

**CARICOM Small Island Developing States (SIDS)
Information Technology Training & Capacity-Building:
Priorities for Sustainable Development Decision-Making**



**Final Report For The
“Information for Decision-making on Sustainable Development (IDSD) Project”**

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EXECUTIVE SUMMARY

1. PROJECT OVERVIEW

The overall IDSD project aims are to: (i) identify and assess regional and country needs in information management systems for sustainable development; (ii) develop a training manual and materials for training of personnel at the national and regional level; and (iii) create a regional electronic site for accessing information on information management systems and techniques.

The Consultant's Terms of Reference call for the identification of priority training needs for the region in generation and using information for sustainable development. In particular, training needs for promoting the use of information technology tools and the management of information technology. The outputs will be used for the development of training materials and the design of a training course scheduled for October 2003. The consultant's tasks ultimately relate to the project's aim of developing methodology tools and approaches. This document is the finalised Training Needs Assessment Report and includes recommendations for the way forward and strategies for addressing existing gaps by the IDSD Project. A separate draft outline of a proposed methodology for defining indicators and baselines for measuring progress in using information for decision-making has also been produced.

2. REGIONAL IT MANAGEMENT INFRASTRUCTURE ASSESSMENT

2.1. Information Management Review

In carrying out the assessment of Regional Sustainable Development Information Management & Infrastructure, a conceptual overview of Information Management was carried out with background provided on: Information, Statistics, Indicators, Information Management Systems, New Tools and Sustainable Development Decision-Making. The report finds that the increasing 'digitisation' or computerisation of data-gathering and dissemination has led to new, increasingly cheaper and more efficient systems of information sharing and management. In the 21st Century, the Internet has become the pre-eminent 'communicator' and has triggered the development of the 'knowledge' or 'information' society movement to widely employ ICT/IT systems for advancing socio-economic development. Given its multi-disciplinary global scope, when utilising these systems for the measurement or management of Sustainable Development, effective decision-making relies on the establishment and monitoring of appropriate requirements, goals and tools (such as statistics and indicators). However, in order for these technological tools to be utilised effectively, organisational and technological frameworks must exist to carry out the associated activities required to establish and maintain these systems.

2.2. Information Infrastructure Review

Similarly an overview was made of the conceptual basis of the term Information Infrastructure with the emphasis being: National Information Infrastructure (NII), Global Information Infrastructure (GII), 'Informatisation' and the INEXSK technique of measuring IT use for economic development. The review found that the evaluation of where a country or region stands in terms of information infrastructure can be accomplished by: (1) Investigating the status of existing IT physical infrastructure for connectivity [in terms of Landline & Cellular Telephone Connections, Personal Computers (PCs), Servers and Internet Service Providers (ISPs)] and the economic activities that underpin them; (2) Assessing IT Scientific and Technological infrastructure, including Training & Research institutions, to understand strengths and weaknesses in terms of human resources capacity; and (3) Considering the expertise and experiences of a broad array of International, Government, Private and Non-Government actors in the area of IT and Information Management.

2.3. Global Sustainable Development Information Management Review

The report found that the United Nations System since 1992 has spawned a number of key Global information management policies, mechanisms and initiatives that have been endorsed by the world community. A review is made of their outputs in terms of: Agenda 21 Chapters 35 & 40; the Barbados SIDS Programme of Action (SIDS-POA); the Millennium Declaration Goals (MDGs), the World Summit on Sustainable Development (WSSD) and the World Summit on the Information Society (WSIS).

Agenda 21 and the Sustainable Development Networking Programme (SDNP)

Agenda 21 contains two chapters (35, Science for Sustainable Development and 40, Information for Decision-Making) that have made a substantial impact on global Sustainable Development Information Management. Two institutional capacity indicators are used by the UN's Commission on Sustainable Development (CSD) to monitor progress in implementing Chapter 40: (1) Under the Information Access sub-theme, Number of Internet Subscribers per 1000 Inhabitants and (2) Under the Communication Infrastructure sub-theme, Main Telephone Lines per 1000 Inhabitants. The one used for Chapter 35 falls under the sub-theme of Science and Technology; it is Expenditure on Research and Development as a Percent of GDP.

Chapter 40 Information for Decision-Making, in particular, is especially noted for: (1) its two sub-programmes of global, regional and local actions required to **bridge the data gap** while also **improving availability of information**; and (2) For laying the basis for the UNDP's Sustainable Development Networking Programme (SDNP) as an early intervention to close the digital divide and provide more information resources for disadvantaged regions and populations. The report identifies two Caribbean SDNPs in the CARICOM Member States of Guyana & Jamaica, a profile of the Jamaica SDNP was provided. The Jamaica SDNP has a well-defined set of goals and objectives that includes: *Introducing and connecting public, private non-government and community sector agencies and interests to local and international sources of information on sustainable development utilising the Internet and other tools; Establishing community Telecentres as focal points in marginalised communities; & Establishing community information networks*

Chapter 35 Science for Sustainable Development is not as well known as Chapter 40, but has come to be seen as increasingly important for utilising IT to enhance decision-making. The multi-disciplinary nature of environmental management makes the development of national Scientific and Technological (S&T) capacity a critically important corollary to Information Management Infrastructures for Sustainable Development Decision-Making.

Barbados SIDS-POA and the Small Island Developing States' Network (SIDSNet)

A review is made of the 1994 UN Conference on the Sustainable Development of Small Island Developing States-SIDS held in Barbados that produced a fifteen point Programme of Action (the Barbados SIDS-POA). It is shown to be the policy foundation for Sustainable Development policies in SIDS worldwide. The 15 SIDS-POA issues or thematic areas, containing the core content of integrated regional environmental & natural resources management strategies, are presented with a review of IT related sections recommending actions that gave birth to the Small Island Developing States Network (SIDSNet). The report notes that SIDSNet is accessible to the region, but that it presently has no institutional link in the Caribbean. However, information findings from missions supporting the consultancy note that, in collaboration with the University of the West Indies' Centre for Environment & Development (UWICED), the launch of a Caribbean SIDSNet node is planned for the near future.

The Millennium Declaration Goals (MDGs), the World Summit on Sustainable Development (WSSD) and the World Summit on the Information Society (WSIS)

MDGs

Stating the origins of the MDGs as the UN's Millennium Declaration adopted by most Heads of State and Government worldwide in the year 2000, it is explained that the declaration has 8 Goals and 18 Targets called the Millennium Development Goals (MDGs); progress towards meeting them is measured by 48 inter-related Indicators. The report identifies the indicators related to Sustainable Development Decision-Making Information as being: 6-Net enrolment ratio in primary education, 7-Proportion of pupils starting grade 1 who reach grade 5 and 8-Literacy rate of 15 – 24 year olds, 47-Telephone Lines per 1000 people and 48-Personal Computers per 1000 people.

WSSD

A list of key outcomes and commitments arising from the 2002 Johannesburg World Summit on Sustainable Development (WSSD) Plan of Implementation was described by the report, along with decisions and statements produced by a related meeting of Latin American & Caribbean (LAC) Ministers of the Environment. The report states that the LAC Initiative endorsed a range of Objectives, Operational Guidelines and Action Priorities that stressed the importance of S&T and IT capacity-building, including human resources development and sustainability/vulnerability indicators, in promoting Sustainable Development and effective participatory decision-making.

WSIS

The World Summit on the Information Society (WSIS) is described as the most recent major UN initiative of relevance to Caribbean Sustainable Development decision-making. A brief history and the UN Resolutions supporting the WSIS process were cited and the organisational arrangements which include the process leading to the Summit being coordinated by a high-level Summit organising committee, chaired by the ITU Secretary-General and consisting of the heads of United Nations bodies and other interested international organizations. Further, it recounts that the UN's Economic and Social Council adopted the idea at the high-level segment of its substantive session of 2000 via a ministerial declaration concerning information and communication technologies. Another important decision is described in which this Council decided to assist WSIS by, among other activities, creation of the Information and Communication Technologies Task Force (ICT-TF) as a successor to the UNCSTD Working Group on IT and Development.

The report acknowledges that the WSIS process has helped to considerably advance the region's awareness of IM/IT issues through a series of preparatory meetings in the Caribbean and abroad. One example given was the WSIS Eastern Caribbean Briefing held in 2002 that recommended important and timely steps to advance the regions IM/IT agenda through the WSIS as : (1) Establish a Caribbean sub-regional WSIS Task Force; (2) Regional agencies engaged in ICT activities (i.e. CDB, ITU, UWI, CARICOM, CTO, UN/ECLAC, OECS, CARICAD, UNESCO, etc.) should collaborate in the work of the sub-regional Task Force; (3) Seek visionary leaders and champions from the Heads of Government and or CEOs of the private sector to lead and direct the Task Force, and (4) The Task Force should identify an issue of crucial importance for the Caribbean and develop proposals around that issue for presentation at the World Summit.

2.4. Regional Sustainable Development Information Management Review

Overview of Caribbean Regional Information Systems

Using a thorough overview of Caribbean Regional Information Systems and/or Networks (Hee-Houng, 2001), a summary description of the major entities in the region is reported in a table format. These pioneering IM/IT mechanisms attempted to address regional and inter-governmental management and decision-making as well as a number of key sectoral interests such as Medicine, Trade, Energy and Agriculture. Overall, the systems and/or networks described may be considered as uni-dimensional single-sector mechanisms that focused more on 'data' and 'information systems' as opposed to multi-disciplinary Sustainable Development 'decision-making'. A selected number of the initiatives studied by Hee-Houng identified, along with relevant mechanisms identified during this consultancy that are more oriented to SD decision-making, are summarised in terms of their history/background and purpose/services; annexes with added information for several agencies are attached separately.

Caribbean Regional Sustainable Development Information Management Mechanisms

An analysis of the resulting Sustainable Development-oriented mechanisms/initiatives is made in the report, revealing that they are generally active in the functional use of IM/IT for decision-making in the following ways: (1) Information-Sharing & Networking (via List-servers and Email); (2) Human Resources Development (through Training, Workshops and Meetings); Institutional Capacity-Building (through the provision of IT Software/Hardware Infrastructure); & Public Awareness & Advocacy (using Websites, List-servers and Email). 4 SIDS-POA thematic decision-making uses are identified: (1) Information-Sharing and Monitoring of various global and regional Multilateral Environmental Agreements-MEAs by CARINFO, CEPNET, UN-ECLAC & REIN; (2) Coastal & Marine Resources Management by CEPNET; (3) Bio-diversity Resources by CCA/CREP/REIN; and Natural and Environmental Disasters by CARDIN. Three of the mechanisms identified are addressing the issue of Information for Decision-Making (CARICOM/UNSD, CARINFO & the newly formed CIVIC). It was noted that some aspects of IM/IT networking for decision-making in several of the other SIDS-POA thematic areas are presently being addressed by regional agencies such as: CPACC (Climate Change & Sea Level Rise via the Coastal Resource Information System); CTO (Tourism Resources via MIST); CARICAD (National Institutions & Administrative Capacity via E-Government Strategy Development); CEIS (Energy Resources); CARDI (Land Resources/Agriculture

via CAIS); CRFM (Coastal Marine Resources/Fisheries); CARICOM (Regional Institutions & Technical Cooperation); UWIDLIS (Human Resource Development); and CEHI (Freshwater Resources).

2.5. The Use of Information for Regional Sustainable Development Decision-Making

The presentation and analysis of five case studies of current uses of IT for Regional Sustainable Development decision-making covered the Mesoamerican Barrier Reef System (MBRS) Project Regional Network, the Government of Jamaica National Environmental Planning Agency (NEPA) Database, the Government of Belize Schools-Computers Wide Area Network (SWAN) Project, the Government of Barbados EduTech Programme, and the Jamaica TechSchool Initiative. The reviews are far from being an exhaustive examination of all existing mechanisms but were limited to a select number known to the consultant or discovered via project missions or web-research, given the time and scope of this consultancy. Preliminary analysis indicates, however, that there are significant opportunities for enhancing the application of IM/IT for decision-making in the region for all the identified SIDS-POA sustainable development issues or themes. While natural resources and environmental management (MBRS) has traditionally been seen as the main strategic use of IM/IT for Sustainable Development decision-making, human resources development (SWAN, EduTech & TechSchool) and other social sector applications (UNSD/CARICOM) should be considered as critical tactical capacity-building areas of interest. Overall, the region's IM/IT management infrastructure could be assessed as having a diverse and growing number of stakeholder organisations and agencies that could benefit from greater collaboration and rationalisation of their noteworthy efforts. Given the global basis for much of our national and regional activities in the field of IT for Sustainable Development, the region would do well to strengthen and better coordinate national and regional participation in the WSIS process.

The Mesoamerican Barrier Reef System (MBRS) Project Regional Network

This case study is an excellent example of IM/IT utilisation for Sustainable Development decision-making, in the context of a regional environmental management project involving Belize and her mainland neighbours: the GEF-funded MBRS Project's Regional Data Communications Network (RDCN). The goal of the MBRS is to enhance protection of the project area's unique and vulnerable marine ecosystems and to assist the participating countries (Belize, Guatemala, Honduras & Mexico) to strengthen and coordinate national policies, regulations and institutional arrangements for their conservation and sustainable use. One of the project's regional objectives is to: "*Develop and Implement a Standardised Data Management System of Ecosystem Monitoring and Facilitate the Dissemination of its Outputs throughout the Region*". The main goal of the RDCN project component is to develop a reliable base of data for the MBRS eco-region and an information system that can be used to support more informed management decisions. The establishment of a regional environment information system (REIS) is considered an essential tool for organising and managing data in support of improved decision-making. From an IM/IT point of view, the REIS mechanism provides the basic framework to guide Bio-Physical & Socio-Economic Data Collection, Processing, Distribution and Utilisation. The REIS will be fed by a regional and issue-specific long-term (synoptic) monitoring programme that will generate information on the region's oceanographic current regime and on the status and processes of MBRS reefs and other critical ecosystems. Data is to be collected on reproduction, larval dispersal & recruitment of corals, fish and other important reef components to further the understanding of ecological linkages between reefs and other marine environments, and processes that influence reef integrity. The specific outputs are: (1) Design and Implementation of a Synoptic Monitoring Programme; (2) Establishment of a bi-lingual (English and Spanish) Project Website; (3) Establishment of a Web-based Regional Environmental Information System, a GIS-capable database; and (4) Provision of Computing & Networking Equipment & Infrastructure to the 4 National RDCN Nodes. The report acknowledged that some useful insights for similar regional networking initiatives and mechanisms, including the IDSD Project, may be gleaned from a review of MBRS' approach to designing and implementing its RDCN. The MBRS network design process is summarised and graphic representation are provided of the end results of these two principal tasks: (1) Design and Implementation of an Electronic Information (or Communication) System, which would manage and make accessible to the project's clients information considered as relevant to management of the MBRS and related ecosystems & to the human communities that depend on it for their livelihood; and (2) Design and Installation of a Computer Network, the platform on which this information system would run.

The Government of Jamaica National Environmental Planning Agency (NEPA) Database

The SIDS-POA Country Report Compact Disc produced by the Government of Jamaica's National Environmental Planning Agency (NEPA) case is also another good example of current IM/IT usage for Sustainable Development decision-making. Using their State of the Environment reports for 1995, 1998 & 2001, NEPA prepared a compact disc (CD) for public dissemination that is structured along the lines of the 15 SIDS-POA thematic areas. Using their large integrated local area network (LAN), NEPA has included a large number of related reports, policy documents and papers into an integrated database with text and graphics. This tool is described as quite useful for briefing policy-makers, assessing progress in the management of national Sustainable Development policy, as well as for meeting a number of MEA reporting requirements.

The Government of Belize Schools-Computers Wide Area Network (SWAN) Project

In the important Human Resource Development area, this case presents how the Government of Belize has begun implementation of a Schools-Computers Wide Area Network (SWAN) project through its Ministry of Education, Youth & Sports (MoEYS). The project addresses the IM/IT issue of access to computers and the Internet at all levels of the education establishment for teaching, learning and educational administration purposes. In order to implement this innovative project in cooperation with Intelco (Belize's first new service provider under its recently liberalised telecommunications regime), a multi-disciplinary SWAN Task Force composed of representative staff from key units was formally set up in 2001 via a MoEYS directive and charged with: (1) Ensuring Timely and Effective SWAN School/NGO Sites Preparation, Hardware Installation, Maintenance & Monitoring; (2) Managing User-related Curriculum, Training & Instructional Software/Internet Administration/Operational Management Issues; & (3) Facilitating Stakeholder Participation & Public Awareness through Continuous Liaison with Intelco & Private Sector Contractors, National & District Education Councils (NEC/DEC), MoEYS Service Areas and School/NGO Sites Managing Authorities. Employing operational arrangements with Intelco and local equipment suppliers developed by the Task Force, the Installation Phase of the project has focused mainly on Information Technology (IT) Infrastructure Development. Technical staff support for network installation & maintenance came from the Employment Training and Education Services (ETES) unit, while administrative support for carrying out the required inter-related activities was coordinated through the Planning, Projects & Performance Measurement (PPPM) unit. PPPM assisted with the preparation and payment of contracts, and with the management of funds according to GOB procedures. District Education Centre (DEC) Officers assisted with the readiness of sites as they were prepared for installations.

The Quality Assurance & Development Services (QADS) unit worked in collaboration with the Central American Health Sciences University (CAHSU) to develop a Science Education website that is housed on the CAHSU server. This collaboration is expected to continue as a part of the MoEYS' goal of digitising the National Curriculum in order to support distance education via the Internet. The major achievements of the SWAN Project & Task Force in 2002, according to three main areas, are summarised and included. Further, the political manifesto of the present Belize Government (2003-08) envisages a significant role for Information Technology and the Internet in promoting sustainable economic development. Besides a far-reaching twelve-point proposal for developing a "High Tech Belize", one of its specific goals is to establish "Computer Education Centres" in all districts. The SWAN Project/Task Force is presently being re-tooled as a ministry-wide service area focusing on IT & Internet Services in order to assist MoEYS and Government to meet this challenge.

The Government of Barbados EduTech Programme

This additional HRD case study comes from the UN Information and Communications Technologies Task Force (UNICTF), the UN Development Programme (UNDP) and the UN Fund for International Partnerships (UNFIP) co-sponsored a gathering called *Meeting on Bridging the Digital Divide for the Caribbean* held as part of the preparatory process for the WSIS at the United Nations in January of this year 2003. It covers the presentation made by Ms. Lolita Applewhaite (Director of the Centre for International Services, Cave Hill Campus of the University of the West Indies in Barbados) on the Government of Barbados' EduTech (Education Sector Enhancement Programme). EduTech is another practical example of IM/IT use in the Education sector that is similar to the Belize SWAN project, but of an order of magnitude larger in terms of financing and scale. In summary, as the first project of its kind and scope among CARICOM member state, EduTech is an innovative and multifaceted initiative to provide the Barbados education sector with the skills, tools and infrastructure to 'leapfrog' into the knowledge-based future.

Jamaica TechSchool Initiative

The final case study presents one of the most unique Caribbean presentations at the UN *Meeting on Bridging the Digital Divide for the Caribbean* that was made by Makonnen Blake, Youth Technology Consultant to the Jamaican Minister of Commerce and Technology. Mr. Blake is a youth IT prodigy who was tapped by the Government of Jamaica to advance the involvement of youth in this vital arena. It covers his activities since his appointment in 1998 in pioneering a creative initiative to open the doors of IT opportunity for young Jamaicans by casting "Youth as IT Teachers" and engaging in a wide range of partnerships with other youth from the region and the developed world.

Overall, the report considers SWAN in Belize, EduTech in Barbados and TechSchool in Jamaica are harbingers of 21st Century Caribbean Knowledge Societies. They, along with the MBRS' Regional Environmental Information System, Jamaica's SDNP & NEPA State of the Environment/SIDS-POA compact disc, also offer proof from the limited assessment done that the Caribbean can successfully deploy IT tools for Sustainable Development Decision-Making that Bridges the Data Gap (Digital Divide) and Increases the Availability of Information.

3. REGIONAL IT TRAINING & CAPACITY BUILDING PRIORITIES

3.1 IM/IT Training and Capacity-Building Conceptual Review

Education, Lifelong Learning and Institutional Change

This section of the report sought to determine regional IT Training & Capacity-Building priorities and began by returning to Mansell & When's 'source book' for a review of the conceptual base for both a 'lifelong learning & institutional change' approach to and specific recommendations for IT skills requirements.

Enhancing the Skills Base for Participation, Facilitation and Control

Three types of skills are described: (1) Participatory Skills necessary for involvement in networked communication and information-sharing. These incorporate computer literacy and fluency in the English language for the use of the Internet, databases and most software until more content is provided in local languages; (2) Facilitating Skills for the design, implementation and maintenance of networks involve a number of essential skills for installation, user training and maintenance. In addition, software and computer systems engineering skills are desirable. Even more emphasis needs to be placed on vocational training to provide a large number of people with the ability to ensure the functionality of networks; and (3) Control Skills that enable the allocation of funds for the acquisition of appropriate ICT equipment in order to manage access to networks in some countries to achieve public or private control.

3.2 Caribbean Sustainable Development IT Training & Capacity-Building Needs

Here the report concludes that the path to appropriate and sustainable IT training for capacity-building lies along the Education sector highway, but, given the changes wrought by the emerging 'global information order', existing educational infrastructures and philosophical dogmas must be revamped. The new 'global information order' requires an 'informationisation' of the educational establishment, with an emphasis on criteria that will enable life-long skills that enable peoples and societies to Participate in, Facilitate operation of & acquire Control over this new 'global information order'. A useful view from India is covered that presents a 4-Level IT skills training framework to be considered by the region as it attempts to find a Caribbean vehicle to carry us along a high-tech Education path. The report surmises that our IT training transport must not only be globally marketable and multi-disciplinary, but it must also be able to navigate our distinct socio-cultural roadways and allow us to both contribute as well as receive goods. In summary, Caribbean IT training for Sustainable Development should become a part of all the region's many educational programmes. Beginning with 'e-Literacy'; IT training has to enable operational use and eventual mastery of the applications, sciences and technologies involved for the benefit of the whole Caribbean Society., Our ultimate success in this endeavour will be judged by our ability to generate new content, products and services that are globally marketable **and** locally beneficial.

Jamaica & Belize Missions and St. Lucia Survey Findings

The input of stakeholders throughout the region is considered essential in the determination of specific Caribbean IT training and capacity-building priorities. This section covers how, as a critical part of the consultancy, brief missions were mounted to Jamaica and Belize where helpful discussions were held with a number of agencies and organisations that have an interest in the IDSD project and Information for Sustainable Development Decision-Making. Similarly, the project-sponsored St. Lucia Resource Persons Meeting was designed to incorporate the views and opinions of a wider Caribbean audience into the IDSD project's

determination of Priority IT Training & Capacity-Building Needs in the region. Using findings from the missions and a survey at the meeting, a needs assessment in the context of identifying perceived constraints as well as any new IT tools that should be recognised, was carried out. The complete findings from the missions to Jamaica and Belize; and the recorded St. Lucia Resource Persons' Survey responses were attached as appendices and the results were examined in the report to establish priority categories of needs, constraints or New IT Tools; the summaries were presented in tables within the document and through the use of three dimensional (3-D) charts to graphically the outcomes.

Analysis of Needs, Constraints & New Tools

According to the results, the most important need identified is Education & Training (including certification) in the following key areas with examples:

- **Databases**, including
 - Creation, development, distribution & management (especially for administrative staff);
 - Regional database development & maintenance training ('train the trainers' programme);
 - Review of administrative forms & systems to facilitate data gathering & recording;
 - Metadata development & management.
- **Networks**, including
 - Satellite networking;
 - Management & design.
- **Web/Internet**, including
 - Development;
 - Management.
- **Computer Operations & Maintenance**, including
 - Basic computer hardware concepts (e.g. RAM, ROM, etc.);
 - Essential office software (e.g. spreadsheets, word processing & database programmes);
 - PC File Management, Data formatting and Presentation programmes such as PowerPoint.
- **Remote Sensing and Geographic Information Systems (GIS)**, including
 - GIS technology for CSOs or clearinghouses;
 - GIS for Environmental (Coastal Zone) management.
- **Software Development and Use**, especially
 - Open-source (Linux) for "e"-Commerce.
- **Management of Changing and Evolving IT Systems & Infrastructure**, including
 - Security/vulnerability issues;
 - Training for negotiators;
 - Technical analysis training;
 - CTO MIST system operations (esp. in manipulation of 'back-end' data for national demands).
- **Statistics & Indicators**, including
 - Energy Balance & Energy Statistics;
 - Statistical coding methodologies, e.g. Costa Rica University Development Observatory;
 - Development of impact indicators.

In the determination of regional IT and capacity-building priorities, the report uses a synopsis of the categories from the findings to indicate that Education and Training is perceived as the single most important need; Infrastructure Capacity, Web & Software Development and National/Regional Collaborative Linkages are also significant needs. Several constraints were identified; the most critical being the lack of Human Resources Capacity, followed by inadequate Financial Resources, weak National/Regional Collaborative Linkages and insufficient Infrastructure Capacity. Web and Software Development was overwhelmingly assessed as the most momentous in terms of New IT Tools, although some notable implements were recognised from the Education & Training and Infrastructure Capacity areas. The overall ranking demonstrates that both Education & Training and Web & Software Development would be crucial components of any effective regional IT Training and Capacity-Building initiative. And, along with Infrastructure Capacity, Human Capacity and National/Regional Collaborative Linkages; they can form the strategic elements of present and future IDSD Project activities. The securing of appropriate Financial Resources must not be overlooked either, as it is viewed as essential to the sustainability of any proposed programme.

Lessons from an Indian View on Human Resources Development to Meet IT Challenges

The case from India shows that it is world known for the phenomenal advances made by its IT industry, especially in the field of software development and export. Assessing what the Caribbean can learn from India's experience, the report summed up a very useful paper in this respect written by R. Narasimhan of India's National Centre for Software Technology (NCST). Debunking what he calls the "hype" and "mystique" that "software is peculiarly matched to the Indian genius", Narasimhan analyses the HRD problem from a broader perspective and proposes a 4-level expertise generation framework, included as a table in the document, based on what he calls "desired ideal" criteria.

3.3 Caribbean Sustainable Development IT Training & Capacity-Building Actions

Requirements for Sustainable Caribbean IT Training & Infrastructure Capacity-Building

Globally Relevant but Locally Available Education and Training

The report concludes in terms of IT that, if the region is to assume and or maintain its control of this rapidly evolving, science & technology-driven instrument, appropriate training of a youthful populace as well as stakeholder IT staff is critical. A recommended template for providing the fundamental skills (Participatory and Facilitating) required, including advanced and basic courses is included:

- High level staff technical training for IT/IM/MIS Department Managers in: Networking, Security & Microsoft SQL (for Database Administrators) leading to the Microsoft Certified Systems Engineer (MCSE) credential;

- Mid level staff technical training for IT/IM/MIS Technicians in hardware and software installation/operation/maintenance (A+ Certificate); and
- Administrative level support staff training in full functionality of combination software packages (e.g. Microsoft Office or Coral Suites).

An example is given of Miami-Dade Community College's establishment of an Emerging Technologies Centre of the Americas (ETCOTA) to cater to hemispheric IT training and workforce needs in recognition of the value of the so-called 'high-end' technology training as a prerequisite for life-long learning IT careers; MDCC was also cognizant of the growing demand for such courses in the wider Latin American & Caribbean region.

