicación	CAMTIC	Costa Rican Chamber of Information and Communication Technologies
Centro Feminista Francisca Carrasco Jiménez		Francisca Carrasco Jiménez Feminist Centre
Club de Libros		Book Club
Colegio Científico		Scientific High School
Comisión Nacional de Tecnologías de Información y Comunicación	CONATIC	National Commission of Information and Communication Technologies
Concejo Nacional de Educación Universitaria Privada	CONESUP	National Council of Private University Education
Concejo Nacional de Investigación en Ciencia y Tecnología	CONICIT	National Council of Science and Technology Research
Concejo Nacional de Rectores de Universidades Estatales	CONARE	National Council of State University Presidents
Fondo de la Niñez y Adolescencia		Fund for Children and Adolescents
Fondo para la Igualdad de Género del ACDI		Gender Equality Fund of ACDI
Fundación Acceso		Access Foundation
Fundación Omar Dengo	FOD	Omar Dengo Foundation
Grupo de Usuarios de Linux en Costa Rica	GLUCR	Linux User Group in Costa Rica
Instituto Costarricense de Electricidad	ICE	Costa Rican Institute of Electricity

Spanish	Spanish acronym	English translation
Instituto Nacional de Estadística y Censos	INEC	National Institute of Statistics and Censuses
Instituto Nacional de las Mujeres	INAMU	National Women's Institute
Instituto Tecnológico de Costa Rica	ITCR	Technological Institute of Costa Rica
Ministerio de Ciencia y Tecnología	MICIT	Ministry of Science and Technology
Ministerio de Educación Pública	MEP	Ministry of Public Education
Oficina de Planificación de Educación Superior (de CONARE)		Higher Education Planning Office (of CONARE)
Pool de Mujeres en los Medios		Women's Media Pool
Programa Construyendo Oportunidades		Building Opportunities program
Programa de Equidad de Género del Instituto Tecnológico de Costa Rica	PEG-ITCR	Gender Equity Program of the Technological Institute of Costa Rica
Programa Estado de la Nación		State of the Nation Program
Radio Feminista Internacional	FIRE	Feminist International Radio Endeavour
Universidad de Costa Rica	UCR	University of Costa Rica
Universidad Estatal a Distancia	UNED	State Distance University
Universidad Nacional	UNA	National University

Capturing Grassroots Voices in the Information Society and Sustainable Development

The Policy Dialogue in India

Anusha Lall and Atanu Garai
OneWorld South Asia

Abstract

Given that agriculture has long been the mainstay of the Indian economy and thus a prime concern of Indian policy-makers (and the association of agriculture with the Sustainable Development framework), there is an emphasis of environmental concerns in the rural development context. The paper discusses how grassroots views can be captured in the national policy formulation processes using mechanisms from the domain of the Information Society. The authors analyze the use of the "village Panchayat model," which has been modified and integrated into the structure of the Indian government. They note that, while in theory, grassroots voices can be heard and included in the policy debate, in practice, peoples' participation remains affected by political considerations and realities of marginalisation on grounds of caste, gender, class, etc.

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The environment as a concern cuts across the sub-themes of sustainable development, such as "poverty eradication," "changing unsustainable patterns of consumption and production" and "protecting and managing the natural resource base of economic and social development."

▲

1
Background

This paper explores and establishes the linkages between the information society (IS) and sustainable development (SD) at various levels. An insight into the synergies at the conceptual and policy levels can be gained through closer examination of the international discourse in this context. The understanding of the manner in which these and other potential synergies have been incorporated into the Indian policy framework towards enhancing overall national development is provided with reference to relevant policy documents. At the same time, the paper identifies the gaps between policy and implementation and provides a ground level view of how the applications of information technologies and systems can be—and in some cases, already have been—mainstreamed into sustainable development initiatives. These grassroots voices and their inclusion into—or exclusion from—policy-making processes, and the role of information and communications technologies (ICTs) in facilitating the integration lie at the heart of this research initiative.

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By the launch of the new millennium, a new mission for India was identified as building knowledge-based activities as a major economic and social resource, with information technology serving as a key pillar.

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2
Methodology

The paper draws upon a variety of online and offline secondary sources for its background and analysis pertaining to the conceptual and policy frameworks of information society and sustainable development in the global and Indian contexts. The integration of the element of grassroots voices into the discussion and its substantiation has been attempted through a mix of secondary and primary research findings. That is, a compilation of project descriptions has been supported by a survey of secondary literature and also inputs from consultations with experts. The grassroots perspective on environmental issues and on the mainstreaming of information and communications technology towards environmental management and sustainable development has been brought in by way of analysis of the findings of a participatory research exercise conducted by OneWorld South Asia. Details of this exercise are provided in Section 5 of this research paper.

3
The Global Dialogue

Development and environment issues have long been featured on the international agenda in a prominent fashion (the latter having gained ground since the 1970s). Thus the evolution of the international discourse on sustainable development predates the international dialogue on information society, which was stimulated by the giant advances in information technology in recent years. However, recent developments in the international arena have worked to establish areas of convergence between the two themes. It is also relevant to note that it is people that form the core of both spheres.

3.1 Sustainable development: Environmental concerns[1]

The adoption of the goal of ensuring environmental sustainability as one of the Millennium Development Goals was one of the key outcomes of the Millennium Summit. But it is the discussions at the World Summit on Sustainable Development (WSSD) held in Johannesburg in 2002 that provided currency to the term sustainable development as it is understood today. In conceptual terms, sustainable development subsumes a number of aspects: economic development, social development and environmental protection. This study focuses on the environmental dimension.

The environment as a concern cuts across the sub-themes of sustainable development, such as "poverty eradication," "changing unsustainable patterns of consumption and production" and "protecting and managing the natural resource base of economic and social development." The term "environment" itself covers issues pertaining to land, water, air, forests, agriculture, energy, etc. These issues range from considerations of access to natural resources; increasing eco-efficiency in the usage of natural resources through various means; integrated resource management; countering or minimizing environmental degradation (especially degradation of land and water resources); combating pollution (land, water, air); conservation of the ecosystem towards combating desertification; mitigating the effect of drought and floods; preserving bio-diversity; and so on.

1 This section largely draws upon, and analyses the Johannesburg Declaration on Sustainable Development available at http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POI_PD.htm, and the Plan of Implementation of the World Summit on Sustainable Development available at http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf.

A summary report on the Political Declaration and Plan of Implementation adopted at the Summit in Johannesburg is also available: WSSD, *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, August 26–September 4, 2002*, New York: United Nations, 2002.

The WSSD discourse itself provides indications of the nature of IS/ICT interventions that would prove relevant in the above context. These IS/ICT applications can be seen to fall under the broad headings of technology transfer; technical assistance; capacity building; warning systems; information or resource management systems; monitoring and assessment mechanisms; communication; education; awareness-raising; promoting and facilitating the exchange of information on best practices; knowledge sharing; dissemination of scientific or technical knowledge; and the wider application of techniques and assessment methodologies, etc. Such tools can also engender support for integrated planning and cooperative initiatives.

3.2 Progress towards an information society[2]

From another direction, the World Summit on the Information Society has also sought to provide an overarching framework for harnessing the potential of ICTs in the pursuit of development goals, including that of ensuring sustainable development. Again, this framework addresses various dimensions of the information society, in terms of infrastructure building; creating a policy environment conducive to the formulation of national level e-strategies; ensuring access to information and knowledge through capacity building for ICT literacy and building confidence in the use of ICTs; and, moreover, using ICT applications to benefit all aspects of life. It is in the context of the last element that WSIS documents draw attention to the potential of ICTs in the field of agriculture, for environmental protection and the management of natural resources, disaster prevention, and in support of sustainable production and consumption patterns.

2 This section is informed by documents from the World Summit on the Information Society including the WSIS-03/GENEVA/DOC/4-E, "Declaration of Principles – Building the Information Society: A Global Challenge in the New Millennium," December 12, 2003; and WSIS-03/GENEVA/DOC/5-E, "Plan of Action," December 12, 2003. Further background reading is also available at http://www.itu.int/wsis/

4
The Indian Context

To begin with a brief country description, India is located in south Asia, with its population having crossed the one billion mark on 2.4 per cent of the world's land area. The Indian economy has been dominated by village farming, modern agriculture, handicrafts, a range of modern industries and a large number of support services. In addition to agriculture, the main branches of the economy have been electricity production, consumer goods, cement, steel production and infrastructure including telecommunications, banking, information technologies and software. Traditionally a mixed economy, the Indian government embarked upon its liberalization program in the 1990s. Among the driving forces behind the economic changes following this period were growth and advances in the information technology sector.[3]

India has a democratic government structure, with a legislature, an executive and an independent judiciary. With 28 states and seven union territories, it is a federation with a unitary bias. There are numerous diversities in terms of ethnicity, culture, language and religion. The English language has associate status and serves as the most important language for national, political and commercial communication and the country has a large, well-educated English-speaking population, more than two-fifths of the people are illiterate and a third live in poverty. In terms of the general indicative statistics, the infant mortality rate is 63 per 1,000 live births, while life expectancy at birth is estimated as 64 years.[4] According to the Human Development Index compiled by the United Nations Development Programme, India ranks 127th of the countries listed.[5]

3 General information on the India country profile can be found in the Central Intelligence Agency (CIA) *World Fact Book 2003* available at http://odci.gov/cia/publications/factbook/geos/in.html; Ministry of Environment and Forests, Government of India, *Agenda 21 – An Assessment, 2002*, available at http://envfor.nic.in/divisions/ic/wssd/doc2/main.htm, the Federal Foreign Office of Germany, *Country Information, 2003*, available at http://auswaertigesamt.de/www/en/laenderinfos/laender/laender -ausgabe_htm?typre_id=14&land_id=60 and Environmental Policy Research Centre, *India Case Study: Analysis of National Strategies for Sustainable Development*, Working Paper June 2004, available at http://iisd.org/measure/capacity/sdsip.asp

4 The United Nations Children Fund, *The State of the World's Children 2005*, New York: UNICEF, 2004.

5 The United Nations Development Programme, *Human Development Report 2004*.

4.1 Addressing environmental concerns: A national sustainable development strategy?[6]

In terms of an environmental profile, the country is characterized by upland plain in the south, flat to rolling plain along the River Ganges, deserts in the west and mountains in the north. The climate is temperate in the north, varying to tropical monsoon in the south. Monsoons cause severe droughts, flash floods and flooding of large areas due to the rains and thunderstorms. Environmental concerns in India can be seen to include deforestation; soil erosion; over-grazing; desertification; air pollution from industrial effluents and vehicle emissions; water pollution from raw sewage; and run-off of agricultural pesticides. The limited access of the population to potable drinking water and sanitation facilities is also a problem.

Environmental legislation has existed in India since before independence, though the inception of a well-developed framework can be traced to 1972, following the United Nations Conference on the Human Environment in Stockholm. India's National Council for Environmental Policy and Planning was set up at that time within the Department of Science and Technology, which evolved into the Ministry of Environment and Forests in 1985. Since then, India has developed a number of strategic environmental plans, ratified the Kyoto Protocol, signed a number of international treaties and geared policy to implement Agenda 21.

India's perspective on sustainable development was captured in a detailed study brought out by the Ministry of Environment and Forests, titled *Empowering People for Sustainable Development* and presented at the World Summit on Sustainable Development.[7] The essential framework for sustainable development in India was identified in terms of democratic continuity; devolution of power; an independent judiciary; civilian control of the armed forces; an independent media; transparency; and people's participation. Four objectives were also identified: combating poverty; empowering people; using core competencies in science and technology; and setting environmental standards in the context of conservation of natural resources and improving the core sectors of the economy. At the same time there was no specific strategy prescribed for sustainable development, with overall development planning taking place in the context of the national Five-Year Plans developed by the Planning Commission of India under the overall guidance of the National Development Council.

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6 This section draws heavily upon Environmental Policy Research Centre, *India Case Study: Analysis of National Strategies for Sustainable Development*, Working Paper June 2004, available at http://iisd.org/measure/capacity/sdsip.asp, in turn drawing upon Central Intelligence Agency (CIA) *World Fact Book* available at http://odci.gov/cia/publications/factbook/geos/in.html; Ministry of Environment and Forests, Government of India, *Agenda 21 – An Assessment, 2002*, available at http://envfor.nic.in/divisions/ic/wssd/doc2/main.htm and the United Nations Commission on Sustainable Development, *Johannesburg Summit 2002 – India – Country Profile, 2002*, available at http://www.johanessburgsumit.org/html/prep_process/india_natl_prep.html

7 Ministry of Environment and Forest, Government of India, *Empowering People for Sustainable Development*, available at http://envfor.nic.in/division/ic/wssd/doc1/main.html

In terms of the institutional arrangements underpinning the sustainable development process, the Ministry of Environment and Forests is a prominent agency. In the run-up to the World Summit on Sustainable Development, it initiated cooperative activities with research institutions, multi-stakeholder consultations, etc. In the follow-up, the National Environmental Council, chaired by the Prime Minister and the Minister of Environment and Forests, played a key coordinating role. There are also a number of institutions working on sustainable development issues such as the Centre of Environment Education and The Energy and Resources Institute (TERI).

4.2 India: A knowledge society

By the launch of the new millennium, a new mission for India was identified as building knowledge-based activities as a major economic and social resource, with information technology serving as a key pillar.[8] The two-dimensional objective of a knowledge society was identified as societal transformation of wealth generation, resting upon knowledge protection. As mentioned, the strategy towards developing a knowledge society relied heavily on the deployment of advances in information technology to give a thrust to the knowledge economy. The advantages of connectivity were especially highlighted as supporting the advance of a range of areas from agriculture to commerce, as well as tele-education and tele-health care.

The characteristics of a knowledge society are given as:

- it uses knowledge through all its constituents and endeavours to empower and enrich its people;
- it uses knowledge as a powerful tool to drive societal transformation;
- it is a learning society committed to innovation;
- it has the capacity to generate, absorb, disseminate and protect knowledge and also use it to create economic wealth and social good for all its constituents; and
- it enlightens its people to take an integrated view of life as a fusion of mind, body and spirit.

The areas of technology identified as the drivers of the process primarily included information and communications technology, biotechnology, space technology, oceanography, material technology, environmental technology, etc. These were to be paralleled by advances in disaster mitigation, weather modification, native knowledge products, conventional and non-conventional energy, sustainable use of bio-resources, telemedicine, tele-education and a range of tele-services. IT was viewed as the integrator of technologies. Rural connectivity was also seen as a major focus in the Indian context.

8 Planning Commission, Government of India, *India as Knowledge Superpower: Strategy for Transformation, Task Force Report*, New Delhi, June 2001.

4.3 Sustainable development and the information society in the Indian policy context

Thus the goals of sustainable development and progress in the field of information and communications technology have begun to receive considerable attention in the Indian policy-making context in recent years. Given that agriculture has long been the mainstay of the Indian economy and thus a prime concern of Indian policy-makers (and the association of agriculture with the sustainable development framework), there is the added emphasis of environmental concerns in the rural development context in particular. The relevance of ICTs in rural initiatives also finds mention.

