PROGRESS REPORT ON TELECOMMUNICATION/ICTs IN THE AMERICAS REGION

BROADBAND FOR SOCIO-ECONOMIC DEVELOPMENT

ASEP
Autoridad Nacional de los Servicios Públicos

ITU

ITU's main purpose in preparing this study is to describe developments in telecommunications and ICTs in the Americas region, using the regional initiatives adopted by WTDC-10 as a reference frame. The intention is to present a reference document that will guide not only the deliberations of the Connect Americas Summit but also ITU's work in the region up to the next WTDC.

The study described in this document pinpoints areas of progress in the development of telecommunications/ICTs in the Americas region, makes recommendations and presents opportunities for the region's countries to share experiences and identify potential projects to promote the development of this important type of infrastructure.

This report has been prepared by ITU experts Salma Jalife and Monica Duhem, under the direction of the ITU Americas Regional Office.

Estados Unidos = United States; Guyana Francesa = French Guyana; Mapa del Caribe = Map of the Caribbean; Islas Caiman = Cayman Islands; Islas Turks … = Turks and Caicos Islands; Antillas Holandesas = Dutch Antilles; Islas Virgenes = Virgin Islands; Republica Dominicana = Dominican Republic; Trinidad y … = Trinidad and Tobago; Mapa de las Antillas = Map of the Antilles; Antigua y … = Antigua and Barbuda; Martinica = Martinique; Gaudelupe = Guadeloupe; San Vicente = Saint Vincent; Santa Lucia = Saint Lucia

The Americas region

The Americas region is home to about 12 per cent of the world's population (934.5 million people[1]) on a continental mass covering almost 43 million square kilometres, the second largest after Asia. In 14 countries[2] in the region more than 75 per cent of the population is concentrated in urban areas. In 15 countries, over 50 per cent of the population has migrated to urban areas, whereas in only nine countries,[3] essentially in the Caribbean, is most of the population distributed in rural areas. Latin America and the Caribbean account for 21 per cent of world's rural population.[4]

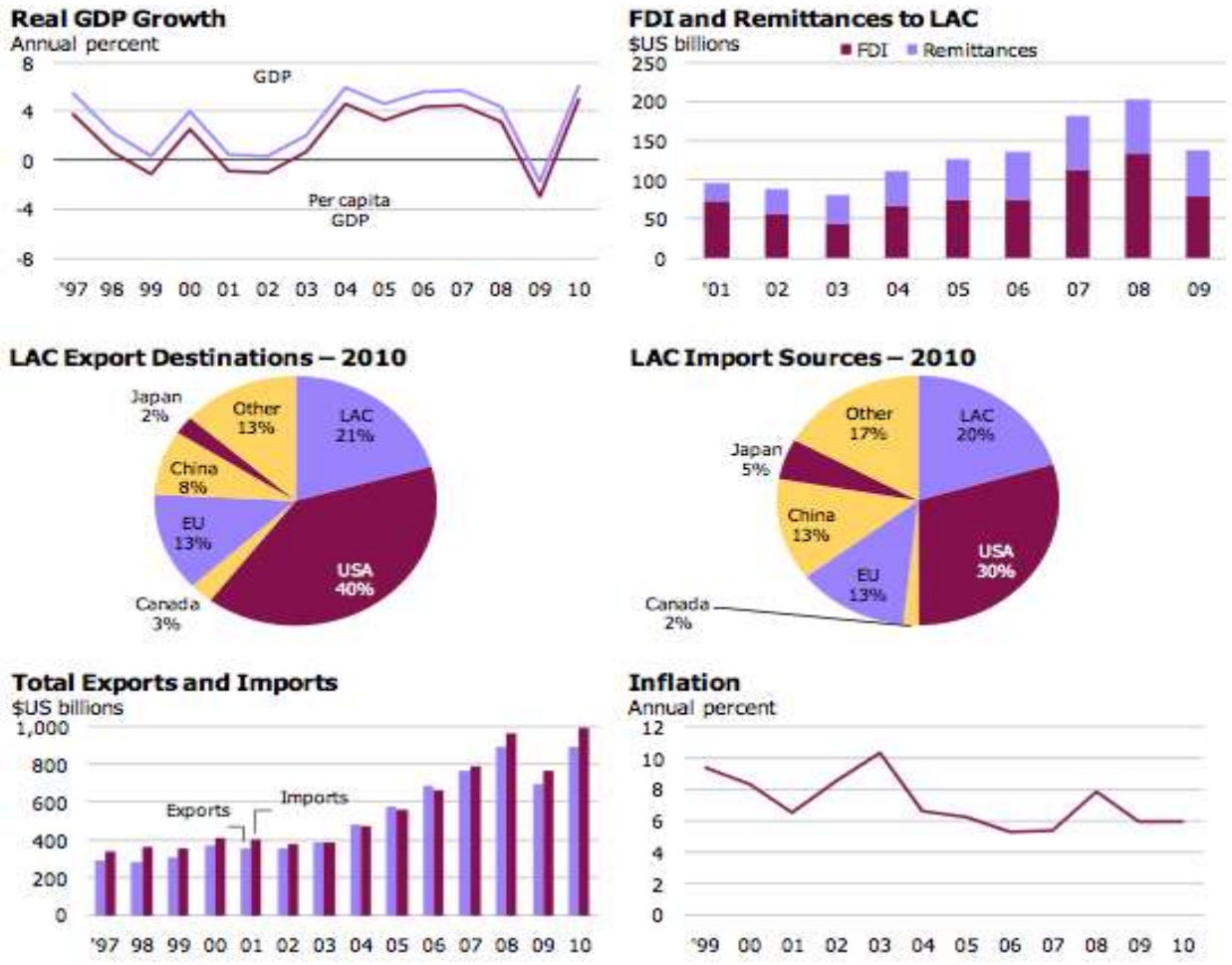
The rural areas are far-flung and have very low population densities and generally little access to basic services and infrastructure. The United States and Canada, despite their level of development, still have gaps in access in certain places, albeit on a much lesser scale than elsewhere in the region. The difficult conditions prevailing in these places has prompted widespread migration, with millions of families suffering serious human rights violations and communities being broken up in their search for better living conditions. This is the plight of the majority of the region's indigenous peoples, who represent roughly 33 million inhabitants,[5] are culturally very diverse and were identified as requiring priority attention by the World Summit on the Information Society (WSIS). In this respect, the actions derived from the Summit associated with the Millennium Development Goals (MDGs) have a paramount goal: to facilitate the provision of services in such places using information and communication technologies (ICTs), to resolve the problem of families being broken up when they migrate in search of better living conditions, and to strengthen the cultures of indigenous peoples, a key factor in the conservation of biodiversity acknowledged in the Convention on Biological Diversity.