The report maintains that, for fundamental manoeuvrability, and as the language of the new 'Global Information Order, these types of vendor-certified training courses are essential in the professional IT world and are increasingly needed by all stakeholder institutions involved in Caribbean Sustainable Development Decision-Making. In determining the types of IT education and training that the IDSD Workplan envisages, eight inter-related areas are suggested coming from the findings of section 3.2. The proposed curriculum would target key IM/IT managers and officials for instruction in:

- Database & Information Systems Development and Management;
- Networking (Local Area Networks-LANs & Wide Area Networks-WANs) Technologies;
- Email/Web/Internet Management;
- Computer Operations & Maintenance;
- Remote Sensing and Geographic Information Systems (GIS);
- Open Source Software Development and Use;
- Management of Changing and Evolving IT Systems & Infrastructure; &
- Sustainable Development Statistics, Indicators & Decision-Making

Knowledge Management and Portals

Knowledge Management

The document states that if the IDSD and other IT Education and Training initiatives for the region are to address critical regional problems and remain abreast of industry and societal trends, they must assess and deploy locally the latest tools available for the benefit of the Caribbean. Two recommended cutting edge mechanisms are 'Knowledge Management' and Portals. Knowledge Management, according to a strategic planning report for an Indian IT firm:

"...is first and foremost a management discipline...that promotes a collaborative and integrated approach to the Creation, Capture, Organisation, Access and Use of an enterprise's information assets. This includes Databases, Documents and most importantly, uncaptured tacit expertise and experience of individual workers.."

"...helps prepare...for an environment of constantly shifting demographics, industries, economies and customer needs by ensuring that people have the expertise and information they need in order to properly assess business problems and opportunities..."

Portals

Databases and portals are described as two key elements of IT with the potential to provide appropriate access to the vast amounts of online data existent in an organisation today in a dynamic and organized manner and UNESCO's "Webworld" Gateway is presented as an example of a portal-type website designed to advance that organisation's capacity for sharing the accomplishments of its own Information Society initiative. A more useful example for the IDSD project is considered to be the OAS Education for the Americas Portal. Carlos Paldao, of the OAS' Inter-American Agency for Cooperation & Development (IACD) that sponsors this mechanism, is quoted as describing the EPA in this manner:

"The Education Portal of the Americas is a clearinghouse of information for students, teachers, researchers, government officials and others who would like to access quality information regarding the Hemisphere's best distance learning programmes and scholarship opportunities from one central location. It is a tool to help all individuals interested in improving their personal and/or professional development."

Towards Establishing Proactive National and Regional IT Policy Frameworks

One of the first policy frameworks for the formulation of National Information Infrastructures (NII) that could then allow for the formation of a Caribbean Regional Information Infrastructure (RII), proposed by the UNSTD's Report of the Working Group on Information Technology and Development, is discussed and included in an annex. The Working Group's report concluded that governments and other stakeholders must be called upon to design new roles for the public and business sectors to enable ICTs to be harassed to economic, social, and environmental development goals. A summary of its recommendations is that:

Each developing country and country in transition establishes a national ICT strategy. Where such strategies already exist, they should be reviewed to ensure that they take note of the guidelines proposed by the UNCSTD Working Group;

Immediate action be taken by national governments to establish a task force or commission or to ensure that another entity is charged with establishing the guidelines for national ICT strategies. Reviews should be undertaken over a six-month period and a report should be prepared by each government outlining the priorities of its national ICT strategy, the mechanisms for continuous updating, and the procedures for implementation of the components of the strategy. Progress on the implementation of this recommendation should be reported to the next session of the Commission in 1999;

Each agency of the United Nations system reviews the financing, production, and use of ICTs for social and economic development in their area of responsibility. This review should monitor the effectiveness of new forms of partnerships in the ICT area, and address the capability of each agency to provide technical assistance in that area. This needs to happen so that the United Nations System can be in the forefront in helping developing countries and countries in transition to implement their national ICT strategies.

Case studies of the Caribbean's IT sector & policies are presented from the Caribbean Digital Diaspora Network Conference on the status of the region's IT use, its policy infrastructure and proposals for its advancement. The report offers brief summaries of these presentations, which enable the reader to get a sense of where the region is at present, where we would like to go in the future and some insights on steps we must take to get there. The interventions described are: Caribbean ICT

Development: Critical Issues and Challenges, by Roderick Sanatan (Manager of Research and Development at UWI's Centre for International Services in Barbados); Caribbean Community (CARICOM) ICT Strategy /Agenda 2003, Ms. Jennifer Britton (Senior Project Officer for Integrated Information Systems at the CARICOM Secretariat); and ICT Development in the CARICOM Countries Discussion Paper, by Dr. L.A. Nurse.

The review of IT policy frameworks in the context of Caribbean IT Training & Capacity-Building indicated that after connectivity, the issue of education and training may be considered the next highest regional priority. However, the report states it is important to recognise that in order for the Caribbean to move effectively to address this almost universal cry, the requisite national legislative and institutional arrangements must be in place and in harmony with the regional administrative framework. The recommendations and guidelines from the UNSTD Working Group on IT and Development are still relevant and could form a template for a course on National ICT Policy formulation. CARICOM is described as having elaborated a coherent strategy agenda that was detailed by Britton and endorsed by Nurse in his DDN-C paper. With the development of a Caribbean ICT policy framework in process, the report suggests that the IDSD project could undertake to specifically support its advancement through training interventions. And, in the context of building regional environmental information management capacity, indicates it may wish to explore the sponsorship of a GEF project as a longer term partnership with the region.

Suggested Stakeholder Principles for Sustainable IT Training & Capacity Building Policies

The concept of e-Governance is recognised in the report as the new emerging paradigm that is meant to encompass steps and procedures for administering the Knowledge Society and making decisions in a participatory and transparent manner using IT. Several instructive sets of guiding principles or processes for establishing rational decision-making for e-Governance are reviewed, including experiences from UNESCO, the Commonwealth Network of Information Technology for Development and a Workshop for the Exchange of Experience on Social Appropriation of New Information and Communication Technologies for Development in Latin America and the Caribbean. Finally, based on data gather during this consultancy, a matrix is offered for evaluating whether a proposed investment in capacity is needed and cost-effective for certain desired IT applications.

Matrix for the Qualitative Determination of Appropriate Institutional Capacity for Desired IT Service and Application (* = Low; ** = Medium; *** = High)

<i>SERVICE</i>	<i>INSTITUTIONAL CAPACITY NEEDED</i>			<i>APPLICATIONS</i>
<i>Functional Use of Technology</i>	<i>Human Resources</i>	<i>Infrastructure</i>	<i>Finance</i>	<i>SD Decision-Making Areas</i>
Email	*	*	*	Information sharing, Coordination
Website	**	*	*	Information sharing, Public Awareness
Database	***	**	**	SIDS-POA & MEAs Monitoring, Other Regional & Local Indicators; GIS; Training; R&D, Knowledge Management
Networking	**	***	***	GIS, Training, R&D, Knowledge Management, Coordination
Portal	**	***	***	Training, R&D, GIS, Knowledge Management
E-Learning	***	**	**	Training, R&D, GIS
Video-conferencing	**	***	***	Training, Information Management, Coordination
E-Commerce	**	***	**	Training, Financing, Distribution

This matrix could also assist decision-makers and other stakeholders in assessing the implications of acquiring a particular technology to implement a Sustainable Development IT programme.

The Immediate Way Forward: A Proposed IDSD Project Action Strategy

Recommended IT Training Packages

In order to promote the effective use of information technology tools and the efficient management of information technology in the Caribbean, two training packages are recommended. The first training package (see IT Training Package text box) is oriented towards promoting the effective use of IT tools and begins with basic computer literacy and goes up to technical mastery

IT Operations Training Package

- **Level 1. Basic Computer Literacy for Administrative & Support Staff**
Training in full functionality of combination software packages for proficiency in operating Word-Processing, Spreadsheet, Database & Presentation programmes.
- **Level 2. Network/PC Literacy for Technical Operations & Maintenance Staff**
Training for IT and MIS Technicians in networking hardware and software installation, operation & maintenance (A+ Certificate); and
- **Level 3. Network Operator for IT Unit/Department Managers or Database Administrators**
Training for Network Managers in: Networking (i-Net +, Network +, Security & Microsoft SQL. Minimum: i-Net+ Certificate; Recommended: Network+ & Linux+ Certificates. Advanced: Microsoft Certified Systems Engineer (MCSE)

The second package is a smorgasbord of courses, some representing training needs identified earlier. They are suggested for the strengthening of regional management capacity to enable the efficient administration of databases, networks and the Internet.

IT Management Training Package

- E-Government Principles & Practice
- Knowledge Management for Knowledge Societies
- Development of Portals & Digital Libraries
- National ICT Policy Development & Management
- Using Sustainable Development Indicators & Statistics for Decision-Making
- Geographic Information Systems (GIS) for Environmental Decision-Making
- Managing Local Area Networks-LANs & Wide Area Networks-WANs
- Managing Email, the Web & the Internet
- Open Source & Proprietary Software Management for Networking
- Security Management for IT Systems & Infrastructure
- Wireless Fidelity (WIFI) Networking Technology & Management

Short to Medium Term Action Strategy

The proposed Short, Medium & Long term elements of an IDSD Project strategy was presented as a table

IDSD Project Action Strategy: Focusing on Key Regional IT Training & Capacity-Building Needs

<u>Timeframe</u>	<u>Project Activity</u>	<u>Key Regional Training Area</u>	<u>Key Regional Capacity-Building Area</u>
On-going since May 2003	Website Focus	SIDS-POA Pilot Issues & Themes Education, Sustainable Development (SD) Education, Information Science & Technology Education	Information Dissemination & Public Awareness, Connectivity Advocacy, Civil Society/NGO Participation
Developed at May 2003 meeting	List-serv	Project Communication & Coordination	Project Partnerships, Information Sharing
Immediate, July-October 2003	Establish Collaborative Partnerships	National Ministries of Education, Natural Resources & Environment, Information or IT and Planning/Development Cooperation; UWI-DLIS; Private Sector (National, Regional & Global); OAS Education Portal (www.educoas.org); UNESCO Communication & Information in the Knowledge Society Gateway (www.unesco.org/webworld); UNU IAS (www.ias.unu.edu); Commonwealth Network of Information Technology for Development (COMNET-IT)	<u>Regional</u> CARICOM Secretariat, OECS Secretariat, CCA/CREP-REIN, CARINFO, CIVIC, UWI-DLIS, CARICAD <u>International</u> OAS/IACD, ITU-Caribbean, UNECLAC-POS, UNEP-CAR/RCU, UNDP SDNP & SIDSNet, UN-WSIS/ITU, <u>Private Sector</u> Caribbean Tourism Organisation Caribbean Association of Industry & Commerce
Immediate July-September 2003	Training Workshop Planning	E-Government Principles & Practice Development of Portals & Digital Libraries National ICT Policy Development & Management Development and Management of Databases Managing Local Area Networks-LANs & Wide Area Networks-WANs Managing Email, the Web & the Internet Geographic Information Systems (GIS) for Decision-Making Open Source & Proprietary Software Management for Networking Security Management for IT Systems & Infrastructure Using Sustainable Development Indicators & Statistics for Decision-	IT Research & Development National Policies & Institutional Capacity Arrangements Regional & Global Resources Coordination Science & Technology Transfer SD Statistics & Indicators

<i>Timeframe</i>	<i>Project Activity</i>	<i>Key Regional Training Area</i>	<i>Key Regional Capacity-Building Area</i>
		Making Wireless Fidelity (WIFI) Networking Technology & Management Knowledge Management for Knowledge Societies	
Short to Medium term, 2003-2005	Caribbean IT Knowledge Portal	E-Literacy, E-Learning, E-Commerce, MEAs Monitoring (National, Regional & Global), Regional SD Digital Library, Caribbean IT Skills Virtual Registry & Exchange	Human Resources Development, Financing, Partnerships, SIDS-POA Collaboration, Caribbean SIDSNet Guidance & Oversight
Medium to Long term, 2004-2009	CARICOM/OAS/UNDESA/UN-ICT GEF Information for Sustainable Development project formulation, assessment & development	MEAs Monitoring (National, Regional & Global), Regional SD Digital Library, Caribbean IT Skills Virtual Registry & Exchange	National Policies & Institutional Capacity; Regional & Global Resources Coordination; Science & Technology Transfer SD Statistics & Indicators

Collaborative Partnerships

The report suggests several collaborative partnerships for immediate exploration.

September 2003 Training Workshop

An approach to implementing the planned September 2003 workshop is offered.

Caribbean IT Training Portal

A description of the action strategy recommendation for development of a Caribbean IT Training & Capacity-Building Portal is given.

Long-term GEF Project Proposal

In support of the developing Caribbean ICT policy framework, the report proposes that the IDSD project undertake sponsorship of a GEF project as a longer term partnership with the region.

UNESCO Digital Divide Strategy

The document ends with a presentation of the recently published UNESCO Digital Divide strategy, which is described as reflecting the paradigm shift taking place at the global level that could assist the proposed IDSD Action Strategy.

1. The IDSD Project

1.1 Project Overview

1. The Caribbean Community (CARICOM) and its member states require support in creating mechanisms for the long-term management of sustainable development and environment information and particularly in defining ways to harness this information for decision-making purposes. In order to assist in meeting this demand, the Organisation of American States (OAS) has teamed up with the United Nations Division on Social and Economic Affairs (UNDESA) to implement a small regional project entitled "**Capacity-Building in Creating Information Management Systems to Improve Decision-making for Sustainable Development for Small Island Developing States (SIDS)**". The OAS has been given the task of managing this important initiative, which is better known as the **Information for Decision-making for Sustainable Development (IDSD) Project**.¹

2. The IDSD project aims to: (i) identify and assess regional and country needs in information management systems for sustainable development; (ii) develop a training manual and materials for training of personnel at the national and regional level; and (iii) create a regional electronic site for accessing information on information management systems and techniques. The project will be executed from November 2002 - October 2003.

It is envisioned that the following outputs will be achieved:

- A pilot network of national, regional, and possibly local institutions involved in information management in the Caribbean region;
- Resource persons trained as information managers within the region that will have the capacity to train information managers themselves at the regional and national levels;
- Training materials on information management systems for training of human resources accessible through SIDSNET connected to regional networks and UN-system sites;
- A forum of exchange for experiences among regional and national information systems' managers; &
- A final report on implementation, including an assessment and evaluation of the projects.

3. IDSD builds on previous work carried out by the United Nations Statistics Division (UNSD) in collaboration with the CARICOM Secretariat/Member States on *"Strengthening Capacity in the Compilation and Dissemination of Statistics and Indicators for Conference Follow-up in the Caribbean region"* and work by the United Nations Environment Programme (UNEP) in the field of environmental information management. The work programme envisions

- A regional experts meeting to assess and agree on priority training needs,
- The identification of best practices and appropriate information management tools,
- The implementation of a training course, and
- The establishment of a website to address information management for sustainable development.

Four pilot countries (Barbados, Belize, Jamaica & St. Lucia) have been selected for the first phase of the project, which is to focus on four thematic areas: Sustainable Tourism, Land use planning, Coastal Zone Management and Disaster Management including Climate Change.

1.2 Consultant's Terms of Reference

4. A short-term Priority Training Needs consultant has been contracted to assist the OAS in identifying priority training and capacity-building needs for the region in generating and using information for sustainable development, particularly in promoting the use and management of this information for enhanced decision-making (see [Annex 1](#)). The outputs from this assignment will also inform the development of training materials and the design of a training course to be held in September 2003.

2. Assessment of Regional Sustainable Development Information Management & Infrastructure

The assessment of Sustainable Development information training and capacity-building needs in the region begins with a conceptual review of both the use of Information & Communication Technology (ICT or IT, I use both interchangeably) for Sustainable Development or Information Management; and the notion of capacity for effective IT utilization or Information Infrastructure.

2.1 Information Management Conceptual Overview

5. In preparing for the IDSD project, a comprehensive assessment report² on Information Management (IM) included background on the concepts Information, IM Systems, New IT Tools and Sustainable Development Decision-Making (quoted in italics below, see Appendix 1 for complete text):

➤ Information/Statistics/Indicators

6. *"Information is commonly defined as either knowledge about something, or as a collection of facts and data. Data are usually described by statistics, numbers that summarize the characteristics of the data collected. Statistical aggregates of processed and raw data can be used as indicators. Indicators try to capture in a simple fashion complex events. The search for indicators for sustainable development has gained in importance, as such indicators are seen as an effective input in the decision making process".*

➤ Information Management Systems

7. *"The practice of collecting, organizing, and communicating knowledge so that it can be used in the most effective way possible by as many users as possible is known as information management. A collection of tools and techniques that facilitate information management is known as an information management system. Traditional information management systems have included paper files and documents, but more recently the advent of computer networks have introduced the use of electronic systems".*

➤ New IT Tools

8. The current 21st Century paradigm in information management systems has, however, gone 'digital' in the words of Nicholas Negroponte³ by spawning a vast array of new IT tools or applications, constantly evolving⁴ according to the laws of Moore and Metcalf¹ such as:

"... Interlinked websites forming an information network, digital clearinghouses of information, electronic databases, search engines, etc. The power and versatility of these tools have enabled users to access and analyze ever-increasing amounts of information in much shorter time frames than has been the case in the past. The Internet has become the favoured tool of use for instant access to and dissemination of information, and once the infrastructure for a network has been put into place, it also represents a relatively low-cost medium for communicating information. Websites, with their potential for both displaying information and providing links to related topics of interest, can serve both as portals and communication forums for sustainable development issues. Other useful electronic tools include e-groups and distribution lists (List-servers), which provide users with periodic postings and updates of events and news in an area of specialty.

➤ Sustainable Development Decision-Making

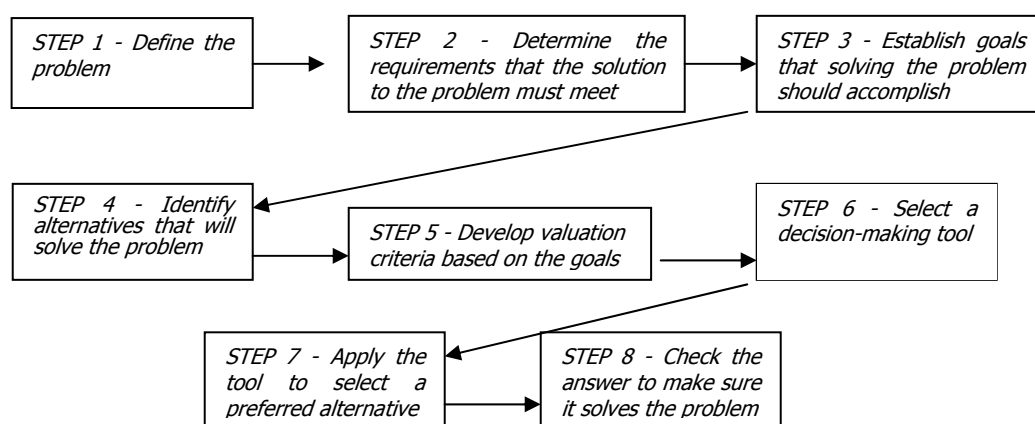
9. In the area of sustainable development decision-making, the IDSD Assessment notes that for the process to be efficient, a series of steps are involved that require appropriate information inputs at different stages, as well as stakeholder feedback (see below):

¹ Moore's Law: A prediction by Intel founder Gordon Moore that every eighteen months, for the foreseeable future, [micro] chip density (and hence computing power) would double while cost remained constant, creating ever more powerful computing devices without raising their price...The bottom line is simple but potent: **faster, cheaper, smaller**.

Metcalf's Law: The observation made by Robert Metcalf, founder of 3Com Corporation, that networks (whether of telephones, computers or people) dramatically increase in value with each additional node or user. Metcalf's Law values the utility of a network as the square of the number of users, and can be easily appreciated by considering the impact of standard railroad gauges, Morse code and standardized electrical outlets in the last century and telephones, fax machines, and the Ethernet & Internet protocols today. Once a standard has achieved critical mass, its value to everyone multiplies exponentially.

- *"Step 1, the definition of the problem, and step 2, determining the requirements that the solution must meet, require baseline information on the needs of the stakeholders. Evidently, this requires either input from the stakeholders themselves (ideally) or from their representatives. Step 3, establishing goals that the problem should accomplish, and step 4, identifying alternative solutions to the problem; require information on not only the ideal outcomes to the problem, but also information on the capacity of the region to respond. This means that in many cases, the solution will not necessarily be ideal, but will need to be adapted to the region's realities. For this, priorities need to be established, and this involves step 5, developing valuation criteria for the goals. Once the approach has been established, the decision-making tools appropriate to the approach have to be decided upon, step 6. Having information on the availability and characteristics of different decision-making tools is critical at this stage. Step 7 involves possessing the knowledge of how to use the decision-making tool in applying it to the problem; here, information on past experiences using the tool comes in very handy. Finally, step 8, checking the answer to make sure it fits the problem, may involve consultation with other agencies or individuals who have worked on similar problems and approaches, in order to confirm the expected results. At each step, the quality and availability of information is in direct correlation with the effectiveness of the approach".*

Decision-Making Process Figure



10. In short, the increasing 'digitisation' or computerisation of data-gathering and dissemination has led to new, increasingly cheaper and more efficient systems of information sharing and management. In the 21st Century, the Internet has become the pre-eminent 'communicator' and has triggered the development of a burgeoning movement to widely employ ICT/IT systems for advancing socio-economic development, the 'knowledge' or 'information' society. Given its multi-disciplinary global scope, when utilising these systems for the measurement or management of Sustainable Development, effective decision-making relies on the establishment of appropriate requirements, goals and tools (such as statistical indicators). However, in order for these technological tools to be utilised effectively, organisational and technological frameworks must exist to carry out the associated activities required to establish and maintain these systems.

2.2 Information Infrastructure Conceptual Overview

11. A useful 'source book' that has an overview of the conceptual basis of 'Information Infrastructure' is the seminal, much-referenced 1997 report (*Knowledge Societies²: Information Technology for Sustainable Development*) to the United Nations Commission on Science & Technology for Development-

² 'Knowledge Society' is a recently coined term that reflects a shift in the perceived role of ICTs/IT, in terms of the major social & economic transformations attributed to them, from 'drivers' of change to a perspective where these technologies are regarded as tools that may provide a new industrial paradigm by combining computerized information systems with the creative potential and knowledge that resides in human beings. These technologies do not create transformations in society by themselves; they are designed and implemented by people in their [respective] social, economic and technological contexts. Some observers mark the production in 1969 of the first 'computer on a chip' and the declining cost of semiconductor technologies & microelectronic as the beginning of the IT 'revolution'.

UNCSTD by its Working Group on IT and Development, edited by Robin Mansell & Uta When (quoted in italics below):

➤ **National Information Infrastructure (NII) & Global Information Infrastructure (GII)**

12. The physical capacity to actually access and use IT depends on the availability of a combination of goods and services, on the one hand, and skilled personnel, on the other hand:

- *"The technologies, organisations and capabilities within a country that facilitate production and use of IT are called National Information Infrastructure (NII); the combination of these factors worldwide is called the Global Information Infrastructure (GII). Before the arrival of microelectronics and digital technologies, ICTs were accounted for statistically as separate industries – computer hardware & software, microelectronics, telecommunications, broadcasting, etc. Today, convergence³, real or forecast, characterises all aspects of IT Infrastructure at least at the technical level."*

➤ **'Informatisation'**

13. Another core concept in IM/IT management, 'Informatisation', focuses on the scientific, technological and engineering disciplines and the management techniques used in information handling and processing. The increasing interchange between science and management is thought to be as important as the applications, hardware & software in the way they are transforming the interaction between people and machines in social, economic and cultural relationships:

- *"Another distinctive feature of ICTs is that they are centrally about "Informatisation" – the progressive application of IT to the input, storage, processing, distribution and presentation of information. This term was used as early as the 1960s by the Japanese and it refers to a social as well as technological process. It requires changes in management processes, organisation, and skills as well as in the tools used in the production of goods and services. This idea links technical, organisational, managerial and institutional aspects of IT. All these aspects must be considered if the social and economic implications of ICTs are to be understood. An 'informatisation' approach is consistent with an emphasis on the importance of technological knowledge and social capabilities as well as on the hardware and software itself ... The recombination of these components (input, storage, processing, distribution and presentation of information) is giving meaning to the NII and GII concepts. The time dimension is important in terms of assessing the implications of further technological innovations for all the segments of the ICT industry. In addition, the process of 'informatisation' is resulting in changes in industry boundaries and providing opportunities for new entry by firms from within, and outside, the traditional ICT industry. This is creating turbulence in the competitive environment. Market instability has major implications for developing countries as uncertainty increases about which countries can develop the capabilities to produce the components of different segments of the industry."*

➤ **The INEXSK Technique of Measuring IT Use for Economic Development**

14. The INEXSK (Infrastructure, Experience, Skills, and Knowledge) approach outlined by Mansell & When (1997), as a measurement technique, aims to provide insight from a telecommunications' industry perspective into the roles that infrastructure, experience and skills play in contributing to knowledge-based economic growth & development:

- *"Analysing the possibilities for ICTs to contribute to knowledge-based social and economic development requires a systematic method for graphing indicators and making international comparisons. The task of assembling the appropriate indicators is hindered by the enormous variety of IT applications. These range from expensive capital goods such as machine tools to the simplest portable calculators and watches. Similar problems exist in attempting to assess the comparative development of IT-based services. Existing data for the industrialized countries do not provide a complete picture of the full size and nature of the ICT use. Data for the developing countries provide an even less complete picture. For many of the least developed countries, useful indicators are virtually non-existent. The absence of adequate statistics is particularly troublesome because of the impacts of these new technologies on investment demands, application opportunities and production possibilities. One approach to these data problems is to use some of the available indicators to create a coherent conceptual framework. If it is properly constructed, such a framework will suggest some of the key features by which ICTs; combined with the requisite human skills and organisational changes, may make significant contributions to economic development."*

The three main indicators seen as underpinning 'knowledge-based' development are briefly summarised as:

³ Technological convergence means that there are few clear boundaries between the supply-side sub-sectors: ICTs are used, and often produced or modified in the case of software, in virtually every segment of the manufacturing, services and natural resources industries.

- *"For Infrastructure, the traditional measure is the size and growth of the telecommunication network. Telephone networks provide a broad base for building other types of infrastructure, such as data communication networks, but cannot serve as the only indicator of development. Unfortunately, few other indicators are as comprehensive as those associated with telecommunications. Where more detailed information is available, telecommunication indicators can be shown to be reasonably good proxies for other variables. For example, where it can be examined, the extent of data networking appears to be consistent with high levels of telephone access. More research is needed to explain variances in the rate and direction of other forms of infrastructure development with the telecommunication indicators.*
 - *To understand the contribution of Experience, electronics industry production and demand can be examined. These (levels and trends in production, consumption and trade in electronic products) are indicators of the production capacities of various countries, and the domestic use and export or import of electronic products. Although production and use of electronic products are only partial measures of the ICT revolution, they do provide insight into the vigour of the social and economic changes that are associated with the process of moving toward greater knowledge use in societies throughout the world.*
 - *In examining Skills, it is vital to develop measures that indicate the state of readiness to enlarge the use of information to develop knowledge. A principal indicator of such readiness is the literacy level. It is also important to develop measures of the skills that may be harnessed in producing or adapting ICTs. The stock of graduates with technical degrees in engineering, mathematics and computer science is relevant here."*
15. In summary, the evaluation of where a country or region stands in terms of information infrastructure can be accomplished by:
- Investigating the status of existing IT physical infrastructure for connectivity [in terms of Landline & Cellular Telephone Connections, Personal Computers (PCs), Servers and Internet Service Providers (ISPs)] and the economic activities that underpin them;
 - Assessing IT Scientific and Technological infrastructure, including Training & Research institutions, to understand strengths and weaknesses in terms of human resources capacity; and
 - Considering the expertise and experiences of a broad array of International, Government. Private and Non-Government actors in the area of IT and Information Management.

2.3 Global Sustainable Development Information Management Review

16. Internationally, the United Nations System since 1992 has spawned a number of key Global information management policies, mechanisms and initiatives that have been endorsed by the world community. In this section, a review is presented of the related outputs of: Agenda 21 Chapters 35 & 40; the Barbados SIDS Programme of Action; the Millennium Declaration, the World Summit on Sustainable Development and the emerging World Summit on the Information Society.