For instance, the Tenth Five-Year Plan,[9] covering the period 2002–2007 aims at balanced growth with focus upon the enhancement of human well-being. It raises the issues of water management; the bringing of wastelands or degraded lands into productive use; connectivity in all parts of the country; the use of technological interventions to improve agricultural productivity; and the strengthening of governance structures in a variety of ways, among others. Two new concerns that have been added in the Indian policy structure are those of energy and food security, and disaster management (in terms of the need to address the consequences of global climate change with reference to cyclones, droughts, floods, etc.). As a point of interest, there is also reference to the need to facilitate experience-sharing (in terms of best practices), and for reinforcing the information network. Environmental sustainability also finds a place as a social indicator for human well-being, along with health, longevity, literacy, etc.

The Tenth Five-Year Plan document specifically cites the inadequate coverage of power supply; limited access of the population to drinking water and sanitation (with the situation definitely worse in rural areas); land and forest degradation; soil erosion; over-exploitation of groundwater; increasing pollution; etc. as pressing problems to be addressed the planning process. There is an interesting contradiction that emerges in terms of the availability of agricultural land and the need to increase the forest cover for environmental reasons. The availability of agricultural land (linked to the question of food security) is also then related to the issue of environmental degradation (in turn a threat to nutritional security and health). Another interesting association that is made is that of availability of resources with good governance.

The policy-makers do point out that there has been inadequate incorporation of ecological issues into the development strategy, "despite the fact that there has long been recognition of the importance of environmental and ecological factors in Indian planning and policy… although India has been a signatory to all international treaties and conventions on ecology and bio-diversity, and has enacted several laws on these issues, there is evidence that biodiversity loss is continuing apace." Just as an example, the present water management policies exhibit almost

9 Planning Commission, Government of India, Tenth Five-Year Plan 2002–2007.

complete neglect of the origins and the catchment areas of rivers, with disastrous implications for the economy and ecology.

Along the patterns of the Millennium Development Goals, the present plan has also provided a set of specific measurable targets for a few key indicators of human development. Speaking directly to the scope of this paper, these targets include "Increase in forest and tree cover to 25 per cent by 2007, and 33 per cent by 2012"; "All villages to have sustained access to potable drinking water within the Plan period"; and the "Cleaning of all major polluted rivers by 2007 and other notified stretches by 2012."

Thus, sustainable development in terms of environmental concerns (here) is indeed a recurring theme in Indian policy. However, there are only a few immediately apparent references to the technological component, especially ICTs, with the exception of telecommunications, which has been cited as a crucial component of infrastructure. Technological and technical inputs for agriculture; development and dissemination of agricultural technologies; strengthening of the agricultural research and development system; scientific watershed management; participative water management policies; enhancing awareness for the appropriate management of forests (highlighting the multiple roles of the forests, the benefits, etc.); support to research and extension and planning capabilities in this context; obviating operational wastages; and generating understanding of—and transparency in—maximizing the potential of various natural resources are some areas where the role of ICTs can be located.

5
Grassroots Voices for the Environment and ICTs

This section focuses upon the outcomes of a participatory research exercise conducted by OneWorld South Asia, with community torchbearers from rural India. The exercise was part of a three-day workshop held in New Delhi, bringing together more than 200 participants from rural pockets of Tamil Nadu, Pondicherry and Andhra Pradesh, Maharashtra, Gujarat, Haryana, Madhya Pradesh, Chhattisgarh and Orissa New Delhi, Assam, Orissa, Rajasthan, Uttar Pradesh, Uttaranchal Himachal Pradesh and Punjab. Results from the workshop were derived primarily by way of focus group discussions and individual and group interviews. The focused group discussions had been divided into three parts: first, to identify concerns in the issue area; second, to explore the potential of information and communication technologies towards ensuring environmental sustainability; and, finally, to discuss practical concerns regarding appropriate technological applications.

These torchbearers were continuing or potential knowledge workers, and their views are included here as a representation of the grassroots voices. In this sense, what has emerged is that not only are the people extremely aware of their environmental and information needs, but also that they seek the space to be proactive and have clear ideas on how their needs could be met. From another direction, while in no way claiming that the issues listed here are comprehensive, they provide the grounds to validate or indicate the gaps in existing policies, as well as provide suggestions for a way forward.

5.1 Environmental perspectives at the grassroots

Environmental issues emerged as a major concern of the grassroots representatives. Allowing for regional diversities and ecological differences, there was some convergence among the participants regarding their most pressing problems. The discussion proceeded on a positive note in that while the people identified their areas of concern, they also took the initiative of suggesting possible appropriate solutions. Five issues, as discussed by the participants can be highlighted here.

1. The issue of water and waste disposal appeared to be the prime concern in rural India, regardless of region. The reasons cited were numerous: erratic rainfall; water had to be brought from long distances; salinity, etc. The wide prevalence of plastic as a non-bio-degradable waste has compounded the problem of waste disposal. The problem of water and waste disposal also translates into a number of health-related concerns. Among some of the possible solutions to this problem the participants of the research exercise listed the advantages of awareness creation among school children, and also the systematic documentation of environmental concerns towards appropriate husbanding of water resources and waste management. The establishment of soak pits, percolation tanks, rainwater

harvesting systems and even separate pipes for carrying drainage water (diverted from flowing into rivers) were some other concrete suggestions.

2. The participants established a very clear relationship between agricultural practices and the environment. Some of the concerns that emerged in this regard were that the use of chemical fertilizers and pesticides was degrading the environment. On the basis of their experience, the people asserted that private producers were promoting such chemical fertilizers and pesticides over natural ones. It was also observed that modern techniques like tractor cultivation were not compatible with the use of natural fertilizers, and many farmers were not investing in some more expensive, yet environmentally sustainable, agricultural practices since surety requirements deterred them from taking loans. Among the possible solutions that were identified during the course of the discussion was the use of organic pesticides, for example "neem" and vermicomposting, as well as enforcement of laws against banned pesticides. The people also made a case for the strong role of the government in transferring research and development outcomes and laboratory knowledge to the field.

3. Concerns about appropriate management of energy resources and rampant deforestation also constituted an important component of the discussion. The rural community spokespersons then took up the solution of afforestation, one of the means to promote which was seen to be generating awareness among school children. The practice of joint forest management as adopted by the Indian government in pockets, and the possibility of community ownership of forests, as well as the celebration of "Environment Day" in villages and districts by the Self-Employed Women's Group (a strong community-based organization operating from Gujarat) were cited as good practices. The need to prevent forest fires and to explore the possibility of alternative occupations for people living off forests as well as alternative fuels was seen as an imperative. The dissemination of information for environmental awareness through tele-centres was also offered as an option.

4. The danger of natural disasters, especially in the wake of recent events, has led to disaster management being listed as an important concern. One of the primary correlations established by the people was that floods and droughts were often caused by deforestation. In this regard the relevance of afforestation and a ban on cutting trees was reiterated. There was also consensus that the government should take adequate measures prior to the onset of the monsoons to prevent floods, including the cleaning of drains. The discussion also covered the ground of generating awareness of the long-term implications of environmental degradation, using various media, such as short films or radio programmes highlighting the consequences of environmental degradation.

5. A pervasive issue to be discussed was the role of governments and Panchayats in environmental preservation. The suggestions to this effect

included government promotion of afforestation on wastelands, the growing of trees on community or temple lands, etc. Emphasis was laid on the involvement of women in afforestation and other such activities, as well as the provision of self-help groups to engage in the same. It was felt that the panchayats should actively follow up on government projects, while asserting the right to information would also help in the implementation of such projects.

5.2 Existing or potential areas for ICT applications towards ensuring environmental sustainability

Having identified some main areas of concern, the community torchbearers also voiced their suggestions regarding the potential of using ICTs for sustainable development. Some of the points of focus were information gathering in terms of comparable data or even information on good practices from other countries, or environment-focused content from communities to be disseminated through community radio or television.

Information dissemination appeared to be the most relevant application for the rural communities with participants citing the relevance of information transmitted through compact discs and the compilation and distribution of a newsletter on environmental issues at the community level. Environmental awareness could be generated through videos and even mobile phones, and media such as community radio could be used to disseminate information on traditional uses and values of plants and trees, news and strips and television programs. Even advertisements can focus on environmental issues and posters can be displayed at bus stands and tea stalls. Announcements of government plans, legislation or notifications can be made via radio.

There were suggestions regarding the various facilities and functions that could be invested in telecentres, with a view to their work encompassing the promotion of environmental conservation. Telecentres can maintain and provide contact details of persons who can provide useful information to the farmers and villagers, they can operate as disaster management centres, they can disseminate information on government schemes (e.g., tree saplings for plantation) as well as information on using bio-pesticides and fertilizers, etc. Information on sanitation and alternative fuels can also be disseminated from village knowledge centres. These centres in coastal villages can also give early warning on weather conditions, wave height, tsunamis and on location of fish schools, etc.

Locale-specific information can immediately be made available via ICTs. For instance, in case of calamities such as droughts or floods, information can be conveyed immediately to hospitals, information on pollution of village tanks or similar problems can be provided to villages without delay; ICTs can help give early warning on forest fires to the forest department, or even to provide knowledge of nature clubs in the area. Information on rainwater harvesting, groundwater depletion, etc. can also be made available using such tools, along with a directory

of how and where relevant equipment can be obtained. Agricultural information from universities and research institutes can be made available to the farmers via the Internet or other applications.

People also suggested that the government should provide the infrastructure for ICTs which, in turn, should be community owned; that films and documentaries on environmental issues and the consequences of environmental degradation should be screened in the village movie theatres; that there should be CDs and video games on environmental issues for children; that awareness programs on the environment should be incorporated into the school curriculum; and that practices such as the planting of trees on the birthdays of eminent persons or dignitaries should be mainstreamed.

5.3 Mechanisms for facilitating participation in Indian policy-making

Thus it becomes evident that the people themselves are key stakeholders and integral to any development in the country, and are willing to participate in the planning and implementation of every project that touches their lives. With reference to the capturing of grassroots concerns and their inclusion in policy-making processes, there is a certain institutional and policy framework for local governance already in place in the Indian context. This has been done through the perpetuation of the village Panchayat model, which has been modified and integrated into the structure of the Indian government by way of the Panchayati Raj System. Policy planning in India is designed to involve multiple stakeholders in the process, and interaction between the centre, state and local bodies. However, it can also be said that as in the case of most government structures, peoples' participation is directed by political considerations and realities of marginalization (on grounds of caste, gender, class, etc.). Despite the attempt to create an inclusive, bottom-up structure in theory, in practice policy is still formulated by a chosen few.

ICTs acquire an added relevance in this context, which have the potential to cut across multiple tiers of governance structures, and facilitate a two-way interaction between the people and policy-makers. The initiative taken by the government's Department of Biotechnology presents a useful example of how people can influence policy. In this case, the government department made public the draft of the National Biotechnology Development Strategy (over the Internet), inviting feedback from the people (through advertisements in print and other media) from March 31 to May 16, 2005 (http://dbtindia.nic.in/biotechstrategy.htm).

Also, the more local mapping happens through ICTs, the more the Panchayats are going to be empowered with the usage of this technique. E-Panchayat efforts are underway in the states of Rajasthan and Andhra Pradesh. The Swajaldhara online monitoring system is one good example where the information on drinking water mission at every Gram Panchayat level can be viewed and assessed. There are other examples such as e-Suvidha, PRIASoft, and the whole range of information kiosks as opportunities to consult people on policy and implementation

processes. The empowerment of Gram Panchayats to undertake the functions earmarked for them would also help influence policies and monitor the implementation process at people's end.

Such advances also generate a vision for the genesis of policy from the grassroots itself. This is the nature of advocacy that this research paper supports with reference to the potential of the role of ICTs in strengthening sustainable development initiatives, towards enhancing overall national development.

6
Exploring the Convergence of Environmental Concerns and ICTs in On-the-Ground Initiatives

Then with the understanding that the linkage between IS and SD and even community participation has not been established clearly in the Indian policy framework, the expression of the linkages has now to be found in projects and programs of the government and other sectors, and in ground-level initiatives by the people. It must also be realized that an important area of convergence can be located in context of rural livelihoods.

Within government structures, the digitization of Andhra Pradesh to provide market-related information through state planning and development monitoring systems; the establishment of an information centre in Karnataka for the maintenance of land records and other documents; the initiative in the floriculture industry in Tumkur; an electronic database of land records in Tamil Nadu; etc. also illustrate a gamut of Indian success stories. With direct environmental implications, the Narmada Control Authority undertook a massive, computerized, networked river management and flood forecasting program across the Narmada basin.

A number of initiatives cutting across the national policy-making structures have emerged in recent years. For instance, a Regional Initiative on Information and Communication Technology and the Environment: Promoting e-Sustainability in Asia-Pacific was formally launched in May 2002 by the Ministry of Environment and Forests (MoEF), the United Nations Environment Programme (UNEP), The Energy and Resources Institute (TERI) and the Confederation of Indian Industries (CII). In terms of its broad objective, the initiative was intended to "address practical realities of ICT applications as enabling mechanisms for improved environmental sustainability, particularly in developing countries."[10] As a point of interest, the regional workshop preceded the WSSD, its proceedings feeding into the WSSD processes.

A number of interesting innovations and projects in this area have also come to the fore. These include e-governance solutions related to hazardous waste management, air and water pollution, etc. provided by Newgen Software Technologies; SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) and Indian Institute of Management Ahmedabad support to grassroots efforts for conserving biodiversity; a Geographic Information System to preserve natural resources used by the Central Pollution Control Board (CPCB); etc. Some of these are described here at some length.

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10 *Information and Communications Technology and the Environment in Asia and the Pacific (ICTEAP)*, Proceedings of the Regional Workshop for Asia-Pacific Region held May 2–3, 2002, in New Delhi, India (United Nations Environment Programme: 2002), p. 1.

The Initiative is intended to "improve regional environment and sustainable development within the framework of the Malmo Ministerial Declaration and the UNEP Global e-Sustainability Initiative by catalysing local and national initiatives." http://www.icteap.org/about.asp

HONEYBEE Electronic Network – Knowledge Network for Augmenting Grassroots Innovations:[11] The network was initiated in April 2000, with a view to facilitating "traditional genius," generating benefits and incentives to innovators working to conserve and utilize natural resources in a sustainable manner. It is a joint venture of the SRISTI, the Indian Institute of Management Ahmedabad (IIMA), and the Gujarat Grassroots Innovation Augmentation Network (GIAN). The thrust of the initiative is to link innovators (who have successfully tackled localized problems—technological or institutional—through their traditional genius, without any help from government, the market, or even NGOs) "with users and peers through village-based kiosks with multi-media/multilingual database, communicating in local language."

The Wired Village Project:[12] The Warana Project has been jointly carried out by the National Informatics Centre on behalf of the Government of India, the Government of Maharashtra and the Warana Vibhag Shikshan Mandal. The project began in December 1998 in the Kolhapur and Sangli districts of Maharashtra and among its objectives were the improvement of agricultural output, along with achieving computer literacy, generating employment and ensuring greater transparency in the administration of villages. The project builds upon the network of cooperatives in the district, in the fields of sugar, milk, poultry, construction, etc. While the cooperative complex already had voice communication facilities, and also computer hardware installations and software applications for routine functions as managing payrolls, billing, Management Information Systems, etc., the special IT Task Force organized by the Prime Minister's Office recommended the development of the cooperative movement through information technology which led to the "wired village" project. State-of-the-art infrastructure was established at Warana, and on the basis of a needs assessment carried out by the National Informatics Centre a number of applications were developed to enable villagers to access information about employment and agricultural plans, information on government procedures especially with regard to applications for government certificates like ration cards, birth and death certificates, crop information, village information consisting of bus, railway, medical and hospital facilities, water supply details, etc. Computer-based educational facilities as well as a Geographical Information System were also put into place. Among the rural development benefits of the project were the computerization of dairy activities and the wired management of sugarcane cultivation.