The region's population is young, although the age pyramid is starting to narrow at the bottom and broaden at the top. Most of the population (between 60 and 70 per cent of the total in each country) is between 15 and 64 years of age, 18 to 30 per cent are under 14 and the over-65 cohort varies from 3.5 to 15 per cent. The 2011 poverty map for Latin America and the Caribbean[6] shows that the poverty threshold of less than USD 2.50 per day is found in the central parts of the Andean countries, in particular Bolivia's Altiplano, rural areas of Paraguay, north-eastern Brazil and a few Central American countries. In the Caribbean, Haiti has the region's highest poverty rate. According to a study conducted in 2009 by the Socio-Economic Database for Latin America and the Caribbean (SEDLAC) and the World Bank, the number of women heads of household whose income is rising is growing at a steady rate in the region.

1 See http://unstats.un.org/unsd/demographic/products/vitstats/default.htm.
2 World Bank data from 2010 (http://data.worldbank.org/indicator/SP.RUR.TOTL.ZS/countries?display=default).
3 *Ibid.*
4 *Ibid.*
5 *Ibid.*
6 See SEDLAC and the World Bank (http://sedlac.econo.unlp.edu.ar/eng/briefs-detalle.php?idE=18).

This means that, if the growth rate is maintained, women will achieve household income parity in the coming decade.

According to data published by the United States International Development Agency (USAID), the gross domestic product (GDP) of Latin American countries, including the Caribbean, has risen in recent years. There has also been a discernable fall in the inflation rate.



Source: 2011 Latin America and the Caribbean Selected Economic and Social Data, USAID, p. 4.

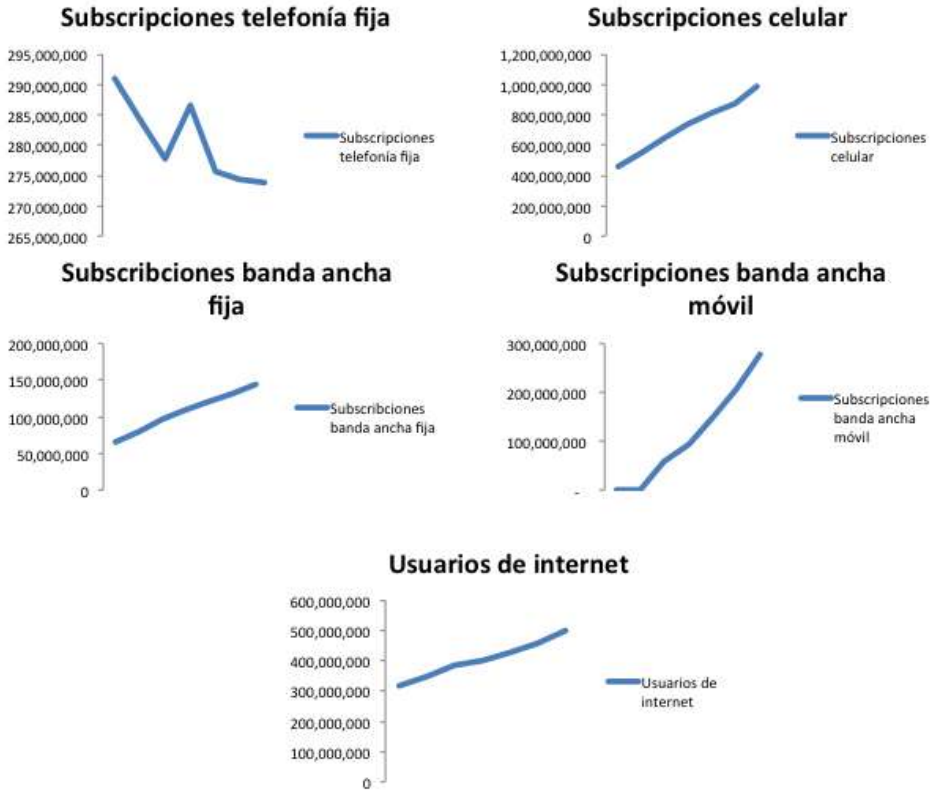
Basic education has attained satisfactory levels in the region, with equal numbers of men and women enrolling in and completing school. When it comes to health, countries such as Bolivia, Guatemala, Guyana and Suriname still have infant mortality rates above the regional average, and the rate remains high in all the other countries except the United States, Canada, Saint Kitts and Nevis, Cuba, Chile, Antigua and Barbuda, Argentina and Uruguay, where it is below average. The extreme case is Haiti, where the rate is five times the average.[7] Viral and bacterial diseases are widely prevalent in most countries of Latin America and the Caribbean. With regard to health and education, ICTs are being integrated into public policies for the development of telemedicine programmes and tele-education programmes at various levels of study.

[7] 2010 World Bank indicators.

Nevertheless, except in the United States and Canada, most of the programmes implemented last as long as the administration introducing them and there is therefore no long-term continuity.

The most developed countries in terms of infrastructure in general are the United States and Canada. In the countries of Latin America, infrastructure is sufficient in urban areas and relatively undeveloped in rural areas, the least developed areas again being those in which poverty is extreme. There are ports, airports, roads, electrical power and land, air and sea transportation. In terms of telecommunications and ICTs, all services - radio, television, cellular telephony, fixed-line telephony, Internet access, submarine cables, satellites, microwave links, etc. - are in practice available, although the degrees of penetration vary (see the section on indicators for a comparison). All markets have a private sector and are open to competition. In the past ten years, the region's countries have turned to public-private partnerships to expand infrastructure investment and development. Awareness of the need to reduce the use of greenhouse gases has heightened. The region is nevertheless home to one of the biggest emitters of CO_2, the United States.