➤ Agenda 21 and the Sustainable Development Networking Programme (SDNP)

17. Beginning with the 1992 UN Conference on Environment and Development-UNCED in Brazil, Agenda 21 contains two chapters (35, Science for Sustainable Development and 40, Information for Decision-Making) that have made a substantial impact on global Sustainable Development Information Management (see Annex 2 for SD Indicators table). Chapter 40, in particular, laid the basis for the UNDP's Sustainable Development Networking programme, an early intervention aimed at both bridging the digital divide and increasing the availability of information for disadvantaged regions and populations. Agenda 21, Chapter 35-Science for Sustainable Development: Although not as well known as Chapter 40, Chapter 35's (www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter35.htm) weight has come to be seen as increasingly apparent in the context of utilising IT for enhanced decision-making. As indicated by the following quote, the multi-disciplinary nature of environmental management makes the development of national Scientific and Technological (S&T) capacity a critically important corollary to IM/IT for Sustainable Development Decision-Making:

- *"Science for sustainable development is the focus of Chapter 35 of Agenda 21. It calls for: a) strengthening the scientific basis for sustainable management; b) enhancing scientific understanding; c) improving long-term scientific assessment; and d) building up scientific capacity and capability. Decisions relating to science have subsequently been taken by the Commission on Sustainable Development at its third (1995), fifth (1997) and sixth (1998) sessions, by the United Nations General Assembly at its Special Session to review the implementation of Agenda 21 (1997). The special session of the General Assembly held in June 1997 to review progress five years after UNCED stressed the need for authoritative scientific evidence for assessing environmental conditions and changes, which would facilitate international consensus-building. Scientific cooperation was to be promoted across disciplines for that purpose, and building scientific and technological capacity in developing countries was extremely important in that regard."*

18. Agenda 21, Chapter 40-Information for Decision-Making: Chapter 40, see [Appendix 2](http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter40.htm) for complete text (www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter40.htm) is especially noted for its prescient description of global, regional and local actions required to **bridge the data gap** while also **improving availability of information**; it also clearly crystallised the global consensus that underlies establishment of the global Sustainable Development Networking Programme (SDNP), the oldest global initiative to facilitate the chapter's implementation with a special focus on the participation of disadvantaged groups and communities. There are currently two Caribbean SDNPs in the CARICOM Member States of Guyana & Jamaica (a profile of the Jamaica SDNP is attached as [Annex 3](#)). The Jamaica SDNP has a well-defined set of goals and objectives that includes:

- *"TO INTRODUCE AND CONECT PUBLIC, PRIVATE NON-GOVERNMENT AND COMMUNITY SECTOR AGENCIES AND INTERESTS TO LOCAL AND INTERNATIONAL SOURCES OF INFORMATION ON SUSTAINABLE DEVELOPMENTUTILISING THE INTERNET AND OTHER TOOLS...";*
- *ESTABLISHMENT OF COMMUNITY TELECENTRES (FOCAL POINTS) IN MARGINALISED COMMUNITIES; &*
- *ESTABLISHMENT OF COMMUNITY INFORMATION NETWORKS"⁶*

A list of the relevant IM/IT policy initiatives and mechanisms offered by the two programmes suggested by Agenda 21/Chapter 40, emphasising Sustainable Development Indicators, Data Management & Information Networking, Science & Technology, Human Resources Development or Training & Institutional Capacity-Building is as follows (my emphasis in bold text):

PROGRAMME A-BRIDGING THE DATA GAP/ACTIVITIES

- *DEVELOPMENT OF INDICATORS OF SUSTAINABLE DEVELOPMENT: **Countries at the national level and international governmental and non-governmental organizations at the international level should develop the concept of indicators of sustainable development.***
- *PROMOTION OF GLOBAL USE OF INDICATORS OF SUSTAINABLE DEVELOPMENT **Relevant organs and organizations of the United Nations system, in cooperation with other international governmental, intergovernmental and non-governmental organizations, should use a suitable set of sustainable development indicators; ...harmonized development of indicators at the national, regional and global levels ... and ... incorporation of a suitable set of these indicators in common, regularly updated, and widely accessible reports and databases.***
- *IMPROVEMENT OF DATA COLLECTION AND USE ... **carry out inventories of environmental, resource and developmental data, based on national/global priorities for the management of sustainable development ... data-collection activities ... need to be strengthened and ... make use of new techniques of data collection, including satellite-based remote sensing.***

PROGRAMME A-BRIDGING THE DATA GAP/MEANS OF IMPLEMENTATION

- *SCIENTIFIC & TECHNOLOGICAL MEANS ... **with the rapid evolution of data-collection and information technologies it is necessary to develop guidelines and mechanisms for the rapid and continuous transfer of those technologies ... and for the training of personnel in their utilization.***
- *HUMAN RESOURCE DEVELOPMENT ... **technical training of those involved in data collection, assessment and transformation, as well as assistance to decision makers concerning how to use such information.***
- ***CAPACITY-BUILDING ... strengthen their capacity to collect, store, organize, assess and use data in decision-making more effectively.***

PROGRAMME B-IMPROVING AVAILABILITY OF INFORMATION/ACTIVITIES

- *DEVELOPMENT OF DOCUMENTATION ABOUT INFORMATION ... **Networking and coordinating mechanisms should be encouraged between the wide variety of other actors, including arrangements with non-governmental organizations for information sharing and donor activities for sharing information on sustainable development.***
- *ESTABLISHMENT AND STRENGTHENING OF ELECTRONIC NETWORKING CAPABILITIES ... **exploit various initiatives for electronic links to support information sharing, to provide access to databases and other information sources, to facilitate communication for meeting broader objectives, such as the implementation of Agenda 21, to facilitate intergovernmental negotiations, to monitor conventions and efforts for sustainable development to transmit environmental alerts, and to transfer technical data ... facilitate the linkage of different electronic networks and the use of appropriate standards and communication protocols for the transparent interchange of electronic communications. Where necessary, new technology should be developed and its use encouraged permitting participation of those not served at present by existing infrastructure and methods. Mechanisms should also be established to carry out the necessary transfer of information to and from non-electronic systems to ensure the involvement of those not able to participate.***

PROGRAMME B-IMPROVING AVAILABILITY OF INFORMATION/ MEANS OF IMPLEMENTATION

- ***CAPACITY-BUILDING ... expand their capacity to receive, store and retrieve, contribute, disseminate, use and provide appropriate public access to relevant environmental and developmental information, by providing technology and training to establish local information services and by supporting partnership and cooperative arrangements.***
- ***SCIENTIFIC AND TECHNOLOGICAL MEANS ... research and development in hardware, software and other aspects of information technology, in particular in developing countries.***

➤ **Barbados SIDS-POA and the Small Island Developing States' Network (SIDSNet)**

19. Next, the 1994 UN Conference on the Sustainable Development of Small Island Developing States-SIDS in Barbados produced a fifteen point Programme of Action (the Barbados SIDS-POA) www.un.org/esa/sustdev/sids; see Appendix 3 for relevant SIDSNet and IM/IT related sections. The Barbados SIDS-POA explicitly laid the policy foundation for Sustainable Development in SIDS worldwide. Covering 15 issues or thematic areas (see text box) with recommended actions at the National, Regional and Global levels, the SIDS-POA contains the core content of an integrated regional environmental & natural resources management strategy.

SIDS-POA Issues or Thematic Areas Text Box

BARBADOS SIDS-POA	
(Sustainable Development of Small Island Developing States Programme of Action)	
ISSUES or THEMATIC AREAS	
<u>Including Sectoral, Multi-Disciplinary & Cross-Cutting Issues</u>	
I.	CLIMATE CHANGE AND SEALEVEL RISE
II.	NATURAL AND ENVIRONMENTAL DISASTERS
III.	MANAGEMENT OF WASTES
IV.	COASTAL AND MARINE RESOURCES
V.	FRESHWATER RESOURCES
VI.	LAND RESOURCES
VII.	ENERGY RESOURCES
VIII.	TOURISM RESOURCES
IX.	BIODIVERSITY RESOURCES
X.	NATIONAL INSTITUTIONS AND ADMINISTRATIVE CAPACITY
XI.	REGIONAL INSTITUTIONS AND TECHNICAL COOPERATION
XII.	TRANSPORT AND COMMUNICATION
XIII.	SCIENCE AND TECHNOLOGY
XIV.	HUMAN RESOURCE DEVELOPMENT
XV.	IMPLEMENTATION, MONITORING AND REVIEW

20. An appraisal of IM/IT Sustainable Development decision-making aspects of the SIDS-POA shows that its most profound contribution are the references to the Small Island Developing States' Network-SIDSNet. Although SIDSNet is accessible to the region, there is presently no institutional link in the Caribbean to this important facility. However, mission meetings during the consultancy revealed that, in collaboration with the University of the West Indies' Centre for Environment & Development (UWICED), the launch of a Caribbean SIDSNET node is planned for the near future. The last five chapters of the SIDS-POA (Chapters X- National Institutions And Administrative Capacity, XI- Regional Institutions And Technical Cooperation, XII- Transport And Communication, XIII- Science And Technology, XIV- Human Resource Development & XV- Implementation, Monitoring And Review) are cross-cutting in general and contain a significant number of references to both SIDSNET and the conceptual and global consensus that underpins it as a key IM/IT tool for Sustainable Development decision-making in SIDS; the selected references are contained in Annex 4, but those mentioning SIDSNET are presented below :

X- NATIONAL INSTITUTIONS AND ADMINISTRATIVE CAPACITY

- *...Establish national information nodes...in order to encourage, at the international level, the development of a Small Islands' Sustainable Development Information Network...*

XIII- SCIENCE AND TECHNOLOGY

- *...Assist Small Island developing States in assessing technology, developing databases on environmentally sound technologies, conducting relevant research and development and training, and developing appropriate information systems...*

XV- IMPLEMENTATION, MONITORING AND REVIEW

- *...UNDP should be invited to coordinate a feasibility study in collaboration with the small island developing States and relevant subregional organizations for the implementation of a Small Island Developing States Information Network (SIDS/NET)...*

➤ **The MDGs, the WSSD and the WSIS**

21. Since the turn of the century, the UN System has produced the Millennium Development Goals (MDGs), the 'Rio + 10' Johannesburg World Summit on Sustainable Development (WSSD) Plan of Implementation and the emerging World Summit on the Information Society (WSIS) process.

MDGs

22. The UN's Millennium Declaration was signed by most Heads of State and Government worldwide in the year 2000. Progress towards meeting the eight (8) Goals and eighteen (18) Targets or Millennium Development Goals⁷ (MDGs), is measured by some forty-eight (48) Indicators. Besides Goal 2 (*Achieve Universal Primary Education*), with its Target 3 (*Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling*) and Indicators 6 – 8 (*Net enrolment ration in primary education; Proportion of pupils starting grade 1 who reach grade 5; and Literacy rate of 15 – 24 year olds*) only two other Goals (# 7-*Ensure Environmental Sustainability* and # 8-*Develop a Global Partnership for Development*) define targets and two indicators, 47-48 (*Telephone Lines per 1000 people & Personal Computers per 1000 people*) related to SD Decision-Making Information; they are reproduced in Table 1 below.

Table 1 MDGs' Sustainable Development Decision-Making Targets and Indicators

MDG GOAL	MDG TARGET	MDG INDICATOR
7. Ensure Environmental Sustainability	9. Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources.	25. Proportion of land area covered by forest. 26. Land area protected to maintain biological diversity. GDP per unit of energy use (as proxy for energy efficiency). 28. Carbon dioxide emissions (per capita) [Plus two figures of global atmospheric pollution: ozone depletion and the accumulation of global warming gases]
	10. Halve, by 2015, the proportion of people without sustainable access to safe drinking water.	29. Proportion of population with sustainable access to an improved water source.
	11. By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers.	30. Proportion of people with access to improved sanitation. 31. Proportion of people with access to secure tenure [Urban/rural disaggregation of several of the above indicators may be relevant for monitoring improvement in the lives of slum dwellers]
8. Develop a Global Partnership for Development	14. Address the Special Needs of Land-locked Countries and Small Island Developing States-SIDS (through the Barbados POA and 22nd UN General Assembly provisions)	Official Development Assistance (ODA) 35. Proportion of ODA for environment in SIDS
	18. In cooperation with the private sector, make available the benefits of new technologies, especially Information and Communications.	47. Telephone Lines per 1000 people. 48. Personal Computers per 1000 people.

WSSD

24. The 2002 Johannesburg World Summit on Sustainable Development (WSSD)⁸, see [Appendix 4](#) for a list of Key Outcomes & Commitments, and its related fora made a number of decisions relating to S&T as well as IM/IT capacity-building mechanisms that are highlighted in its Plan of Implementation (sections in bold print are my emphasis):

"THE WSSD PLAN OF IMPLEMENTATION

- ***underlined the importance of science-based decision-making, inter alia, by: integrating scientists' advice into decision-making bodies; partnerships between scientific, public and private institutions; improved collaboration between natural and social scientists, and establishing regular channels for requesting and receiving advice between scientists and policy makers; making greater use of integrated scientific assessments, risk assessments and interdisciplinary and intersectoral approaches; increasing the beneficial use of local and indigenous knowledge. Strengthening and creating centres for sustainable development in developing countries were encouraged, as well as networking with and between centres of scientific excellence and between science and education for sustainable development. Tools for science-based decision-making and sharing of knowledge and experiences to be promoted include: information and communication technologies, ground-based observations, satellite technologies, and national statistical services capable of providing sound data, assessment models, accurate***

databases and integrated information systems. The Plan also urged **support for publicly funded research and development entities to engage in strategic alliances for the purpose of enhancing research and development.**”

25. On the margins of the WSSD, the United Nations Environment Programme (UNEP) Forum of Ministers of Environment of Latin America & the Caribbean held its First Special Meeting and put forward its own Latin American and Caribbean Initiative for Sustainable Development⁹. The LAC Initiative endorsed a range of Objectives, Operational Guidelines and Action Priorities that stressed the importance of S&T and IT capacity-building, including human resources development and sustainability/vulnerability indicators, in promoting Sustainable Development and effective participatory decision-making. Some of the most relevant to Caribbean SIDS are presented below (the bold text is my emphasis):

“LAC SD INITIATIVE, OBJECTIVE C:

- **...Implementation of competitive sustainable development models backed by public policies designed to develop science and technology, financing sources, human resources capacity-building, institutional development, the evaluation of environmental goods and services as well as sustainability indicators adapted to each country’s social, economic, environmental and political conditions, or the needs of sub-regional groups of countries.**

LAC SD INITIATIVE, OPERATIONAL GUIDELINE

- **Urge the developed countries to fulfil these commitments to give priority to the Small Island Developing States in the region, especially in financing the implementation of the Barbados SIDS-POA.**

LAC SD INITIATIVE, OPERATIONAL GUIDELINE

- **Increase participation by non-governmental agents and improve transparency in decision-making processes by strengthening initiatives such as the establishment of National Councils on Sustainable Development and the preparation of national and local Agendas 21.**

LAC SD INITIATIVE, OPERATIONAL GUIDELINE

- **Initiating or continuing environmental or natural resources evaluation processes to make better use of the region’s comparative advantages, incorporating indicators relating to environmental liabilities and assets to permit their inclusion in national accounting systems.**

LAC SD INITIATIVE, OPERATIONAL GUIDELINE

- **Formulating strategies to incorporate; transfer and develop technologies to be supported by mobilising and expanding existing financial institutions’ resources.**

LAC SD INITIATIVE, OPERATIONAL GUIDELINE

- **Enhancing or adjusting existing systems of sustainability indicators that respond to the region’s social, economic and political characteristics, or building such systems.**

LAC SD INITIATIVE, OPERATIONAL GUIDELINE

- **Promoting capacity building through the strengthening of national, sub-regional and regional institutions and the development of human resources.**

LAC SD INITIATIVE, ACTION PRIORITY.

- **...Introducing an environmental dimension in economic and social processes; strengthening technical and vocational training institutions; promoting human resources development, particularly in information and communication technology; the need for qualitative and analytical work on vulnerability indices to define the economic, social and environmental vulnerability of countries concerned; sustainable management of water resources; sustainable generation of energy and increasing the use of renewable sources; managing protected areas for the sustainable use of biodiversity; adapting to impacts caused by climate change and sustainable management of urban and rural areas, with special emphasis ... on minimising risks and vulnerability to natural disasters. Actions to promote scientific and technological innovation, strengthening research and development institutions and increasing existing sources of financing... centres of excellence in research and development should promote the building of a solid scientific alliance through, among others, scientific exchanges, establishing interdisciplinary information networks and formulating joint research projects; &**

LAC SD INITIATIVE GUIDING GOALS AND INDICATIVE PURPOSES

- **Institutional Arrangements – Evaluation and indicators. i) Develop and implement an assessment process to follow up the progress made towards attaining sustainable development objectives, including the results of the Johannesburg Plan [of Implementation], adopting national and regional sustainability indicators that respond to the region’s unique social, economic and political features.”**

WSIS

27. The World Summit on the Information Society (WSIS) is the last of the major UN IM/IT mechanisms that have great relevance to Caribbean Sustainable Development decision-making, as the next section reveals. The WSIS process began with an action plan presented by the Secretary-General of the International Telecommunication Union (ITU) to the UN and was formally endorsed by the UN General Assembly at its 56th Session in 2001¹⁰ (see [Annex 5](#) for the resolution’s full text). The process leading to the Summit is coordinated by a high-level Summit organising committee, chaired by the ITU Secretary-General and consisting of the heads of United Nations bodies and other interested international organizations. Further, the Summit is to be convened under the patronage of the United Nations

Secretary-General, and although the ITU is taking the lead role in its preparation, the UN's Economic and Social Council previously adopted the idea at the high-level segment of its substantive session of 2000 via a ministerial declaration concerning information and communication technologies. Subsequently the Council provided institutional assistance to WSIS through related work done in this area, including the creation of the Information and Communication Technologies Task Force (ICT-TF) as a successor to the UNCSTD Working Group on IT and Development. The General Assembly's justification for its WSIS endorsement includes:

- ***"The urgent need to harness the potential of knowledge and technology for promoting the goals of the United Nations Millennium Declaration and to find effective and innovative ways to put this potential at the service of development for all,***
- ***The pivotal role of the United Nations system in promoting development, in particular with respect to access to and transfer of technology, especially information and communication technologies and services, inter alia, through partnerships with all relevant stakeholders,***
- ***The need to harness synergies and to create cooperation among the various information and communication technologies initiatives, at the regional and global levels, currently being undertaken or planned to promote and foster the potential of information and communication technologies for development by other international organizations and civil society, and***
- ***The need, at the highest political level, to marshal the global consensus and commitment required to promote the urgently needed access of all countries to information, knowledge and communication technologies for development so as to reap the full benefits of the information and communication technologies revolution, and to address the whole range of relevant issues related to the information society, through the development of a common vision and understanding of the information society and the adoption of a declaration and plan of action for implementation by Governments, international institutions and all sectors of civil society."***

In summary, the 21 December 2001 resolution:

- ***Welcomed the resolution adopted by the ITU Council at its 2001 session, in which the Council endorsed the proposal of its Secretary-General to hold the World Summit on the Information Society at the highest possible level in two phases, the first in Geneva from 10 to 12 December 2003 and the second in Tunis in 2005, pursuant to resolution 73 adopted by the ITU's Plenipotentiary Conference at its 1998 session, held in Minneapolis, United States of America;***
- ***Recommended that the preparations for the Summit take place through an open-ended intergovernmental preparatory committee, which would define the agenda of the Summit, finalize both the draft declaration and the draft plan of action, and decide on the modalities of the participation of other stakeholders in the Summit;***
- ***Invited the ITU to assume the leading managerial role in the executive secretariat of the Summit and its preparatory process;***
- ***Invited Governments to participate actively in the preparatory process of the Summit and to be represented in the Summit at the highest possible level;***
- ***Encouraged effective contributions from and the active participation of all relevant United Nations bodies, in particular the ICT-TF, and encouraged other intergovernmental organizations, including international and regional institutions, non-governmental organizations, civil society and the private sector to contribute to, and actively participate in, the intergovernmental preparatory process of the Summit and the Summit itself;***
- ***Invited the international community to make voluntary contributions to the special trust fund established by the International Telecommunication Union to support the preparations for and the holding of the Summit, as well as to facilitate the effective participation of representatives of developing countries, in particular the least developed countries, in the regional meetings to be held in the second half of 2002, in the preparatory meetings to be held in the first half of 2002 and in 2003, and in the Summit itself;***
- ***Invited the UN Secretary-General to inform all heads of State and Government of the resolution's adoption; and***
- ***Invited the ITU Secretary-General to submit to the General Assembly, at its fifty-seventh and fifty-eighth sessions, through the Economic and Social Council, for information, a report on the preparations for the Summit.***

A second WSIS resolution by the UNGA was made in December 2002¹¹. As we shall see in subsequent sections below, the WSIS process has helped to considerably advance the region's awareness of IM/IT issues through a series of preparatory meetings in the Caribbean and abroad. One example is the WSIS Eastern Caribbean Briefing held in 2002, [http://www.caribank.org/Secre.nsf/WSISReport/\\$File/CarifoWSISrep1.pdf?](http://www.caribank.org/Secre.nsf/WSISReport/$File/CarifoWSISrep1.pdf?), attached at Annex 6. The meeting recommended some important and timely steps to advance the regions IM/IT agenda through the WSIS: Establish a Caribbean sub-regional WSIS Task Force; Regional agencies engaged in ICT activities (i.e. CDB, ITU, UWI, CARICOM, CTO, UN/ECLAC, OECS, CARICAD, UNESCO, etc.) should collaborate in the work of the sub-regional Task Force; Seek visionary leaders and champions from the Heads of Government and or CEOs of the private sector to lead and direct the Task Force.; & The Task Force should identify an issue of crucial importance for the Caribbean and develop proposals around that issue for presentation at the World Summit.

2.4 Regional Sustainable Development Information Management Review

➤ Overview of Caribbean Regional Information Systems

28. A well-known Caribbean Information Specialist, Mrs. Maritza Hee-Houng of Trinidad & Tobago, completed a quite thorough overview of Caribbean Regional Information Systems and/or Networks two years ago (Hee-Houng, 2001)¹², see [Appendix 5](#). A brief description of the major entities reviewed is reported in [Annex 7](#). Table 2 below summarises these pioneering regional IM/IT mechanisms that attempted to address regional and inter-governmental management and decision-making as well as a number of key sectoral interests such as Medicine, Trade, Energy and Agriculture.

Table 2 Overview of Caribbean Regional Information Systems from Hee-Houng (2001)

System/Network	Description
CARISPLAN – Caribbean Information Systems Planning Network	Established by UNECLAC in 1979 with IDRC funding, the CARISPLAN network aimed at the collection, processing and dissemination of information relevant to socio-economic planning in the region. With ECLAC as coordinating centre, supported by national documentation centres in the CARICOM countries, CARISPLAN built one regional and several national bibliographic databases, and provided a range of services, including current awareness, selective dissemination, abstracting and indexing, and document delivery. UNECLAC, had the leadership role, and moving with the technology and the times, in 1998 mounted its CARISPLAN database on the Internet; in addition it now offers users a virtual library, the Caribbean Digital Library (CDL), more in keeping with current user expectations.
CCCRIS – Consultative Committee on Caribbean Regional Information Systems	Mandated by the CARICOM Conference of Heads of Government in 1987, CCCRIS' functions were defined as : 1.Ensuring appropriate regional information systems activities or criteria; 2. Ensuring systematic evaluation of regional information systems; 3. Rendering required assistance in the establishment of regional information systems; 4. Coordinating overall regional information systems management; & 5. Linking with bodies or institutions involved in information systems establishment.
RIITF – CARICOM Regional Information Infrastructure Task Force	Mandated by the CARICOM Ministers of Information at the 1995 1 st Meeting of the Standing Committee of Ministers Responsible for Information, this was chaired by Senator Phillip Goddard then Barbados Minister of Telecommunications.
MEDCARIB - Coordinated by BIREME, a PAHO specialist centre in Brazil	Founded as the Caribbean component of the Latin American and Caribbean Health Information Network, the network's development was initiated by that Latin American-oriented network. It has been operational for several years and has made a significant contribution to the management and delivery of Caribbean health information.
CARTIS – Caribbean Trade Information System	CARTIS was established under the CARICOM Secretariat in 1990 and aimed at improving inter-regional trade, through the collection and dissemination of trade information. Operating as a network with the usual components of national nodes, both company, bibliographical and statistical data were originally collected by the regional centre, the CARICOM Export Development Project (CEDP), in Barbados, that was subsumed into a new independent regional agency Caribbean Export Development Agency (CE).
CEIS – Caribbean Energy Information System	CEIS was adopted in the Regional Energy Action Plan approved at the CARICOM Heads of Government Conference in 1983. It became operational in 1987, as a cooperative network among Caribbean countries committed to the pooling and sharing of energy information.
INFONET – OECS Information Network	INFONET was established as a sub regional component of the CARISPLAN network, incorporating the information of the countries which make up the Organisation of Eastern Caribbean States (OECS). The system aimed to collect and disseminate information in the priority areas for development in the OECS, and in addition to facilitate the participation of the OECS as a group in the CARISPLAN and other regional networks.
CAGRIS – Caribbean Agricultural Information System	CAGRIS was established in the late 1980's with support from the UN Food and Agriculture Organization's (FAO) international system, AGRIS. In related sectoral IT/IM developments, the Inter-American Institute for Cooperation in Agriculture (IICA) has initiated an Agricultural Information and Documentation System for Latin America and the Caribbean (SIDALC). CARDI, the Caribbean Agricultural Research Development Institute is also developing CAIS (www.caisnet.org), its Caribbean Agricultural Information System and SIDALC and CAIS have agreed to cooperate on these systems.