Jal-Chitra:[13] This initiative involved the creation and testing of the software Jal-Chitra, designed to provide an interactive water map of the village, enabling the community to keep track of the amount of water available from each water source, record water quality testing, listing maintenance work done and required,

11 A detailed description and other information pertaining to this initiative can be found at http://www.icteap.org/details.asp?rec=32

12 For details refer to http://icteap.org/details.asp?rec=38 and http://informatics.nic.in/archive/inf2kapr/welcome.html

13 For details refer to http://www.icteap.org/details.asp?rec=42

estimating water demand, generating future monthly water budgets, and even showing the amount of community needs met through groundwater sources and rainwater harvesting systems. The software was developed by the Ajit Foundation, in close collaboration with the Barefoot College of Tilonia, and was tested in villages of Rajasthan by the Social Work and Research Centre and by the Mazdoor Kissan Shakti Sangathan.

"Information Technology Integration" in Dairy Farming:[14] The Gujarat Cooperative Milk Marketing Federations decided to adopt the "Information Technology Integration" program in 1995, and now caters to 15 states in India where the Anand Pattern of Dairy Cooperatives is prevalent, managed by the National Dairy Development Board.[15] The identified objective was to create a new efficiency for dairy cooperatives through incorporating information technology in all aspects of business, heightening competitiveness and extending market need. Thousands of computers were installed in the villages to provide better efficiency, trust and transparency in the business, and an online computer network put into operation to link all the stakeholders in the business. Villagers involved in the dairy activities received computer and e-commerce training, while a computerized database and Geographical Information System maps were created of all the farmers and their cattle at the supply end. To broaden its scope to the national level, the National Dairy Development Board set up a National Information Network.

ITC e-Choupal:[16] The e-Choupal was conceived and implemented by ITC's International Business Division, which is one of India's largest exporters of agricultural commodities. The project was launched in June 2000, covering villages across Madhya Pradesh, Andhra Pradesh, Karnataka and Uttar Pradesh. This Internet-based intervention in rural India was intended to leverage information technology to tackle the challenges of fragmented farms, weak infrastructure and the involvement of numerous intermediaries in Indian agriculture that had made the agri-business sector globally un-competitive, in spite of the country's rich and abundant resources. Thus, the broad objective was to enhance the competitiveness of Indian agriculture and stimulate higher quality and productivity, higher incomes, enlarged capacity for farmer risk management and larger investments. The target audience of farmers was also actively involved in the project as "sanchalaks," or the managers of the Internet kiosks that are set up in the villages. These kiosks enable the agricultural community to access ready information on the weather and market prices, disseminate knowledge on scientific farm practices and risk management, facilitate the sale of farm inputs and purchase of farm products.

14 For details refer to http://www.icteap.org/details.asp?rec=47 and http://www.nddb.org

15 The dairy cooperative movement in Gujarat also termed as the White Revolution spawned the Anand Pattern of Dairy Cooperatives bringing about a revolution in dairy farming, milk production and its management.

16 For details refer to http://www.icteap.org/details.asp?rec=49

The Information Village Research Project:[17] The project in its original form was initiated in 1998, with the objective of empowering rural poor through easy access to information and the use of ICTs to facilitate livelihood activities. It began with the establishment of Village Knowledge Centres (VKCs) in 10 villages near Pondicherry by the MS Swaminathan Research Foundation, in an attempt to fill the gaps in public service delivery with reference to the communication infrastructure and the information-seeking habits and information needs of the target population. It is interesting to note that even in its earliest form this project adopted a bottom-up approach to implementation in the sense that the VKCs were run on a semi-voluntary basis, with operators identified on the basis of education, socio-economic status, gender and age; information-gathering activities carried out by local volunteers (mainly women); and supervision undertaken by the local government structures. It is also equally interesting to note that the addressing of ecological considerations as well as environmental concerns of the people was integral to the project. The operators were trained at the eco-technology centre of the Foundation. A core activity of the Value Addition Centre at the hub of the network was the sourcing of predictions on wave conditions and delivering them to the village centres as timely and relevant information for local fishers. Locale-specific information such as detailed accounts on sugarcane cultivation, a guidebook on the application of bio-fertilizers in rice cultivation, provision for the exchange of information on availability of labour and materials in the region, etc., has also been disseminated by the VKCs. The network also serves as an environmental early warning system. This project has laid the foundations of the nationwide movement known as Mission 2007.

Low-Cost Telecom Access for Rural Communities:[18] With the idea of providing and operating telecom and Internet services in small towns and rural areas as the broad thrust area, n-Logue, established under the aegis of the TeNet group of IIT, Chennai, in collaboration with other agencies, designed and promoted a new system, "corDECT," as a cost-effective and useful alternative to the telephone. This system was intended to provide simultaneous voice and Internet connectivity. At the same time, though connectivity was viewed as a key issue, emphasis was also laid on the provision of useful content. Thus n-Logue has tied up with a range of content providers, and also with state governments to drive e-governance applications, to enable the rural citizen to access government services from the rural telephone and Internet kiosks to be established in every village under the project plan. The initiative seeks to support programs for rural development and service delivery, enable commercial activities in villages and use the kiosks for bringing education and training to rural areas, as well as enhancing the provision of health and veterinary services.

17 For details refer to http://www.icteap.org/details.asp?rec=34 and http://www.mssrf.org/informationvillage/informationvillage.html

18 For details refer to http://www.icteap.org/details.asp?rec=35 and http://www.tenet.res.in/nlogue.html

Connecting Rural India to the Global Village:[19] This initiative by TARAhaat has been operational since September 2000 in the districts of Bundelkhand, with the objective of bringing Internet-based relevant information, products and services to the Indian rural market. It emphasizes three main components for rural connectivity—content, access and fulfilment, while reaching out to all kinds of users including farmers, traders, housewives, senior citizens, children, etc., literate and non-literate. Content is updated by a network of the TARA outreach workers and alliance partners; delivery of information goods and services is managed through local courier or TARA franchisee vans; and TARAhaat relies on local connectivity where available or provides access via satellite for the TARAkendras which are business-cum-community centres set up by local entrepreneurs. The rationale for the project is to empower villages to demand basic amenities and to underpin the income generation capabilities of the people to pay for them. The community-to-community services connect rural producers with the urban and overseas customers creating opportunities for income flows; and TARAhaat also aimed at generating growing business-to-business and community-to-community traffic in order to establish an effective channel of communication among government agencies, businesses and rural consumers.

BIOTIK:[20] Launched in January 2005, BIOTIK is an initiative in biodiversity informatics for developing two knowledge bases of the tree species of Western Ghats, India and Northern Annamites of Lao PDR. BIOTIK aims at completely cataloguing all the tree species available in both the areas identified as biodiversity hotspots. As part of the project, still in the development stage, a multimedia-based species identification software is planned to be developed to identify tree species in these two areas which will eventually evolve into comprehensive knowledge bases with digital herbariums, photographs of characters of the species (before and after flowering) and all relevant botanical and taxonomy-related information. These knowledge bases will be available on the Web (using SVG, PHP, MySQL) where one can identify the tree species; on CD/DVD-ROMs; and also on simputers with local language support (Malayalam, Kannada and Lao). Using the BIOTIK database, staffs of the forest departments, buffer zone population and those involved in forest community-related projects, like joint forest management, will be able to consolidate the present knowledge available in terms of biodiversity, besides evolving indicators for biodiversity in the long run. On the other hand, the staff of the stakeholders, like the forest department, will be trained and will be able to keep the knowledge base up-to-date while also gaining an intensive knowledge about what exactly they are taking care of. The implications can be quite scaling, from contributing to the global databases on taxonomy, to facilitating the participation of local populations in conservation.

19 For details refer to http://www.icteap.org/details.asp?rec=36 and http://www.tarahaat.com

20 See, Digital Opportunity Channel. BIOTIK: A knowledge-sharing portal for managing biodiversity informatics. Online: http://www.digitalopportunity.org/article/view/117978/1/1075

OSCAR:[21] Launched in January 2004, OSCAR develops open source weed identification software for the major weed species of rice-wheat crop systems that can be deployed on simputers. The application will address extension workers, farmers/farmer groups, and students in the Indo-Gangetic plains. The application will have 50 weed species in the database, their botanical characteristics, their incidence and ways to control them on field. It will also be ported in local languages like Hindi, Urdu and Bangla (if necessary in Punjabi and Nepali). The activities are designed in such a way that, on one hand, the botanical/taxonomic work proceeds to enrich the database of weed species by collecting photographs for each character of every species, drawing the identikit, and on the other hand, the development work progresses simultaneously benefiting from the botanical work. A beta version for Windows exists and the Linux/simputer version is almost in its beta stage. These versions are tested in the field during the workshops and subsequent field trips in the Indo-Gangetic plains with farmers, extension workers and students. Initially students were not part of targeted audiences but we learned during the field trips that OSCAR can be a good educational tool and added them to the list of targeted audiences. It is expected by June 2006, complete versions of OSCAR for Windows, Linux Desktop and Simputer will be ready. There are basic issues in agriculture that OSCAR or, for that matter, any ICTs may not be able to address, but OSCAR will certainly demonstrate the significance of application of FLOSS (Free/Libre Open Source Software) to areas like agriculture.

ICTs for wildlife preservation: India's decade-old tiger counting method has attracted criticism about accuracy—conservation experts have detected that anomalies in the counting results lead to inaccurate data. Spatial monitoring of tiger, prey and habitat generates intensive stratified sampling for tiger density estimation. GIS data obtained through spatial mapping is further reinforced through data collected in field surveys using very high radio frequency (VHF), global positioning system (GPS) and satellite tracking systems that provide the exact count, knowledge of dispersal, source/sink concept, meta population and basic ecology (e.g., ranging patterns, predation ecology, recruitment and behaviour).[22]

Sharing local knowledge – Open Knowledge Network:[23] Since late 2003, Open Knowledge Network (OKN) aims to practise the principles of knowledge-sharing, building on the experience of others, building capacity in communities to support knowledge-sharing, working offline for free, but synchronizing with the Net and peer-to-peer networking of existing knowledge workers. At present,

21 Digital Opportunity Channel. Open source simple computer for agriculture in rural areas. Online: http://www.digitalopportunity.org/article/view/117977/1/

22 Union Ministry of Environment and Forests, Government of India. *Joining the dots: The report of the tiger task force*. New Delhi: Project Tiger, the Ministry, 2005. 217 p. Online: http://envfor.nic.in/pt/TTF2005/index.html; Union Ministry of Environment and Forests, Government of India. Strengthening the monitoring system for tigers. Presentation by Y. V. Jhala and Q. Qureshi. Online: http://www.envfor.nic.in/pt/presentation/IBWl-F-Jhala.pdf

23 See, Open Knowledge Network. http://www.openknowledge.net

OKN operates in Africa (with local partners in Kenya/Tanzania and Uganda in east Africa; Mali and Senegal in west Africa; and Zimbabwe in southern Africa); South Asia (with local partners in north and south India and Sri Lanka, and partners identified in Nepal); and Latin America (networking with potential partners in Peru and Brazil). OKN uses a Content Management System (CMS) and interactive portals to generate and exchange text, audio and video-based local content on wide-ranging socio-economic issues. Such knowledge reflects people's concerns about environmental issues that affect their lives. OKN also enables the scientific community to transmit proven knowledge to rural citizens enabling them to practise livelihood activities consistent with environmental sustainability.

ICTs in environmental monitoring and impact assessment: The use of ICTs in environment monitoring and impact assessment has long been implemented in several infrastructure-building projects. Management and development of natural resources of the country has been prioritized by the Planning Commission and the National Natural Resource Management System (NNRMS) was augmented in the early 1980s, towards optimal utilization of remote sensing along with conventional data. As part of the NNRMS programs, a micro-level environmental impact assessment was conducted in Kolli Hills in the state of Tamil Nadu using remote sensing and GIS for mapping the resources, analyzing their status, potential and preparing an area-specific treatment package for sustainable utilization, conservation and development. The assessment aggregated primary and secondary data on various resources from field and various state agencies to generate spatial and non-spatial data. The database generates resource status, potential and changes occurred in land use and land cover—it clearly demonstrates the necessity of undertaking multi-pronged efforts to contain the damage happened.

Awareness-raising for ensuring cleaner production: Raising awareness is identified as an effective mechanism for reducing chemical onslaughts on the ozone layer, accelerated by illegal trade on ODS. Media support is crucial for raising awareness and this can be done by disseminating information over the Internet. The launch of the UNEP – Regional Office of Asia Pacific – Compliance Assistance Program aims to "provide appropriate information in a timely manner" to enable well-guided environmental action.

ICT in disaster management: The use of various ICT applications in disaster management is underscored in disaster mitigation initiatives in various states. Experiences with various disasters demonstrate the importance of ICTs in rescue operations, rehabilitation and regeneration of environmental conditions as witnessed in the supercyclone of Orissa in 1999, earthquake of Gujarat in 2001 and more recently, the tsunami across the coastal area of southern India and Sri Lanka. The India Meteorological Department (IMD) tracks the evolution of cyclones through the INSAT satellite and 10 cyclone detection radars and sends advance warning to various user groups, including mass media. The warning system provides for a cyclone alert of 48 hours, and a cyclone warning of 24 hours. Moreover, there is a special Disaster Warning System (DWS) for the dissemination of cyclone warnings in local languages through INSAT to designated addresses in isolated

places in coastal areas. Based on inputs from the IMD and CWC on the rainfall behaviour and water levels in the reservoirs and the crop situation, the National Crop Weather Watch Group monitors drought conditions. Remote sensing techniques are also exploited to monitor drought conditions based on vegetative and moisture index status. Information networks are made operational for exchanging scientific data related to specific disasters, e.g., floods, earthquake, drought, etc. It is possible for extending these information networks within the reach of common citizens using Internet, telephony or similar interactive ICT applications. It is observed that infokiosk network in IVRP (Pondicherry) has been successful in airing advanced warning through the microphones retrieved from Web sites on impending tsunami waves to the fishing community residing along the coastal lines, besides coordinating relief efforts using the network.[24]

From such beginnings, attention can also be drawn to some recent efforts of the Indian government towards using ICT tools and information systems to strengthen its decision-making processes. A number of these efforts are geared towards addressing environmental concerns:

- For instance, there is the example of the database of flora of over 9,500 species and the plants of the Botanical garden in NOIDA—including the information about known cultivation procedures. This step has paved the way for the government of India to procure plant seeds from various parts of the world.
- The Botanical Survey of India is engaged in developing databases on 45 food product plants; 36 fibre-yielding plants; 98 dye and tans yielding plants; 34 medicinal plants; 40 oil and oil seed plants; and 49 gum and resin yielding plants. It is potentially possible to use the various ICT channels to distribute information on these plants across the nation.
- The Forest Survey of India has made efforts to generate information and database on forest cover and forest resources in the country, publishing the state forest report. The FSI also prepares the national vegetation map once every two years using remote sensing data and a national-level basic forestry inventory system, including the forest type mapping as well as assessing the forest cover in 28 tiger reserves in India (resulting in providing useful information to the Tiger Task Force).
- The government is also using Information Systems to monitor the compliance of environmental safeguard measures through online monitoring of stake emission, monitoring of fugitive dust, reclamation and rehabilitation of mined out areas, etc.
- A number of other initiatives include the World Bank-funded spatial environmental planning project in 14 states in India which finds mention in the Tenth Five-Year plan for preparing zoning atlases in 142 districts; urban ENVIS; information exchange program among the state

24 David McAlary. Experts Say Tsunami Warning System Would Have Saved Lives. http://www.voanews.com/english/2004-12-28-voa5.cfm

PCBs and municipalities; the JICA-supported, water quality management of River Ganga (resulting from the attempts of Action Ganga program) and other key rivers such as Yamuna; and an ICT-enabled mass awareness campaign for increase in forest and tree cover to 25 per cent and 33 per cent by 2007 and 2012 respectively, including the Vrishka Mela and seedling information centres at village markets; TV infomercials, song and drama publicity, etc.