Changes in telecommunication service penetration in the Americas 2005-2011



Subscripciones telefonía fija = Fixed-line telephone subscriptions
Subscripciones celular = Mobile-cellular subscriptions
Subscripciones banda ancha fija = Fixed broadband subscriptions
Subscripciones banda ancha movil = Mobile broadband subscriptions
Usuarios de Internet = Internet users

Source: ITU.

The continent is made up of four large geographical areas: North America, Central America, South America and the Caribbean. These geographical areas are in turn made up of 35 independent countries and other territories. With the exception of Bolivia and Paraguay, every country has a long coastline. Those two countries are nevertheless a key source of river and lake water. The region's land mass sits atop various tectonic plates. Their movements occasionally cause natural disasters such as earthquakes, volcanic eruptions, tidal waves and tsunamis. Other natural phenomena, such as drought and flooding, are brought about by climate diversity. In practice, the continental mass links the north and south poles, which explains why the region is home to contrasting climate zones. There is also a high-altitude chain of mountain systems extending practically the entire length of the region and, in the form of volcanoes, into the Caribbean.

From the Bering Sea down to Patagonia, the Americas are the world's richest and most diverse biosphere, comprising polar regions, high mountains, deserts, tropical and equatorial forests that are home among other things, to medicinal plant and animal species that form part of the

region's natural ecosystems.[8] As a region it is rich in biodiversity, and contains half the countries with the world's greatest biodiversity (Brazil, Colombia, Ecuador, Peru and Mexico). The ten countries with the greatest biodiversity host over 60 per cent of the world's species.

The region's historical, political, economic and social conditions have shaped three major subregions, which differ slightly from the geographical areas described above. The first is North America, which comprises the United States and Canada. Mexico is a pivotal country, given its role vis-à-vis its trading partners to the north, and serves as a link to the rest of Latin America. The second subregion is Latin America, which comprises 19 countries: Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Cuba, the Dominican Republic, Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay, Uruguay, Chile and Argentina, of which 18 are Spanish-speaking and one (Brazil) is Portuguese-speaking. The third and final subregion comprises the islands of the 13 Caribbean countries plus Belize, namely Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Granada, Guyana, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago. In those countries the main language is English or French.

The economic situation varies widely throughout the region. The Americas are home to the world's biggest economy, that of the United States, on which the other countries in the region depend economically to varying degrees. Canada is also an industrialized country, and the United States' biggest trading partner. Unlike the United States and Canada, which have consolidated themselves as digital economies in the information and knowledge society, Latin America and the Caribbean continue to rely chiefly on raw materials and goods manufactured with natural resources, which account for more than 50 per cent of exports to other countries. Latin America has nevertheless strengthened its innovation strategies in the past ten years. It has also timidly diversified towards Asian markets, mainly China, allowing the countries concerned to withstand the 2008-2009 global financial crisis better than most. The Caribbean, for its part, has strengthened its economic relationship as a bloc, in recognition that, by integrating, it can generate the critical mass needed to ensure economic security for its countries in a globalized environment.

The continent has consolidated into at least five subregional markets, which have maintained slight growth in the economies of Latin America and the Caribbean. The latter continue to be poorly diversified economically and to invest very small percentages in technological research and development.

Subregional markets

North American Free Trade Agreement, between Mexico, the United States and Canada; Mercosur, between Argentina, Brazil, Paraguay and Uruguay; the Andean Community of Nations, comprising Bolivia, Ecuador, Peru, Venezuela and Colombia; the Dominican Republic-

[8] See www.oas.org/dsd/policy_series/1_spa.pdf.

Central America Free Trade Agreement (DR-CAFTA), between the United States and Central American countries (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua) plus the Dominican Republic, reinforcing the Central American Common Market (CACM); the Caribbean Community and Common Market (CARICOM), in which Barbados, Belize and Dominica participate[9]; and the CACM (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua).

The region's governments must substantially improve their public policies in order to promote a long-term development climate that is inclusive and sustainable. In the medium term, 2015 is the deadline by which various development goals are to be met, both in the context of WSIS and with regard to the MDGs. Looking beyond those goals, the States in the region that have yet to attain the development levels of the United States and Canada currently face a number of structural problems. The aim is better education, a solid infrastructure and the integration of innovation processes leading to productive development. All three aspects are intended to reduce inequality in income distribution and to improve the quality and provision of public services in order to create opportunities for individual and collective development.

[9] Other participants: Antigua and Barbuda, Bahamas, Granada, Guyana, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname and rinidad and Tobago.

Introduction

The Connect Americas Summit is an event organized by the International Telecommunication Union (ITU) in order to mobilize the human, financial and technical resources needed to close the world's digital divide. It offers a venue for public and private sector leaders, regional and international organizations and development agencies to create partnerships that will result in projects to reduce the ICT gap. The summit was preceded by a preparatory process during which telecommunication/ICT and communication development projects were identified as well as possible partnerships for their implementation.

Telecommunications/ICTs play a key role in the economy and society. Both have proven to be effective means of innovation, growth and productivity worldwide. Widespread access to telecommunications and ICTs provides a host of opportunities to optimize public services (health, education, technological research and development) and make them more efficient, and to help preserve the environment. Telecommunications and ICTs also help facilitate the exchange of ideas and views around the world, to share information. For this reason, the summit's deliberations and outcomes will be very beneficial for the Americas region.

Telecommunication development and the penetration and use of ICTs vary throughout the region. The countries of the Americas differ hugely with regard to telecommunication infrastructure development, the related services and the prices users have to pay for access to them.

Two years after the adoption of the Hyderabad Action Plan, it is important to pause and diagnose the region's level of development, in such a way as to identify the progress made and the windows of opportunity for further advances in telecommunication infrastructure development, reducing the digital divide, creating capacities and providing access to all the benefits derived from telecommunications and ICTs, in order to contribute to economic growth and social development.