➤ Caribbean Regional Sustainable Development Information Management Mechanisms

29. Overall, the regional IM/IT systems and/or networks described above may be considered as uni-dimensional single-sector mechanisms that focus more on 'data' and 'information systems' as opposed to multi-disciplinary Sustainable Development 'decision-making'. Along with other relevant mechanisms identified during this consultancy, a selected number of the initiatives identified by Hee-Houng that are more oriented to SD decision-making have been briefly summarised in Table 3 below in terms of their history/background and purpose/services; summary annexes with added information for several agencies were prepared and attached separately:

Table 3 Selected Caribbean Regional Sustainable Development Information Management Mechanisms

Mechanism/Project	History/Background	Purpose/Services
<p>CEPNET¹³&¹⁴; Information Systems for the Management of Marine and Coastal Resources</p> <p>Web: www.cep.unep.org Email: uneprcuja@cwjamaica.com</p>	<p>The United Nations Environment Programme's Caribbean Regional Coordinating Unit (UNEP-CAR/RCU) oversees the Caribbean Environment Programme's CEPNET; a CEP subprogramme that provides overall support to all its activities by promoting effective information management. A focus is given to the development of mechanisms that can facilitate the dissemination of environmental information relevant to CEP's priorities. These include access to data, information and networks of expertise & knowledge. The development of tools for geographic analysis to support environmental decision-making has become a primary activity for CEPNET. It has the capacity to implement projects and/or support training programmes in GIS, remote sensing, Internet-based applications such as Web-GIS, on-line training & clearinghouse mechanisms. CEPNET collaborates with UNEP and other global environmental reporting agencies as well as with CPACC's Coastal Resources Information System (CRIS), UWICED, IOCARIBE, CREP/CCA</p>	<p>The primary objectives of CEPNET are:</p> <ol style="list-style-type: none"> To strengthen capabilities for coastal & marine resources information management in the Wider Caribbean Region and the CEP countries; To increase access to marine & coastal resources information through strengthening of networking mechanisms and database development; To disseminate information resulting from the projects and activities of CEP; To assist the regional subprogrammes of CEP in matters related to information management. <p>CEPNET is responsible for the development and maintenance of the CEP website, which has now integrated the CEPNews bulletin into the CEPNews Centre. The CEP site also offers the CEP Technical Report series, thematic databases, environmental links relevant to the Wider Caribbean Region and other CEP publications.</p>
<p>UNSD/CARICOM Statistics & Indicators Capacity-Building Project (see Annex 8)</p> <p>Web: www.un.org/esa/devaccou/nt/progress98-99Hiii.htm or http://unstats.un.org/unsd/environment Email: shahr@un.org</p>	<p>UNSD has been assisting the CARICOM region since 2000 through the Project "Strengthening Capacity in the Compilation of Statistics and Indicators for Conference Follow-up in the CARICOM Region". The Project jointly carried out by UNSD and CARICOM, covers the areas of social/gender and environment statistics, with a supporting component of information technology.</p>	<p>Its overall objectives have been to strengthen the capacity of national and regional statistical offices to collect and analyse statistical information in support of policy development, and to establish a network of experts to improve intra-regional cooperation. One of the main outputs of the Project is the publication of two regional reports, <i>The CARICOM Environment in Figures 2002</i>, which was published in April 2003, and "Women and Men in the Caribbean Community: Facts & Figures, 1980-2001", which will be published in the second half of 2003.</p>
<p>UNECLAC-CDCC/ Caribbean SIDS Support</p> <p>Web: www.eclacpos.org Email: uneprcuja@cwjamaica.com</p>	<p>The mission and mandate of ECLAC/CDCC are to undertake activities which are functionally linked to the realities of Caribbean life, to prepare the region to better deal with a changing world environment, to provide strategic thinking and information to Governments to provide the basis for policy formulation and to provide hands-on expertise when needed.</p>	<p>Arising from the 1997 Caribbean Ministerial Meeting on Implementation of the Barbados SIDS-POA, ECLAC/CDCC and the CARICOM Secretariats also act jointly as the 'executive agency' for the Caribbean Small Island Developing States. The unit is also responsible for developing Caribbean Sustainable Development databases as a repository of knowledge and information for Caribbean SIDS environmental policy development & issue analyses that are to be hosted and mirrored on SIDSNet and other locations, and the online searchable <u>SIDS Related Projects and Programmes Database</u>.</p>
<p>CRFM</p> <p>Website: www.caricom-fisheries.com <u>Documents Received:</u></p> <ul style="list-style-type: none"> CRFM Draft Strategic Plan 2003-2008 Description of Programmes & Projects 	<p><u>Programmes/Projects:</u></p> <ul style="list-style-type: none"> Member States' fisheries IT capacity-building activities took place during the earlier CFRAMP period and provided computers, web & email service and related software CARIFIS Regional database development Strategic & Medium Term Plan includes "Research & Data Analysis for Policy Formulation and Decision-Making" programme CARIFIS Database IT Training for Member States' Data Manager, Trainers and CRFM Staff <p><u>Services:</u></p> <ul style="list-style-type: none"> CRFM Website 	<p><u>Needs:</u></p> <ul style="list-style-type: none"> Website Development & Maintenance capacity-building and training for CRFM Member States Institutionalisation of IT knowledge & skills in Member States Management of changing and evolving information technology infrastructure More intra-country linkages at the national level between the fisheries sector, planning authorities and other relevant sectors Fisheries Economics training for improved national decision-making <p><u>Constraints:</u></p> <ul style="list-style-type: none"> Lack of integrated national planning framework

Mechanism/Project	History/Background	Purpose/Services
		<ul style="list-style-type: none"> o Insufficient national surveillance capacity o Lack of common Regional & National approach to IM New Tools: <ul style="list-style-type: none"> o Satellite-based Remote Sensing IT tools for Fisheries Management
REIN – Caribbean Conservation Association / Caribbean Regional Environment Programme Regional Environmental Information Network (see Annex 9) Web: www.caribbeanconservation.org Email: crepadministrative@caribsurf.com or ccatechofficer@ccanet.net	Presently under development, REIN is a “niche” or specialised network which will specifically address one the CREP project’s objectives of promoting better environmental quality at selected Amenity Area demonstration sites throughout the region. Its primary aim is the promotion of Integrated Protected Area Management Systems.	The REIN vision envisages “strengthened regional, national and local community information and communication systems committed to continuously enhancing access and use of environmental information within the Caribbean through an effective structure, and to demonstrate the benefits of integrating protected areas management with the promotion of sustainable livelihoods.”
CARDIN – Caribbean Disaster Information Network Web: www.cardin.uwimona.edu.jm:1104	The Caribbean Disaster Information Network (CARDIN) was established in June 1999 to provide linkages with Caribbean disaster organizations, to widen the scope of the collection of disaster related information and to ensure improved access to such material. The project is funded by the European Community Humanitarian Office (ECHO) . The Library of the University of the West Indies at Mona , has been selected as the focal point for disaster information in the Caribbean.	To strengthen the capacity within the Caribbean community, for the collection, indexing, dissemination and use of disaster related information; serves as a sub-regional disaster information centre. This is a network of institutions across the Caribbean using ICTs to archive and retrieve data which is vital to their disaster preparedness planning. IT has enhanced the overall planning of this disparate network.
CARINFO – Caribbean Information Action Group (see Annex 10) Web: www.caribank.org/Secre.nsf/welcomepage?OpenPage or www.caribank.org Email: sealyw@caribank.org	CARINFO is the successor body for the Consultative Committee of Caribbean Regional Information Systems (CCCRIS) which was established in 1988 following mandates received from both the Conference of Heads of Government of the Caribbean Community (CARICOM) and the Caribbean Development Cooperation Committee (CDCC). CARINFO is thus a regional grouping of Caribbean institutions and bodies committed to regional efforts to promote collaborative knowledge networking in support of a true knowledge society through activities related to access, technology, content and continuing education.	Enhancing the development process through insightful and informed advocacy and consultation: -Advising people and governments of the Caribbean Community on the preparation and actions required for sustainable development in the information age; -Identification, initiation and support of viable products that would demonstrate the feasibility of providing access to information to the citizens of the region; -Addressing copyright and intellectual property rights issues; and -Making interventions, at the policy level, regarding Internet and ICT-related issues viz., mechanisms to ensure quality control of indigenous material to be placed on the international network; and universal access to essential services at a reasonable cost.
CIVIC - Caribbean ICT Stakeholders Virtual Community Web: http://www.icamericas.net/workshops/caribbean/ Email: carib-ict-consultation@icamericas.net	Caribbean ICT Virtual Community (CIVIC) is a permanent virtual forum of Caribbean ICT stakeholders. It is a venue for sharing information, holding discussions, networking and linking ideas, actors, projects or initiatives on ICTs and development in the Caribbean, which is Caribbean managed. It was initiated by the participants of the WSIS-sponsored Caribbean ICT Roundtable at Barbados on October 28-30 2002, but it is open to all active Caribbean ICT stakeholders.	CIVIC aims to provide an up to date perspective on the status of development of ICT in the Caribbean and recommendations on how WSIS and the processes to follow can be used to accelerate integration of ICT applications for human development in this region of the world. . It aims also to contribute to build a common vision/perspective on ICTs, and to promote a Caribbean strategy and Caribbean wide actions.

2.5. The Use of Information for Regional Sustainable Development Decision-Making

30. Our analysis of the mechanisms/initiatives reviewed above reveals that they are generally active in the functional use of IM/IT for decision-making in the following ways:

- Information-Sharing & Networking (via List-servs and Email);
- Human Resources Development (through Training, Workshops and Meetings)
- Institutional Capacity-Building (through the provision of IT Software/Hardware Infrastructure); &
- Public Awareness & Advocacy (using Websites, List-servs and Email).

Besides Information-sharing and Monitoring of various global and regional Multilateral Environmental Agreements-MEAs (CARINFO, CEPNET, UN-ECLAC & REIN), three other important SIDS-POA thematic or subject Sustainable Development decision-making uses identified are Coastal & Marine Resources Management (CEPNET/CARIFIS), Bio-diversity Resources (CCA/CREP/REIN) and Natural and Environmental Disasters (CARDIN). Three mechanisms identified are addressing the Agenda 21/Chapter 40 issue of Information for Decision-Making (CARICOM/UNSD-see text box below, CARINFO & the newly formed CIVIC) It should be noted that some aspects of IM/IT networking for decision-making in several other SIDS-POA thematic areas are presently being addressed by regional agencies such as:

- CPACC Project (Climate Change & Sea Level Rise via CRIS, www.cpacc.org);
- Caribbean Tourism Organisation-CTO (Tourism Resources via MIST, www.doitcaribbean.com);
- Caribbean Centre for Development Administration-CARICAD (National Institutions & Administrative Capacity via E-Government Strategy Development, caricad@caribsurf.com);
- Caribbean Energy Information System-CEIS (Energy Resources, www.comnet.mt/ceis/);
- Caribbean Agricultural Research Development Institute-CARDI (Land Resources/Agriculture via CAIS, www.caisnet.org);
- CARICOM Regional Fisheries Mechanism-CRFM (Coastal Marine Resources/Fisheries, www.caricom-fisheries.com);
- CARICOM Secretariat-CARICOM (Regional Institutions & Technical Cooperation, www.caricom.org);
- UWI Department of Library & Information Studies-UWIDLIS (Human Resource Development, www.dls.uwimona.edu.jm); and
- The Caribbean Environmental Health Institute-CEHI (Freshwater Resources, www.cehi.org.lc).

UNSD/CARICOM Statistics & Indicators Project Text Box

UNSD/CARICOM Project on "Strengthening Capacity in the Compilation of Statistics and Indicators for Conference Follow-up in the CARICOM Region"

Summary Objectives:

- Its overall objectives have been to strengthen the capacity of national and regional statistical offices to collect and analyse statistical information in support of policy development, and to establish a network of experts to improve intra-regional cooperation.

Major outputs and impacts of the Project

- One of the main outputs of the Project was the publication of two regional reports, *The CARICOM Environment in Figures 2002* which was published in April 2003, and "Women and Men in the Caribbean Community: Facts & Figures, 1980-2001" which will be published in the second half of 2003.
- An Advisory Group comprising seven directors of national statistics offices in the region, representatives of the CARICOM Secretariat and of UNSD, was established in 2001. The main task of the Group is to review the achievements of the Project and to discuss ways of furthering the capacity-building objectives of the Project beyond the Project span. The terms of reference were presented to and endorsed by the SCCS meeting in 2001, including institutionalizing the production of the two regional publications.
- Several Member States in the region have organized workshops or seminars at the national level in environment and social/gender statistics and have increased inter-agency collaboration since the inception of the Project. The Project has provided stimulus and support to the existing initiatives of Belize and Jamaica in environment statistics. Two environment statistics compendia have been published in Belize in 1999 and 2000, and one in Jamaica in 2002. Grenada, Dominica, St. Lucia, St. Vincent & the Grenadines and Suriname published their first environment statistics compendia during the course of the Project. St. Kitts & Nevis has produced a CD-ROM with their first environment statistics compendium and hard copies are currently being printed. Grenada and Suriname published their first gender statistics compendia and Dominica has produced a draft gender statistics report for publication. These efforts have been achieved through a combination of Government commitment and the additional technical assistance provided by the Project.
- The CARICOM Secretariat has been assuming an increasing responsibility in the social and gender statistics related activities of the Project. The setting up of the Advisory Group clearly shows the commitment and ownership that the Project has spawned relative to sustaining the activities of data compilation, the organization of national workshops, inter-agency groups or committees, and the publication of regional and national compendia in these two fields of statistics.

➤ The Mesoamerican Barrier Reef System (MBRS) Project Regional Network¹⁵

31. This consultancy revealed an excellent example of IM/IT utilisation for Sustainable Development decision-making, in the context of a regional environmental management project involving Belize and her mainland neighbours: the GEF-funded Meso-american Barrier Reef System (MBRS) ; website: www.mbrs.org.bz) Project's Regional Data Communications Network (RDCN). The goal of the MBRS is to enhance protection of the project area's unique and vulnerable marine ecosystems and to assist the participating countries (Belize, Guatemala, Honduras & Mexico) to strengthen and coordinate national policies, regulations and institutional arrangements for their conservation and sustainable use. One of the project's regional objectives is to: "*Develop and Implement a Standardised Data Management System of Ecosystem Monitoring and Facilitate the Dissemination of its Outputs throughout the Region*". The main goal of the RDCN project component is to develop a reliable base of data for the MBRS eco-region and an information system that can be used to support more informed management decisions. The establishment of a regional environment information system (REIS) is considered an essential tool for organising and managing data in support of improved decision-making. From an IM/IT point of view, the REIS mechanism provides the basic framework to guide Bio-Physical & Socio-Economic Data Collection, Processing, Distribution and Utilisation. The REIS will be fed by a regional and issue-specific long-term

(synoptic) monitoring programme that will generate information on the region's oceanographic current regime and on the status and processes of MBRS reefs and other critical ecosystems. Data is to be collected on reproduction, larval dispersal & recruitment of corals, fish and other important reef components to further the understanding of ecological linkages between reefs and other marine environments, and processes that influence reef integrity. The specific outputs of this project component are:

- Design and Implementation of a Synoptic Monitoring Programme
- Establishment of a bi-lingual (English and Spanish) Project Website
- Establishment of a Web-based Regional Environmental Information System, a GIS-capable database
- Provision of Computing & Networking Equipment & Infrastructure to the 4 National RDCN Nodes

MBRS Network Design & Implementation Process

32. Some useful insights for similar regional networking initiatives and mechanisms, including the IDSD Project, may be gleaned from a review of MBRS' approach to designing and implementing its RDCN. The MBRS network design process was built on two principal tasks:

- 1) Design and Implementation of an Electronic Information (or Communication) System, which would manage and make accessible to the project's clients information considered as relevant to management of the MBRS and related ecosystems & to the human communities that depend on it for their livelihood; and
- 2) Design and Installation of a Computer Network, the platform on which this information system would run.

It was determined that two consulting firms would be employed to assist the project team: the Canadian firm of ESG International was chosen to execute the Network Design & Implementation job, while the American firm of Research Planning Inc. (RPI) was given the Information System Design & Implementation consultancy. Because the design of the environmental monitoring methodology had to be closely interlinked with the design of the data communications network, close liaison was required among the project's components and among the consultants in order to ensure that the infrastructure or physical design could support the information management needs. The design process involved the following sub-tasks:

- Requirements Analysis-The project hosted an Expert Meeting with 15 regional & international experts to discuss the REIS and the RDCN that resulted in specific recommendations for hardware, software and network technologies; long-term sustainability; as well as information regarding resources and levels of telecommunication services available in the four MBRS countries.
- Node Agency Selection-The project had to select agencies in each MBRS country to host network nodes in order to implement the regional network; National Barrier Reef Committees in the participating countries participated in choosing agencies that best met a set of criteria for site selection (see textbox below).
- Proposed Node Agencies' Physical Site Verifications-Visits were made to candidate agencies to conduct physical site verifications and meet with local Internet Service Providers (ISPs); the results of these visits were: 1) To obtain first-hand information about the proposed facilities for use in network design, 2) To ascertain quality and prices of telecommunication services & 3) To strengthen relations between the project and the agencies.
- Data Communications/Telecommunications Infrastructure Research-Investigations were done by electronic correspondence and personal interviews to identify available technologies and connectivity.
- Preparation of a Network Design Specification-This involved the synthesis of prior information, evaluation of various network topologies & significant current hardware/software research; this resulted in design recommendations, comparison of various network configuration options along with their respective diagrams, analysis of their respective advantages/disadvantages and detailed equipment purchase requirements statements.
- Preparation of Comprehensive Statements of Requirements-For hardware (computers, input/output peripherals, networking components), electrical wiring and software (both operating system & networking).
- Equipment Procurement-Carried out through a transparent bidding process according to World Bank guidelines, based on the detailed requirements statements.

MBRS National Node Agency Selection Criteria Text Box

MBRS National Node Agency IM/IT Selection Criteria

I. NETWORK MANAGEMENT INFRASTRUCTURE

- Provision of a secure and environmentally appropriate location for network equipment
- Provision of Internet connectivity for network operation
- Ability to take administrative responsibility for equipment maintenance, both physical & operational, on the agency's premises

II. WEB MANAGEMENT CAPACITY

- Ability to update clearinghouse with current information on node country MBRS-related topics
- Data management experience with anticipated volume MBRS-related information
- Able to collect existing node country data & maintain country-specific website within MBRS website

III. BIO-PHYSICAL MONITORING SUPPORT CAPACITY

- Ability to support local 'thematic' (sectoral or technical) area node agencies with physical access or connectivity to the regional network

IV. DATA-SHARING

- Selected node agencies must be willing to share some of its information with the MBRS project for either internal use or public dissemination
- Selected node agencies would enter into signed data-sharing agreements between the MBRS project and the node agency

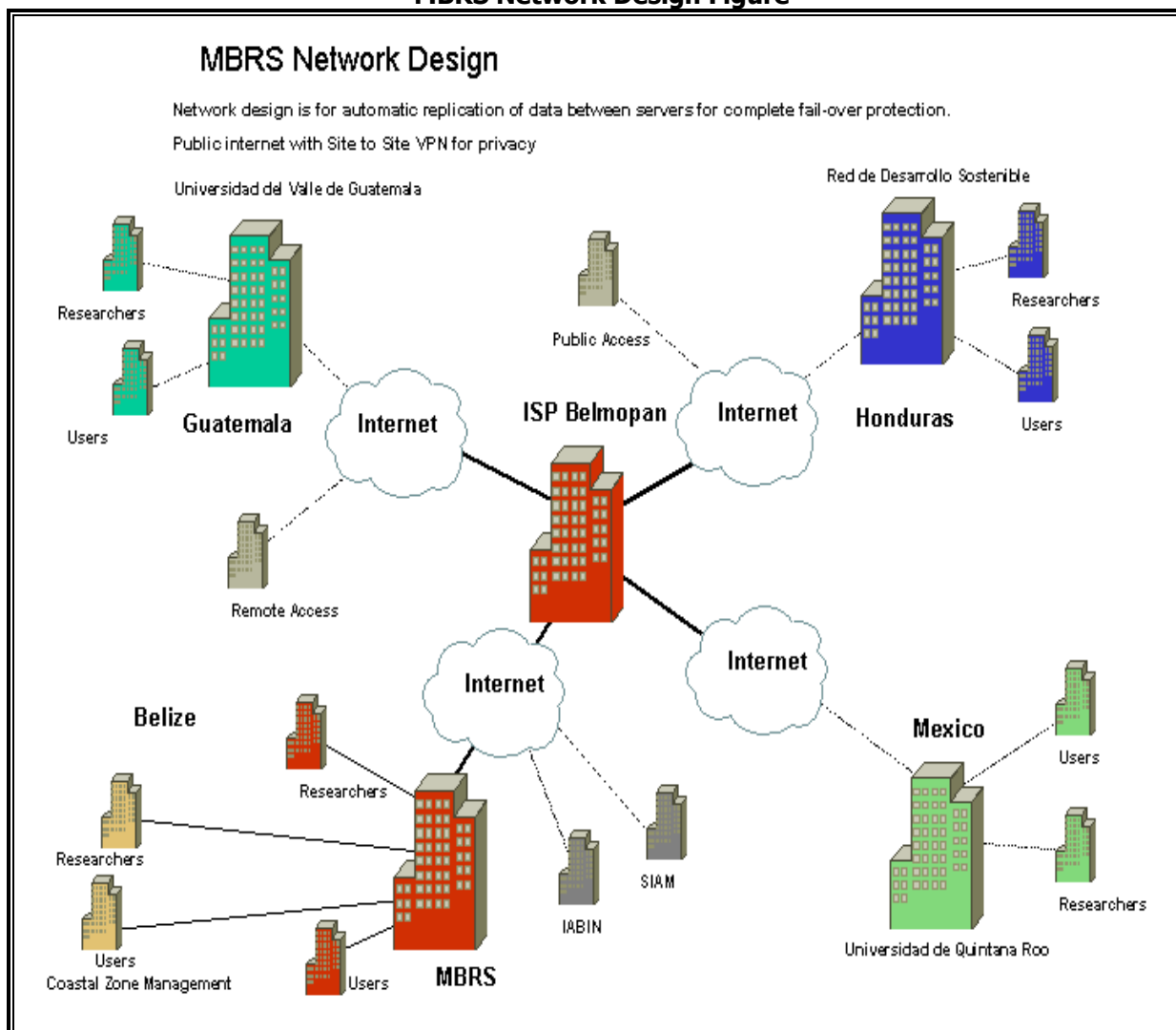
Several additional IT design considerations were:

- Shared Resources,
- Scalability,
- Reliability,
- Maintainability,
- Modularity,
- Security,
- Web server software,
- Affordability & long-term sustainability,
- Back-end/front-end application & systems software, and
- Interoperability with SIAM (the Mesoamerican Environmental Information System) and IABIN (the Inter-American Biodiversity Information Network).

Final MBRS Network Design & Infrastructure

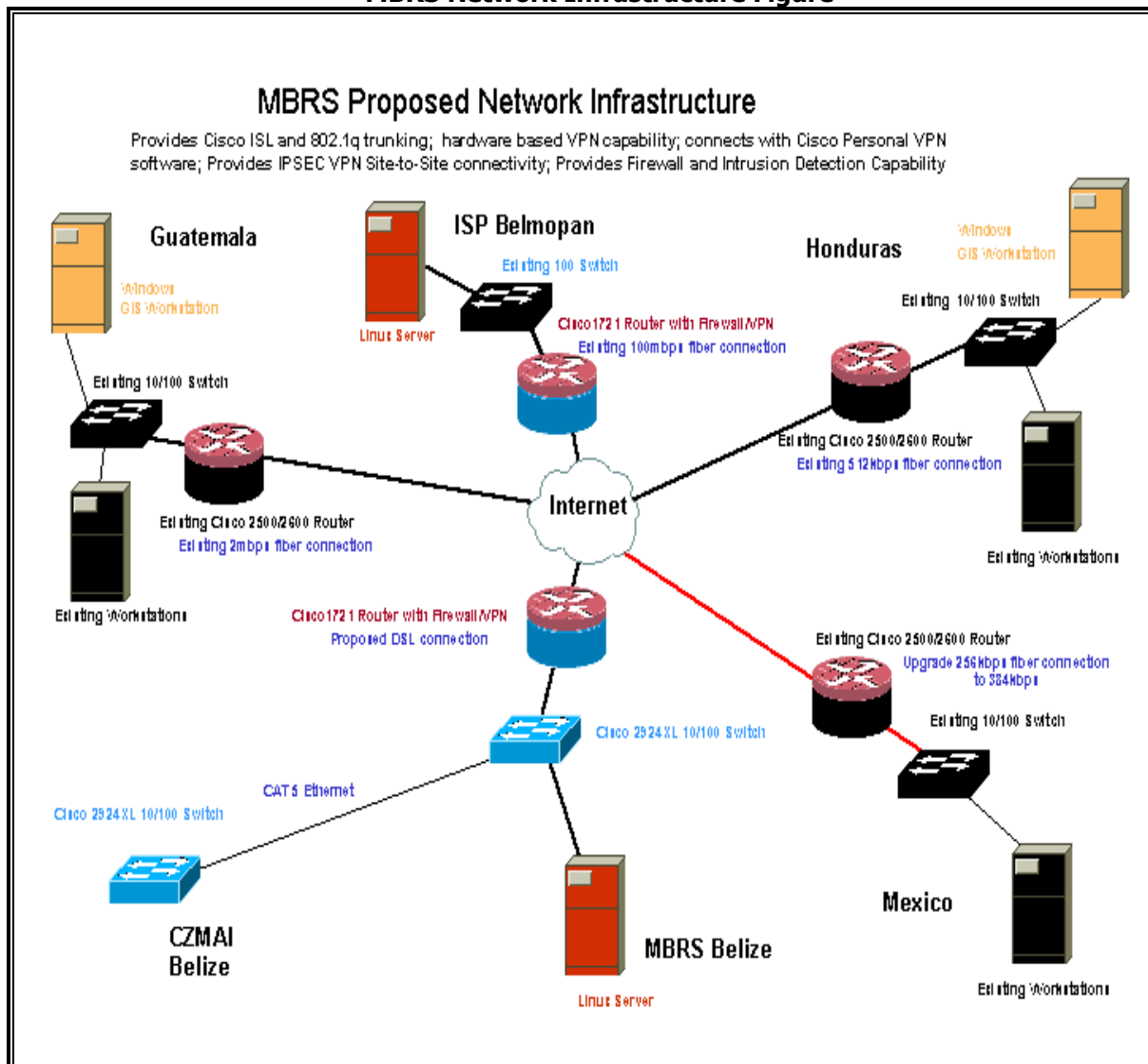
33. The final network design chosen (see design figure below) was a wide area network (WAN), within which node servers in the MBRS countries are permanently connected to a central server at the project's Belize City headquarters via a Virtual Private Network (VPN) established over the Internet to provide data-sharing, collaboration and file replication. Remote users and specially designated organisations such as CONANP (the Mexican National Protected Areas Commission), SIAM & IABIN would have access to the REIS database from the central server via the Internet; while government agencies, research institutions, NGOs and the public would connect to the project website via the Internet.

MBRS Network Design Figure



The network infrastructure configuration finally selected (see infrastructure figure below) was the partially distributed option that is centred on two redundant servers in Belize. New servers are to be installed at the MBRS headquarters in Belize City and the ISP so that the co-location facility is hosted in Belmopan as there is a high hurricane/disaster risk for the Belize City facilities. In summary, the MBRS project expects to complete procurement of equipment and telecommunication service by mid 2003. Afterwards, network installation will be carried out and the REIS implemented and made operational. It is further planned that, after the network is installed, maintenance and security plans will be drafted along with the provision of any necessary training in network and/or server management for system administrators who are assigned those tasks. Finally, after the RDCN and REIS are physically implemented, the administrative and operational framework will be finalised and established using Memoranda of Understanding and Data-Sharing Agreements between the country node agencies and the MBRS headquarters; including data collection and data entry arrangements as well as other partners involved. Ultimately, the Synoptic Monitoring Programme will then come on stream and begin collecting system usage and performance statistics that will guide future expansion and address any performance bottlenecks as they arise. The sustainable development decision-making aim of the MBRS IM/IT network is the efficient provision of useful information related to the Mesoamerican Barrier Reef System and related ecosystems to its users. However, for this to be successfully achieved, the cooperation of all its stakeholders and partners in creating, analysing and managing the information housed on the network is essential.

MBRS Network Infrastructure Figure



➤ **The Government of Jamaica National Environmental Planning Agency (NEPA) Database**

34. Another good example of current IM/IT usage for Sustainable Development decision-making is the SIDS-POA Country Report Compact Disc produced by the Government of Jamaica's National Environmental Planning Agency (NEPA). Using their State of the Environment reports for 1995, 1998 & 2001, NEPA prepared a compact disc (CD) for public dissemination that is structured along the lines of the 15 SIDS-POA thematic areas (see [Annex 11](#)). Using their large integrated local area network (LAN), NEPA has included a large number of related reports, policy documents and papers into an integrated database with text and graphics. This tool is quite useful for briefing policy-makers, assessing progress in the management of national Sustainable Development policy, as well as for meeting a number of MEA reporting requirements.

➤ **The Government of Belize Schools-Computers Wide Area Network (SWAN) Project**

35. In the important Human Resource Development area, the Government of Belize has begun implementation of a Schools-Computers Wide Area Network (SWAN) project through its Ministry of Education, Youth & Sports (MoEYS). The SWAN project (see text box below) addresses the IM/IT issue of access to computers and the Internet at all levels of the education establishment for teaching, learning

and educational administration purposes. In order to implement this innovative project in cooperation with Intelco (Belize's first new service provider under its recently liberalised telecommunications regime), a multi-disciplinary SWAN Task Force composed of representative staff from key units was formally set up in 2001 via a MoEYS directive and charged with:

- **Ensuring Timely and Effective SWAN School/NGO Sites Preparation, Hardware Installation, Maintenance & Monitoring;**
- **Managing User-related Curriculum, Training & Instructional Software/Internet Administration/Operational Management Issues; &**
- **Facilitating Stakeholder Participation & Public Awareness through Continuous Liaison with Intelco & Private Sector Contractors, National & District Education Councils (NEC/DEC), MoEYS Service Areas and School/NGO Sites Managing Authorities.**

Belize SWAN Project Summary Text Box

I. BACKGROUND: The VISION...

To Harness Information and Telecommunication Technology for Enhancing Education, Improving National Welfare & Securing Belize's Place in the New Global Economy!