ENVIS is a strong ally in the whole process—ENVIS nodes are active among the civil society organizations and academia as well as some government departments; the importance of IS in the green and brown agenda as well as the information and human networking aspects are apparent in the ENVIS models.

Various efforts by the NGOs in seeking decision-taking support from the people and through ICT-enabled consultative means such as the:

a. CSE-led Tiger Task Force that used a combination of Forest cover maps generated through online means, and a series of consultation leading to the understanding of the trio-nature of tiger reserves (the people; the forest; and the tigers—the inseparable trio);
b. MSSRF's coastal systems research using a combination of ICT-enabled tools and people consultancy means;
c. the New Andaman plan of MSSRF and other NGOs after the Tsunami disaster where again the ICT power through the maps generated by the Oceanography department and the ISRO; and
d. the green rating project of CSE's mapping the paper mills in India; and the water usage monitoring among Indian industry are a few of the many such information-led; people-assisted environmental programs. (Others include; Delhi groundwater prospects map of CSE; CLEAN India program of Development Alternatives; and the whole range of IS for SD work of MSSRF, DA and others.).

The range of efforts facilitated by the UNEP, SACEP, CSD, GEF, ESCAP, SAARC, EU, ICEF, etc., can also be touched upon. This would include establishing SD indicators, environmental information, assessment and research—most of the donor support is directed towards well-intentioned NGOs such as TERI, CSE, etc.

The whole range of information systems is developed, handled and used by the government of India and their functionaries for decision-making purposes. Wherever and whenever the civil society organizations get the opportunity they consult people on behalf of the government directly such as the Sunita Narain's efforts in the Tiger Task Force or the MS Swaminathan Committee on the Coastal System Research, etc.

The government of India is also engaged in efforts such as the following:

1. Cartosat II and Hamsat launched to help mapping and HAM operators in their work;

2. the idea propounded by Mission 2007 partners to empower communities with spatial information for local planning; and
3. the range of initiatives that are geared towards resource mapping by school children and communities using personal digital assistants (PDAs) synchronized with information systems.

7
Conclusions and Policy Recommendations

From the above, it becomes apparent that there are a number of initiatives that can provide a point of departure to establish some linkages between sustainable development and information and ICTs. It is also interesting to note that there is great variance in the scope of the different projects. At the same time, there is some consistency in that, for the most part, the people are viewed as an integral part of the project. In fact in some cases the addressing of environmental concerns is ancillary to projects primarily intended to address grassroots issues. At this juncture, it would also be relevant to state that people's participation has acquired great importance for agenda-setting in the policy framework, not least in the contexts of maintaining environmental sustainability and of the vision of India as a knowledge society.

It may then be said that this paper attempts to bring together three seemingly disparate elements—at least as they might appear in the Indian context. However, on closer examination, a number of areas of convergence between the information society and sustainable development begin to emerge, as well as the added dimension of the need to include people's voices.

The potential for convergence of sustainable development and the information society has not been adequately addressed in the Indian policy framework. At the same time, it also becomes evident that there is a certain momentum that is being built through ground-level initiatives emerging from civil society organizations, community-based organizations, etc., and this momentum finds expression in a number of government and even private-sector undertakings as well. However, these initiatives by and large operate more at the level of pilot projects and, in most cases, in isolation.

Thus, as a recommendation for the next generation policy directions, it becomes imperative that there is an attempt to build upon the existing initiatives, as well as to integrate them into some nature of coherent macro-program. It also becomes important to identify the synergies of these different projects towards a holistic development program. For instance, as has been observed in the case of India, environmental concerns become inextricably linked with agriculture and rural livelihoods for the majority of the population. Therefore, even in the cases cited through this research paper, it would be difficult to delineate projects that are exclusively addressing issues of the environment; rather, they appear to cover the entire gamut of sustainable development. Also, the success of a particular application or model in one case can by tested in other areas as well. Scalability and replication of existing initiatives need to be explored.

Examining the inclusion of grassroots voices in policy-making, not least with regard to the linkages between the environment and ICTs, it also becomes apparent that no coherent policy-making process would be complete without reference

to the people's or the grassroots perspective. And the examples listed in the paper also ably demonstrate that not only are the people willing to participate in a proactive manner, they are also a source for new ideas and initiatives that are consistent with on-the-ground realities.

It may then be useful to explore the possibility of a single agency or even a network (the active role of the Ministry of Environment and Forests as a single agency as well as a facilitator for cooperative efforts for environmental management serves as an excellent example) to provide an overarching framework bringing together the advances towards information society, sustainable development and grassroots participation. It would also be useful to explore the role of different sectors in such an undertaking. An interim step towards developing such a framework would be to conduct more research studies which would share success stories and serve as a reference and inspiration for future developments.

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The main initiative in defining goals and directions to be followed was the drawing up of National Agenda 21, which laid out the guidelines for sustainable development in Brazil.

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Socializing Knowledge and Reducing Regional Inequalities

Strategies for Brazil

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Abstract

This work sets out to explore the Brazilian information society and sustainable development programs, in an effort to locate intersection points and to identify how information society polices can collaborate in the reduction of regional inequalities in Brazil. Knowledge appears to be an essential factor in stimulating social and economic development. The socialization of knowledge appears to be a process capable of making specific knowledge accessible and available where it can be useful and necessary. Reducing regional inequalities is possible if there is a commitment to development as well as sustainability throughout the whole of society, based on the concepts of sustainable development and aligned with the possibilities of the information society and the diffusion of knowledge.

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The process of socializing knowledge, though it is often experimental, can be systematized, facilitating its application and making it possible to evaluate its results.

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1
Introduction

Brazil is the fifth largest country of the world, an emerging economy that is gaining more credibility on the international scene. With a little more than 178 million inhabitants scattered over more than 8,547,403.5 km^2, Brazil has an annual GDP of R$1.4 trillion and occupies a central position in the economic and social development of South America. Moreover, Brazil occupies a position of world prominence by having in its territory the largest tropical forest in the world, with more than four million km^2 of green area.

Despite its great importance and its immense natural riches, Brazil is a country characterized by inequalities, marked by the country's geography. The most developed regions—Southeast and South—are distinguished by their high degree of industrialization; by their great concentration of population and riches; and also by their constant assaults on the environment, which have left incurable scars on all the Brazilian coastlands.[1] The less developed regions—North and Northeast—have the worst social indicators[2] of all Brazil, and to this day suffer from a lack of resources and from emigration *en masse* to the more developed regions.

This work sets out to explore the Brazilian information society and sustainable development programs, emphasizing the socialization of knowledge and the reduction of regional inequalities. The objective is to identify points in common between the policies of these two programs, and also to investigate the role of knowledge in the economic and social development of less privileged communities in Brazil.

Therefore, the two programs will be studied in depth from their creation to their current state, besides the search for a clearer and more complete definition of the term "socialization of knowledge," and also a critical analysis of the government's current policies and actions. "This study is timely and relevant as there is an urgent and growing need of effective policies to combat poverty and social inequalities, contributing to the achievement of sustainable development, whose benefits can be felt by all." Section 2 analyzes the information society and sustainable development in Brazil and briefly examines the situation in the country before the Millennium Development Goals. The history, strengths and weaknesses of the information society and sustainable development are discussed as are the linkages between the two spheres. The Millennium Development Goals are presented in a national context, examining how Brazil has struggled with their challenges.

1 The Brazilian coastlands originally had a type of endemic vegetation called Atlantic Forest, which extended over all the coastlands of the country. The more than 500 years of disorderly occupation of the coastlands reduced the Atlantic Forest to a small percentage of its original reserve. See http://www.biodiversityhotspots.org/xp/Hotspots/atlantic_forest/

2 Forty-six per cent and 43 per cent respectively of the total population in 1990, 21.7M and 4.9M respectively. Source: IBGE [Brazilian Institute of Geography and Statistics] PNAD [National Research Through Sampling Residences] 1991 and 1991 Census.

Section 3 provides a brief theoretical basis for knowledge. In this section, a concise definition of knowledge is offered, based on the work of some well-known authors. The relationship between knowledge and development is explored, existing theories are compared and bases for continuing the study are outlined.

Section 4 sets out the vision developed during the study of the term "socialization of knowledge." In this section, a definition of the term is offered along with a brief analysis of its relevance for the information society.

Section 5 provides a critical analysis of the importance of the socialization of knowledge in reducing regional inequalities. A brief account of regional differences in Brazil is given here, and the value of the socialization of knowledge in the process of development and reduction of inequalities is discussed.

To conclude, Section 6 offers recommendations made with a view to greater interchange between sustainable development and the information society, with the objective of balancing development through the generation and dissemination of knowledge.

2
Information Society and Sustainable Development Programs in Brazil

The sustainable development and information society programs in Brazil are in different stages of development. So far, the two programs have produced important documents: the *Green Book* in the case of the information society; and *Agenda 21* in the case of sustainable development. And each document refers to the other.

2.1 Information society

Officially launched in 1999, the Brazilian Information Society Program (SocInfo) could count on broad support from the federal government; being part of the 2000–2003 multi-year plan; receiving a large contribution of resources; and involving various ministries, companies (national and multinational) and universities. The program was very well structured, carrying out broad consultations and seeking support from various sectors of society.

In September 2000, the program released the *Green Book*, a document resulting from several months of work and consultation. This document is one of the most complete compilations of ideas and proposals for the implementation of the information society in Brazil. It also brought together various visions concerning the possible applications of information technologies. This document's major objective was to provide a basis for addressing communication and information technologies among the government sectors, opening up paths for defining policies and strategic actions.

The *Green Book* embraces topics from various areas of society, even proposing concrete actions. Among the various areas and subjects addressed in the document, one small paragraph[3] makes the linkage between technology and sustainable development. The text says that, for Brazil, sustainable development is a "*basic reference to be incorporated into its Information Society project*." The same paragraph cites two important areas for applying information and communication technologies on behalf of sustainability: monitoring and environmental evaluation systems; and the use of new means of communication for environmental education, consciousness-raising and information, and national and international cooperation.

Though the *Green Book* has provided a solid basis for Brazil's information society program, the latter does not seem to have followed a successful trajectory. The agenda of the previous program for the end of the year 2000, the launching of the other document entitled the *White Book*, marked the end of the implementation phase that would be the consolidation of the definitive plan for the program.

3 *Green Book*, p. 9, "Sustainable Development: The Preservation of the Future."

Three other phases followed: take-off; operation in management; and consolidation. Meanwhile, the program never managed to launch the *White Book*; the efforts apparently dissolved and none of the following phases was started.

The SocInfo Program promised to be a great articulator and inductor of initiatives, involving various sectors of the government and society in drawing up policies relating to the information society. The government may have lost an excellent opportunity, allowing SocInfo to fade just when international discussion on the information society was gaining momentum. Today, the program could have been an example of cooperation between the sectors of society and its conclusions and actions would be of great importance in international discussions about the information society.

2.2 Sustainable development

The Brazilian government has carried out various actions aimed at sustainable development which, in recent years, has become a relatively common expression in political speeches and reporting by the media. Initiatives related to sustainable development meet with great support from the government and society, inspiring various studies, non-governmental organizations and businesses.

The main initiative in defining goals and directions to be followed was the drawing up of National Agenda 21, which laid out the guidelines for sustainable development in Brazil. This document was produced based on the work of the Sustainable Development Policies Commission and the Brazilian Agenda 21 (CPDS) created in 1997, which brought together representatives of the government, companies and non-governmental organizations. CPDS was responsible for the whole process of consultation and drawing up the documents which make up Brazil's Agenda 21, involving around 40,000 persons, until it was published in 2002.

The process identified six topics and 21 objectives. We call specific attention to the last topic, "Science and Technology for Sustainable Development," as it provides interesting concepts of sustainability, dealing with topics such as the spreading of knowledge, the democratization of the decision-making process and raising the consciousness of Brazilian society. Another point to be highlighted in Agenda 21 is Objective 5, "Information and Knowledge" for sustainable development. This objective presents the idea of the empowerment of society through education and knowledge and sets out power, not as a form of domination, but as the "possibility of doing." The actions proposed by this objective recommend the valuing of traditional knowledge, providing incentives for research related to sustainable development, and also the generation and dissemination of knowledge.

Agenda 21 is a useful guide and theoretical basis for the implementation of sustainable development policies in Brazil, and can be used, not only by the government, but in the policies of businesses and in the actions of non-governmental organizations. Agenda 21 faces common challenges in other areas, such as the lack of investments, lack of coordination within the government and other bureaucratic hindrances.

To set the works in motion and further the political pronouncement in favour of implementing the actions proposed in Agenda 21, CPDS was recreated in January 2004, and now has the participation of a great many of the ministries, representatives of local governments, non-governmental organizations and businesses.

Policies are also starting to be created and implemented; the Millennium Development Goals are also beginning to be included in discussions, contributing to the increase in diversity of the topics. Brazil is even in a privileged position, with various government actions being implemented, such as the Children and Youth Conference on the Environment, and more efficient policies for combatting environmental abuses and guaranteeing the sustainability of productive processes. Despite the advances, Brazil still needs to create policies and carry out actions to involve society more on the path to sustainability, setting out as goals topics such as the reduction of poverty, generation of income and the integration of isolated regions.

2.3 Brazil and the Millennium Development Goals (MDGs)

The Brazilian government has been expanding its actions with regard to the Millennium Development Goals,[4] reaffirming its commitment to objectives and goals in various spheres. In October 2003, the Brazilian government instituted the Technical Group (TG) to accompany the ODMs. This group is responsible for drawing up the national action plan for achieving goals, as well as monitoring the country's progress in the direction of the MDGs. This group is strictly governmental, having the participation of a reduced number of government ministries and sectors, most of them directly linked to the presidency of the republic.

In September 2004, the TG launched the *National Report on Accompaniment*, which consolidates the government's effort to structure the monitoring of the MDGs. From the report, it is possible to see that the government is giving high priority to areas like combatting hunger, which is receiving a major contribution of resources, as well as mobilizing a large part of the government's social and income-transferring programs. Hunger-combatting activities have been a priority since the beginning of the current government, in 2003, which aspires to eradicate hunger in the country with a series of employment-generating and income programs, direct transfers of income, specific policies for combatting hunger and special policies for vulnerable groups.

Another objective which has received a lot of attention and is already achieving relative progress is Goal 6 – "Combatting HIV/AIDS, malaria and other diseases." The government has a good history of combatting HIV/AIDS, being one of the few countries in Latin America which guarantees free access to therapy and to anti-retroviral treatment (ART). Free access to drugs is due in part to the fact that Brazil produces generic and low-cost versions of non-patented ART drugs. Access to drugs for treatment of HIV/AIDS could be even better if the government passes

4 http://www.un.org/millenniumgoals/
http://www.noswe can.org.br/

the law which is already on its way through the national congress, which lists drugs for the prevention and treatment of AIDS as non-patented, which would allow Brazilian industries to produce generic versions of drugs which today belong exclusively to multinationals.