The World Telecommunication Development Conference held in Hyderabad, India, in 2010 (WTDC-10) identified a number of regional initiatives focused on each region's telecommunication/ICT development needs. In the specific case of the Americas, five initiatives were approved.

1. Emergency communications
2. Digital broadcasting
3. Broadband access and uptake in urban and rural areas
4. Reduction of Internet access costs
5. Human capacity building on ICTs, with emphasis on persons with disabilities and people living in rural and deprived urban areas

The aim of this document is to present a study that:

1. describes telecommunication/ICT development in the Americas in the context of the regional initiatives approved in Hyderabad, using ITU indicators;
2. identifies a series of projects or ideas in the region;
3. sets out a roadmap of recommendations, with goals and actions varying in the light of national and subregional needs;
4. relates the proposed recommendations to both the MDGs and the WSIS principles and goals;
5. describes the situation in Haiti in the light of the work carried out by ITU for least developed countries.

Methodology

To fulfil the above objectives, the study is divided into five parts. Specific criteria set out at the start of each part determine the scope of the analysis conducted by country and for each of the five regional initiatives.

Part One sums up the progress made by the countries of the Americas with regard to the five regional initiatives approved in Hyderabad. Its five sections are based on specific criteria drawn up for each of the regional initiatives in order to develop standard indicators for the region that give an idea of the state of development of and opportunities in telecommunications/ICTs.

Part Two lists a series of successfully implemented telecommunication/ICT-related projects and projects that are being implemented.

Part Three, using as a basis the global overview of the state of telecommunication/ICT development in the region, sets out recommendations derived from the analysis of the five regional initiatives and presents a roadmap of recommendations for achieving various development objectives.

Part Four analyses the above recommendations in the light of the MDGs and the WSIS goals.

Lastly, Part Five provides ITU's findings for least developed countries. In the Americas, only Haiti falls into that category.

The information compiled during the period allocated for the study (one month) was obtained from online sources. The data used were obtained from reliable sources, such as the World Bank's indicator site, and with the support of the ITU/BDT ICT Data and Statistics Division.

Part One

Telecommunication/ICT development in the region with regard to the WTDC-10 regional initiatives

The fifth ITU World Telecommunication Development Conference (WTDC-10) was held in Hyderabad, India, from 24 May to 5 June 2010. One of its objectives was to adopt regional initiatives for Africa, the Americas, the Arab States, Asia and the Pacific, the Community of Independent States (CIS) and Europe, and guidelines for their implementation.

Five regional initiatives were approved for the Americas region. They take account of needs and of the specific sectors on which the region's countries will have to work in order to ensure suitable development of telecommunications/ICTs and their applications, which are key factors for economic growth and social development in the countries of the region.

Americas regional initiatives

"The Americas regional initiatives are intended to address specific telecommunication/information and communication technology (ICT) priority areas, through partnerships and resource mobilization to implement small-, medium- and large-scale projects. Under each regional initiative, projects will be developed and implemented to meet the region's needs.

1 Emergency communications

Objective: To provide assistance to Member States at all phases of disaster management, i.e. disaster preparedness including early warning, disaster response/relief, and rehabilitation of telecommunication networks.

Expected results

1. Identification of suitable technologies to be used for emergency communications
2. Creation of common databases to share information on emergency communications
3. Design of national and subregional emergency communication plans and early-warning systems, taking into account the impact of climate change
4. Development of appropriate policy, regulatory and legislative frameworks on emergency communications at national and regional level
5. Increased human capacity skills on emergency communications.

2 Digital broadcasting

Objective: To assist ITU Member States in making a smooth transition from analogue to digital broadcasting.

Expected results

1. Policy and regulatory frameworks for digital terrestrial broadcasting, including mobile television
2. Digital broadcasting master plans for the transition from analogue to digital broadcasting, including mobile TV and IPTV
3. Appropriate mechanisms for conversion from analogue to digital archives
4. Provision of assistance in the field of interactive multimedia services to broadcasters in the Americas region
5. Enhanced human resources skills in the area of digital broadcasting technologies
6. Comprehensive guidelines on the transition from analogue to digital broadcasting
7. Creation of the compendium of public policies on the transition to digital terrestrial radio and television.

3 Broadband access and uptake in urban and rural areas

Objective: To assist Member States in the development of broadband access in urban and rural areas.

Expected results

1. National ICT master plan to meet the requirements of developing countries
2. Improved broadband infrastructure and access to affordable ICT services in urban and rural areas
3. Promotion of access to ICTs in public social service institutions such as educational centres, health centres and social rehabilitation centres, and of the use of ICTs by the population to access these social services
4. Development of ICT applications that address local needs
5. Enhanced human resources skills in the area of broadband communication networks
6. Support to non-profit cooperatives that provide services in underserved rural and suburban areas
7. Provision of used computers to educational institutions in rural areas.

4 Reduction of Internet access costs

Objective: To assist Member States in identifying ways and means to reduce the cost of Internet access and interconnection.

Expected results

1. Study of the policy and regulatory aspects of Internet exchange points (IXPs)

2. Establishment of national and regional IXPs
3. Promotion of cooperation and regulatory information sharing.

5 Human capacity building on ICTs, with emphasis on persons with disabilities and people living in rural and deprived urban areas

Objective: To provide, on a sustainable basis, training programmes on ICTs addressing the particular needs of persons with disabilities and people living in rural and deprived urban areas.

Expected results

1. Human capacity building programmes especially tailored for the needs of persons with disabilities and people living in rural/remote areas
2. Identification of training centres to deliver the programmes at the community level
3. Promotion of technical cooperation between telecommunication/ICT training institutions in regard to capacity building and resources for sustainable delivery of the special programmes
4. Increased availability of public access to knowledge for people with special needs."[10]

As can be seen, not only did WTDC-10 approve initiatives which, in the view of the Member States, are the main ones for the region, those initiatives include objectives and expected results. Policy and regulatory aspects are not part of this study's remit; it therefore concentrates on analysing the development dimension of the five regional initiatives.