WHAT?: To provide computers and unlimited internet access for all primary, secondary, and tertiary level schools, all libraries and other educational institutions in Belize.

HOW?: To establish a wireless & fiber-optics based Wide Area Network (WAN) linking all government offices and other governmental institutions, e.g. schools, libraries, hospitals, police stations, etc.

HOW MUCH?: By using the wide area network to provide Government with all the telecommunications services it presently obtains, substantial savings can be achieved.

II. MEETING NATIONAL IT INFRASTRUCTURE REQUIREMENTS

- Data Communication Backbone for Government owned Virtual Private Network (VPN)
- Internet Diffusion for Social Sector Reforms (Education, Health)
- Supporting National Poverty Elimination Strategy to Provide IT Access for Poor & Rural communities
- Strengthening of Tourism & Financial sectors
- Development of IT and Services Sector

III. EXPECTED BENEFITS: NATIONALLY

- Established links to all major population areas nationally
- Established country-wide Computer networking framework for government
- High-speed internet access supported country-wide for schools and other distance learning programs
- Any locale allowed to be used for IT services, development and products

IV. EXPECTED BENEFITS: EDUCATION SECTOR

- Compliments existing IT initiatives in the Education sector
- Schools will get hardware & unlimited internet access at no cost
- NGO's and Civil Society receive hardware plus unlimited Internet access at low monthly per unit user fees.

Employing operational arrangements with Intelco and local equipment suppliers developed by the Task Force, the Installation Phase of the project has focused mainly on Information Technology (IT) Infrastructure Development. Technical staff support for network installation & maintenance came from the Employment Training and Education Services (ETES) unit, while administrative support for carrying out the required inter-related activities was coordinated through the Planning, Projects & Performance Measurement (PPPM) unit. PPPM assisted with the preparation and payment of contracts, and with the management of funds according to GOB procedures. District Education Centre (DEC) Officers assisted with the readiness of sites as they were prepared for installations. The Quality Assurance & Development Services (QADS) unit worked in collaboration with the Central American Health Sciences University (CAHSU) to develop a Science Education website that is housed on the CAHSU server. This collaboration is expected to continue as a part of the MoEYS' goal of digitising the National Curriculum in order to support distance education via the Internet. The major achievements of the SWAN Project & Task Force in 2002, according to three main areas, are summarised below:

SITE PREPARATION

- Over 60 school/library/NGO sites were prepared & launched (Belize district-52, Cayo district-2 & Toledo district-2).
- Improvements have been completed at 40 more sites (Belize district-8, Cayo district/Belmopan-19 & Orange Walk district-13). Final preparations are being made for their launch; all LAN installation work has been completed at the sites in Belmopan and 4 LAN installations have been completed for the Orange Walk sites.
- Over 1200 computers with Internet access donated by Intelco and installed by Intelco & SWAN.
- Coordinated and directed IT Volunteer Partners and Donors from Peace Corps, Canada and VSO

USER SERVICES

- MoEYS website linked to all SWAN computers as default browser homepage.
- Developed Student's Science webpage in collaboration with Central American Health Sciences University
- Sponsored 2 workshops to provide IT/Internet skills training for Lab Supervisors.
- Developed a Basic IT Training Manual and provided weekly Introduction to IT classes for over 150 teachers.

STAKEHOLDER CONSULTATION

- Regular MoEYS/Intelco project management meetings held.
- User Agreement with Problem Reporting Procedures annex drafted and sent to Solicitor General.
- SWAN Computer Lab Preparation Construction Guidelines drafted and sent to all Managing Authorities.
- Regular Meetings held with the National Education Council (NEC), the Belize District Education Council & Principals and the Belize Association of Principals of Secondary Schools (BAPSS).
- Regular Briefings given to Chief Education Officer & Chief Executive Officer.

The political manifesto of the present Belize Government (2003-08) envisages a significant role for Information Technology and the Internet in promoting sustainable economic development. Besides a far-reaching twelve-point proposal for developing a "High Tech Belize", one of its specific goals is to establish "Computer Education Centres" in all districts. The SWAN Project/Task Force is presently being re-tooled as a ministry-wide service area focusing on IT & Internet Services in order to assist MoEYS and Government to meet this challenge.

➤ The Government of Barbados EduTech Programme

36. As a part of the preparatory process for the WSIS, the UN Information and Communications Technologies Task Force (UNICT-TF), the UN Development Programme (UNDP) and the UN Fund for International Partnerships (UNFIP) co-sponsored a gathering called *Meeting on Bridging the Digital Divide for the Caribbean* (see [Annex 12](#)) at the United Nations in January of this year 2003. Among the many relevant presentations made by regional representatives and participants, Ms. Lolita Applewhaite (Director of the Centre for International Services, Cave Hill Campus of the University of the West Indies in Barbados) made an intervention on the Government of Barbados' EduTech (Education Sector Enhancement Programme, see [Annex 13](#)). EduTech is another practical example of IM/IT use in the Education sector that is similar to the Belize SWAN project, but of an order of magnitude larger in terms of financing and scale (see text box below):

BACKGROUND

- The aim of EduTech is to infuse technology into the education system in Barbados. The programme is funded jointly by loans from the IDB, the CDB and the Barbados government with some aspects funded by the Barbados private sector.
- Implementation of EduTech started in 1998 and will be applied in the entire school system in Barbados: Private, Public, Primary and Secondary Schools.
- The EduTech objective is not simply to place computers in schools, but to change the culture of the classroom.

JUSTIFICATION

- Nationally and internationally, there is increasing demand for higher levels of literacy, numeracy, technological skills and competencies such as problem-solving and team-working abilities.
- Barbados's excellent education system served it well in the agrarian and industrial eras.
- Given the need to respond to demands of technological, knowledge-based society; Barbados's education system has not kept pace with the national and international shifts.

GOAL

- To bring about an increase in the number of students contributing to the sustainable social and economic development of Barbados; to use technology to improve the quality of education; and to develop students that are highly skilled and readily re-trainable in a technologically rich and rapidly changing environment.

STRATEGIES

- The transformation of the fundamental philosophy and teaching approach of the education system.
- The integration of available technologies as a necessary tool in this new approach to schooling.

OUTPUTS

- Provide new approaches to teaching and learning,
- Integrate the use of available technology within the teaching and learning process, and
- Reform the curriculum.

In summary, as the first project of its kind and scope among CARICOM member state, EduTech is an innovative and multifaceted initiative to provide the Barbados education sector with the skills, tools and infrastructure to 'leapfrog' into the knowledge-based future.

Barbados EduTech Programme Summary Text Box

EDUTECH PROGRAMME COMPONENTS

- Civil Works
- Training
- Institutional Strengthening
- Technology

Civil Works

- Rehabilitation of buildings and installation of cable.

Training

- Development of basic computer skills
- Acquisition of pedagogical IT skills, understanding and knowledge
- Development of skills and competencies for educational leadership
- Child-centred learning
- Special needs education
- Integration of technology into the teaching/learning process
- Project management and management of change.
- School IT Leadership Team (SILT) comprising the principal, an Information Technology coordinator and a senior teacher
- Training for parents of children provided with laptops

Institutional strengthening

- Programme Unit
- Education Evaluation Centre
- Software Review Centre
- Policy Committee
- Steering and Implementation Committee
- School Implementation Committee

Technology

Approaches to the use of technology in the education system:

1. The provision to children of generic skills of computer use
2. The use of subject-based packages focusing on the core curriculum in the primary schools
3. The fostering of creativity in students through project based learning opportunities
4. The use of interactive media and audio-visual technology;
5. The use by teachers of technology for their timetabling and lesson preparation; and
6. The setting up of an Education Management Information System (EMIS)

Hardware

Primary school

- one or two computer labs, depending on the school roll
- four to six computers in each classroom

Secondary school

- five subject rooms with 30 computers each, two with 20 each and one with ten computers
- Library or Information Resource Centre equipped with 20 computers with access to the internet

Schools with small classrooms

- Special childproof laptop computers, using infra red or radio technology.

Special needs schools

- Braille keyboards, hearing assisted devices

Software

- Criteria set out by the Ministry

Schools' Intranet

- Ministry has become its own Internet Service Provider (ISP)

➤ **Jamaica TechSchool Initiative**

37. One of the most unique Caribbean presentations at the recently held UN *Meeting on Bridging the Digital Divide for the Caribbean* was made by Makonnen Blake, Youth Technology Consultant to the Jamaican Minister of Commerce and Technology. Mr. Blake is a youth IT prodigy who was tapped by the Government of Jamaica to advance the involvement of youth in this vital arena. Since his appointment in 1998, Blake has pioneered a creative initiative to open the doors of IT opportunity for young Jamaicans by casting "Youth as IT Teachers" and engaging in a wide range of partnerships with other youth from the region and the developed world (see text box below and [Annex 14](#)).

Jamaica TechSchool Highlights Text Box

TechSchool Overview

- Since 1998, we have been operating TechSchool Jamaica, a cyberschool where we teach youth tech skills at workshops and by Internet.
- Over the years we have taught many Jamaican students and children from other Caribbean territories such as Trinidad, Mexico and Guyana.

Digital Peace Corps Proposal

- All of this leads up to my idea, to create a Digital Peace Corps composed of tech gifted youths like Melissa, Aaron and the international youths of Nation One and send them to schools in the Caribbean to stimulate technology development.

How It Could Work

- Link with Nation One/MIT to partner with youth technology resources of the developed world
- Link students through Student Internet Website Design competition to build educational websites across the Caribbean and the world by Internet.
- Link students through this UN Caribbean Digital Diaspora Network.

"THE SKILL OF USING COMPUTERS COMES MOST EASILY TO US, THE YOUTHS WHO WERE BORN IN THE COMPUTER AGE. WE YOUTHS HAVE VISIONS OF NEW WAYS TO TAP THIS GREAT RESOURCE, VISIONS NOT CLOUDED BY PAST EXPERIENCES, EITHER OUR OWN OR OTHERS. YOUTH CREATE NEW PATHWAYS WITH THIS NEW 'TOY'."

Makonnen Blake, Youth Technology Consultant to the Jamaican Minister of Commerce and Technology

38. The five preceding reviews are far from being an exhaustive presentation, much-less analysis, of current IM/IT case studies covering Caribbean Regional Sustainable Development decision-making. Given the limited time and scope of this consultancy, only a few of the initiatives known to the consultant or discovered via web-research have been selected for inclusion. Preliminary analysis indicates, however, that there are significant opportunities for enhancing the application of IM/IT for decision-making in the region for all the identified SIDS-POA sustainable development issues or themes. While natural resources and environmental management (MBRS) has traditionally been seen as the main strategic use of IM/IT for Sustainable Development decision-making, human resources development (SWAN, EduTech & TechSchool) and other social sector applications (UNSD/CARICOM) should be considered as critical tactical capacity-building areas of interest. Overall, the region's IM/IT management infrastructure could be assessed as having a diverse and growing number of stakeholder organisations and agencies that could benefit from greater collaboration and rationalisation of their noteworthy efforts. Given the global basis for much of our national and regional activities in the field of IT for Sustainable Development, the region would do well to strengthen and better coordinate national and regional participation in the WSIS process.

3.0 Caribbean IT Training & Capacity-Building Priorities

3.1 IM/IT Training and Capacity-Building Conceptual Review

32. This section on determining regional IT Training & Capacity-Building priorities begins by returning to Mansell & When's 'source book'¹⁶ for a review of the conceptual base for both a 'lifelong learning & institutional change' approach to and specific recommendations for IT skills requirements; two relevant sections are quoted in italics below:

➤ Education, Lifelong Learning and Institutional Change

"Major transformations are occurring in the formal education sector and other organisations that play a key role in enabling people to develop new capabilities. These changes are partly the result of the increasing use of ICTs as enabling technologies for education and learning. The possibility of continuous informal education and lifelong learning is growing with the increased availability of IT applications and creativity in their application to address development problems. In developing countries, the potential of the application of IT to these areas is only beginning to be realized. However, this potential can only be exploited if the formal and informal educational processes in developing countries allow people to acquire the skills that are necessary to use new technologies creatively and productively. Major changes in formal education systems and institutions as well as the organisations that contribute to informal learning are needed to build new capabilities. The introduction of lifelong learning strategies requires that the foundations of learning be strengthened and changed. It also implies that there must be flexibility for movement between education, training & work and new roles for public and private sector institutions that contribute to the learning process." (My emphasis)

➤ Enhancing the Skills Base for Participation, Facilitation and Control

"The use of IT to support development goals does not need to be considered only in terms of the extension of telephony networks to every household. Alternate modes of access may be preferable in some circumstances and the choice of radio, television or telephony as a means of connection of citizens to networks of information is dependent on each country's circumstances. The skills base that is built up must be compatible with the mix of ICTs available and provide a basis for continuing learning. Three specific skills are particularly important:

- *Participatory Skills are necessary for involvement in networked communication and information-sharing. These incorporate computer literacy and fluency in the English language for the use of the Internet, databases and most software until more content is provided in local languages.*
- *Facilitating Skills for the design, implementation and maintenance of networks involve a number of essential skills for installation, user training and maintenance. In addition, software and computer systems engineering skills are desirable. Even more emphasis needs to be placed on vocational training to provide a large number of people with the ability to ensure the functionality of networks.*
- *Control Skills imply the allocation of funds for the acquisition of appropriate ICT equipment in order to manage access to networks in some countries to achieve public or private control*

3.2 Caribbean Sustainable Development IT Training & Capacity-Building Needs

➤ Jamaica & Belize Missions and St. Lucia Survey Findings

37. The input of stakeholders throughout the region was essential in the determination of specific Caribbean IT training and capacity-building priorities. As a critical part of this consultancy, therefore, brief missions were mounted to Jamaica and Belize in May 2003 where helpful discussions were held with a number of agencies and organisations that have an interest in the IDSD project and Information for Sustainable Development Decision-Making. Similarly, the May 2003 project-sponsored St. Lucia Resource Persons Meeting was designed to incorporate the views and opinions of a wider Caribbean audience into the IDSD project's determination of Priority IT Training & Capacity-Building Needs in the region. Enquiries during the missions and a survey at the meeting were directed towards assessing these needs in the context of identifying perceived constraints as well as any new IT tools that should be recognised. The complete findings from the missions to Jamaica and Belize; and the recorded St. Lucia Resource Persons' Survey responses are attached at [Appendix 6](#) and [Appendix 7](#) respectively. The findings were examined to establish priority categories by tabulating the number of times the replies received from discussions and the survey, generally fit into common groups within the three issues of needs, constraints or New IT Tools; see summaries in Tables 5 & 6 below and grouped responses in [Annex 15](#) & [Annex 16](#). The three dimensional (3-D) charts presented on the following page are used to graphically depict both analyses.

Chart 1; Jamaica and Belize Mission Findings Summary

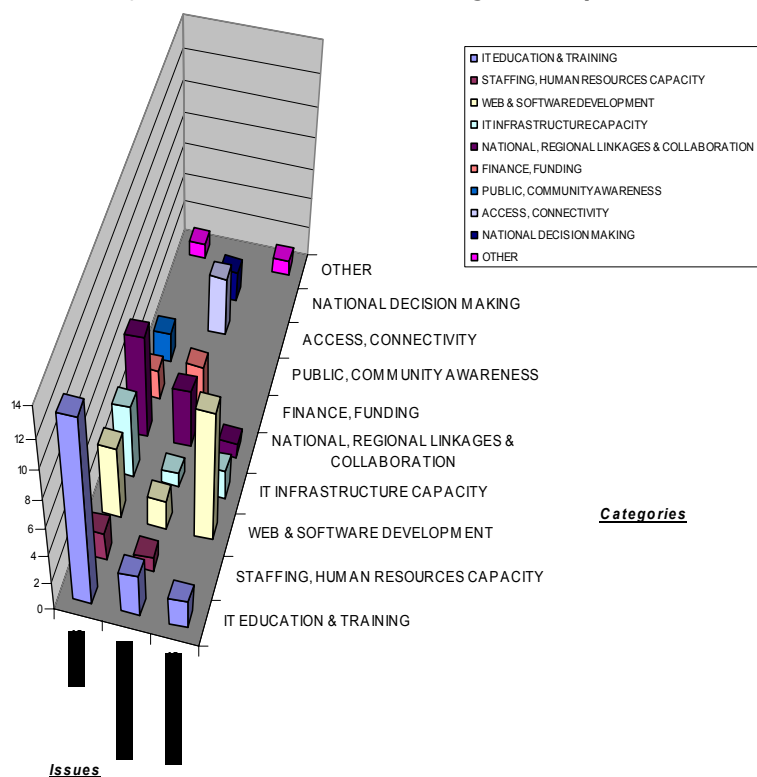


Chart 2; St. Lucia Meeting Resource Persons Survey Findings Summary

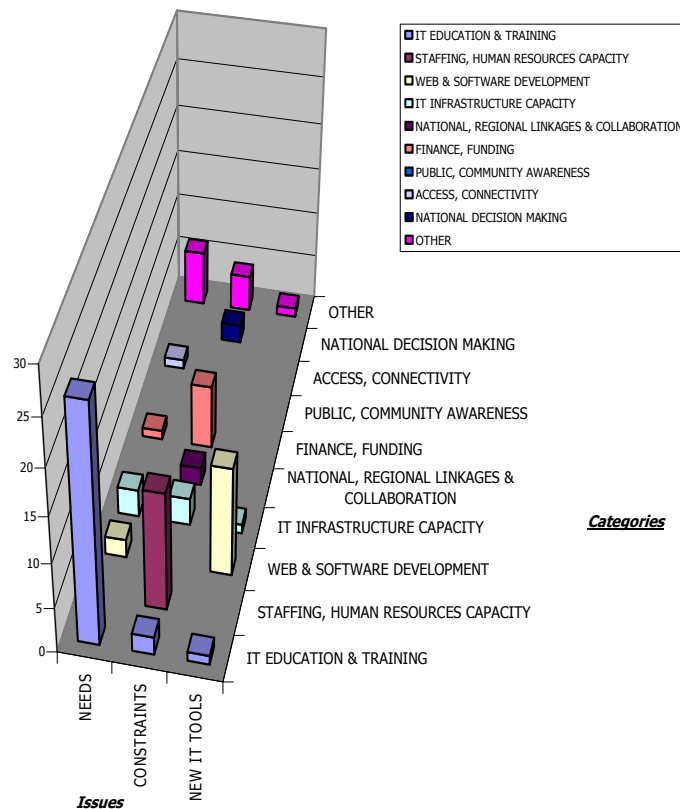


Table 4; Jamaica and Belize Mission Findings Summary

Needs	Constraints	New IT Tools
IT Education & Training (13) National/Regional Linkages & Collaboration (7) Web & Software Development (5) IT Infrastructure Capacity (5) Finance/Funding (2) Public/Community Awareness (2) Staffing/Human Resources Capacity (2) Other (1)	National/Regional Linkages & Collaboration (4) Access/Connectivity (4) IT Education & Training (3) Finance/Funding (3) Web & Software Development (2) National Decision-Making (2) Staffing/Human Resources Capacity (1) IT Infrastructure Capacity (1) Other (1)	Web & Software Development (9) IT Education & Training (2) IT Infrastructure Capacity (2) National/Regional Linkages & Collaboration (1)

Table 5; St. Lucia Meeting Resource Persons Survey Findings Summary

Needs	Constraints	New IT Tools
IT Education & Training (26) IT Infrastructure Capacity (3) Web & Software Development (2) Finance/Funding (1) Access/Connectivity (1) Other (6)	Staffing/Human Resources Capacity (13) Finance/Funding (7) IT Infrastructure Capacity (3) National/Regional Linkages & Collaboration (2) IT Education & Training (2) National Decision-Making (2) Other (4)	Web & Software Development (12) It Education & Training (1) IT Infrastructure Capacity (1) Other (1)

➤ **Analysis of Needs, Constraints & New Tools**

36. Needs

I. IT EDUCATION & TRAINING (39)

According to both findings, the most important need identified is Education & Training (including certification) in the following key areas with examples:

- **Databases**, including
 - Creation, development, distribution & management (especially for administrative staff);
 - Regional database development & maintenance training ('train the trainers' programme);
 - Review of administrative forms & systems to facilitate data gathering & recording;
 - Metadata development & management.
- **Networks**, including
 - Satellite networking;
 - Management & design.
- **Web/Internet**, including
 - Development;
 - Management.
- **Computer Operations & Maintenance**, including
 - Basic computer hardware concepts (e.g. RAM, ROM, etc.);
 - Essential office software (e.g. spreadsheets, word processing & database programmes);
 - PC File Management, Data formatting and Presentation programmes such as PowerPoint.
- **Remote Sensing and Geographic Information Systems (GIS)**, including
 - GIS technology for CSOs or clearinghouses;
 - GIS for Environmental (Coastal Zone) management.
- **Software Development and Use**, especially
 - Open-source (Linux) for "e"-Commerce.
- **Management of Changing and Evolving IT Systems & Infrastructure**, including
 - Security/vulnerability issues;
 - Training for negotiators;
 - Technical analysis training;
 - CTO MIST system operations (esp. in manipulation of 'back-end' data for national demands).
- **Statistics & Indicators**, including
 - Energy Balance & Energy Statistics;
 - Statistical coding methodologies, e.g. Costa Rica University Development Observatory;
 - Development of impact indicators.

II. IT INFRASTRUCTURE CAPACITY (8)

The next most important need cited by the two groups, IT Infrastructure Capacity, emphasised:

- **Management of Changing and Evolving IT Systems & Infrastructure**, including
 - Provision of greater data storage & conversion services to relevant SD/SIDS-POA data nodes;
 - Long-term capacity-building projects for National partners;

- Formal on-going capacity-building programmes.
- **Web/Internet**, including
 - Increased emphasis on Internet and Web management capacity-building.
- **Statistics/Indicators**, including
 - Strengthening national environmental statistics capacity of CSOs or clearinghouses.

III. WEB & SOFTWARE DEVELOPMENT (7)

The development of software for Internet and Web-based applications could be considered the third category of need most observed overall; the area, with examples is:

- **Web/Internet**, including
 - Development of Caribbean SD-related /SIDS-POA Website & Content Software and Linkages;
 - Internet and Web management capacity-building;
 - Continuous updating of regional SD websites' content, including IDSD Project thematic areas;
 - Streamlining & Continuous updating of regional SD websites;
 - Website Development & Maintenance capacity-building and training.

IV. NATIONAL/REGIONAL LINKAGES & COLLABORATION (7)

The establishment or enhancing of functional (collaborative and integrated) national and/or regional IT organisational linkages was noted a relatively large number of times by the Jamaica & Belize mission interviewees, although it was not mentioned as a need by any of the survey respondents at the St. Lucia meeting. This reflects an acknowledged need to strengthen collaboration between stakeholders that are principally responsible for SIDS-POA thematic areas⁴ in the Caribbean, on four levels:

- The National level (esp. Intra-national Policy Harmonisation by local & regional representatives);
- The Regional level;
- The Hemispheric level;
- The United Nations & Global level.

V. OTHER (FINANCE, STAFFING, PUBLIC AWARENESS & ACCESS/CONNECTIVITY) IMPORTANT NEEDS

Several other important areas mentioned were:

- Increased financial resources and revenue generation for programme sustainability;
- Definition & Institutionalisation of specific IT Knowledge, Skill Levels & Requirements;
- Provision of greater public access to and more community reporting activities about relevant SD/SIDS-POA data;
- Improved computer connectivity & Internet access for selected audiences or groups.

37. Constraints

I. STAFFING/HUMAN RESOURCES CAPACITY (14)

The main perceived stumbling block for improved regional IT training & capacity, particularly by the St. Lucia meeting respondents, seems to lie in the area of national authorities and their respective capacities to adequately deploy, maintain & improve local human resources; in particular:

- **Insufficient Time for Substantive Workloads and IT-Related Tasks**, including
 - Time to dedicate to research & training;
 - Time of both providers & receivers of training;
 - Timely data collection;
 - Work loads & priorities of coordinating agencies.
- **Supply of Trained and/or Specialist IT and Related Staff**, including
 - Lack of competent National CSO/sectoral agency staff to receive training;
 - Lack specialist staff for collection, processing sharing of relevant SD/ SIDS-POA information;
 - Staff turnover once trained;
 - Absorptive capacity of institutions to apply training.
- **Inadequate Human Resources Management**, including
 - Lack of 'trickle-down' of skills and knowledge to appropriate end-users;
 - Appropriate personnel selection.
- **Insufficient Number of Permanent IT and Related Staff**, including
 - Lack of human resources or personnel;
 - Lack of designated or permanent IT staff.

II. FINANCE/FUNDING (10)

Finance and funding can be considered as the second major inhibiting factor, as defined by remarks that fall into two areas:

⁴ Specific references were made to agencies such as the CARICOM Secretariat, the OECS Secretariat, the Caribbean Meteorological Organisation (CMO), the Caribbean Environmental Health Institute (CEHI), the Caribbean Energy Information System (CEIS), The Institute of Marine Affairs (IMA), the Caribbean Planning for Adaptation to Global Climate Change/ Adaptation to Climate Change in the Caribbean/Mainstreaming Adaptation to Climate Change in the Caribbean (CPACC/ACCC/MACC) Projects, the Caribbean Disaster Emergency Response Agency (CDERA), the Caribbean Development Bank (CDB), the Caribbean Regional Fisheries Mechanism (CRFM), the Caribbean Tourism Organisation (CTO) and the University of the West Indies (UWI) DLIS & CED.

- **Inadequate Financial Resources**, including
 - Sustainability of programme services;
 - Lack of financial resources;
 - General lack of resources/funding;
 - Lack of funding for travel.
- **High Costs of Goods & Services**, including
 - High cost of appropriate certified 'high-end' IM/IT training;
 - High cost of proprietary technology;
 - Internet access costs.

III. NATIONAL/REGIONAL LINKAGES & COLLABORATION (6)

The third area perceived to hamper regional IT training & capacity-building is that of functional cooperation & links, both at home and abroad locally and in the following areas:

- **Not enough High Level IM/IT Policy & Management Coordination**, including
 - Lack of national/regional policy collaboration & coordination;
 - Lack of common Regional & National approach to IM;
 - Balkanised' approaches among agencies;
 - Lack of voluntary agreement by sectoral agencies to share or release data;
 - Lack of inter-sectoral collaboration.
- **Not enough High Level MEAs Policy & Management Coordination**, including
 - Lack of information and coordination at national (Government/NGO) level regarding hemispheric and regional Multi-lateral Environmental Agreements (MEAs).

IV. IT EDUCATION & TRAINING (5)

In addition to being seen as an important need, the lack or inefficient use of IT skills is also seen as another important restraining element in these areas:

- **Computer Operations & Maintenance**, including
 - Low levels of IT or "e" Literacy;
 - Staff underutilisation of the full range of software applications.
- **Remote Sensing and Geographic Information Systems (GIS)**, including
 - Lack of Cartography skills in GIS section.
- **Supply of Trained and/or Specialist IT and Related Staff**, including
 - Lack of flexibility by trainers in meeting specific needs of users.
- **Web/Internet**, including
 - Limited availability of training materials, on-line or otherwise.