Another important source of data on MDGs in Brazil is the *Collection of Thematic Studies on the Millennium Development Goals*,[5] launched in April 2004, the result of the sharing between PNUD (UNDP) and various public and private universities. The study details the progress achieved within the sphere of each goal, presents the challenges faced until now, and raises the need for national and external resources.

The studies also predict the status of the MDGs for the year 2015. According to the studies, Brazil will only totally complete goals 2 and 3, and also partly complete Goal 6, if the pace of current efforts is maintained. The studies serve as a source of data and try to create an atmosphere favourable to engagement, so that the various sectors of society may feel encouraged to work for the achievement of the proposed goals. It also serves as an alarm for those formulating policies, showing that the current efforts are far from being sufficient to attain the Millennium Development Goals by 2015.

5 http://www.pnud.org.br/studies/index.php

3
Knowledge

Knowledge has already been defined in various ways, one of the more accepted definitions being that of Daniel Bell (1973:175), who defines it as:

> "An organized set of statements of facts or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form."

Bell distinguishes knowledge from news and from entertainment, and, in the above definition, Bell sets out as an essential feature of knowledge that it is transmitted to others. To complement the vision of knowledge it is useful to remember the definition of information provided by Porat (1977:2), "Information is data that has been organized and communicated."

Knowledge and information are factors of indisputable importance in society. Their use determines new economic patterns, creates new types of undertakings, generates new patterns of growth, and changes our way of life. Society makes intense use of knowledge and of information, resting on these pillars to guarantee its growth and maintenance. A society's economic and social growth and development can be understood by its level of access to knowledge, which is both the cause and the consequence of development.

3.1 Knowledge and development

Economic growth has already been related to knowledge on some occasions, as in the example of Paul Romer's *new theory of growth*,[6] which relates access to knowledge to productivity in work. Romer also gives clues in other works on the role of knowledge in the development of poor countries, as in "Economic Growth,"[7] where he speaks of the reuse of ideals already existing in other countries to raise the technological level of productive activities in poor countries. This reuse of knowledge was also dealt with by Jacobs (1969), who speaks of the process of generating new ideals through combining existing pieces of knowledge.

Still in the field of the theory of economic development, the recent work of Chen and Kee (2005) develops a new model of development, where the principal force for economic growth is knowledge. The model shows the direct linkage between the growth of human capital and stable economic growth. Chen and Dahlman (2004) describe four preconditions which must be in place for knowledge to be an effective force for growth. According to them, the four preconditions, or four pillars, of the economy of knowledge are:

6 Romer, P., "Endogenous Technological Change," *Journal of Political Economy*, 98:5 (1990), pp. S71–102.

7 Romer, P., "Economic Growth," *The Fortune Encyclopedia of Economics*, David R. Henderson, ed., New York: Time Warner Books, 1993.

- **Education and Training**
  An educated and skilful population is necessary for creating, sharing and using knowledge.
- **Information Infrastructure**
  A dynamic information infrastructure to facilitate effective communication and the dissemination and processing of information.
- **Economic Incentive and Institutional System**
  An economic and institutional system to provide incentives for the efficient use of new and existing knowledge and the flourishing of entrepreneurship.
- **Innovation Systems**
  A network of businesses, research centres, universities, consultants and other organizations for using the growing global stock of knowledge, assimilating it and adapting it for local needs, and creating new knowledge.

Chen and Dahlman postulate that the quantity of knowledge, and how it is used, are essential determinants of the total productivity factor. They emphasize that the strengthening of these four pillars induces the increase of the quantity and quality of knowledge available for economic production, consequently increasing economic growth.

Despite the fact that the above-mentioned examples hardly seem to apply to economic development, we can expand their application and say that knowledge is a factor fundamental to the broad development of society. For economic growth to occur, it is necessary to generate knowledge, make it accessible and use it. This can only be done if there are persons who are educated and capable of doing so.

To guarantee that growth is not only strictly economic, it is necessary to acquire broad and diversified knowledge. In this case, what is learned about the environment is of great importance, since knowledge acquired may be used for the preservation of nature, and also in the orientation of industry to the creation of new products and new ways of using raw materials.

4
Socialization of Knowledge

The term "socialization of knowledge" is present in some publications and articles, though for the time being there is no clear definition of the term to allow it to be used with precision.

In addition to the simple meaning, the expression includes the idea of transforming private and individual knowledge to public and collective knowledge. The process of socializing knowledge, though it is often experimental, can be systematized, facilitating its application and making it possible to evaluate its results.

Socialization can be described as a process of four interlinked and interdependent phases:

Sharing – Sharing is the beginning and the driver of socialization. Sharing in the broader sense means dividing or distributing. But we can extend its meaning a little and say that sharing is also the desire to make private knowledge public. To guarantee that knowledge can be distributed or made public is the initial and fundamental step in the sharing of knowledge. The possibility of distributing knowledge must always be present in the minds of those who produce it, knowing that often specific knowledge is blocked by inflexible patents or restrictive property rights which cancel out the possibility of using knowledge more widely, usefully and beneficially.

Making Available – The second step in the socialization of knowledge is making it available. Based on the sharing described above, making available assumes the meaning of making knowledge ready for use, not necessarily for final use, but to be organized and prepared for other uses. Making available is an important piece in the socialization of knowledge in that it is the intersection between the producer of knowledge and the intermediate or final users of that knowledge. Whoever produces knowledge and seeks its socialization must be responsible for bringing it to at least this step, though not having to follow up the other steps of adaptation and delivery.

Adaptation/Adjustment – One of the most important steps is the adaptation of knowledge. Adaptation can be simple, such as translation into another language, or more complex, such as the adjustment of the whole context to have the knowledge become relevant and understandable to those who receive it. It is of great importance that the adaptation be specific; the given knowledge must be adapted or adjusted in accordance with the specificities and peculiarities of its receiving group. Making knowledge relevant and understandable is essential for its socialization; the content of knowledge being socialized must undergo adjustment to guarantee its cultural acceptability as well.

Delivery – This step marks the change of focus from content to form. Delivery means using the most appropriate means to carry knowledge to the receiving

group. The various means of communication currently available present a broad range of possibilities and media, which must be used consciously and in a planned way. Delivery is the last step of socialization, and is no less complex than the others. Efficient delivery is the essence of socialization. The communication of knowledge directly influences its appropriate use and also the continuity of the socialization cycle, which brings about the possibility of using knowledge received to generate new knowledge or to continue socializing, adapting and delivering what has been received.

Everything takes place in its own space, which must not be dissociated from existing social, political and scientific spaces. The socialization of knowledge cycle is the place where specific knowledge mixes with relevant knowledge for the receiving group. This other knowledge is linked to socialization by the fact that, in this case, it is the tools responsible for making knowledge produced readily available and useful to others.

The socialization of knowledge becomes a differential in the creative process, through which it is possible to enter into contact with various other types of specific knowledge, as well as initiating the process of constant evaluation and refinement of knowledge. The socialization cycle allows the same knowledge to be re-edited innumerable times, creating syntheses of knowledge which are applied in various situations and places, with each conjunct with its distinctive features providing the original conjunct with new perspectives and information, making shared and cyclical growth possible.

5
Socializing Knowledge and Reducing Regional Inequalities

Brazil experiences serious regional inequalities. For years, economic growth was centred on various "poles of development," regions identified in Brazil as crucial for successful development of Brazil in a context of population increases. These "poles" remain to this day as the regions that lead the Brazilian economy. The Southeast region[8] is home to most of Brazil's financial resources, industries and knowledge-producing institutions, having reached this plateau at the cost of the continuous and disorderly exploration of the environment, making unsustainable use of water resources and forest reserves. The less-developed regions, on the other hand, have not undergone such environmental assaults and even preserve a good part of their forest reserves and maintain their hydrographic basins with a low level of pollution.

These regions face the problem that places economic development and sustainability on opposite sides. The new challenge is the promotion of regional development, aligned with environmental preservation. Development is a way of reducing deep social inequalities; generating income; improving food conditions, health and access to education; and guaranteeing the basic conditions of sanitation. Sustainability will guarantee that natural resources will not be extinguished or become unusable in a short period of time and allow the existence of social conditions suitable for the healthy life of communities generating income and employment, connected to quality education and the presence of the basic conditions for human existence.

To create solutions and balance development with sustainability, it is necessary to add another term to the equation. It has already been shown that knowledge is an important factor in development. We can also say that it is capable of influencing both sides of the problem, creating the area of intersection and common interests between development and sustainability. The recognition of knowledge as a driving force of development brings about the possibility of foreseeing new strategies for stimulating sustainable development.

When we speak of reducing regional inequalities, we are speaking of creating possibilities for the sustainable development of less privileged regions. We can depend on those models of development which include knowledge as an essential factor, but we have to remember that those regions have a very low level of education. A strategy which makes access to strategic knowledge possible for those regions is therefore necessary, for knowledge can drive and give direction to development.

8 The Southeast region includes the states of Rio de Janeiro, São Paulo, Minas Gerais and Espírito Santo.

Socialization of knowledge brings about the possibility of having strategic knowledge reach where it is needed. It must be attained by private and public initiatives through businesses, universities, research institutions and civil society organizations. We are at the moment of defining priorities and actions for the information society, and it is possible to foresee at this moment an opportunity to bring together the two sides of the equation, using knowledge as the link.

There are projects that united both sides, knowledge and development, most of them successful and replicable. Brazil has two good examples of such projects that tapped the potential of knowledge in favour of development. The two projects, presented as case studies in the annex, were developed in poor regions of Brazil, where the lack of proper knowledge was a clear barrier to economic and human development. They showcase the transformative power of knowledge socialization in the rural areas of Brazil.

5.1 The role of the information society in reducing regional inequalities

Discussions around the World Summit on the Information Society (WSIS) have a fairly limited scope within the Brazilian government and society. The WSIS topics were not widely circulated within governmental circles. Recently, the focus of the government's pronouncements has been free software, a subject which is dominating almost all discussions and initiatives concerning the information society. Some recent government initiatives[9] can even be associated with some points of the WSIS Declaration of Principles, but this takes place fairly timidly and sporadically.

An analysis of Brazil's current policies related to the information society shows that there is little linking between the information society and sustainable development sectors. Despite the references in the official documents, such as in the *Green Book*, the government seems not to have had very much interest in exploring the linkages between the two spheres. Government organs directly linked to these policies, like the Ministry of the Environment, the Ministry of Science and Technology and the Ministry of Planning still encounter difficulties in foreseeing possibilities of collaboration within the information society. Until now, the few initiatives have taken place in isolation, and have not been the result of the direct and strategic collaboration of various government organs.

More significant initiatives come from state governments, such as the government of the State of Ceará, which in 2004 began the policy of spreading knowledge with the declared objective of creating foci of development in the interior of the state. The Ceará initiative is the best example of cooperation between the various sectors of society, involving a variety of participants, from private banks to universities, which joined together to begin to change the reality of the state,

9 For example, the Cidadão [Citizen] Technical Program of training young people in free software, which can be linked to Paragraph 11 of the Declaration of Principles given in the first phase of the WSIS. http://tecnicocidadao.soujava.org.br/

which has 62 per cent of its GDP[10] concentrated in the metropolitan region, which is equivalent to barely 3.42 per cent of its territory.

The Ceará experience in the creation of Technological Vocational Centres (TVCs) gives an example of action which helps to balance development, not forgetting the particular features of each locality. The CVTs are platforms for spreading practical knowledge, which offer from basic occupational education courses to higher learning opportunities. Knowledge is mainly in the areas of food technology, electromechanics, irrigation, water resources and environmental sanitation, and knowledge of the climate, vegetation and soil. The CVTs also serve as locations for the encouragement of entrepreneurship and to lodge incubators of new businesses. All this is the result of sharing by the federal and state governments with private initiatives, institutions of learning and local governments. Besides the physical structure, the professionals involved and the costs of common operation, each school is linked to an "information highway," making it possible constantly to update and trade knowledge among the various CVTs.

This is one of the examples where the information society promotes development through the spreading of knowledge. The multiplication and diversification of these programs can change the way in which small communities conduct their development, beginning to move more quickly and still maintaining their traditions and cultural roots.

10 Estimated at R$24,203764,000 in 2002. Source: IBGE [BIGS], *Gross Domestic Product of Municipalities – 1999–2002.*

6
Recommendations

Despite the weak link between the information society and sustainable development programs, there are opportunities to achieve good results through cooperation between the two sides. The government as a whole still deals with each one in isolation, but programs already exist which are bringing together concepts of sustainability and the information society and obtaining practical and tangible results. Some actions have been identified which would make it possible to increase the exchange between the areas:

- Changes in the information society program.
  - The SocInfo Program in Brazil needs to undergo restructuring and reactivation. Besides the specific aspects relating to technology, an improvement to the program would be a greater emphasis on the social aspect of the information society, bringing to the program professionals from areas not directly linked to technology, and also the social and environmental sciences.
  - Complementing the above recommendation, the ideal situation would be for the SocInfo Program to have mixed management, shared between various federal government ministries, and balancing technological, economic and social interests.
- Stimulus to academic research.
  - Academic research has the very important role of generating new knowledge in a creative and innovative way. More incentives need to be created for this research to be directed toward the search for solutions for Brazil's internal problems, beginning with the most basic and most urgent ones.
  - Academic centres must be concerned that research is put into practice, and that new solutions can be shared with society.
- Greater civil society involvement.
  - Some non-governmental organizations have been involved in the World Summit on the Information Society process, but broader participation by civil society is necessary to guarantee diversity and sustainability in the process of building the information society in Brazil.
  - Besides involvement in the policy-creating process, NGOs must have the responsibility of accompanying and collaborating in the implementation and drawing up of projects, especially in the area of spreading knowledge and implementing sustainable technologies in the chain of production.

- Consciousness-raising of business.
  - Companies are also responsible for forming policies in Brazil; pressure and support by large corporations are always necessary for major changes. The government needs to create a campaign of consciousness-raising of business to show the benefits of sustainability to businesses. The use of free software is, for example, a way to reduce costs and to contribute to the spreading of free knowledge.
  - The corporate world needs to understand that "good business does not exist in a failed society – Tr."[11] Sustainability brings benefits to all and must be one of the directing principles of investment.

Sustainable Development can only take place in a world where all parties are present, have an active voice and balanced power. "The innovation and prosperity which the markets encourage, the security and basic conditions which governments provide and the ethical patterns which civil society calls for – Tr." must be present.[12]

11 Almeida, Fernando, 2002, p. 17.

12 Almeida in WBCSD, 2002, p. 19.

7
Conclusion

This study explored information society and sustainable development policy spheres in Brazil.

It also defined the term "socialization of information," which is in ever more frequent use. We also explored how the socialization of knowledge can act in the process of development, and how it can help to reduce inequalities within Brazil.

The information society program has stagnated despite Brazil's active involvement in the WSIS. The program continues to be at a halt and has very little influence within the Brazilian political scene. But the program is not extinct and continues to function and, therefore, it is still possible it will recover its political strength, renewing its goals and expanding its activity.