Telecommunication/ICT development in the Americas region

The Americas region is large, and the countries in it vary widely in terms of economic and social development, size, population and population density. This study therefore analyses telecommunication/ICT development in line with geographical categories drawn up on the basis of similarities and instances of cooperation observed in subregional development projects. The aim of organizing and presenting the information by subregion is to help create synergies and economies of scale at subregional level. Table 1 shows the breakdown of countries by zone. The countries in each zone are listed in the right-hand column. They have similar telecommunication/ICT structures and development, shared social and cultural characteristics and trade relations. Cuba and the Dominican Republic have been placed in the Mesoamerica zone, even though geographically they form part of the Caribbean zone. Likewise Belize, even though it is part of Central America, has been placed in the Caribbean zone because of its affinity to the countries in that zone and the language it has in common with them. It will be seen later in the study, however, that in some instances these three countries are aligned with the activities of their geographical areas.

[10] Final report, World Telecommunication Development Conference, Appendix 7 to Annex C (Hyderabad Action Plan).

Table 1. Division of Americas subregions for the purposes of the study

Zone	Countries
Northern (2 countries)	United States and Canada
Mesoamerican (9 countries)	Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Dominican Republic, Cuba
Andean (5 countries)	Venezuela, Colombia, Ecuador, Peru, Bolivia
Southern (5 countries)	Brazil, Uruguay, Paraguay, Argentina and Chile
Caribbean (14 countries)	Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Granada, Guyana, Haiti, Jamaica, San Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago

As mentioned in the methodology, evaluation criteria have been established for the five regional initiatives, so that development in the region's zones can be uniformly considered with respect to the evaluation criteria selected.

1 Emergency communications

The aim of emergency telecommunication services is to facilitate communications during emergency situations and to provide emergency response and recovery operations to re-establish local infrastructure, thus enabling the population to restore normal living conditions in the wake of a natural or man-made disaster or other emergency.

Emergency telecommunications encompass all available telecommunication platforms and services. They entail a series of considerations to define and establish the functional capacity that communication services require. The advent of next-generation networks (NGN) requires the development of new integrated standards and plans for timely management of emergency communications.

Evaluation criteria

A. Prevention/mitigation

Endeavour to eliminate or reduce the potential impact of disasters and/or reduce the possibility that they will occur, while at the same time increasing the community's capacity to withstand disasters.

- Identification and protection of critical national telecommunication infrastructure, identification of weaknesses and points of interdependence between telecommunications and other infrastructure.
- Mitigation of the weaknesses identified with a view to assessing telecommunication needs in the event of a disaster or crisis, adoption of any legislation required to govern the availability of such resources, and preparation of an emergency response plan.

- Provision of telecommunication systems for public protection and disaster relief (PPDR) organizations, and fast-track arrangements for the granting of licences and selection of frequencies in the event of a disaster or crisis.
- Incorporation of national emergency telecommunication plans into national emergency plans.

B. Preparedness

- Draw up emergency telecommunication response plans in coordination with the national emergency management authorities.
- Forge partnerships and conclude memoranda of understanding.
- Set up early-warning systems.
- Draw up an inventory of resources.
- Conduct exercises and provide training.
- Set up an emergency operations centre and an emergency coordination centre for telecommunications.
- Draw up an administrative continuity plan.

C. Response

Response activities tend to run parallel to preparedness activities (defined in the emergency plan) and are prepared and approved beforehand. They consist in agreements and plans on the measures to be taken in the event of an emergency or disaster, the aim being to take such measures in the immediate aftermath of the disaster in order to manage its consequences.

- Declaration of emergency (general procedures for declaring an emergency).
- Activation of emergency telecommunications and ICTs.
- Cooperation with the department in charge of national emergency management.
- Contact with all telecommunication partners and experts identified in the emergency response plan.
- Provision of advice and assistance to emergency bodies and the telecommunication industry for the restoration of essential infrastructure.
- Facilitate international and intergovernmental communications.
- Facilitate appropriate provision of telecommunication equipment and services, including import and re-export of telecommunication equipment.
- Receive and analyse requests for radio frequencies and authorize their use.
- Alert the public.

D. Recovery

- Immediate recovery activities to ensure that basic telecommunication services remain available to PPDR organizations.

- Long-term recovery with respect to the infrastructure needed for national telecommunications.

Development in the region

A great deal of effort has been made in the Americas to put in place emergency plans and systems in order to ensure communications continue to work before, during and after any natural disaster.

The Inter-American Telecommunication Commission (CITEL) has produced an excellent compilation of disaster management policies and regulations. This Technical Notebook contains information on participating organizations worldwide. In the regional framework, it describes the institutions responding to any phase of disaster: alert, response during the disaster and post-disaster reconstruction. It also lists, by country, the strategies developed by each of the countries that replied to a questionnaire drawn up by CITEL. The Notebook is updated by the members of Permanent Consultative Committee I, meaning the information is current and exhaustive. The region's countries should take it into account in their activities in this field, whether nationally or in cooperation with other countries. The Notebook is entitled *Disaster response policies and regulation: international, regional, national* (CCP.I-TEL/doc.1934/11 rev.1, officially published in Spanish only).

Northern zone

Both the United States and Canada have national emergency communication plans and have properly defined the players involved in the event of an emergency, crucial infrastructure and contingency plans.

In the case of the United States, the Department of Homeland Security (DHS) coordinates the National Emergency Communications Plan (NECP), which establishes national objectives and priorities in order, *inter alia*, to minimize existing shortcomings in emergency communication procedures. It also furnishes emergency response recommendations and guidelines to communication service providers, government officials and Congress, in order to bolster emergency communication capacities.

The NECP defines the entities listed below.