V. IT INFRASTRUCTURE CAPACITY (4)

Inadequate IT Infrastructure Capacity was cited as negatively affecting the following areas & cases:

- **Management of Changing and Evolving IT Systems & Infrastructure**, including
 - Lack of National Government Standards in software and related hardware functionality (e.g. expensive Oracle vs. cheaper MSSQL for Database operations)
 - Digitising older reports
 - Disaggregating of data & distribution over many departments, agencies or ministries
 - Lack of computers at national level offices

VI. WEB & SOFTWARE DEVELOPMENT (2)

The lack of an adequate web presence constrains IT training & capacity-building; two examples are:

- **Web/Internet**, including
 - Low quality and technical level of SIDSNET Website
 - Ineffective Website design

VII. OTHER (NATIONAL DECISION-MAKING, ACCESS/CONNECTIVITY) SIGNIFICANT CONSTRAINTS

There are two other significant constraint areas:

- **National Decision-Making**, which includes
 - Inadequate decision-making processes by national Governments in terms of attitudes and aptitudes regarding IM/IT information development & use;
 - Lack of integrated national planning framework;
 - Need for increased awareness among policy-makers;
 - Lack of informed decision-making by political directorate.
- **Access/Connectivity**, including
 - Lack of 'Connectivity' and High-speed Internet Access.

38. New Tools

I. WEB & SOFTWARE DEVELOPMENT (21)

In the arena of new technologies for IT training & capacity-building, the development of Internet and Web-based software applications is clearly considered to be of utmost importance; being overwhelmingly

mentioned by almost all mission interviewees and survey respondents. The web is almost omnipresent in its scope, seemingly related in one way or another to most of the feedback received on new IT tools. Some exemplary observations, by area, are:

- **Web/Internet**, including
 - Web conferencing;
 - Web-based distribution of information, including spatial information;
 - Web-based Internet Video-conferencing software & technology;
 - On-line newsletter;
 - Webpage design;
 - CEPNET, SPAW, CAMPaM List-servs;
 - SIDSNET Energy Issues List-serv.
- **Software Development and Use**, especially
 - Open source software, e.g. Linux, Kykr, DMP & MySQL;
 - Website "e"-Commerce software development & use;
 - Scenario modelling software (e.g. Polestar);
 - Development of web-based databases using open source software & open standards for data storage;
 - IDSS Disaster management software (available through US Southern Command);
 - Open source software for database & content management;
 - SQL server & Access software tools, esp. reporting systems such as Crystal Reports and SPSS.
- **Databases**, including
 - Visual Basic software for MS Access Databases;
 - Simplified database software;
 - Flexible National & sectoral databases that allow linkages at national, regional & international levels.
- **Networks**, including
 - Virtual Private Network (VPN) software & technology.
- **Remote Sensing and Geographic Information Systems (GIS)**, including
 - Web-based GIS database software development & use.

II. IT EDUCATION & TRAINING (3)

Internet and Web-related education and training are a noteworthy new IT tools; the relevant areas observed and a few examples are listed below:

- **Web/Internet**, including
 - Virtual negotiations training.
- **Software Development and Use**, especially
 - WEB-CT and VIRTUAL-U Course Tools software development & use.
- **Remote Sensing and Geographic Information Systems (GIS)**, including
 - GIS Skills training.

III. IT INFRASTRUCTURE CAPACITY (3)

The building of new IT infrastructure capacities was also a noteworthy category suggested by the following areas and instances:

- **Web/Internet**, including
 - Standardised IT platforms and databases.
- **Remote Sensing and Geographic Information Systems (GIS)**, including
 - Satellite-based Remote Sensing IT tools for Fisheries Management.
- **Networks**, including
 - Wireless Fidelity (WIFI) Networking Technology.

IV. NATIONAL/REGIONAL LINKAGES & COLLABORATION (1)

Although it was only identified by one of the Jamaica/Belize mission interviewees, the need to employ appropriate statistical indicators in the coordinated monitoring of SD and the SIDS-POA is an acute imperative; the applicable area and illustration is:

- **Statistics/Indicators**, including
 - Technical indicators for SIDS-POA, including IDSD Project, thematic areas, with delegation of responsibility for update/maintenance to relevant hemispheric & regional SD agencies.

Synopsis

39. In the determination of regional IT and capacity-building priorities, using a synopsis of the categories from the findings (Table 6 below), the results indicate that Education and Training is perceived as the single most important need; Infrastructure Capacity, Web & Software Development and National/Regional Collaborative Linkages are also significant needs. Several constraints were identified; the most critical being the lack of Human Resources Capacity, followed by inadequate Financial Resources, weak National/Regional Collaborative Linkages and insufficient Infrastructure Capacity. Web

and Software Development was overwhelmingly assessed as the most momentous in terms of New IT Tools, although some notable implements were recognised from the Education & Training and Infrastructure Capacity areas.

Table 6 Synopsis of Key IT Training & Capacity Building Areas

CATEGORY/FREQUENCY	NEED	CONSTRAINT	NEW IT TOOL
Education & Training/ <u>47</u>	<u>(39)</u>	<u>(05)</u>	<u>(03)</u>
Web & Software Development/ <u>30</u>	<u>(07)</u>	<u>(02)</u>	<u>(21)</u>
Infrastructure Capacity/ <u>15</u>	<u>(08)</u>	<u>(04)</u>	<u>(03)</u>
National/Regional Linkages & Collaboration/ <u>14</u>	<u>(07)</u>	<u>(06)</u>	<u>(01)</u>
Human Resources Capacity/ <u>14</u>	<u>(01)</u>	<u>(14)</u>	<u>(0)</u>
Finance/Funding/ <u>10</u>	<u>(01)</u>	<u>(10)</u>	<u>(0)</u>
Other:			
o Access/Connectivity <u>(02)</u>	<u>(01)</u>	<u>(01)</u>	
o Public Awareness <u>(01)</u>	<u>(01)</u>		
o National Decision-Making <u>(01)</u>		<u>(01)</u>	

Clearly, the overall ranking demonstrates that both Education & Training and Web & Software Development would be crucial components of any effective regional IT Training and Capacity-Building initiative. And, along with Infrastructure Capacity, Human Capacity and National/Regional Collaborative Linkages; they can form the strategic elements of present and future IDSD Project activities. The securing of appropriate Financial Resources must not be overlooked either, as it is viewed as essential to the sustainability of any proposed programme. Before turning to final section 3.3 below on recommended actions, a brief examination is given on an Indian view on IT Human Resources Development.

➤ **Lessons from an Indian View on Human Resources Development to Meet IT Challenges**

40. India is world known for the phenomenal advances made by its IT industry, especially in the field of software development and export. What can the Caribbean learn from India's experience? A very useful paper¹⁷ in this respect was written by R. Narasimhan (rn@saathi.ncst.ernet.in) a National Fellow in IT at India's National Centre for Software Technology (NCST). Debunking what he calls the "hype" and "mystique" that "software is peculiarly matched to the Indian genius", Narasimhan analyses the HRD problem from a broader perspective and proposes a 4-level expertise generation framework (see Table 4 below) based on what he calls "desired ideal" criteria:

Indian IT Software Training Challenge

"The single most extraordinary development in the Indian industrial scene during the last decade and a half has been the phenomenal growth of the Indian software industry, especially its export performance. It does not seem that in the foreseeable future-say, in the next decade or so-the growth of the software industry in India would slow down. Software exports of US\$ 50 billions, from the present level of US\$ 2.5 billions, are seriously being targeted in 10 years from now. In this context, both within the government and outside, anxieties have been expressed on the ability of our educational system to meet the challenge of producing enough software specialists. Ad-hoc solutions have been proposed: for example, to increase the intake in Indian Institutes of Technology (IITs) in the software specialisations; to start additional institutes of the calibre of the existing IITs; to upgrade the Regional Engineering Colleges (RECs) to the level of the IITs; and so on."

Survival in the Global Village Requires Global Skills

"If it is true that technology 'push' is transforming this world into a global village, then, the ultimate requirement for survival is to be able to function as a significant contributing member of this global village. The skills one equips oneself with, and the knowledge one is able to command of this world (near-by and far-away) are determinants of the kinds of roles one can play in this global village. The skills one acquires, whether as part of in-school training, or through individual initiatives at home, must be marketable in this global village. In a world dominated by ICTs, survival demands that one's skills are ICT-friendly, and the products one makes are designed and/or manufactured with ICT-friendly processes."

Meeting the Skills Challenge through Multi-Disciplinary Education

"This does not imply that everyone should acquire the specialised competencies of a software engineer or a programmer. India's economy needs people specialised in a variety of skills and conversant with the use of modern tools in their own varied specialisations. The needs of domestic computerisation on a large scale, and new challenges such as e-commerce, can only be met by involving every arts, science and commerce college-in addition to the engineering colleges and the institutes of technology-in addressing the relevant educational needs as part of general education... Truly multi-disciplinary education is involved in preparing young people to use modern tools in their own fields of expertise, and to compete with others in the world in a global market. For instance, proper exploitation of the www-technology demands expertise in commerce, design, arts, advertising and marketing. Meaningful work in such technologies can be undertaken only by inter-disciplinary teams."

2 Indian ICT Industry Weaknesses: Few Local Benefits & Absence of Domestic Market

- 1) *"The ICT industry in India, for all its creditable global performance, suffers from several weaknesses as is well-known to most major actors in this sector. The Prime Minister, while inaugurating the HiTec City in Hyderabad, identified one such weakness. He is reported to have said, "the benefits of IT could not remain confined to the well-off and the English-educated...I will consider my government's commitment to IT fulfilled only when it improves the life of the poor and the powerless."* (Deccan Herald, Bangalore, 23 Nov 1998)"
- 2) *"Secondly, although the power of ICTs stems from the coming together of information and communication technologies, the prevalent tendency in India is to talk exclusively about IT, to identify IT with the software industry, and to stress, exclusively again, in all discussions the export performance of the Indian software industry. In such discussions one tends to forget that ICT is primarily an enabling technology and an infrastructural one – like electric power technology. THE REAL BENEFITS OF ICT WOULD ACCRUE TO A COUNTRY ONLY TO THE EXTENT THAT ICT IS DEPLOYED TO INNOVATE AND IMPROVE THE PERFORMANCE OF OTHER INDUSTRIES AND SERVICES IN GENERAL. The absence of such a realisation is, again the prime reason for the almost total absence of an informed domestic market for ICTs in India."*

A 4-Level Skills and Knowledge Acquisition Scenario⁵

Table 7 Narasimhan's Four "Desired Ideal" Levels of IT Training

LEVEL	DESCRIPTION	EMPLOYMENT
Level 0: Universal Prerequisites	<p>With ICT becoming a pervasive technology, to access the full potentials of an ICT-dominated world, <u>every</u> person should become ICT-literate. Minimally this means full familiarity with the use of a personal computer, and basic proficiency in the fundamental tools of personal computing such as email, word-processing, spreadsheets, databases, and of course, the use of the keyboard and the mouse. Students going through formal education should... be proficient in:</p> <ul style="list-style-type: none"> ▪ <i>Communication:</i> Oral communication, general and technical writing, and listening skills. ▪ <i>Quantitative & Qualitative Analysis:</i> Including discrete mathematics, basic introduction to statistics and calculus. ▪ <i>Organisational Functions:</i> Introduction to economics, accounting, finance, human resources, marketing, production, etc. <p><u>Ideally every student passing out of +2 (6th Form) must have acquired these prerequisite skills and foundational knowledge.</u></p>	<ul style="list-style-type: none"> ○ Data-entry Operators ○ Information Systems (IS) Application Assistants
Level 1: Entry-level Skills & Knowledge in Information Systems (IS) ⁶	<ul style="list-style-type: none"> ▪ Thorough familiarity with Level 0 skills and foundational knowledge. ▪ Familiarity with and competence in the use of vendor-delivered products intended for general use. This implies working-level knowledge of similarities and differences between products with overlapping functionalities (e.g., different word-processing packages) and the ability to choose the best product to meet given requirements. ▪ Similar know-how and skills in the use of products incorporating knowledge in domains one is specialising in (e.g., products like MATHLAB, SPSS, SAS, AUTOCAD, SAP, etc.). ▪ Capability to be trained to use customised (and/or home-grown) products. ▪ Familiarity with presentational graphics and their use in the generation of appropriate visual aids for popular or technical presentations. This implies availability of foundational design know-how: Layout, Lettering, Colour Contrast, 	<ul style="list-style-type: none"> ○ Data-entry Operators ○ Information Systems (IS) Application Assistants

⁵ *"We must emphasise that we are here concerned only with the ICT-expertise that make-up the knowledge and skills at each level. We are not spelling out here the domain knowledge that relates to student specialisations such as Physics, Chemistry, Mathematics, Commerce, Business Administration, and so on...We are emphasizing the need for integrating training in ICT knowledge and skills with the education system in its entirety..."* (R. Narasimhan)

LEVEL	DESCRIPTION	EMPLOYMENT
	Drawing, etc. <u>Ideally, all first degree holders from liberal arts, science and commerce colleges must have acquired Level 1 skills and knowledge of IS.</u>	
Level 2: Operating With Available Technologies ⁷	<ul style="list-style-type: none"> ▪ Level 1 skills and knowledge are prerequisites ▪ <u>Knowledge of how</u> IS (both hardware & software) work, rather than <u>mere skills in using</u> them. ▪ Enough knowledge of programming, data-structures and mathematics to be able to design and implement applications packages in areas in which one has the requisite domain knowledge ▪ Advanced technical writing skills to be able to write, and/or supervise the production of, "help" manuals at various levels of detail and complexity. ("help" manuals could be technical maintenance manuals or user manuals.) ▪ Articulating requirement specifications and/or translating requirement specifications into systems specifications and design. ▪ Enough basic IS expertise to maintain (i.e. debug/rectify) application packages of various levels of complexity. 	<ul style="list-style-type: none"> ○ Hardware/ software Maintenance ○ System Integration Assistants ○ Product Development Supervisors ○ Requirement/System Specifications Design
Level 3: Generating New Technologies	<ul style="list-style-type: none"> ▪ Full-fledged IS expertise. ▪ Knowledge in cutting edge aspects of current technology. ▪ Ability to add to technology or generate new technology in one's specialisations: e.g., graphics, networks, database techniques, operating systems, etc. ▪ Enough technical and user understanding of the markets to judge what product innovations would sell. ▪ Enough production know-how and grasp of marketing details to assess rationally the cost of product/process innovations. 	<ul style="list-style-type: none"> ○ Application Development Managers ○ Project Leaders ○ Middle Level Managers

41. The path to appropriate and sustainable IT training for capacity-building lies along the Education sector highway, but, given the changes wrought by the emerging 'global information order', existing educational infrastructures and philosophical dogmas must be revamped. The new 'global information order' requires an 'informatisation' of the educational establishment, with an emphasis on criteria that will enable life-long skills that enable peoples and societies to Participate in, Facilitate operation of & acquire Control over this new 'global information order'. A useful view comes from India in attempting to find a Caribbean vehicle to carry us along a high-tech Education path: our IT training transport must not only be globally marketable and multi-disciplinary, but it must also be able to navigate our distinct socio-cultural roadways and allow us to both contribute as well as receive goods. In summary, Caribbean IT training for Sustainable Development should become a part of all the region's many educational programmes. Beginning with 'e-Literacy; IT training has to enable operational use and eventual mastery of the applications, sciences and technologies involved for the benefit of the whole Caribbean Society., Our ultimate success in this endeavour will be judged by our ability to generate new content, products and services that are globally marketable **and** locally beneficial.

⁶ "Information systems are engineered systems based on ICT with desired input-output specifications. To create such engineered systems (also called system integration usually) both hardware and software skills and knowledge may be needed."

⁷ "Levels 2 and 3 relate primarily to students majoring in engineering. Level 2 roughly corresponds to students working for a first degree in engineering. Level 3 corresponds to students working for higher degrees (Masters, Doctorate) in engineering, and also those engaged in R&D activities in R&D organisations.

3.3 Caribbean Sustainable Development IT Training & Capacity-Building Actions

➤ Requirements for Sustainable Caribbean IT Training & Infrastructure Capacity-Building

Globally Relevant but Locally Available Education and Training

42. The SWAN in Belize, EduTech in Barbados and TechSchool in Jamaica are harbingers of 21st Century Caribbean Knowledge Societies. They, along with the MBRS' Regional Environmental Information System, Jamaica's SDNP & NEPA State of the Environment/SIDS-POA compact disc, also offer proof from our limited assessment that the Caribbean can successfully deploy IT tools for Sustainable Development Decision-Making that Bridges the Data Gap (Digital Divide) and Increases the Availability of Information. However, if the region is to assume and or maintain its control of this rapidly evolving, science & technology-driven instrument, appropriate training of a youthful populace as well as stakeholder IT staff is critical. The management of the only private sector training agency interviewed (the Belize Institute for Information Technology) suggested that there are three acknowledged levels of technical training among corporate IT departments. They offer, and I recommend them as, a template for providing the fundamental skills (Participatory and Facilitating) required, including advanced and basic courses:

- High level staff technical training for IT/IM/MIS Department Managers in: Networking, Security & Microsoft SQL (for Database Administrators) leading to the Microsoft Certified Systems Engineer (MCSE) credential;
- Mid level staff technical training for IT/IM/MIS Technicians in hardware and software installation/operation/maintenance (A+ Certificate); and
- Administrative level support staff training in full functionality of combination software packages (e.g. Microsoft Office or Coral Suites).

Recognising the value of the so-called 'high-end' technology training as a prerequisite for life-long learning IT careers, and cognizant of the growing demand for such courses in the wider Latin American & Caribbean region, Miami-Dade Community College has established an Emerging Technologies Centre of the Americas (ETCOTA) to cater to hemispheric IT training and workforce needs (see text box below).

Miami Dade Community College Emerging Technologies Centre Text Box

MIAMI DADE COMMUNITY COLLEGE EMERGING TECHNOLOGIES CENTRE

The Emerging Technologies Centre of the Americas (ETCOTA) currently offers a wide variety of programs, certificates and degrees in Telecommunications and Computer Information Systems at five of MDCC's campuses. By early spring 2002, the ETCOTA will also have a 40,000 square foot state-of-the-art education and training facility at the downtown Wolfson Campus. This ETCOTA site, funded by the 2001 Florida Legislature in the amount of \$5.2 million, will be located two blocks from the Network Access Point (NAP) of the Americas and within walking distance of the BellSouth Multimedia Internet Exchange (MIX), another NAP. The ETCOTA will serve the education, training and workforce needs of Miami-Dade County, the tri-county Internet Coast, the State of Florida and Central and South America and the Caribbean Basin.

The scope of offerings and opportunities for individuals and businesses is among the most extensive in the nation; including:

- **CERTIFICATION TRAINING** in Microsoft (MCP, MCSE and MOUS); Cisco (CCNA and CCNP); Oracle, Nortel, Novell and IMB (AS-400); and, A+, I-Net+ and Network+.
- **COLLEGE CERTIFICATE PROGRAMS** in, for example: Digital Communications Technician, Electronics Telecommunications Specialist, Graphic Illustrator, Telecommunications Technician, CAD Operations, Data Processing Equipment Repair, Electronics Semiconductor Processing and Electronics Specialist.
- **ASSOCIATE IN SCIENCE DEGREES** in, for example: Computer Engineering Technology, Electronics, Micro-Electronics Technology, Computer Information Systems Technology, Internet Communications, Telecommunication Engineering Technology and Multimedia Presentation Technology.

The final "build-out" of the ETCOTA will create a state-of-the art facility with a 120-seat auditorium with broadband connectivity, 5 specialized laboratories for instruction, 14 high-tech classrooms and faculty offices. For further information, call William Kornegay, Chairperson of Computer Information Systems and Design Technology, 305-237-3928 or e-mail at wkornega@mdcc.edu.

43. For fundamental manoeuvrability, and as the language of the new 'Global Information Order, these types of vendor-certified training courses are essential in the professional IT world and are increasingly needed by all stakeholder institutions involved in Caribbean Sustainable Development Decision-Making. In determining the types of IT education and training that the IDSD Workplan envisages, eight inter-related areas are suggested by the findings of section 3.2. The proposed curriculum, based on the previous analysis of inputs from national and regional stakeholders, would target key IM/IT managers and officials for instruction in:

- Database & Information Systems Development and Management;
- Networking (Local Area Networks-LANs & Wide Area Networks-WANs) Technologies;
- Email/Web/Internet Management;
- Computer Operations & Maintenance;
- Remote Sensing and Geographic Information Systems (GIS);
- Open Source Software Development and Use;
- Management of Changing and Evolving IT Systems & Infrastructure; &
- Sustainable Development Statistics, Indicators & Decision-Making

Knowledge Management and Portals

44. If the IDSD and other IT Education and Training initiatives for the region are to address critical regional problems and remain abreast of industry and societal trends, they must assess and deploy locally the latest tools available for the benefit of the Caribbean. Two recommended cutting edge mechanisms are 'Knowledge Management' and Portals. Knowledge Management¹⁸, according to a strategic planning report for an Indian IT firm by Jashwant in 2000:

- ***"...is first and foremost a management discipline...that promotes a collaborative and integrated approach to the Creation, Capture, Organisation, Access and Use of an enterprise's information assets. This includes Databases, Documents and most importantly, uncaptured tacit expertise and experience of individual workers.."***
- ***"...helps prepare...for an environment of constantly shifting demographics, industries, economies and customer needs by ensuring that people have the expertise and information they need in order to properly assess business problems and opportunities..."***

One of the findings from the previous section is the serious constraint posed by inadequate and insufficient human resources, particularly in the context of haemorrhaging organisation memory due to rapid staff turnover. The justification for Knowledge Management is that it is a tool for dealing with just this kind of problem and related situations such as:

- ***"Too often one part of an organisation repeats work of another part simply because it is impossible to keep track of, make use of knowledge in other parts of an organisation."***
- ***Productivity and opportunity loss [due to] a lack of knowledge where and when it is needed in a useable format."***
- ***Information overload [because of] too much unsorted and non-targeted information."***
- ***'Knowledge is Power' mentality [caused by] misunderstanding that sharing of knowledge will lead to a reduction of personal power."***
- ***Knowledge attrition; according to some estimates, the average organisation loses half its knowledge base through turnover of employees, customers and investors. Due to the intangibility of Knowledge Management, there is no unit to measure the loss...on account of...an employee leaving the organisation."***

As we move rapidly into the 'Knowledge Society' era, Knowledge Management could be recognised as an essential a component of a manager's or a decision-maker's 'tool-kit' as the laptop, cell phone or personal digital assistant is today.

45. Soraya Abad-Mota, from her Databases and Portals for Knowledge Management article in ***Digital Libraries and Virtual Workplaces: Important Initiatives for Latin America in the Information Age***, (Reenen, 2002)¹⁹ recognizes that:

- ***"Databases and portals⁸ are two key elements of IT with the potential to provide appropriate access to the vast amounts of online data existent in an organisation today in a dynamic and organized manner."***

⁸ A portal is an overloaded term used to describe, among other things, a bundle of services provided electronically, through the web, to a set of users.

UNESCO's "Webworld" Gateway, www.unesco.org/webworld/index.shtml (see Annex 17), is an example of a portal-type website designed to advance that organisation's capacity for sharing the accomplishments of its own Information Society initiative. A more useful example for the IDSD project is best represented by the OAS Education for the Americas Portal (see Annex 18). Carlos Paldao, of the OAS' Inter-American Agency for Cooperation & Development (IACD) that sponsors this mechanism, writes in his *An Open Door to Education in the Americas* article (Reenen, 2002):

- ***"The Education Portal of the Americas is a clearinghouse of information for students, teachers, researchers, government officials and others who would like to access quality information regarding the Hemisphere's best distance learning programmes and scholarship opportunities from one central location. It is a tool to help all individuals interested in improving their personal and/or professional development."***

The EPA was developed by the IACD as part of the mandate given to the OAS by the Plan of Action stemming from the Third Summit of the Americas and the resulting Connectivity Agenda for the Americas. Portals, when compared to other Internet and web applications for the diffusion of information, may offer the best model for the proposed IDSD project's information dissemination objectives.

Towards Establishing Proactive National and Regional IT Policy Frameworks

46. One of the first policy frameworks for the formulation of National Information Infrastructures (NII) that could then allow for the formation of a Caribbean Regional Information Infrastructure (RII) was proposed by the UNSTD's *Report of the Working Group on Information Technology and Development*, in Mansell & When's 1998 bible of the Knowledge Society 'movement' (see Annex 19). The Working Group's report concluded that governments and other stakeholders must be called upon to design new roles for the public and business sectors to enable ICTs to be harnessed to economic, social, and environmental development goals. A summary of its recommendations is that:

- ***Each developing country and country in transition establishes a national ICT strategy. Where such strategies already exist, they should be reviewed to ensure that they take note of the guidelines proposed by the UNCSTD Working Group;***
- ***Immediate action be taken by national governments to establish a task force or commission or to ensure that another entity is charged with establishing the guidelines for national ICT strategies. Reviews should be undertaken over a six-month period and a report should be prepared by each government outlining the priorities of its national ICT strategy, the mechanisms for continuous updating, and the procedures for implementation of the components of the strategy. Progress on the implementation of this recommendation should be reported to the next session of the Commission in 1999;***
- ***Each agency of the United Nations system reviews the financing, production, and use of ICTs for social and economic development in their area of responsibility. This review should monitor the effectiveness of new forms of partnerships in the ICT area, and address the capability of each agency to provide technical assistance in that area. This needs to happen so that the United Nations System can be in the forefront in helping developing countries and countries in transition to implement their national ICT strategies.***

47. Along with enabling presentations on Barbados' EduTech and Jamaica's TechSchool, as part of the WSIS preparatory process, the January 2003 Digital Diaspora Network-Caribbean (DDN-C) Conference allowed the CARICOM Secretariat and other Caribbean stakeholders to present informative papers on the status of the region's IT use, its policy infrastructure and proposals for its advancement. The remainder of this section offers brief summaries of these presentations, which enable the reader to get a sense of where the region is at present, where we would like to go in the future and some insights on steps we must take to get there.

Caribbean ICT Development: Critical Issues and Challenges, see Annex 20; this presentation by Roderick Sanatan (Manager of Research and Development at UWI's Centre for International Services in Barbados) covered the following topics:

- **Definition and Measurement Issues**
 1. **DEFINING ICTs:**
 - *Traditional definition concerns Voice communication technology linked to the telecommunication network*
 - *Today, reference is to the delivery of a worldwide broadcasting capability, a mechanism for information dissemination and a medium for interaction between individuals and their marketplace for goods and services*
 - *ICTs are not a panacea for development or a replacement for real world processes*
 2. **MEASURING ICTs**

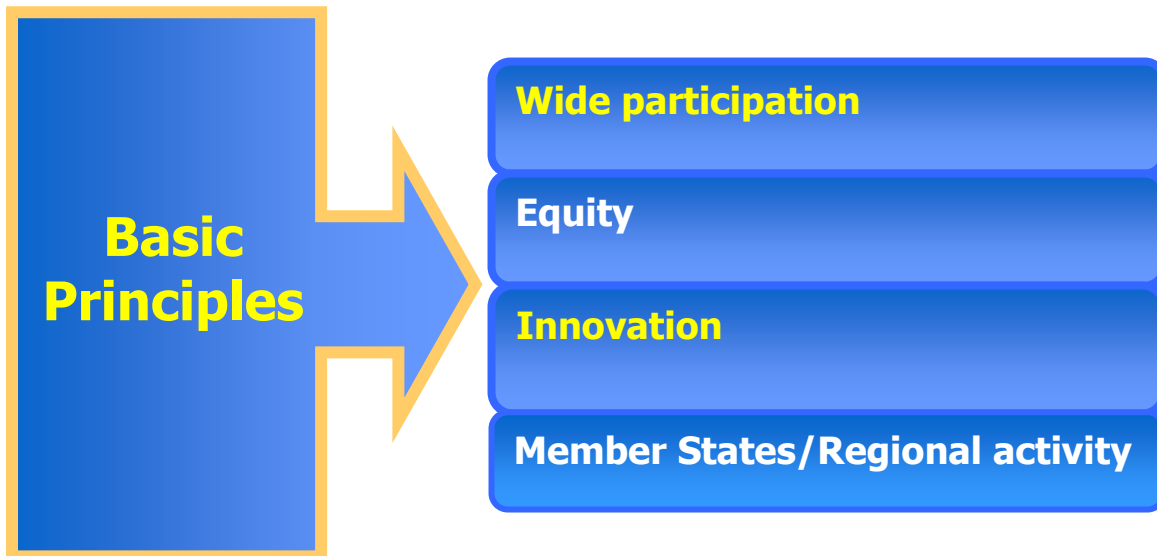
- *Connectivity - physical capacity, infrastructure, pricing, etc.*
- *Access - wider determinants*
- *Policy Environment - systems and applications*
- *Usage - content, absorption, human capacity, investment*
- **Priority Areas for Caribbean Development**
 - 3. **PRIORITY AREAS FOR CARIBBEAN DEVELOPMENT**
 - *Strategic competitiveness of the region using ICT*
 - *Technology diffusion challenge – Investment and human capacity*
 - *External Trade for Services and Manufacturing, ICT efficiency*
 - *Domestic Systems - Regulation & policy, human capacity/education, production - entrepreneurship, business applications*
- **Selected Issues and Challenges**
 - **Technology Shifts**
 - *Internet usage, Mobile shift*
 - **Electronic Commerce**
 - *Legislation and administration, Entrepreneurship, Settlement issues, E-Government systems*
 - **The Digital Divide**
 - *The information society, Vulnerability, Social cohesion, Diaspora linkages*

Sanatan concluded by recommending to regional stakeholders the *judicious* use of indices for ICT measurement, while focusing on *applications* to real development. He also reminded the meeting that ICT offers tremendous opportunities for business *exploitation* and Civil Society *advocacy*. His emphasis on human capacity-building as one of the major suggested priorities for the region concurs with this consultancy's findings.