Sustainable development in Brazil is gaining strength each day and is being developed consistently and actively. Brazil's Agenda 21 is an example of cooperation between the various sectors of society and showed itself to be a fairly complete and all-embracing document. Perhaps its breadth is a negative factor, hindering its implementation. A major effort by the whole government to accomplish the subjects of the Brazilian Agenda 21, directed towards the completion of the Millennium Development Goals, is still lacking.

Knowledge arises as a factor capable of changing the pace of development. We must, therefore, value policies of spreading and socializing knowledge. The socialization of knowledge is the process that transforms private and individual knowledge into public and collective knowledge, ready to be used where it is necessary and useful.

Socialization of knowledge is not restricted to the examples described here, as it can be used in most of the various types of projects and situations. The examples given here are simple responses discovered to solve complex problems; the idea behind these solutions is the use of knowledge as a driving force for development and change. Knowledge, free and available to all, is present in Brazil and in many other countries; what is necessary is its broad use and acceptance, always based on sustainability and the free circulation of information.

Annex
Case Studies

TecBor Project

The TecBor project, Alternative Technology for Rubber Production in Amazonia, is an excellent example of the application of the socialization of knowledge for the reduction of regional inequalities. The project is a proposal for alternative technology to produce natural rubber in Amazonia, a rubber-producing region which experienced a great decline in production from the beginning of the 20th century.

The project was based on the initiative of researchers at the University of Brasilia to find a sustainable alternative for the current methods of producing natural rubber. The success of the studies and the perfection of the methods directed experts to the possibility of applying this knowledge in regions that were less developed and that were using rudimentary methods for producing natural rubber.

Socialization of knowledge takes place when the project creates a way of distributing technology, transferring knowledge produced in the laboratory to the rubber-producing communities in the Amazon region. The production technique is very simple. The socialization of the knowledge happens when the knowledge is spread in various ways, especially by community leaders or heads of associations to the producers, and by producer to producer, so that in this way a pyramid of spreading the technology can be erected. The project made a discreet use of ICTs, using mostly books, and recorded videotapes to train and spread knowledge. Given the level of ICTs used in the communities where the project was implemented, more advanced technologies might not have been as effective as the low-tech options. Community leaders and producers could easily make copies of the books and video tapes, allowing for knowledge to be shared. Rubber producers were able to get more in-depth knowledge through their local focal points that would have contact with the technical supervisors and laboratories responsible for the development of the technology. The technology is also available in a "social technologies bank,"[13] maintained by a foundation that was also one of the initial founders of the project.

The network of scientists, disseminators, community leaders and producers make possible the permanent monitoring of the conditions of production and, therefore, of the quality of the rubber.

The technology provides that rubber is produced on small properties, by families and with direct deliveries to industries, without the necessity of intermediaries or passing through processing plants, which, when taken into account with the high quality of the product produced, guarantees a better income for the producer, allowing him to stay in the forest and avoiding migration to the peripheries of the great cities.

13 Fundação Banco do Brasil – Banco de Tecnologias Socias: http://www.tecnologiasocial.org.br

Another advantage is that the production process involved does not require electric power or excessive use of water. The products and procedures involved in production are not prejudicial to the health of the producer or to the environment. Thus they compare very favourably to the former preparation process still in use in some areas of Amazonia, which subjects the producer to unhealthy working conditions, with the occurrence of blindness and pulmonary problems caused by the smoke.

The TecBor project is thus a very good example, which succeeds in allying the socialization of knowledge to the reduction of inequalities. The success of the project can be observed through indicators such as the GDP of municipalities where the technology was applied. One of the municipalities, Carauari-AM, had a growth of practically 10 per cent in its GDP per capita[14] in the first year of the application of the project. This shows all the potential of social technologies when applied correctly and allied to a strategy of socialization of knowledge directed toward sustainable development.

Amanhã [Tomorrow] Project

In the rural regions of Brazil, small producers are normally limited to crops of low commercial value, not only by the costs of planting more valuable crops, but also by a lack of adequate access to water. Lack of information often causes expensive and improper irrigation techniques to be used in low-value crops. Sometimes the irrigation receives financial subsidies from the government, but ones which are not accompanied by technical knowledge for implementing it. Improper irrigation still contributes to the draining of the reserves and the pollution of underground reserves and the soil, causing the abandonment of lands which had been fertile.

A World Bank project started in the State of Bahia in the Northeast region tried to implement efficient options for managing water, besides providing an incentive for cultivating products of greater value. The project ran up against the reluctance of the farmers, who resisted the changes and did not adopt the solutions provided by the project.

An analysis of the reasons for the limited interest in change led to a shifting of focus and the project went on to emphasize the involvement of the children of the farmers. A vocational school was created to teach the young people new agricultural techniques, better irrigation and the management of plant nurseries. The school continued to expand the offering and went on to offer classes in sewing, building furniture, and the production of meat and fowl, besides teaching the operation of mills and the repair of agricultural machinery. The school had 100 hectares of high-value plantations which were used for educational purposes. With the resources generated by all its activities, the school became self-sustaining.

14 Extracted from IBGE [BIGS], *Gross Domestic Product of Municipalities 1999–2002*.

Through education, trading knowledge and contact with new technologies, the young people were able to influence their parents and convince them to try new techniques and diversify their crops. The traditional cultivation of beans went on to be accompanied by planting mangoes, bananas and maracocks, higher-value fruits. This diversification of crops allowed for the sustainable management of the land, besides providing an increase in income from the family agriculture of at least three times.

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▼

GIS is considered to be one of the most important tools for increased public participation and development that offers new socio-economic development opportunities. It can encourage human resource development within the country, facilitate the participation of youth in public life, help provide an analytic and scientific understanding of development issues, and much more.

Abdallah Diwan, Community Development Coordinator of Egypt's ICT Trust Fund

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Geographic Information Systems (GIS) in Egypt

Supporting Natural Resource Management and Local Development

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Abstract

Sobeih sets the context by explaining that Egypt has become one of the leaders in the technology sector across the Arab region, with advances in computer programing, ambitious plans to computerize schools, the establishment of public Internet access centres and general promotion of technological development. She describes Geographic Information Systems (GIS) as a technology that could be used by Egypt, and by other countries, to assist with natural resource management initiatives and enable increased public participation in decision-making. Finally, Sobeih offers a model and outlines specific policy suggestions to help realize Egypt's potential to use GIS technology to reach its sustainable development goals.

▼

GIS can bolster a community development organization's efforts by enhancing decision-making, resource allocation, and strategic planning functions. In an age when knowledge is power, GIS can offer distinctive tools that enable an organization to gain an edge, provided the organization is willing to make the necessary investment of time and resources to develop a foundation in the GIS basics.

▲

1
Introduction

Many countries are already using Geographic Information Systems (GIS) to plan and implement programs to promote sustainable socio-economic and environmental development. The technology, often called mapping software, can be used for a variety of purposes, including resource management, development planning, cartography, and route planning. For example, a GIS might allow emergency planners to easily calculate emergency response times in the event of a natural disaster or a GIS might be used to find wetlands that need protection from pollution.[1] In Egypt, many of the technical requirements for successful GIS-based development programs already exist, and the incentives to use these tools, especially in the areas of water management, natural resource preservation and public participation, are very strong. Egypt's major challenges in the successful use of GIS for meeting its sustainable development (SD) goals are twofold: first, Egypt has to build the capacity of its citizens, governments, communities and the private sector to use GIS tools; and second, it must increase access to the technologies required. This paper presents some examples of existing policies and practical programs being implemented and offers recommendations for further advancing the use of GIS for development in Egypt.

GIS technology can help in identifying gaps and disparities in service provision, and in drawing communities into the planning process. By helping create a sense of ownership, consensus, acknowledgment and transparency in the district level decision-making process, GIS can be the vehicle for creating a community's development potential.

In order to implement this technology effectively, Egypt needs policies that will support the development of human resources, acquisition of hardware and software, and building of institutional capacities. IT Clubs, community technology centres which already exist in over 700 locations in Egypt, present an opportunity to introduce GIS to communities and the general public. The IT Clubs can be used to provide basic natural resource management knowledge processed by GIS technology, a step that could lead to increased participation in public and private sector decision-making.

1 Wikipidia and Goodchild.

2
Research Methodology

The research entailed a literature review of Egyptian policy documents and international sources on participatory GIS, as well as a survey of practical projects in Egypt focusing on the use of IT for development. Further, consultations with technical experts, government officials, private sector employees involved in policy development and civil society members were undertaken through a survey questionnaire, informal meetings and a national workshop held in Alexandria in the summer of 2005.

The workshop, held in the Bibliotheca Alexandrina in conjunction with a public presentation of GIS and its potential for Egypt's development, included four thematic panels on cultural, economic, environmental and social aspects of sustainable development. It gathered 65 participants from different sectors: civil society associations, including Nahdaet AlMahrosa, The Friends of the Environment Association, Meshwar, Life Makers, Future Protector Association, Sustainable Development Association and others; international institutions, including The Anna Lindh Association, The ICT Trust Fund, the World Bank and UNDP; and academic participants from the Alexandria University, GIS professionals and representatives of Bibliotheca Alexandrina. In addition, government officials from the Alexandrian Municipality as well as the Ministry of Communications and Information Technology also attended. Finally, young people active in non-governmental organizations (NGOs), university initiatives and high school programs also contributed to the workshop. The recommendations from the workshop served as a basis for the recommendations for GIS applications in their respective thematic areas in this paper.

The "culture" panel stressed the need for practical solutions to meet the cultural needs of citizens through collaboration of "existing working forces"—business, government and private parties who have an interest in the development of GIS applications for cultural development. It also highlighted the need for further research so that cultural problems, or "bottlenecks" could be better described and understood. Illiteracy, IT illiteracy and the lack of awareness about environmental issues facing Egypt were given as examples of priority areas for focusing such research. Participants on the culture panel recommended that new projects and programs incorporating the use of GIS for cultural development be designed on the basis of these research recommendations, and results of evaluations of similar projects and programs in Egypt and elsewhere. The establishment of "IT Culture Clubs," envisioned as youth-led and volunteer-run initiatives, was proposed as a way to sustain continued development, implementation and improvement of these projects.

The panel examining economic aspects of sustainable development concentrated on production of "blueprints"—hardware and software solutions—to help establish and maintain procedures to encourage the preservation of Egypt's natural

resources. The panel's participants recommended that further work be conducted in order to account for potential economic impacts of environmental degradation in Egypt, and to implement control standards to minimize negative environmental impact of economic activities. Panel participants suggested three initiatives to be considered in the design of programs using GIS for economic development: one, a "Tourist Portal," a collection of interactive maps to be provided in airports and important tourist destinations that would help visitors find information about the different tourist attractions and about how to get there; two, a "Shopping Gateway," consisting of kiosks with interactive maps to be placed in markets and malls providing information about surrounding shops and other points of interest; and three, an "Info-Portal" that would inform members of civil society about the different governmental and non-governmental services available to them.

The group focusing on environmental awareness emphasized the need for increased availability of information to Egypt's citizens about their natural surroundings. The most important potential of GIS, according to them, is in "widening the horizons of civil society," allowing citizens to participate in decision-making in an informed and meaningful way and giving them some of the tools to recommend solutions for environmental crises. Their recommendations focused on developing the human resources in both the general public and public sector organization to build Egypt's capacity to use GIS, so that the country's sustainable development challenges can be better understood. Among specific initiatives suggested were an initiative to update information on rural and urban infrastructure availability and needs, a program to enhance networking of civil society organizations and individuals, and a project to gather and present information about Egypt's national resources through easily accessible means.

In general, the panel on social aspects made similar recommendations to those described above, and proposed the introduction of "GIS Screens" in sports and cultural centres, schools, universities, malls and government buildings, in order to provide data about available social services, youth activities and NGO operations in each neighbourhood, classified simply according to field of activity.

A theme running through the series of informal and formal interviews conducted for this paper is the lack of public awareness of the potential and demands of the IT market in Egypt. There is a perception among Egyptians that the IT sector remains weak despite the government's efforts to strengthen it. Numerous projects and programs, especially those aimed at engaging youth in the IT sector, seem to be met with little interest. Young people care mostly about employment issues, and their involvement in GIS research or other projects usually depends on the initiative's ability to create job opportunities. Youth respondents were the most vocal about the need to conduct evaluations and research supported by factual evidence, and to present results in terms of concrete proposals for change, instead of falling back into rhetorical debates which can be time consuming and inefficient.

The majority of interview respondents felt that Egypt could reap the most benefit from GIS technology by employing it to increase public participation. Egypt is already implementing GIS for several projects in this area, but most of these have yet to be evaluated. Their estimated impacts are positive, but participants called for publication of official reports of these projects so that they could be considered in the planning of future activities. One potential difficulty is that the use of GIS is still not widespread enough in Egypt to be seriously considered as a vehicle for increasing public participation.[2] Considering that the government encourages young people and civil society in general to get involved in the information society (IS) and to develop their skills,[3] GIS access and education may be a strategic area for development of further capacity building programs in Egypt.

In the words of Abdallah Diwan, Community Development Coordinator of Egypt's ICT Trust Fund,

> "GIS is considered to be one of the most important tools for increased public participation and development that offers new socio-economic development opportunities. It can encourage human resource development within the country, facilitate the participation of youth in public life, help provide an analytic and scientific understanding of development issues, and much more. Our generation is [lucky to have the potential to benefit from] such technology, and we should be encouraged to make use of it."[4]

Informal interview respondents and workshop participants recommended presenting, in detail, successful models of participatory GIS projects, and exploring in more detail, through a survey, what people know about the information society, sustainable development and GIS.

A running theme heard in these consultations is that the social aspects of sustainable development and, more specifically, the issue of unemployment among young people should be considered in all policy planning. The question of unemployment continues to dominate all discussions around environmental protection, the development of an information society and the use of GIS in Egypt.

2 Mr. Hany Eskandar (Strategy and Planning Officer in the Ministry of Communications & Information Technology).

3 Dr. Nayer Wanas (ICT for Development Consultant - ICT Fund - MCIT, Egypt).
Mr. Sherif El-Tokali (Information and Communication Specialist in the UNDP, Egypt).

4 Personal conversation.

3
Logical Framework

The Egyptian government is adopting a vision to use information and its underlying technologies to advance sustainable human development. This vision is currently being integrated into the current activities of the Ministry of Communication and Information Technology (MCIT), which strives to:

a) increase employment opportunities in the communications and information technology sectors through collaboration with the other ministries;
b) build an information society able to absorb and benefit from the expanding sources of information; and
c) foster poverty eradication initiatives.

This vision also focuses on advocating the adoption of sustainable human development policies and supporting operational activities that demonstrate ways to create jobs and techniques that protect the environment and promote sound governance, with special emphasis on the needs of underprivileged people.

But none of these targets can be reached easily, unless Egypt becomes a knowledge-based society capable of building communication and participation channels among all levels, towards its regional, national and local priorities while ensuring transparency in decision-making, enhancing public participation and empowering less privileged groups in society to create meaningful change in their lives.

With this in mind, this paper argues that GIS can be used effectively to help fulfil two sustainable development objectives in Egypt: first, to monitor and manage the use of natural resources, and second, to increase public participation and strengthen governance around natural resource management.

In addition to making the case for improved natural resource management and public participation through the use of GIS, the paper examines opportunities for coordinating Egypt's IS and SD policies around GIS-related dialogue between these two policy communities. In particular, it focuses on the lack of awareness of GIS technology and its potential; the lack of access to GIS tools within communities as well as within the government; the lack of training and capacity building opportunities; and the challenge of focusing IT resources on promoting and enabling GIS use for Egypt's sustainable development. Finally, it gives some practical recommendations for dealing with these issues. The paper is limited in scope and in no way presents a comprehensive overview of the potential for GIS application in Egypt. It aims to serve as a discussion piece among decision-makers and community members, with the hope that further examinations of the topic will follow.