Table 2. Entities related to the Emergency Plan (United States)

SAFECOM	Executive Committee and Emergency Response Council
ECPC	Emergency Communications Preparedness Center
FPIC	Federal Partnership for Interoperable Communications
APIC	Project 25 Interface Committee
NPSTC	National Public Safety Telecommunications Council
NSTAC	National Security Telecommunications Advisory Committee
CIPAC	Critical Infrastructure Partnership Advisory Council

Source: compiled using information provided by the US DHS (www.dhs.gov/xabout/structure).

As can be seen, the United States has a very comprehensive set of tools when it comes to emergency communications.

The most common natural risks in the country are hurricanes, floods and occasionally earthquakes.

In Canada, the government department in charge of emergency telecommunications is Industry Canada. Its priority in an emergency is to facilitate the repair, replacement and expansion of telecommunication systems.

Industry Canada has a group in charge of emergency communications that is trained to cope with and handle any risk. The group works closely with provincial emergency management organizations and with the telecommunication industry countrywide. This cooperation has resulted in national plans, mutual aid agreements and coordination for telecommunication assistance in an emergency.

Canada has interoperability agreements with its neighbour, the United States, for support in the event of an emergency.

The Office of Emergency Communications ensures communications with those requesting assistance and government officials, and is in charge of implementation of the National Emergency Telecommunications Plan (NETP) and the three Regional Emergency Telecommunications Plans (one for each of Industry Canada's three geographical regions). The office is made up of:

Table 3. Emergency plans (Canada)

IWN	Integrated mobile activities for government agencies
ICTAP	Technical assistance for State and local agencies
SAFECOM	Policy and guidance for strengthening interoperable communications on the State, local and tribal levels

Source: compiled using information provided by Industry Canada (www.ic.gc.ca).

As can be seen, the United States and Canada are very advanced when it comes to the development of emergency communications, especially the United States, where field trials are being conducted.

Mesoamerican zone

The Mesoamerican zone, like the Caribbean, is highly vulnerable to natural disasters, the most frequently observed being hurricanes, droughts, floods and earthquakes.[11]

In Mexico, the National Civil Protection System (Sistema Nacional de Protección Civil) is the unit in charge of natural disaster prevention and mitigation. It answers to the Secretariat of Governance (Secretaría de Gobernación) and is responsible for implementing the National Civil

[11] Charvériat (2000).

Protection Programme (Programa Nacional de Protección Civil), which makes no specific provision for emergency communications. The National Disaster Prevention Centre (Centro Nacional de Prevención de Desastres, CENAPRED), for its part, is in charge of providing the National Civil Protection System with support in respect of its operational technical requirements. The centre's technical directors use ICTs to design, install and operate networks of instruments to monitor and communicate alerts pertaining to natural phenomena.

Mexico has made progress in the use of ICTs for natural disaster prevention, although it has no clear or defined emergency communication strategy. One sign of progress was the Presidential Declaration on the Tuxtla Mechanism for Dialogue and Coordination, signed in 2009 in Guanacaste, Costa Rica, whereby Mexico, together with the heads of State of Costa Rica, El Salvador, Guatemala and Panama, the Prime Minister of Belize, the President of Colombia, the Vice-President of the Dominican Republic (a Central American Integration System (SICA) Associate Member) and the representative of the Constitutional President of Honduras agreed to adopt the platform and obtain the resources required for the sustainable operation of the Mesoamerican Territorial Information System for Disaster Risk Reduction (Sistema Mesoamericano de Información Territorial para la Reducción del Riesgo de Desastres Naturales, SMIT).[12] The project is described in Box 1.

In Guatemala, the Office of the Vice-President, together with the National Coordinating Office for Disaster Reduction (Coordinación Nacional para la Reducción de Desastres, CONRED) published the National Disaster Prevention and Mitigation Programme 2009-2011 (Programa Nacional de Prevención and Mitigación ante Desastres 2009-2011). Although the programme discusses the need to strengthen surveillance of information on threats, and although such information is scientific and technical in nature and ICT applications are therefore important for prevention and information purposes, there are no indications that an emergency communication plan is forthcoming.

Honduras has the Standing Contingency Commission (Comisión Permanente de Contingencias, COPECO). The Commission's guidelines, rules and laws include a document entitled "Rol de Respuestas de los Centros de Información en Situaciones de Desastre"[13] (Response Role of Information Centres in Disaster Situations), which speaks about the importance of establishing information centres and their key role during an emergency, and about the importance of ICTs for both disaster prevention and mitigation. Honduras also has the National Risk Management System (Sistema Nacional de Gestión de Riesgos).

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[12] Guanacaste Declaration (http://www.sica.int/busqueda/Centro%20de%20Documentación.aspx?IDItem=38691&IdCat=30&IdEnt=401&Idm=1&IdmStyle=1).

[13] See http://copeco.gob.hn/n/sites/default/files/Rol%20de%20Respuesta%20de%20los%20Centros%20de%20Informacion%20en%20Situaciones%20de%20Desastres_0.pdf.

In El Salvador, the General Civil Protection Directorate (Dirección General de Protección Civil, DGPC) is in charge of conducting interinstitutional relations for the management of emergencies.

In Nicaragua, the National Disaster Prevention, Mitigation and Response System (Sistema Nacional para la Prevención, Mitigación and Atención de Desastres, SINAPRED) is in charge of preventing and managing natural disasters.

Box 1

Disaster mitigation and prevention project for the Mesoamerican zone

Description

The Mesoamerican Territorial Information System (Sistema Mesoamericano de Información Territorial, SMIT), which has been operational since late 2011, will serve to exchange information based on standards for the improvement of natural disaster risk management. It has the following specific objectives:

- improve the technological platforms of institutions providing information to the SMIT;
- bolster the capacity of institutions to organize and publish existing information;
- facilitate coordination for the exchange of information and knowledge between the institutions making up the SMIT.

The project is headed by CATHALAC (Water Center for the Humid Tropics of Latin America and the Caribbean), which is the central executive unit, and came about thanks to the active participation of national institutions in the risk management sector considered to be focal points. In the case of Colombia, the focal points are represented by the Risk Management Directorate (Dirección de Gestión del Riesgo) and the Agustín Codazzi Geographic Institute (IGAC).