Caribbean Community (CARICOM) ICT Strategy /Agenda 2003, see Annex 21; this presentation by Ms. Jennifer Britton (Senior Project Officer for Integrated Information Systems at the CARICOM Secretariat) began with her discussion of a "*CARICOM ICT Sector Index*" that described Telecommunications sector liberalisation in the region as being carried out through de-monopolisation within and outside the World Trade Organisation (WTO) context. She also described current legal & regulatory frameworks among CARICOM member states. In reviewing 'connectivity', she stated that penetration in the region is between 20% to 50% of the population for fixed lines; less than 8% for the Internet and under 13% for mobile phones. Major IT use and applications were said to occur in the education, health, energy, tourism, and agriculture sectors; international business & manufacturing; and E-Commerce & e-government. After an overview of the ICT sector in CARICOM's newest member state, Haiti (1 national telecom company; 2 mobile phone operators, Haitians use mobile more than fixed lines; 10 ISPs; 200 private cyber cafés and a rate of Internet penetration that is more than recorded), she gave these highlights of CARICOM's 2003 IT Strategy & Agenda:

- **Rationale**
 - *Quebec City summit – promotion of an Agenda for Connectivity in the Americas.*
 - *CARICOM HOG agreed that the Secretariat through a specialised small working group would promote & advance community guidelines, principles and action with respect to ICT and the CARICOM Agenda for connectivity.*
 - *CARICOM's Secretariat was mandated to present a CARICOM ICT strategy for ratification at the next meeting scheduled for **February 7th, 2003, at Georgetown, Guyana** and a commitment was made to "... further pursue meaningful participation in hemispheric and other policy-making fora on the global information society."*
- **Elements of CARICOM Agenda for Connectivity**
 - **Definition of connectivity**
 - *A society's internal capacity for communication with its global environment through the use of telecommunications, information technologies and the products of its content industries.*
 - **Definition of Agenda for Connectivity**
 - *Individually & collectively move towards expanding access to global knowledge & full integration with the knowledge society*
 - *Promote the modernization of the telecommunications sector*
 - *Establish conditions taking into account national legal frameworks that promote and strengthen free and fair competition in telecommunications services*
 - *Seek out innovative ways of facilitating access to and usage of computers and software in our learning environments*
 - **Participation**
 - *CARICOM Member States, CARICOM Secretariat, CARICOM Agencies, Institutions & Funding partners*
 - **CARICOM Policy Approach Components**
 - *Infrastructure, Utilisation (Applications Software)& Content*
 - *A regulatory framework to support & sustain the development of the Agenda*
 - *Financing options, Importance reflected in macro-economic policies & allocation of public expenditures*

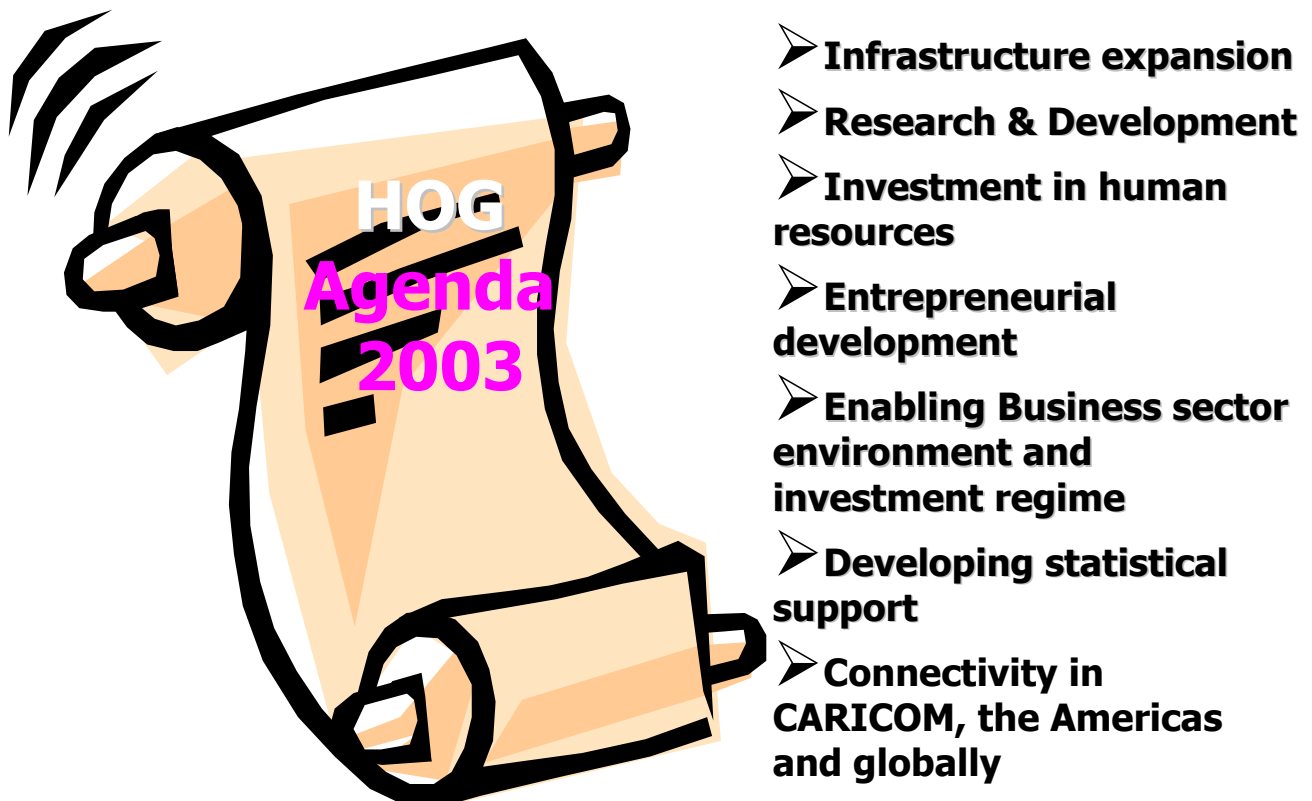
- *Performance Measurement should be shared by Government, Private Sector & Civil society*
- Principles
See graphic below:



Caribbean Community (CARICOM) ICT Strategy /Agenda Principles

- Vision
 - *Must be conceived & executed with 3 sectors of society*
 - *Must be guided by principles of equity and universality*
 - *Promotion of infrastructure use & content development that reflects countries cultural identities.*

See graphic below:



CARICOM ICT Vision

- **Strategies**
 - *Integration & Harmonisation of existing CARICOM efforts*
 - *Analysis & adoption of the best National and international practices*
 - *Creation & reinforcement of alliances*
 - *Establishment of a small working group / Oversight Agency*
 - *Focus groups establishment for collaborative action-Infrastructure, Application & Content*
- **Action Platform**
 - Assessment*
 - *Designated Entity to oversee*
 - *Inventory of national efforts*
 - *Infrastructure (indicators –e.g. Civil society)*
 - *Utilisation (sectors – health, education)*
 - *E- readiness (esp. Legal & regulatory framework)*
 - Planning*
 - *Establish a forum for discussion & agreement*
 - *Define policies/priorities/plans of action*
 - *Nominate a high-level Gov't entity to co-ordinate activities*
 - *Establish short/medium & long-term plans*
 - Execution*
 - *Action will be undertaken simultaneously on five (5) fronts:*
 - *Infrastructure, Utilisation, Content, Regulatory framework & Financing*
 - Evaluation*
 - *Definition of a performance measurement framework that specifically checks:*
 - *Number of/percent of (specific behaviour/response)*
 - *Relevance & validity*
 - *Key performance indicators*
 - *Performance of key processes (activities & outputs)*
 - *Define collection method*
 - *Detail/define who needs to be involved*
 - *Analysis of relationships between categories*

The CARICOM Secretariat has a well-defined agenda that could become one of a number of 'smart' partnerships entered into by the IDSD Project. Besides supporting investment in human resources capacity, there are a number of synergies that could be made to occur, and in particular, the IDSD Project might join with CARICOM to focus on Internet or web applications and content oriented towards the SIDS-POA thematic areas. This would require a close working relationship between the OAS and the CARICOM Secretariat, as already envisaged in the IDSD project design; previous OAS/CARICOM collaborative efforts have led to CPACC/MACC/CCCCC that regional Climate Change programming. There is also an opportunity to collaborate with CARICOM on infrastructure and networking through the Pilot Network component of the IDSD Project.

ICT Development in the CARICOM Countries Discussion Paper, see Appendix 8; this informative discussion paper By Dr. L.A. Nurse²⁰ outlines first the purpose, background and mission of the Caribbean Digital Diaspora Network:

Purpose/Background

- *Convinced of the positive potential of ICT to accelerate economic growth and social development, the UN ICT Task Force, in collaboration with United Nations Development Programme and United Nations Fund for International Partnerships, is embarking on an initiative to contribute to the development process in the Caribbean. The initiative is known as the Digital Diaspora Network for the Caribbean (DDN-C). To achieve its objectives, the initiative seeks to use networking and partnering strategies to build and mobilize a competent community of interest and to identify resources to facilitate the development and implementation of Caribbean ICT – based projects.*
- *It is proposed that a network should be established to mobilize the technological, entrepreneurial, and professional expertise of persons of Caribbean origin, now residing in North America (the Caribbean Diaspora), businesses with a Caribbean orientation, and Caribbean counterparts. While in this phase the focus is on the development of a North American / Caribbean network, it is recognized that it may be expanded in a later phase to include European and/or other countries with appropriate resource and networking capability.*

After discussing the DDN-C's mission, rational and process, Nurse goes on to describe the network's operation and its expected results. The main part of the paper then looks at Caribbean IT strategies, the Status of IT in the region and proposes a Framework for Action with an overview of important issues and challenges to IT development in the Caribbean. Some highlights are excerpted and presented below:

Mission:

- The Caribbean Digital Diaspora Network will be programmed to provide a rich source of ideas, skills and support and to act as a platform for the exchange of information and other resources to create and sustain digital opportunities in the Caribbean

Caribbean Strategies:

Strategic Objectives

The CARICOM Secretariat is developing the ICT strategy for the Caribbean. They have already identified the following strategic objectives.

- Promotion of e-enabled human capital, to enhance human capacity through on-line communities and on-line learning (e-communities)
- An enabling e-business environment for the growth of on-line business (e-business) and creation of new business opportunities.
- Efficient functioning of governmental machinery to build civil society and democratic governance (e-government)

Application of ICTs

To achieve the strategic objectives, implementation of the action plan will target the major sectors of the region's economies, along with some cross-sectoral activities where important to achieving a broader national or regional goal. The application of ICT in the Caribbean will therefore be focused on the following areas.

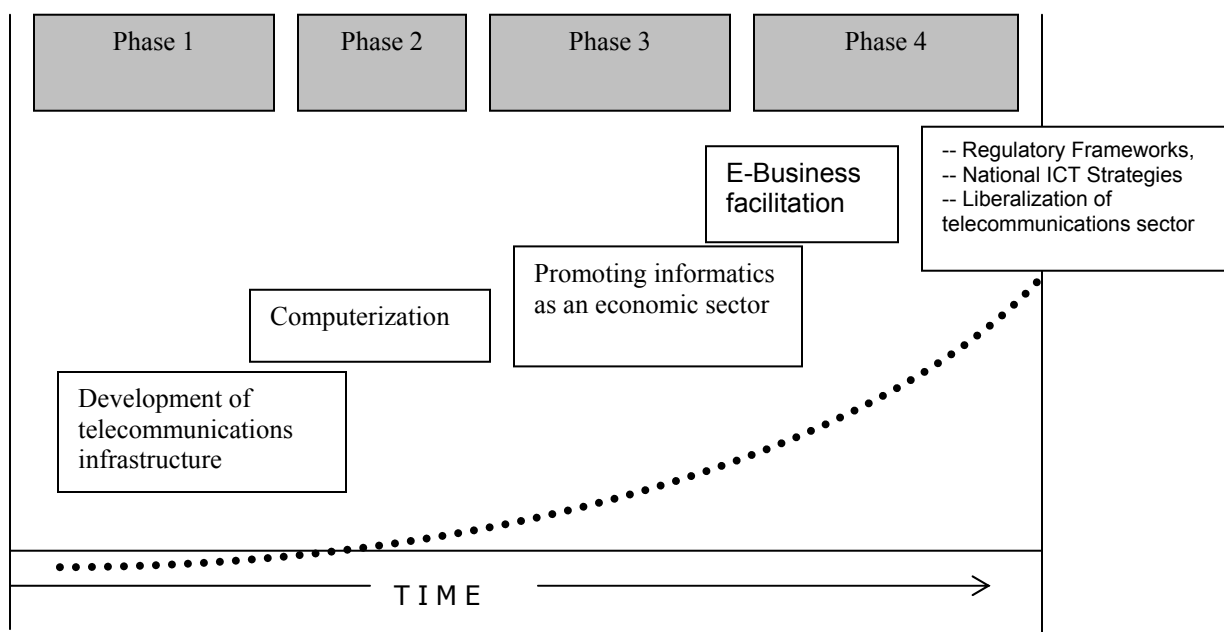
- ICT policy Framework
- Infrastructure, Connectivity & Costs
- Human Capacity development – Education
- Health & Telemedicine
- E-Business Environment
- E-Government for Civil Society & Democratic Governance Economic Opportunities
- Enabling Efficiency & Productivity in the Tourism sector
- Resources for ICT development in the Caribbean
- Developing agriculture with Information.
- Outsourcing
- Culture & recreation
- Economic opportunities
- Environmental Stability
- International Business Services
- Disaster Recovery
- Manufacturing

Current Status of ICT in the Caribbean

Overview

ICT activities in the Caribbean have been developing along a traditional continuum, focusing progressively on telecommunications infrastructure, computerization, development of informatics as an economic sector, and most recently on e-business facilitation. This process may be categorized as a sector enhancement approach. See figure below:

A typology of the ICT Development Continuum in the CARICOM Countries



Teledensity and Access

Teledensity is a measure of basic network capacity, which in turn is a major requirement for Internet access. It is defined as the number of telephone lines per 100 persons in the population. Best estimates by the ITU indicate that Teledensity is still rather low in the CARICOM countries averaging 27.7% compared to 65.51% in Canada and 66.45% in the USA.

Network access is also critical. In the ICT context access requires three main components viz. basic telephone access, PC penetration and Internet access. All are necessary because the Internet currently relies on the telecommunications network for transmission and the PC still provides the main interface to the Internet.

(a) Network Access

Network access can be measured through the statistics on 'household penetration.' The available estimates relate to the wire-line service only, but it must be remembered that the growth of mobile service will eventually modify the significance of the term 'household penetration'

(b) Penetration of PC's

On average there are only 9.14 PC's per 100 persons in the CARICOM Countries, which while being above the average for The Americas as a whole, contrasts very unfavourably with estimates for the leading countries of 40.31 PC's per 100 persons in the Canada and 62.50 in the USA.

(c) Internet Access

Table 2 also provides the ITU estimates of the number of Internet users in the CARICOM countries. The contrast with the USA and Canada is similar to that observed for PC penetration. For instance whereas there are approximately 2,014 users in Canada and 5,015 in the USA for every 1,000 inhabitants, the average for the Caribbean is only 507.96.

However it can be seen that there is not a linear relationship between PC penetration and the number of Internet users. There is a perception in the Caribbean that this is very much related to the cost of service provided by the ISPs, and to the extent to which the internet is used in business processes where there will be multiple users per service.

Legal and Regulatory Framework

Only Jamaica may be said to have developed and proclaimed a national ICT policy. Antigua, Barbados, Grenada, Guyana, St. Lucia and Trinidad and Tobago are understood to have drafts under consideration. The position of the other countries is unclear. However, it is questionable whether countries should try to pursue this path alone. Therefore it is now accepted that a more efficient and cost effective strategy would be to develop a regional approach. The countries have therefore put in place a CARICOM mechanism for determining a regional ICT policy.

The process has so far included the following:

- i. The 13th Heads of Government Meeting in Georgetown Guyana recognized the potential of ICT for enhancing and integrating Caribbean societies in education, health, poverty reduction, delivery of public information and governance. All these principles are enunciated in the CARICOM Charter of Civil Society.
- ii. Accepted recommendations of the special meeting of CARICOM Ministers responsible for information, communication and or technology from their June 2000 meeting in Antigua & Barbuda. These recommendations related to a process for outlining policy, agenda and strategy for development of ICT in the CARICOM region.
- iii. Mandated the CARICOM Secretariat to present the CARICOM ICT strategy for consideration at its 14th meeting scheduled for February 7th, 2003, in Georgetown, Guyana.

Policy Framework for the Caribbean

Setting the Agenda

The following processes among others will therefore influence the policy framework:

- The WTO negotiations
- The UN Millennium Development Goals (MDGs)
- The Summit of the Americas process
- The Proposed CARICOM ICT Strategy (to be presented at the 14th Inter-sessional Meeting in early 2003).
- National ICT policies

Each of these processes will be driven by its own specific goals, and its own 'raison d'être'. There is however a point of convergence. That point is the resolve that ICT should be pursued not simply as an end in itself, but more importantly as a catalyst for human social and economic development, notwithstanding the fact that it is also an area of dynamic business activity.

- This position emerges partly from the realization that the difference between developing and developed countries is not only reflected in, but is also being exacerbated by the dramatic shift from a global income divide to a global knowledge divide. The modern development process is therefore being driven more by the harnessing of knowledge, rather than by simply managing production. ICT, the enabling process, will therefore be required to play an increasingly more crucial role in the development of developing countries.

Policy Forums

- As indicated earlier, the eventual ICT policy of the CARICOM countries will be greatly influenced by the agendas of the several forums to which the region is a party. Significantly, all of these recognize that ICT will play a defining role in the development process. ICT has therefore been a subject of special focus in the international, hemispheric, regional and national development policies and agendas which impact on the Caribbean.

(a) The Summit of the Americas process

At its Montreal meeting the development agenda was prefaced with the following statement regarding connectivity.

"We, the democratically elected Heads of State and Government of the Americas, meeting in Quebec City⁹, recognize that a technological revolution is unfolding and that our region is entering a new economy, one defined by a vastly enhanced capacity to access knowledge and to improve flows of information. We are

⁹ The 2001 Summit of the Americas held in Quebec, Canada 2001

convinced that the promotion of a Connectivity Agenda for the Americas will facilitate the beneficial integration of the hemisphere into an increasingly knowledge-based society. We share the goal of providing all citizens of the Americas with the opportunity to develop the tools to access and share knowledge that will allow them to fully seize opportunities to strengthen democracy, create prosperity and realize their human potential. Connectivity will open new opportunities to our society in all areas, for which equal access and appropriate training are necessary."

A connectivity agenda was also outlined as follows:

- 1) Individually and collectively move towards expanding access to global knowledge and full integration with the knowledge society
- 2) Promote the modernization of the telecommunications sector
- 3) Establish conditions taking into account national legal frameworks that promote and strengthen free and fair competition in telecommunications services
- 4) Seek out innovative ways of facilitating access to and usage of computers and software in our learning environments

(b) The CARICOM Strategy

In a communiqué following the most recent meeting¹⁰ it was reaffirmed that the CARICOM Heads of Government:

"... Recognized the potential of information and communications technologies (ICTs) for enhancing and integrating our societies in areas such as education, health, poverty- reduction, delivery of public information and governance – objectives articulated in the CARICOM charter of civil Society. They also noted the potential (of ICTs) for transforming our economic landscape, growing the CSME and advancing the regional trade agenda, by increasing competitiveness in services and seizing opportunities offered by e-commerce. The heads are however not unmindful of increasing challenges the digital revolution has posed for smaller economies such as ours, underscoring the need for a regional approach.

The CARICOM Secretariat was mandated to present a CARICOM ICT strategy for ratification at the next meeting scheduled for February 7th, 2003, in Georgetown, Guyana, and a commitment was made to

"... further pursue meaningful participation in hemispheric and other policy-making fora on the global information society." Special mention was made of:

- a. Full participation in the hemispheric ICT process under the OAS through the Inter-American Telecommunications Commission (CITEL); as outlined at the Quebec meeting, detailed in this report
- b. Participate fully in the global process working with the European Latin America& Caribbean alliance for information Society. (IEU-LAC)
- c. Cooperate with the UN task force for information society set up by Secretary -General Kofi Annan.

Policy Summary

It is therefore clear that development of a Caribbean ICT policy framework is in process. The outstanding features and overall principles may be summarized as:

- Participation in regional, hemispheric and global strategies for development of the information society.
- Implementation Process requiring:
 - The support and participation of civil society i.e. The private sector, the public sector, NGOs and the general population.
 - A forum where the players can participate in formulating policies, defining priorities, strategies, and plans of action.
 - A high-level government entity empowered to coordinate the short, medium, and long-term.
- A high level national executing agency to manage the planning, executing, and financing processes. The process should involve the entities responsible for defining economic policy and budgetary allocation at the applicable central, regional and sub-regional levels.
- A long-term commitment extending at least ten years

ICT Issues and Challenges

Impact on Existing Activities

Potential for Development

However, in striving to benefit from this potential offered by ICT, a number of critical issues must be addressed. The issues include:

- | | |
|------------------------|--------------------------------|
| i. Connectivity | iv. Resource allocation |
| ii. Skills Development | v. Bridging the digital divide |
| iii. Content | |

Connectivity

Skills Development

- Next to providing connectivity and access, skills development must be made a critical component of the ICT strategy. This issue is most important in areas where basic literacy is low. Even in countries with high literacy, e-literacy will be a necessary objective of skills development. However, basic literacy and e-literacy need not be treated as separate processes.
- For Example, pupils using laptops in the classroom, or a classroom with an interactive whiteboard connected to a computer and to the Internet, can simultaneously facilitate teacher and student input, intellectual stimulation, creativity, downloading of content from the internet, and distance learning. All of the major learning processes, especially the cognitive and affective, are therefore integrated and need only to be managed through good lesson plans. Smart Technologies website (www.smarttech.com) among others provides guidance for teachers on how to use this type of technology in the classroom.

¹⁰ The 23rd meeting of CARICOM Heads of Government held in Georgetown, Guyana July 2002. At this meeting a document was presented by the Secretariat outlining strategy for development of a CARICOM ICT policy.

- If ICT can be incorporated into the education processes and classroom methodologies, especially at an early point in the educational cycle, a smooth and effective solution would have been achieved. The EduTech programme being implemented by the Ministry of Education in Barbados is an example of this approach.

- A comprehensive ICT skills development strategy will not be confined to the classroom and will require development of both end-user and technical skills. The end-user skills would include basic keyboarding skills, net literacy, handling ICT, hosting information, retrieving information etc. The technical skills would revolve around the development, management and maintenance of hardware and software systems and of course networking and connectivity.

Content

- The next important issue and challenge in developing a comprehensive ICT policy relates to content. Content must be understandable not only to highly trained professionals but also to the average citizen in the community. For example, a farmer in a rural community could also benefit directly from information about market prices for his products, best agricultural practices for the crops he produces, or the latest government assistance programmes for farmers without awaiting the uncertain visit of an extension officer. Therefore the way information is presented through ICTs will also be an important factor.

- This will have implications for the development of content in a contextual framework, including where possible, in the local language or idiom. In addition, content need not be restricted to written-text format, as in many communities voice data or graphics may be the most effective communication tools. Moreover, the use of culturally relevant icons in the software and hybrid voice/text technologies would be a distinct advantage. These factors will in turn have a linkage effect to the skills training programmes and also present business and or career development opportunities for programmers and developers.

Resource Allocation

- The deep linkages and interrelationships between ICT and all sectors of the economy have been established; consequently an effective ICT programme should be developed within a strategic planning framework. Governments therefore will need not only to spell out the vision, but also to break that vision down into manageable components with specific targets and time frames for each. This in turn would lead to rational resource allocation in a logical developmental framework.

- Each country's sustainable development needs should determine the national strategy in each case. Furthermore at the national level, Governments need to demonstrate the political will to incorporate more ICT into the operational and other aspects of governance (e-government), and to allocate appropriate resources for achieving this objective.

- In addition to governments' resource allocation strategy and deployment of ICT, the business sector, NGO's and international organizations will be required to contribute resources. This in turn is likely to lead to new business opportunities to be explored by the private sector participants.

Bridging the Digital Divide

- Another major issue, the digital divide, exists at two levels. Firstly it can be observed within countries i.e. at the national level and secondly between countries, i.e. at the international level. The most dramatic manifestation of the digital divide, however, is at the international level between developed and developing countries. It is precisely because of this that international intermediary organizations, e.g. The UN agencies, World Bank, Inter American Development Bank, will be required to play a major role in helping to bridge that digital divide.

Fortunately, the issue of the digital divide is at the top of the international political and economic agenda. This is reflected in:

- The adoption of the Information Society Charter by the G-8 countries at the Okinawa Summit in July 2000
- The United Nations Economic and Social Council establishing a Task Force on ICT and Development.
- The Proposed World Summits on "information society" scheduled for 2003¹¹ and 2005.
- The establishment of the Infodev programme by The World Bank for identifying, developing and supporting fundable ICT projects in eligible member countries.
- The FTAA process has outlined a connectivity agenda for the hemisphere of the Americas, with implementation to be managed by The Inter-American Telecommunications Agency (CITEL).¹²

In addition to the policy positions, practical initiatives have also been created to address this issue. Some of these specifically target the Caribbean basin and/or the hemisphere. The Caribbean countries should actively seek to benefit directly from these.

- UNDP's Sustainable Development Networking Programme (www.sdn.undp.org)
- World Bank's Global Development Network (www.gdnet.org)
- The Global Knowledge Partnership (www.globalknowledge.org). This is an informal partnership between public sector, business, NGO's and international organizations including UNDP and the World Bank.
- World Bank's Global Information and Communication Technologies Department of the IFC. (GITC) (<http://info.worldbank.org/ict/policy>.)
- Institute for Connectivity, a department within IDRC – Canada. This capability was established by Canada as a contribution to the Summit of the Americas process. It assists with developing and financing qualifying ICT projects in the developing countries of the hemisphere.