4
The Current IS and Sustainable Development Policy Landscape

Egypt faces many environmental challenges. Protecting the country's natural resources and regenerating those resources which have suffered degradation stand as important features of the country's sustainable development goals along with the campaign to help the poor. Collaborative efforts of the Ministry of State for Environmental Affairs and the Ministry of Information and Communication Technologies have focused on building the country's capacities to manage human and environmental resources and to enable Egypt to meet its obligations to international conventions and treaties. Egypt's environmental strategy focuses on the following areas:

1. Climate Change: The government's official aim is to promote renewable energy technologies, efficient lighting systems and energy conservation techniques, and to encourage Clean Development Mechanism activities, including the introduction of fuel cells and electric buses.
2. Biodiversity: Egypt's goal is to conserve medicinal plants and natural wetlands.
3. International Waters: The government has developed initiatives aimed at protecting groundwater and international surface waters from pollution and has demonstrated the use of low-cost techniques for wastewater treatment through a pilot project on Lake Manzala.
4. Capacity Building: Through what are called "featured projects," a national strategy is being planned to give every individual, business and community the opportunity to harness the benefits of the new information society.

Since the establishment of the Ministry of Communication and Information Technology (MCIT) in 1999, considerable progress toward meeting announced goals and plans has been made. MCIT has taken upon itself to build the Egyptian information society and work towards bridging the digital divide. In the next few years, it is expected that the ministry will have composed a comprehensive framework to lay the foundations for the Egyptian information society. This framework is to replace the ICT national plan which has achieved many of its objectives: the telecommunications infrastructure in Egypt has been developed and expanded; hundreds of information centres have been established; an expanded pool of IT skilled labour has been created; and information systems and databases have been established among governmental and private entities. In addition, the country's access to ICTs and connectivity has been strengthened and some automated government services have been made available online. Numerous projects have also been implemented with a range of development-related goals, including fostering local content and applications; providing improved e-government services for citizens; improving the education system and health services; and promoting Egypt's cultural identity through digital documentation and dissemination of the country's cultural and natural heritage.

5
GIS as an Opportunity for Coordinating Egypt's IS and SD Policies

Two key issues for advancing Egypt's sustainable development goals include increasing public participation in decision-making and improving the management of Egypt's natural resources, especially its waters. Geographic Information Systems, or GIS for short, could prove to be one of the most important technological tools Egypt can employ in order to tackle these issues.

5.1 What is GIS?

A GIS is a system for managing spatial data. In the strictest sense, it is a computer system capable of integrating, storing, editing, analyzing and displaying geographically-referenced information. In a more generic sense, GIS is a "smart map" tool that allows users to create interactive queries, analyze spatial information and edit data.

During the 1960s and 1970s, people recognized the need to assess the earth's surface in an integrated way according to the independent aspects of the earth's surface. They used a certain technique of overlaying transparent copies of resource maps on light tables and looked for places where the various attributes on the maps coincided.

The computer map-making and other related areas, such as soil science, surveying, photogrammetry and remote sensing, developed side by side in the late 1970s. At first, this evolution did not produce much until systems evolved, experience grew and geographic information systems emerged.

The early 1980s witnessed the expansion of GIS. Nowadays, GIS is widely recognized by public agencies, research laboratories, academic institutions, private industry and public utilities as a useful tool for supporting urban and provincial resource planning and management.

5.2 GIS components

Components of a GIS include more than just computer technology. GIS is an integrated system of users, data, hardware and software. Data tend to be at the centre of any GIS system, while the computer components of the system support data management and analysis.

The most essential component of a useful GIS is people. In order to analyze locally-generated data, Egypt needs individuals with technical expertise as well as knowledge of the national and local contexts in which she or he operates. Therefore, Egypt needs to develop its own capabilities in GIS and related technologies. The need for local expertise is recognized by international agencies such as the Food and Agriculture Organization (FAO), which encourages countries to develop

their own capabilities in GIS and related technologies in order to provide technical expertise at the national level.

5.3 GIS, Egypt's natural resources and public participation in decision-making

Egypt has a fast-growing population whose basic needs are met principally from the natural resources of the river Nile, its floodplain and delta. The growing pressure on water resources obliges the country to re-use drainage water for irrigation and industrial purposes. The water finally drained into the complex of coastal lagoons, or into the sea, is of low quality.

Water is a constant preoccupation at the national level, given also that it affects—and is affected (directly and indirectly) by—all other elements in the country. To effectively deal with this vital resource, extensive networking and close collaboration between all levels/parties in the country are necessary. This includes the public and private sectors gathering all efforts in order to create a common vision to build an influential information society capable of reaching sustainable development goals.

The special importance of water for Egypt makes it a good example of an area where GIS could be used to advance the country's sustainable development goals. For instance, GIS can be used in decision support systems to help execute specific interventions in water, foster environmental protection and encourage cultural heritage conservation among communities at all levels in Egypt. GIS can also be employed to increase public participation in decision-making. For Egypt, participatory GIS presents an opportunity to increase monitoring of water resources and fisheries by local communities.

Enabling citizens to better understand environmental problems facing their communities and to critically evaluate proposed solutions is the first step in increasing public participation at all levels. Technology in general, and GIS in particular, presents the possibility for public empowerment and awareness-raising about environmental problems in local communities. GIS is also an important teaching technique in university geography departments, but there remains a need to increase access to training and GIS technology itself among the general public.

6
Examples of Current GIS Use in Egypt

The Egyptian government has designed a number of useful GIS-based applications in different sectors throughout the country, however, the use of GIS is still limited and GIS remains, to a large extent, a technology restricted to the public sector and academia, unknown to the majority of the public. At present, no dedicated department or unit for GIS exists in any ministry or branch of government, save for a few experts and employees who are working under the umbrella of specific projects adopted by the government. Nonetheless, it is important to recognize that the Egyptian government has drawn on GIS technology in a number of promising projects, including the following examples:

6.1 GIS for capacity building

The following three projects have a focus on building the country's human resource capacities.

1. MCIT's GIS effort

MCIT has set up a geographical information system (GIS) workgroup to develop plans and coordinate efforts with the Egyptian GIS community to introduce GIS projects in various business sectors, such as telecommunications, the postal system and others. The workgroup's strategy is to promote the role of the private sector, utilize existing GIS investments and efforts, adopt worldwide GIS standards, and create synergy and cooperation among all Egyptian GIS stakeholders.

2. The Educational Buildings Project

Eleven years ago, the Ministry of Education initiated a project to develop GIS that would provide information on the status of educational buildings. The system today includes 360,000 photographs and more than four million registers including details about educational buildings and suppliers. The system consists of a primary layer of basic statistical data, including demographic data on gender, age, administrative division, geographical area and level of education; and a secondary layer of information and databases, including school maps, quality control, electronic archiving and more. A third layer includes applications related to procedural interactions including project monitoring, specialized programs analyzing the buildings' requirements, planning for students and class scheduling. A final layer of programs is based on a geotechnical system that supports top-level decision-making and includes applications to help determine prime construction locations and underserved areas and needed facilities. This matrix has improved the planning of educational buildings and allowed decision-makers to respond properly to urgent budget situations, transactions with suppliers, and even natural catastrophes.

3. The *CAPMAS GIS*

The Central Agency for Public Mobilization and Statistics (CAPMAS) developed a system that covers five governorates through a computer network. It enables the governorates to more easily engage in various planning and monitoring operations. The program provides maps for collecting census data and conducting surveys; establishes a territorial GIS for governorates; and provides training on both geographical information and communications systems.

It is worth mentioning here that most of projects of this nature are still undergoing construction and evaluation. In other words, their impacts have not been tested yet nor have their services yet reached the level required to make them interesting for the general public. Without a doubt, establishing further projects and programs with no evaluation of the ones currently implemented can be dangerous. The local communities and the next generations need accurate documentation, reports and analytical evaluations of all plans and projects in order to work towards goals of sustainability. In fact, exact lessons about the real needs of their communities, are necessary to build on the current programs and plans.

6.2 GIS for natural resource management

The following two projects adopted by the Egyptian government with the collaboration of international institutions and other countries focus specifically on natural resources management.

1. Egyptian Italian Environmental Cooperation Program (EIECP), Phase II

Led in partnership with the United Nations Development Programme (Egypt), this project aims to strengthen the capacity of national and local institutions and organizations to effectively manage water resources through a fully-tested decision support system (DSS).

In particular, it supports the National Water Research Centre's work to implement GIS in the design, testing and networking databases to enable public and private sectors and client agencies and organizations access to the available data.

Policy implication

The absence of an institutionalized system to monitor and assess the use of scarce water resources presents a major challenge for successfully using GIS in Egypt. There is a need to design sound water-use policies, so that a system for efficient water management can be built.

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2. The MELMARINA Project: Making management tools for aquatic resources in North Africa

The overall objective of the project is the development of a lagoonal ecosystem monitoring mechanism which combines field surveys, long-term monitoring

through field instrumentation and remote sensing with hydraulic/ecological modelling. More specifically, it aims to:

1. develop early warning tools and decision support systems that examine the environmental equilibria between the aquatic resources of specific coastal and inland lagoonal areas;
2. establish and evaluate long-term research on monitoring, measuring and modelling sustainable development in the coastal lagoonal areas;
3. assess and model the impact of human activities on water availability, distribution and quality;
4. promote commonality in research methodology through information exchange and by instigating training programs for young scientists at North African partner institutions in specialist areas of aquatic resource monitoring and modelling; and
5. forge active links with other international and national bodies concerned with management of aquatic (especially lagoonal) resources and to exploit further the results of the project by widely disseminating results.

Two related projects, in Morocco and Tunisia, are also being implemented. Many North African coastal lagoons are severely degraded, yet some remain high value aquatic ecosystems that are important as natural resources for local human populations and contribute substantially to regional biodiversity. North Africa's lagoons are all impacted by a variety of environmental change processes, but human activities have had the greatest effect during the 20th century. Pressures resulting from these activities are set to continue and in many cases increase throughout the 21st century.

Policy implication

Environmental monitoring within North Africa's aquatic ecosystems is inadequate and management planning and policies are poorly supported by relevant scientific information. Policies need to support the development of lagoonal ecosystem monitoring (through field surveys and long-term monitoring through field instrumentation and remote sensing) and its integration within hydraulic/ecological modelling.

While the projects described above seem to be having a positive overall impact, it is important to stress once again that evaluating their efficiency in the development context should be a primary concern of all of the projects' stakeholders. More specifically, we should be aware of whether projects have been able to meet their internally-set targets such as, for example, increasing public awareness of environmental management needs and increasing the capacity of Egyptian citizens to effectively employ GIS.

7
Integrating IS and SD Policies

In 1996, the framework program for developing a national Integrated Coastal Zone Management (ICZM) plan for Egypt was prepared; it addressed the main issues confronting the coastal zone and water. During the last few years, the short-term objectives of the framework were achieved, and now the medium-term projects of the framework are being implemented:

- In 1996–1999, a project for preparing an ICZM plan for the Egyptian Red Sea Coastal region was carried out and it was financed by Global Environment Facility (GEF).
- In 1997–1998, the National Oil Spill Contingency Plan (NOSOP) was updated.
- In 1998, the NOSOP was included and presented to all involved authorities. Its mandate extended to include marine pollution emergencies.
- In 1997, a continuous Environmental Integrated Management Program (EIMP) was established to monitor the air and marine environment at the background and ambient levels.
- Inspection of industrial land-based sources of marine pollution is an ongoing process implemented in collaboration between the Central Unit for Industrial Inspection and Compliance and the EEAA Regional Branches and Laboratories.
- Finally, the EEAA implements all programs and projects in southern Sinai and the Red Sea protectorates, as they are typical marine parks. All are aiming to protect the existing ecosystems and enable rehabilitation of the damaged ecosystems.

Besides the previously mentioned programs and projects, a set of information sharing mechanisms have been adopted by the government, including the following.

Capacity-Building, Education, Training and Awareness-Raising: In 2000–2001, training of EEAA staff and other stakeholders on environmental management, risk assessment, identification monitoring and inspection was carried out. An emphasis was placed on the marine environment as a common interest to multiple stakeholders; for this purpose, seminars and training courses introducing the Environmental Impact Assessment (EIA) methodologies were offered to the tourism industry, domestic and foreign investors, private corporations and banks and, not least of all, government agencies.

Information Collection: Information and its availability is a crucial issue in environmental management. In response to the need for an advanced information system, EEAA has established a mechanism to collected data from different projects such as EIMP, NOSCP and GEF.

Research: Cooperation and coordination in the field of environmental research and technology are encouraged by EEAA. Universities, research institutes and leading governmental laboratories are integral parts of EEAA's research facilities. For instance, research in the field of mitigation of the impact of oil spills on the coastal and marine environment is carried out by local and international universities.

Financing: Financing coastal zone and marine activities is managed by EEAA through the Egyptian Environmental Fund, the recurrent budget and the investment budget. Some of the activities are jointly financed by donors and the Egyptian government.

Cooperation: Egypt is party to 30 global and regional treaties, conventions and other agreements relating to the marine and other aspects of the environment. Two sub-regional agreements also exist with neighbouring countries to cooperate and react collectively in case of marine pollution causality. Egypt sees itself to be very much part of the "global alliance," striving to balance the needs of conservation with the needs of development.

According to Tarek Kamel, Egyptian Minister of Communications and Information Technology,

> "The Ministry […] has two strategic objectives. The first is related to the spread of ICT tools nation wide, while the other focuses on the foundation of an export oriented ICT industry. The latter can be only achieved through joining forces with the private sector. We depend on out sourcing and all initiatives are implemented through public private partnerships. The ministry, for its part, triggers initiatives, formulates strategies, determines policies, stipulates regulation and gets stakeholders together."[5]

On the other hand, the Egyptian Environment Affairs Agency (EEAA) is rebuilding its infrastructure in part through the use of the *Egyptian Environmental Information System*. The Agency is collecting and classifying environmental data; conducting studies; documenting reports, especially regarding socio-environmental situations; helping in the preparation of policies and plans to rationalize decision-making; and monitoring its own use of information technology (both the hardware and software).

In collaboration, the Ministry of Communication and Technology, the UNDP and the EEAA have published a report of achievements in progress toward building a sustainable information society in Egypt. It mentions the following achievements:

- The EEAA's Web site, http://www.eeaa.gov.eg
- CEDARE Environmental Information Systems,[6] including the development of:

5 Egypt's Information Society, MCIT, 2005.

6 *Ibid*.

1. Remote Sensing Data Systems covering the Red Sea and Gulf of Aden
2. Red Sea and Gulf of Aden Marine Turtles Information System
3. Red Sea and Gulf of Aden Birds Information Systems
4. Nubian Aquifer Regional Information System (NARIS)
5. Admiralty Charts Covering the Red Sea and Gulf of Aden Region
6. Red Sea and Gulf of Aden living Marine Resources Modelling Software
7. Alexandria Solid Wastes Complaints Tracking Information System
8. North Africa Environmental Web Portal

Policy implication

Although ensuring access to these resources and the information contained within them is not in itself a guarantee of positive impacts on the local communities and their progress toward sustainable development, it is a first necessary step.