Advances

- In the fourth quarter of 2011, the **SMIT regional platform** became fully operational and was finally presented to the national links at the VIth SMIT Regional Workshop, held in Mexico City, Mexico, on 8 and 9 December 2011. The CATHALAC representatives briefed officials from Mesoamerican Project countries on the new system's functions, scope and services for information management, on the basis of established tools and development methodologies, and incorporating the suggestions made by countries at the Vth SMIT Regional Workshop, which was held in San José, Costa Rica, on 31 August and 1 September 2011. The new **SMIT regional platform** has attributes such as country information, regional information, a functional structure for access to services and the reference material obtained during the first phase. It was observed that much of the information visualized in the regional platform was of potential use in other national and regional initiatives.
- The heads of State and government attending the XIIIth Tuxtla Summit, on 5 December 2011, instructed national prevention and civil protection entities to continue operating and updating the SMIT; they asked the Inter-American Development Bank (IDB) to coordinate the creation of a cooperative fund to ensure its sustainability; and they incorporated Belize and the Dominican Republic into all the system's components.
- The countries are currently analysing additional subjects, such as the SMIT's sustainability and the financing options for a second project phase. In this respect, a number of needs have been identified, as have opportunities for the SMIT to work along lines of benefit to national socio-economic sectors, under development planning in which disaster risk management is the integrating axis.
- It is important to note that a working plan was drawn up during the VIth SMIT Regional Workshop for the implementation of the second SMIT phase, which will last for about 18 more months.
- Between April and September 2011, the computer equipment (servers and computers) hosting the SMIT was officially handed over to the national civil protection authorities of the following institutions: CONRED in Guatemala, SINAPROC (Sistema Nacional de Protección Civil, or National Civil Protection System) in Panama, COPECO in Honduras, IGAC in Colombia, SINAPRED in Nicaragua, the DGPC in El Salvador, the CNE in Costa Rica and CENAPRED in Mexico.

In terms of Colombia's participation and contribution to the project, the following are noteworthy:

- the National Workshop held on 20 August 2010, during which entities of the Colombian Space Data Infrastructure (Infraestructura Colombiana de Datos Espaciales, ICDE) and the SNPAD were informed about the objectives of the Mesoamerican Project and the SMIT, with the participation of the Project Regional Coordinator (Joel Pérez);
- the third Regional Meeting, held in Bogotá on 25 and 26 November 2010, at which national and regional advances in integrating information systems and space infrastructure platforms were presented;
- participation in the IVth Regional Meeting, held on 28 and 29 April 2011 in Guatemala City, during which information was provided on the project's advances and strategies were prepared with a view to achieving the results proposed in the construction of the SMIT;
- the presentation of a technical and economic proposal for the development of a face-to-face and virtual training plan, which was considered by the project;
- the development of a workshop on the management of geographical metadata, aimed at those in charge of geographical information in the Mesoamerican countries (the workshop was held in Panama on 15 and 16 March 2011);
- the invitation for the development of three virtual courses (special data infrastructures; geographical information systems; standards) through the IGAC Regional Telecentre (http://geoservice.igac.gov.co/moodle/);
- proposal for a template for the documentation of geographical products (metadata) in accordance with ISO-19115, which was adopted by the Mesoamerican countries.

Source: compiled from information obtained at http://www.proyectomesoamerica.org.

Costa Rica, for its part, has established the National Risk Management Plan (Plan Nacional de Gestión de Riesgo),[14] a strategic planning instrument intended to link the various processes relating to risk management through subsystems within the National Risk Management System (Sistema Nacional de Gestión del Riesgo). The plan instructs the National Risk Prevention and Emergency Response Committee (Comisión Nacional de Prevención de Riesgos and Atención de Emergencias, CNE) on its execution and establishes the terms of reference of the institutions involved, in order to guide the allocation of the corresponding resources, their organization and the requisite verification and control mechanisms.

Costa Rica has an emergency telecommunication network or system,[15] a radio system coordinated by the CNE. In addition, the Vice-Ministry of Telecommunications is currently working on regulations which, if approved, will authorize the Executive to dictate temporary measures to be taken by telecommunication service operators, providers and users, either temporarily to provide certain services directly or to operate certain telecommunication networks as required to alleviate the effects of the state of emergency.

Lastly, in Panama the National Civil Protection System (Sistema Nacional de Protección Civil) is in charge of emergency prevention, mitigation and management. No protocol has been drawn up on emergency communications.

[14] The Plan may be consulted at: http://www.cne.go.cr/Documentos/planificacion/plan_nacional_para_gestion_riesgo_2010_2015.pdf.

[15] For further information: Ministry of the Environment, Energy and Telecommunications (MINAET), *Red Alterna de Comunicaciones para Emergencias: Estudio de Buenas Prácticas,* Costa Rica, July 2010, 70 pp.

Andean zone

Colombia has the Telecommunication Sector Emergency and Contingency Plan (Plan de Emergencia y Contingencia del Sector de Telecomunicaciones), which was last updated in December 2008, and the National Disaster Prevention and Response System (Sistema Nacional de Prevención and Atención de Desastres, SNPAD).[16]

Peru[17] created the Special Network for Communications in Emergency Situations (Red Especial de Comunicaciones en Situaciones de Emergencia, RECSE). Following the earthquake of 15 August 2007, the necessary measures were taken under Supreme Decree No. 030-2007-MTC to create the Emergency Situation Communication System (Sistema de Comunicaciones en Situaciones de Emergencia). On 19 October 2010, Supreme Decree No. 051-2010-MTC was adopted, approving the General Normative Framework for the Emergency Communication System, which establishes guidelines for the efficient, timely and coordinated management and operation of telecommunication services before, during and after an emergency.

The framework makes provision, *inter alia*, for mechanisms to be deployed by senior State emergency communication authorities through the Space/Terrestrial Emergency Communication Network (Red Espacial Terrestre de Comunicaciones en Emergencia, RECSA) and the Emergency Communication Special Satellite Network (Red Especial Satelital de Comunicaciones de Emergencia, REDSAT). RECSA is supported on conventional fixed and mobile telephone service networks, as operators are obliged to set aside free and permanent capacity for the purpose.