48. The review of IT policy frameworks in the context of Caribbean IT Training & Capacity-Building has indicated that after connectivity, the issue of education and training may be considered the next highest regional priority. However, it is important to recognise that in order for the Caribbean to move effectively

¹¹ The 2003 conference is presently proposed for December 2003, in Geneva, and expected to be at the level of Heads of State and Government. The process leading up to the summit includes four regional preparatory conferences. The World Summit on Information Society (WSIS) regional preparatory conference for Latin America and the Caribbean took place in Bavao, D.R., the 29-31st of January 2003.

¹² CITEL has already started working with the CARICOM Secretariat on devising a regional connectivity strategy.

to address this almost universal cry, the requisite national legislative and institutional arrangements must be in place and in harmony with the regional administrative framework. The recommendations and guidelines from the UNSTD Working Group on IT and Development are still relevant and could form a template for a course on National ICT Policy formulation. CARICOM has elaborated a coherent strategy agenda that has been detailed by Britton and endorsed by Nurse in his DDN-C paper. Taking note of the indicators in the DDN-C paper, they are the type of measuring instruments required to ascertain regional use and assist in decision-making for all stakeholders¹³. With the development of a Caribbean ICT policy framework in process, the IDSD project could undertake to specifically support its advancement through training interventions. And, in the context of building regional environmental information management capacity, may wish to explore the sponsorship of a GEF project as a longer term partnership with the region. Before the closing section on a proposed action strategy for the IDSD project, a summary of some guiding principles for stakeholder decision-making is included in the next section.

➤ **Suggested Stakeholder Principles for Sustainable IT Training & Capacity Building Policies**

49. The concept of e-Governance has become recognised as the new emerging paradigm that is meant to encompass steps and procedures for administering the Knowledge Society and making decisions in a participatory and transparent manner using IT. Several instructive sets of guiding principles or processes for establishing rational decision-making for e-Governance are reviewed in this section; they include experiences from UNESCO, the Commonwealth Network of Information Technology for Development and a Workshop for the Exchange of Experience on Social Appropriation of New Information and Communication Technologies for Development in Latin America and the Caribbean. Finally, based on data gathered during this consultancy, a matrix is offered for evaluating whether a proposed investment in capacity is needed and cost-effective for certain desired IT applications.

UNESCO E-Governance Survey

50. Taken from UNESCO's Webworld gateway, a recently completed survey (see text box below) offers some insights into practical e-governance experiences:

¹³ One of this consultancy's outputs is a methodology for the development of indicators and the definition of such indicators that can reflect the status of generation and use of information in individual countries and that are capable of measuring progress in this area. The Teledensity indicators (basic telephone access, PC penetration and Internet access) are useful in that respect as well.

UNESCO E-Governance Survey Text Box

E-Governance Survey of 15 Countries

Key Finding

The "push" for public service reform has brought in its wake the pervasive harnessing of ICTs to achieve administrative and social goals. A key feature driving this reform is public pressure for increased accountability and value for money in public service operations. This is one of the findings of a study including 15 country abstracts providing an initial snapshot for countries chosen to represent different situations in each of UNESCO's region.

E-Governance Government Initiatives:

- **Development of cyberlaws**
- **Liberalization of telecommunications**
- **Plans for e-government**
- **Plans for the development of an info-society**
- **Deployment of community e-centres**
- **Instances of public feedback to statements of direction, draft legislation and so on**
- **Web-sites of government agencies, particularly if these offer value beyond a public relations image.**

Special Case of Islands and Small States:

- With unique challenges and opportunities [for Islands & Small States]...the traditional issues of economic vulnerability and geographical isolation are exacerbated in the digital era by lack of critical mass in terms of service provision and sweeping globalization.
- And yet these countries are facing the greatest opportunity, in relative terms. Government in these environments is often effectively a single-layer central administration, and there is an opportunity to tap into wider virtual markets. Access to information and education through ICTs is potentially vast, relative to the national supply, and planned seamless information and technical infrastructure building are within relatively easy reach.
- All this enables a leap-frogging of social and economic development into the digital age, given the political and managerial leadership and foresight.

SOURCE: [John Rose \(j.rose@unesco.org\)](mailto:j.rose@unesco.org), UNESCO, Information Society Division. News article "Country Profiles for e-Governance" on the Webworld gateway (<http://www.unesco.org/webworld/index.shtml>); Results of the Commonwealth Network of Information Technology for Development (COMNET IT)/UNESCO Global Survey on On-line Governance published in 2000.

The main justification for the survey comes from today's aware and information-hungry public. Worldwide, citizens have been empowered by their timely access to data on Government policies, proposals and operations. So the push is on to use IT for decision-making in the broadest sense: Involving citizens and the public in 'on-line' civic, social and administrative endeavours. The lessons arising from this survey may be for governments and civil society to gain insight into what kinds of initiatives are being carried out globally, as well as to assess their effectiveness. The global E-Governance government initiatives are: (1) Development of cyberlaws; (2) Liberalization of telecommunications; (3) Plans for e-government; (4) Plans for the development of an info-society; (5) Deployment of community e-centres (Telecentres); (6) Instances of public feedback to statements of direction, draft legislation, etc.; and (7) Web-sites of government agencies, particularly if these offer value beyond a public relations image. Recognition is given to the special case of Small States and Islands in that size is a disadvantage in today's telecommunications-driven world that requires private sector inputs driven by profits based on volume of customers. However, given less bureaucratic government structures and rapid technology changes leading to ever cheaper products, small states and islands may be able to put these factors to their advantage if they utilise a planned approach for establishing seamless information structures and build the appropriate technical infrastructure. The idea is that later digital age entrants can learn from past experiences and therefore 'leapfrog' into the new global information order; the caveat is that political will and managerial expertise are prerequisites.

e-Government Principles from Malta

51. A useful set of principles was put forward in an article by Damian Xuereb (e-Government Technical Programme Manager, Ministry for Information Technology & Investments, Government of Malta; E-mail:

damian.xuereb@gov.mt), in the COMNET-IT¹⁴ Forum (www.comnet-it.org). They offer a comprehensive five part set of E-Government principles for national decision-makers (see Annex 22). The headings for five elements and their respective principles have been placed in the text box below:

Malta e-Government Principles Text Box

ESTABLISHING STRONG PRINCIPLES

1. Leadership
2. Technical skills
3. Business acumen
4. Support across the board

BUILDING THE FOUNDATIONS

5. Objective policy
6. Centralisation of funds

THE TECHNICAL SIDE

7. High speed networks
8. Data vaults and unique identifiers
9. Integrated processing & storage
10. Reusable components

MONITORING

12. Centralised administration
13. Resilience
14. Setting the alarms

IMPROVEMENT

15. Planning ahead
16. Re-engineering or re-inventing

Beginning first with the need to establish strong principles, Mr. Xuereb explains that effective leadership at the highest levels is essential; that the importance of local technical skills cannot be minimised; that good business acumen must be brought to bear; and that support must be sought and gained from national stakeholders 'across the board' before going forward. The second area of the Malta e-Government prescription deals with the need to build appropriate foundations for a national e-Government process by first of all getting the policy right, meaning it must be balanced and address the needs of the nation; further, he suggests that the centralisation of funding will ensure coordinated sustainability of the initiative. Thirdly, the overall technical requirements are covered by recommendations for: High-Speed Networks, robust Data Vaults and Identification mechanisms, Integrated Processing & Storage and the employment of Reusable Components for economy and efficiency. The fourth part concerns monitoring and oversight of the infrastructure through building centralised administrative structures and policies that will foster the resiliency required for on-line operations across a myriad of departments and agencies; this centralised approach must, however, have the systems in place to alert the managers and technical staff at the first instance of any difficulty. The fifth and final area covered by Mr. Xuereb is a call for constant improvement through always planning ahead in this rapidly changing milieu going through regular re-engineering or re-inventing of the resulting policy framework and its constituent hardware, software and human resources.

Letter to Aunt Ofelia: Seven Proposals for Human Development Using New ICTs

52. One of the better sets of decision-making codes comes in the form of a letter to a mythical "Aunt Ofelia" who has recently been appointed Secretary of Communications in a Latin American country. This approach allowed the authors to use their creativity in crafting proposals for taking better advantage of the opportunities for human development in the region offered by ICTs. They were prepared by Ricardo

¹⁴ The Commonwealth Network of Information Technology for Development (COMNET-IT) is an international foundation sponsored by the Commonwealth Secretariat and the Government of Malta. It resources its activities through a network of collaborators and agencies including institutions represented on its Board, which act as operational centres providing primary expertise and support.

Gómez¹⁵ and Benjamín Casadiago¹⁶ as the result of a workshop involving three-dozen specialists who met in Cajamarca, Peru in March 2002.¹⁷ These self-explanatory proposals are a useful contribution to the ongoing debate over the use of new technologies for human development, understood by the authors to mean *promoting democracy with social justice, economic prosperity with equity, and realization of the full human potential*. They close with this saying: ***In the end we ask ourselves, from a human development perspective, what is the usefulness of the Internet?***



Letter to Aunt Ofelia: Seven Proposals for Human Development Using New Information and Communication Technologies



1. OFFER CONCRETE SOLUTIONS: *Connectivity is not an end in itself, but it is a Tool that can help find concrete solutions to people's problems and needs.*



2. MOVE FORWARD AT THE PACE OF THE COMMUNITY: *Development projects take time and they generally work better when done in a manner consistent with the timing and pace of the communities involved.*



3. LEARN FROM MISTAKES: *It is usually very hard to evaluate the positive and negative results and the real impact that ICTs have on human development.*



4. LOCALIZE GLOBALIZED COMMUNICATION: *ICTs and development projects must be firmly rooted in people's local reality, their organizations, their customs and their culture.*



5. WORK WITH A GENDER PERSPECTIVE: *Working with a gender perspective means taking account of the differences that exist in our society in the relationships between men and women*



6. LET PEOPLE SPEAK WITH THEIR OWN VOICE: *What is important is to learn to communicate the way people communicate.*



7. GENERATE NEW KNOWLEDGE: *ICTs can play an important role in human development, to the extent that they become tools for generating useful new knowledge and contributing to the transformation of our reality.*

Technology/Capacity/Application Matrix

53. The following matrix tool is offered as a subjective approach for quickly determining if the associated investment in institutional capacity for delivery of a desired IT service or tool is appropriate, as well as sustainable, in the context of certain specific decision-making applications. The methodology is borrowed from the qualitative evaluation matrix employed in the field of Environmental Impact Assessment and hinges on estimating the capacity 'impact', in terms of human resources, infrastructure & finance, that a desired IT mechanism may cause. Some suggested uses for Caribbean Sustainable Development IT stakeholders are as follows:

¹⁵[1] Ricardo Gómez is coordinator of the PAN Americas Program, International Development Research Centre, IDRC, Canada. www.idrc.ca/pan

¹⁶[2] Benjamín Casadiago is Director of the Fundación Raíces Mágicas, Colombia. Mincho@soon.com

¹⁷[3] Workshop for the Exchange of Experience on Social Appropriation of New Information and Communication Technologies for Development in Latin America and the Caribbean organized by ITDG (www.itdg.org.pe), Cajamarca, Peru, March 2002. Although many people participated in the discussions and commented early drafts of this document, the final responsibility for its content is with the authors. Available at www.idrc.ca/pan/ricardo/publications/ofelia.htm

1. Certain applications, such as information sharing and coordination, can be accomplished via email or a network or a portal. However, the capacity implications of choosing one over the other differ markedly.
2. Alternately, if one is desirous of a video-conferencing service, e-mail's institutional capacity requirements, though lower, simply won't enable you to deliver the 'goods'.
3. Another use of this exploratory technique would be to determine the associated Human Resource requirements of an expected decision-making application; for example, if you don't have trained staff who are capable of utilising and programming in SQL (structured query language), a 'high' human resource is required, then don't decide to get that fancy new database even if you can afford it. You would need to be aware of the linkage between operating and maintaining the database and your current or anticipated human resources.

Matrix for the Qualitative Determination of Appropriate Institutional Capacity for Desired IT Service and Application

(* = Low; ** = Medium; *** = High)

<i>SERVICE</i>	<i>INSTITUTIONAL CAPACITY NEEDED</i>			<i>APPLICATIONS</i>
<i>Functional Use of Technology</i>	<i>Human Resources</i>	<i>Infrastructure</i>	<i>Finance</i>	<i>SD Decision-Making Areas</i>
Email	*	*	*	Information sharing, Coordination
Website	**	*	*	Information sharing, Public Awareness
Database	***	**	**	SIDS-POA & MEAs Monitoring, Other Regional & Local Indicators; GIS; Training; R&D, Knowledge Management
Networking	**	***	***	GIS, Training, R&D, Knowledge Management, Coordination
Portal	**	***	***	Training, R&D, GIS, Knowledge Management
E-Learning	***	**	**	Training, R&D, GIS
Video-conferencing	**	***	***	Training, Information Management, Coordination
E-Commerce	**	***	**	Training, Financing, Distribution

This matrix could also assist decision-makers and other stakeholders in assessing the implications of acquiring a particular technology to implement a Sustainable Development IT programme.

➤ **The Immediate Way Forward: A Proposed IDSD Project Action Strategy**

Recommended IT Training Packages

54. In order to promote the effective use of information technology tools and the efficient management of information technology in the Caribbean, two training packages are recommended based on the findings of section 3.2, research carried out during this consultancy and consultations with stakeholders as well as project participants. The first training package (see IT Training Package text box) is oriented towards promoting the effective use of IT tools and begins with basic computer literacy and goes up to technical mastery. The beginning course component of this package can be implemented immediately almost anywhere in the region. However, the second and third levels require certification exams and might have to be done virtually or in a country that has the facilities and/or certification programmes. The establishment of an IDSD portal with e-Learning capabilities could allow the Level 1 Computer Literacy course to be taught on-line. The active collaboration of UWI-DLIS should be sought along with UWI's Distance Education Centre and territorial campuses to provide venues for any required classroom on-line interaction and follow-up.

IT Operations Training Package

- **Level 1. Basic Computer Literacy for Administrative & Support Staff**
Training in full functionality of combination software packages for proficiency in operating Word-Processing, Spreadsheet, Database & Presentation programmes.
- **Level 2. Network/PC Literacy for Technical Operations & Maintenance Staff**
Training for IT and MIS Technicians in networking hardware and software installation, operation & maintenance (A+ Certificate); and
- **Level 3. Network Operator for IT Unit/Department Managers or Database Administrators**
Training for Network Managers in: Networking (i-Net +, Network +, Security & Microsoft SQL. Minimum: i-Net+ Certificate; Recommended: Network+ & Linux+ Certificates. Advanced: Microsoft Certified Systems Engineer (MCSE)

The second package is a smorgasbord of courses, some representing training needs identified earlier. They are suggested for the strengthening of regional management capacity to enable the efficient administration of databases, networks and the Internet. An E-Government course, perhaps in association with CARICAD's on-going programme, is suggested for government official at the highest level possible. Serious constraints posed by inadequate and insufficient human resources, particularly in the context of the negative impact of haemorrhaging organisation memory due to rapid staff turnover, one of the mission/survey findings, is the justification for a Knowledge Management course. Portals, and their related digital libraries, are recommended as the best tool for IDSD project information dissemination and a course in their development & management should be a priority. The National ICT Policy development course is also an urgent need in the region, and UN-ICT could be partnered with the project in providing a learning intervention for senior regional policy & decision-makers. In carrying out the Sustainable Development Indicators & Statistics for Decision-Making course, besides the UNSD, the project can investigate a partnership with the UN University' Institute of Advanced Studies that has a related project (www.ias.unu.edu/research/scitech.cfm), see Annex 23. The GIS course is recommended, due to the utility of this software and the regional demand for training in it, for regional agencies associated with Environmental Management; UWI's St. Augustine & Cave Hill campuses and the Institute for Marine Affairs in Trinidad have GIS training and management capabilities. Except for the WIFI course, the region has institutions that are capable of delivering all of these courses. They could be delivered in the form of short seminars and would require, in and some instances oversight or sponsorship by university-level instructors. An alternate method of delivery would be for the IDSD project to sponsor the formulation of these IT management training courses as e-Learning modules that could be accessed on the project's website via a proposed portal.

IT Management Training Package

- **E-Government Principles & Practice**
- **Knowledge Management for Knowledge Societies**
- **Development of Portals & Digital Libraries**
- **National ICT Policy Development & Management**
- **Using Sustainable Development Indicators & Statistics for Decision-Making**
- **Geographic Information Systems (GIS) for Environmental Decision-Making**
- **Managing Local Area Networks-LANs & Wide Area Networks-WANs**
- **Managing Email, the Web & the Internet**
- **Open Source & Proprietary Software Management for Networking**
- **Security Management for IT Systems & Infrastructure**
- **Wireless Fidelity (WIFI) Networking Technology & Management**

Short to Medium Term Action Strategy

55. The table below and following discussion outlines the proposed Short, Medium & Long term elements of an IDSD Project strategy consistent with the findings of this consultancy.

IDSD Project Action Strategy: Focusing on Key Regional IT Training & Capacity-Building Needs

<i>Timeframe</i>	<i>Project Activity</i>	<i>Key Regional Training Area</i>	<i>Key Regional Capacity-Building Area</i>
On-going since May 2003	Website Focus	SIDS-POA Pilot Issues & Themes Education, Sustainable Development (SD) Education, Information Science & Technology Education	Information Dissemination & Public Awareness, Connectivity Advocacy, Civil Society/NGO Participation
Developed at May 2003 meeting	List-serv	Project Communication & Coordination	Project Partnerships, Information Sharing
Immediate, July-September 2003	Establish Collaborative Partnerships	National Ministries of Education, Natural Resources & Environment, Information or IT and Planning/Development Cooperation; UWI-DLIS; Private Sector (National, Regional & Global); OAS Education Portal (www.educoas.org); UNESCO Communication & Information in the Knowledge Society Gateway (www.unesco.org/webworld); UNU IAS (www.ias.unu.edu); Commonwealth Network of Information Technology for Development (COMNET-IT)	<u>Regional</u> CARICOM Secretariat, OECS Secretariat, CCA/CREP-REIN, CARINFO, CIVIC, UWI-DLIS, CARICAD <u>International</u> OAS/IACD, ITU-Caribbean, UNECLAC-POS, UNEP-CAR/RCU, UNDP SDNP & SIDSNet, UN-WSIS/ITU, <u>Private Sector</u> Caribbean Tourism Organisation Caribbean Association of Industry & Commerce
Immediate July-October 2003	Training Workshop Planning	E-Government Principles & Practice Development of Portals & Digital Libraries National ICT Policy Development & Management Development and Management of Databases Managing Local Area Networks-LANs & Wide Area Networks-WANs Managing Email, the Web & the Internet Geographic Information Systems (GIS) for Decision-Making Open Source & Proprietary Software Management for Networking Security Management for IT Systems & Infrastructure Using Sustainable Development Indicators & Statistics for Decision-Making Wireless Fidelity (WIFI) Networking Technology & Management Knowledge Management for Knowledge Societies	IT Research & Development National Policies & Institutional Capacity Arrangements Regional & Global Resources Coordination Science & Technology Transfer SD Statistics & Indicators
Short to Medium term, 2003-2005	Caribbean IT Knowledge Portal	E-Literacy, E-Learning, E-Commerce, MEAs Monitoring (National, Regional & Global), Regional SD Digital Library, Caribbean IT Skills Virtual Registry & Exchange	Human Resources Development, Financing, Partnerships, SIDS-POA Collaboration, Caribbean SIDSNet Guidance & Oversight
Medium to Long term, 2004-2009	CARICOM/OAS/UNDESA/UN-ICT GEF Information for Sustainable Development project formulation, assessment & development	MEAs Monitoring (National, Regional & Global), Regional SD Digital Library, Caribbean IT Skills Virtual Registry & Exchange	National Policies & Institutional Capacity; Regional & Global Resources Coordination; Science & Technology Transfer SD Statistics & Indicators

Collaborative Partnerships

IDSD is being executed by the OAS in conjunction with the UN Department of Economic & Social Affairs (UN-DESA), and the DDN-C is also a UN sponsored very 'smart' partnership that includes the UN-ICT. As the acknowledged UN-level agency responsible for administering many aspects of global information policy and facilitating the WSIS process, UN-ICT would be a good partner for planned IDSD project activities. All this is to say that IDSD could seek out work with the DDN-C, perhaps through DESA or UNSD, to support the project's work plan. In collaboration with CIVIC, CARINFO and the identified participants and stakeholders, IDSD could assist in joining this virtual and more external driven initiative with the established regional networks on the ground. It would enable a wide participation of stakeholders, agencies and individuals across the Caribbean and abroad to collaborate. The DDN-C process has endorsed a regional capacity-building process centred on the CARICOM Secretariat and CARICOM countries are direct beneficiaries of IDSD.

October 2003 Training Workshop

One way of implementing the project's training might be to use a creative partnership revolving around UWI's DLIS and the Belize Institute for Information Technology-BIIT, to provide a globally relevant but locally available on-line programme of IT courses. Beginning with the planned IDSD training workshop and proposed portal infrastructure, e-Learning modules could be developed over the short-term and, as much as current regional IT infrastructure permits, made available via the web, perhaps using the UWI Distance Education infrastructure available at campuses throughout the region. For Caribbean Sustainable Development Decision-Making stakeholders, including those identified during this consultancy, a special effort should be made to include well planned interventions from both the ITU's Caribbean representative on the WSIS preparatory process and a representative of the UN SIDSNet. This might offer a 'trigger' for deepening collaboration and focusing on the up-coming WSIS 2003 and SIDS 2004 meetings. UWI-DLIS, in particular, is well-placed to act as a link to WSIS related international initiatives. Specialty courses in GIS, Remote Sensing, Satellite technologies and Sustainable Development Indicators could be arranged with the input of available regional specialists from both academia and agencies such as UNEP-CAR/RCU's CEPNET. Acknowledging the IDSD Project's limited resources and time-frame, perhaps its website could evolve, over the medium term with smart partnerships, to become the host for a Caribbean 'IT Training Portal' or Gateway, on which more will be discussed shortly. CARINFO and the CARICOM Secretariat could be pressed into service to facilitate regional oversight and organise content, particularly in regards to SIDS-POA thematic areas. By linking with SIDSNet, through the planned Caribbean SIDSNet node at UWICED, the IDSD website/portal/gateway could become a digital meeting place for SIDS IT Training globally.

Caribbean IT Training Portal

Given that the OAS is the executing agency for the IDSD project, another smart partnership that should be pursued is collaboration with the IACD in carrying out the action strategy recommended, specifically the development of a Caribbean IT Training & Capacity-Building Portal. Portals, when compared to other Internet and web applications for the diffusion of information, may offer the best model for the proposed IDSD project's information dissemination objectives. Besides their accessibility over the Internet for data acquisition via 'digital library' technology, portals also can contain links to the IDSD list-serv as well as the other key regional SIDS-POA stakeholders in the public and private sectors. Further, the issue of networking can be resolved by the proper establishment and provisioning of the pilot local nodes; the MBRS REIS approach could be useful here. However, given the ability of the selected portal model to accommodate user passwords, the input and linkage for IDSD pilot country area activities could be accomplished as well. An outline of the longer-term possibilities of such a Caribbean IT Training & Capacity-Building Portal would emphasise three operational elements: Supply (providing easy access to all available programmes of participating stakeholders); Demand (linking, via secure networking, individual and institutional IT requirements as well as profile information); and Service (a digital library with an 'IT Exchange' facility and perhaps archiving capabilities for SIDS-POA & other MEAs' monitoring reports). The end result would be to establish a virtual Caribbean Sustainable Development Decision-Support information service for regional stakeholders at all levels. The e-Learning aspect of the proposed portal could be the most dynamic and offers some prospects of financial sustainability. Once again, UWI could oversee the provision and certification of the academic-related competencies such as those

suggested by Narasimhan: *Communication, Quantitative & Qualitative Analysis and Organisational Functions*. Regional private sector IT institutes, such as BIIT, with their access to vendor certified international curricula could provide state-of-the-art technical training in Networking and Web Software; including the much touted open-source versions that are being employed increasing by regional agencies such as the MBRS in its Regional Environmental Information System.

Long-term GEF Project Proposal

With the development of a Caribbean ICT policy framework in process, the IDSD project could undertake to specifically support its advancement through training interventions. And, in the context of building regional environmental information management capacity, may wish to explore the sponsorship of a GEF project as a longer term partnership with the region.

UNESCO Digital Divide Strategy

The recently published UNESCO Digital Divide strategy (see text box) is presented to reflect the paradigm shift taking place at the global level that can assist our proposed IDSD Action Strategy. The UNESCO strategy, though aimed mainly at the Education Sector, encourages the 'democratisation' of IT broadly throughout society and supports E-Government as well as Science & Technology uses. This consultancy's findings demonstrate that UNESCO's call for Universal Computer Literacy and free Internet access for schools & public libraries resonates well in the Caribbean. Barbados' EduTech, Belize's SWAN and Jamaica's TechSchool initiatives reflect well the region's possibilities for 'leap-frogging' in this area. Further, the S&T thrust of the UNESCO strategy emphasises environmental management and accords well with the Sustainable Development directions of the proposed IDSD strategy. Finally, the Caribbean IT Training & Capacity-Building portal scheme supports UNESCO's call for distance education & life-long learning opportunities.

UNESCO Digital Divide Strategy Text Box

UNESCO Four Point Strategy to Combat the Digital Divide

POINT ONE-FIRST A SET OF COMMON PRINCIPLES FOR THE INFORMATION SOCIETY OF THE FUTURE MUST BE DEFINED. THESE, SAYS UNESCO, SHOULD INCLUDE:

- Freedom of expression and its corollary, freedom of the press.
- Free, compulsory and universal primary education.
- The recognition that education as well as cultural goods and services cannot be treated as mere commodities.
The pre-eminence of public policy.
- The promotion of public domain information and public service broadcasting.

POINT TWO-SUPPORT FOR ACCESS BY THE GREATEST NUMBER TO THE LEARNING OPPORTUNITIES OFFERED BY NEW INFORMATION TECHNOLOGIES. THIS IMPLIES THAT:

- Computer literacy be recognized as a basic skill in educational systems and free access to the internet be provided in schools and public libraries.
- Full advantage be taken of distance education and the life-long learning opportunities offered by ICTs.

POINT THREE-IN ORDER TO STRENGTHEN CAPACITIES FOR SCIENTIFIC RESEARCH AND INFORMATION SHARING, UNESCO WISHES TO SEE INCREASED EXCHANGE AND COOPERATION AMONG SPECIALISTS AND INTEREST GROUPS WORKING IN THE FIELDS OF EDUCATION, SCIENCE, CULTURE AND COMMUNICATION. TO THIS END UNESCO:

- Encourages the use of new methods of content development and access to education and to scientific information, e.g. virtual universities, virtual laboratories, and research groups. Such methods can contribute to bridging the scientific divide, enabling researchers in developing countries to participate in research at the international level and to share its results.
- Promotes actions that focus on building linkages and synergies between science and local and indigenous knowledge, particularly in environmental management practices and in the transmission of local knowledge from one generation to the next.

POINT FOUR- UNESCO ENCOURAGES STATES TO USE ICTS TO PROMOTE GREATER PARTICIPATION BY CITIZENS IN DEMOCRATIC LIFE BY:

- Using the internet and other ICTs as tools for dialogue between citizens and the authorities.
- Integrating new and "traditional" technologies, including library services and community media; the production, adaptation, translation and sharing of local contents; and the setting up of pilot projects corresponding to different cultural contexts.
- Giving high priority to the needs of those disadvantaged and marginalized groups that are presently excluded so that information societies be open and inclusive.
- Improving access to the benefits of the information society for women and youth; and
- Extending material assistance to countries at present unable to offer access to ICTs to large numbers of their citizens.

Source: UNESCO Director-General Koichiro Matsuura speech to UNESCO Members States on September 11, 2002 in Paris.

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