Such initiatives improve the implementation of public awareness and help build a knowledge-based society, provided that information about them is accessible to the public.

8
Opportunities for Using GIS in Egypt

GIS can be applied in terms of the questions the users want answered. It is set to survey the potential users to determine their information needs, and to identify those needs that can best be met by GIS incorporating various combinations of data retrieval and transformation. The crucial usage of GIS is based on its capacity for modelling: constructing models of the real world from digital databases, and using these models to simulate the effect of a specific process over time for a given scenario. For example, continentally, topography maps can be joined with hydrologic maps and climate data to produce maps of land suitability for various types or intensities of use, or specific crops. Demographic and administrative data can be added to provide projections of future supply-and-demand scenarios by region or country.

The Egyptian environment is quite fertile; however, the effort to preserve it faces numerous obstacles imposed by a lack of appropriate information systems and multidisciplinary expertise required for environmental management. Further, the conceptual understanding of, and plans for, practically addressing the links among environment, demography, economics and society, still need to be developed.[7]

Transparent decision-making in Egypt, as elsewhere, can be obstructed by a lack of public participation, caused by a perceived, or real, lack of knowledge which would allow the public to join in debates and decision making. According to Brian Carnahan:

> "GIS can bolster a community development organization's efforts by enhancing decision-making, resource allocation, and strategic planning functions. In an age when knowledge is power, GIS can offer distinctive tools that enable an organization to gain an edge, provided the organization is willing to make the necessary investment of time and resources to develop a foundation in the GIS basics."[8]

A practical suggestion for the use of GIS in Egypt is through community-based IT Clubs.

IT Clubs: An opportunity to further GIS use in Egypt

There are a number of issues with GIS technology that need to be addressed for it to be successfully implemented as a tool for increasing public participation in natural resource management. First, although GIS is becoming more accessible and affordable, there is still a severe lack of awareness among the public about the technology and its potential. Second, while the level access to GIS tools varies, it

7 UNESCO; Dominique Roger. Egypt.

8 Carnahan, Brian. September/October, 2000. "Geographic Information Systems," Shelterforce.

is generally low even in government departments, and let alone in local communities. Third, there is a serious deficiency in training and capacity building opportunities that would allow local communities, the public sector and business professionals to acquire the necessary know-how in order to effectively use GIS. These three deficiencies could be tackled through an expansion of the objectives of an existing initiative in Egypt that aims to introduce technology centres, or IT Clubs, to communities throughout the country.

IT Clubs are meant to serve the general public and local communities and to provide spaces for linking environmental, economic, and social issues in a sustainable manner. The term "IT Clubs" describes centres, currently in an expanding number of urban and sub-urban locations, where citizens can access the Internet, computer training and other services. Egypt is probably one of the first few countries, together with Peru and Estonia, to have launched community IT Clubs *en masse* for the general public.[9]

As The Ministry of Communication and Information Technology (MCIT) is directing considerable resources in the creation and expansion of such centres, it seems logical to integrate GIS into the project instead of creating new infrastructure for the use of GIS by the general public and local communities.

Each IT Club is situated in at least 50 sq metres of space, complete with restrooms, air conditioning, lighting and safe, modern electrical installations. Each club provides Internet access for just one Egyptian Pound (about US$0.16) per hour. In each club, an instructor is available to train new users in basic keyboard skills, software applications and Web design. Each club provides its services for anyone, including local businesses, wishing to develop business material, work on spreadsheets and presentations, or even embark on their own e-commerce ventures. They can provide a great chance for students to do research electronically.

To the citizen, however, the centres may have much more relevance if a common thread of information content links them. To this end, an initiative to establish an Internet portal or, in other words, a common entry point to information related to issues important to the citizen, would assist her or him in the pursuit and development of additional socio-economic opportunities. The portal would sit at the core of the IT Clubs initiative, and constitute the content/information backbone of the system. The type of information presented, and the links to socio-economic, rural and development organizations will be mainly related to the following sample areas (however, an assessment survey may point to additional requirements which are likely to change over time):

> **Local Information,** specific to the IT Club in each locality and provided by the managers of each IT Club: This will include local and regional events, local job opportunities, local news, etc. Moreover, managers of

9 For further information, consult the Egypt ICT Trust Fund's site: http://www.ictfund.org.eg/index.php?option=com_frontpage&Itemid=1&lang=

And the MCIT's site: http://www.mcit.gov.eg/, and the UNDP: http://www.undp.org.eg/

each IT Club will keep in touch with each other and exchange information, on behalf of their constituents, in an effort to create an active IT Clubs Network.

News Section, compiled daily in partnerships with development agencies. It will ensure that important development information will effectively reach citizens in rural areas. The news section may also include specific items of time-sensitive information such as daily commodity prices.

Food Security Area, developed in partnership with the Ministry of Agriculture and the Food and Agriculture Organization. It will include agricultural information, including prices, market information, weather warnings, education courses, advisory services, etc.

Employment Opportunities, provided by the project initially, then outsourced. This section will be provided in partnership with relevant government ministries, the Social Fund for Development, etc. It will include government and private sector vacancies, tele-working, small and medium enterprise financing, guidelines related to small loans and microfinancing, application forms and skills-building courseware. At a later stage, e-commerce, e-trade and related online opportunities may be developed.

Law, Rights and Social Services, provided by the project at a national level, by government administration at governorate level and in partnership with NGOs and Civil Society Organizations: This will include local and national government information, family-related legal information, National Council of Women information, legal assistance services, application for identifications such as a driver's licence, forms and guidelines.

Health, provided in partnership with the Ministry of Health, WHO, UNICEF and local authorities: This will include information about community health services, tele-medicine and diagnostic services for doctors (receiving end), health allowances (insurance), labour disability compensations, immunization campaigns, infectious diseases campaigns (HIV/AIDS, TB, etc.), water and sanitation.

Education, in partnership with the Ministry of Education and Higher Learning and UNESCO: this will include online literacy courseware, school curricula and skills and vocational training materials.

Environment, which will include information about environmental protection, incentives, water provision and river waterways.

The above information is supposed to be available as the default browser screen at each IT Club, and provided as a constantly updated service. Specific areas may be kept available for local content customization to increase exposure to local

services and opportunities. Other areas may include classified advertising, auctions, free e-mail offerings, etc.

When properly maintained and updated, the Community Development Portal may become the single most important factor in the overall success and acceptance of the IT Clubs in Egypt.[10] And the feasible mechanism and technology to facilitate the role of IT Clubs in empowering the public participation and create new opportunities and open new gates for the local communities is the GIS.

According to all indications, Egypt has all the necessary facilities for such projects, but the main problem is in evaluating all these plans. Without evaluation, it's impossible to estimate progress and assess successes and failures. Many of the respondents in the interviews I conducted focused on this point.[11]

GIS can be integrated with other multimedia technology, making it possible to present information in user-friendly formats. The IT Clubs could be provided with "edutainment" (entertainment and education) tools for different contexts in order to encourage participation among all levels.[12] The key value of combining GIS data with IT Clubs is allowing communities to use GIS tools. The efficiency of GIS as an educational and entertainment tool has been recognized by various GIS experts, based on the successful experiences with the public regarding its use in many fields. One of those experts, Michael Clarke, from the Buffalo Local Initiatives Support Corporation (LISC), describes his experience this way:

> "By looking at the maps we created, people got a sense of the connections. They could see why certain areas were targeted [through a community planning process] as places to build housing, playgrounds, or community gardens. They could see the big picture and why certain things made sense. They also saw that there were nonprofits in the neighbourhood 10 blocks from where they live that have after school programs for their kids."[13]

In addition to the IT Clubs, Egypt has instituted several "Smart" schools which offer computer lab-based tutorials and mobile units to close the gaps in locations which are still out-of-reach to IT Clubs, and which also provide a movable platform for training. These information points could be used in a similar way to enable communities to benefit from GIS technologies.

10 Evaluation unavailable as Egypt is still taking the first steps with IT Clubs in the GIS era.

11 See Research Methodology Section.

12 (for example see: "Writing and reading a mouse click away," a project for UNDP, Egypt and Mobile IT Club: http://www.ictfund.org.eg/index.php?option=com_content&task=view&id=23&Itemid=44&lang).

13 Interview conducted as part of the research for this study.

9
Conclusion

The most important recommendation for policy development is to promote the use of GIS in decision-making and enhance opportunities for the public to use GIS to contribute to decision-making. A necessary component of development lies in strengthening democracy by empowering local communities. While Egypt seems to be heading down such a path, it seems to be suffering from a kind of nervousness about what lies ahead.

Building a participatory information system (PIS) needs a management information system with a geographic information system interface. PIS can be used to collect data on distribution of public services with area- and household-level data. These data, once processed, can be used by local government decision-makers to help in planning, implementing, managing and monitoring public sector development activities at district level. The collected data from communities can be disaggregated according to gender, educational level, occupation, as well as according to access to schools, water and health facilities. The GIS interface can be used to present data not only to government officials, but also to communities with the intention of making them aware of community strengths, weaknesses and development potentials and priorities. The GIS can also be used to overlay data on water courses, roads, settlements, forests, cultivation, power and communications infrastructure.[14] One can imagine the numerous utilities if this knowledge reaches the public through, for example, the mass media.

A vital point emerges here, that of transparency. One cannot talk about public participation and GIS if an environment of mistrust exists between local communities and the policy-makers. Further, questions of equity (in access, training, etc.), efficient information exchange, and appropriate delivery mechanisms must be considered in any planning for the introduction of GIS for public use.

Knowing the results and impacts of current projects is critical for making GIS tools effective for achieving Egypt's sustainable development goals. Evaluating existing projects, such as the ones described in this paper, would present an excellent opportunity to inform the further development of sustainable development and ICT policy in Egypt. The necessary evaluations can be carried out in cooperation among governments, communities and local and international NGOs.

Using GIS to increase public participation in decision-making, particularly in the areas of environmental monitoring and natural resource management, has great potential for Egypt. This is especially true because many of the prerequisites for making participatory GIS a reality have already been put into place: the telecommunications infrastructure has been modernized with a reliable, fast and developed core backbone, telecom and Internet services have been expanded, and

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general ICT awareness has greatly been improved by IT Clubs. In fact, Egypt may be in a position to develop and test a framework for implementing participatory GIS in other countries in the region, and beyond.

Policy implication

A number of specific objectives could be more easily achieved through the use of GIS. Drafting information society and sustainable development policies should be done with the following objectives in mind:

- institutionalizing effective coastal resource planning and management in Egypt through a fully-tested decision support system (DSS);
- creating or enhancing the exchange structures for the management of coastal resources through; establishment of inter-institutional coordination mechanisms for projects undertaken at the local and national levels;
- developing demonstration activities at the most significant sites;
- awareness-raising, training and networking of various demographic groups and key social and economic actors as well as establishing linkages between them not only in Egypt but around the Mediterranean basin as well;
- strengthening mechanisms for participatory planning at the local community level, by way of enabling local communities and civil society organizations to participate in information gathering, analysis, decision-making and enforcement;
- strengthening the administrative capacity of local government; and
- presenting a proposal for an Egyptian model for a sustainable information society, with a focus on creating public awareness among the Alexandrian community to fully realize the benefits of better integration of fisheries and agriculture with the rest of the economy.

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Conclusion

Information and communication technologies, like other tools, are not essentially or inherently good, or bad. They can, however, have positive as well as negative effects on development: they can narrow—or widen—gender gaps in employment; they can help reduce environmental strain, but can, and do, create additional damage through ICT-related waste; and they can help rectify, but also contribute to, problems associated with regional inequities.

This dual nature of ICTs, and the increased reliance on knowledge and information in general, have put the intersection of information society and sustainable development at the forefront of national policy-making. Many countries are currently developing information society strategies and looking to research institutions, the business community, other countries and international processes, such as the WSIS, for guidance. Until recently, however, few approaches have focused on harmonizing the visions of the emerging information society with the principles and priorities articulated by the United Nations' Millennium Development Goals (MDGs) and the World Summit on Sustainable Development. The reason for this, in part, is that the information society and sustainable development communities have each used different vocabularies and processes for determining national priorities. Information society specialists within governments have primarily been drawn from the fields of telecommunications and economic development and tend to work in ministries of telecommunications. Sustainable development specialists come from a range of social and natural science backgrounds and typically work in environment ministries.

The crafting of national information society policies is an excellent chance for crossing this, primarily operational, gap between the IS and SD policy communities and for enabling the transition to sustainable development. By presenting a number of national case studies, *A Developing Connection* articulates:

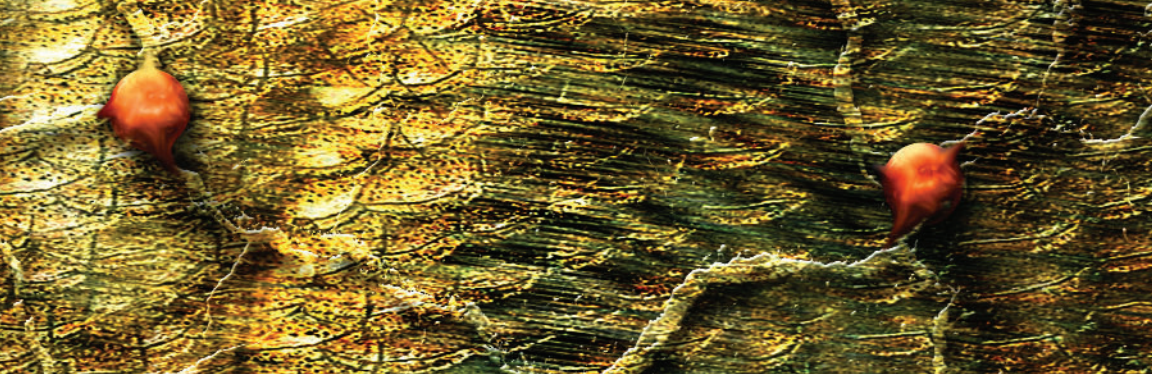
- national visions, based on various frameworks for understanding the linkages between the information society and sustainable development;
- explorations of national efforts and initiatives to realize this vision; and
- examinations of policy changes which might catalyze greater benefits of ICTs in the future.

In order to ensure that the research undertaken has impact on the policy process, the young researchers endeavoured to identify and engage in dialogue key national stakeholders and institutions for influencing relevant policy development in the realms of the information society and sustainable development. In most cases, the meetings and workshops organized by the researchers presented a rare opportunity for policy-makers from these two policy communities to meet and talk.

Through the *Information Society and Sustainable Development: Next Generation Policy Directions* research study which led to the publication of this book, we sought to engage developing country researchers and policy-makers in national

and international dialogues on the information society and sustainable development. We also attempted to identify and investigate priority areas for national policy and program development at the convergence of sustainable development and the information society. Finally, we hope that the young researchers from Brazil, Costa Rica, Egypt, India, Kenya and South Africa have built their capacity and confidence to undertake applied policy research and analysis on harnessing the information society to achieve national sustainable development priorities.

In other words, it was through the process of creating this book, as well as through its content, that we hope to have contributed to developing a connection between information society and sustainable development policy spheres.



A Developing Connection

Bridging the Policy Gap between the Information Society and Sustainable Development

In "A Developing Connection," seven young researchers from six countries look at the emerging relationship between sustainable development and the information society. The potential of information and communications technology to contribute to a more sustainable world is limitless. The challenge is to bring the policy communities together and help them understand the links. In this volume, some important challenges are outlined—and some important examples of success are highlighted.

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