In Venezuela, the National Civil Protection and Disaster Administration Directorate (Dirección Nacional de Protección Civil y Administración de Desastres) has an ICT unit that is in charge of operating the communication network that is used by the Directorate and that is needed for disaster prevention, mitigation and emergency response.

In Ecuador, the National Risk Management Secretariat (Secretaría Nacional de Gestión de Riesgos, SNGR) has a National Comprehensive Security and Safety Agendas Plan (Plan Nacional de Seguridad Integral and Agendas de Seguridad). It also has an emergency communication protocol applicable under the system of declaring a state of emergency to service operators, the Armed Forces Joint Command (Comando Conjunto de las Fuerzas Armadas, CCFFAA), the National Telecommunication Secretariat (Secretaría Nacional de Telecommunications, SENATEL) and the Telecommunication Superintendency (SUPERTEL). In 2011, Ecuador's Telecommunication and Information Society Ministry (MINTEL), together with the SNGR, launched a project to carry out a diagnosis of the emergency communication network.

[16] See http://archivo.minICT.gov.co/mincom/documents/portal/documents/root/PlanSectorialEmergencias.pdf.

[17] See http://transparencia.mtc.gob.pe/idm_docs/normas_legales/1_0_1360.pdf.

Lastly, in Bolivia action in the event of a natural disaster falls to Civil Defence, which has national action plans for droughts, fires, frost and floods but has no defined plans for emergency communications.

Caribbean zone

Because of its geographical position, the Caribbean zone is particularly vulnerable to natural disasters. It is also the Americas subregion with the highest number of countries. The 14 countries making up the Caribbean zone belong to the Caribbean Disaster Emergency Response Agency (CDERA), an intergovernmental agency established in September 1991 by the Agreement of the Conference of Heads of Government of CARICOM.

The zone's main natural disaster risks are hurricanes, tropical storms, which cause flooding and wind damage to infrastructure, and earthquakes. In addition, volcanic activity occurs in Dominica, Saint Lucia and Saint Vincent.

Table 4. Disaster management bodies (Caribbean)

Caribbean	Emergency management entity
Antigua and Barbuda	National Office of Disaster Services
Bahamas	National Disaster Agency
Barbados	Department of Emergency Management
Belize	National Emergency Management Organization
Dominica	Office for Disaster Management
Granada	National Disaster Management Agency
Guyana	Civil Defence Commission
Haiti	Civil Protection Directorate
Jamaica	Office of Disaster Preparedness and Emergency Management
San Kitts and Nevis	National Emergency Management Agency
Saint Lucia	National Emergency Management Organization
Saint Vincent and the Grenadines	National Emergency Management Office (Prime Minister)
Suriname	National Coordination Centre for Disaster
Trinidad and Tobago	Office for Disaster Preparedness and Management

The 14 countries of the Caribbean zone have an emergency management body, which, together with CDERA, is in charge of disaster management.

By the same token, all countries in the Caribbean zone have a national emergency plan. Almost none of the plans examined, however, had established a strategy for the contingency plan.

Telecommunication infrastructure is a key component of disaster response and reconstruction. It is therefore vital for the countries in the Caribbean zone to continue working to identify critical telecommunication infrastructure, to establish action lines for national emergency communication plans, including early warning systems, and to forge associations with organizations and the private sector, among others.

Southern zone

In Argentina, the General Civil Defence Directorate (Dirección General de Defensa Civil) of the Ministry of Justice, Security and Human Rights issued a communication protocol outlining the internal work to be done by communication centres (covering all parts of the country) with a view to optimizing communication services. According to the protocol, the various communication centres are obliged to inform the central office of all events relating to a threatening situation; it also stipulates how to communicate in the event of an emergency.

In Brazil, the Ministry of National Integration (Ministério da Integração Nacional) published the Regulations for the Activation and Implementation of National Emergency Network Services of Amateur Radio Operators (Norma de ativação e execução dos serviços da rede nacional de emergência de radioamadores, RENER) in 2002.

The University Centre for Disaster Studies and Research (Centro Universitário de Estudos e Pesquisas sobre Desastres) has also been established, for the purposes of the National Civil Defence Policy. Its mission is to act with areas relating to analysis for disaster risk mitigation and to cooperate with technical, scientific and cultural support.

In Chile, in the wake of the shortcomings brought to light on 27 February 2010, then President Michelle Bachelet established an interministerial committee tasked with providing a detailed diagnosis of the country's Emergency and Civil Protection System (Sistema de Emergencia and Protección Civil). The National Emergency Office (Oficina Nacional de Emergencia, ONEMI) is in charge of coordinating and implementing emergency prevention and civil protection activities and of advising the authorities when it comes to emergency planning and coordination.

The National Early-warning System (Sistema Nacional de Alerta Temprana) has undergone a process of modernization and strengthening that included infrastructure remodelling on the basis of various international benchmarks, the incorporation of technology for ongoing monitoring and back-up communication systems for the reporting and transmission of information on the emergency (HF systems, VHF, satellite and Internet telephony in the national system and all regional systems), regional offices operating round the clock in safe areas, an emergency satellite network, a national HF and VHF telecommunication network, a back-up telecommunication network hosted by the army, an agreement with amateur radio operators, an agreement with radio stations for the dissemination of emergency information, and so on.

In Uruguay, the National Emergency System (Sistema Nacional de Emergencias) is a permanent, public system the aim of which is to protect people, significant objects and the environment against a potential or actual disaster situation, by means of coordination with the State for the appropriate use of available public and private resources, so as to furnish the conditions for sustainable national development.

2 Digital broadcasting

Broadcasting is one of the world's main sources of information and entertainment. It is so widespread as to be considered a universal service. In the Americas, it reaches nearly 95 per cent of homes. This is why public policy for the migration of broadcasting to digital technology (terrestrial digital television, or TDT) has to be drawn up in a process of clear, inclusive and appropriate planning. Governments must be able to spearhead and coordinate the process, and in turn involve all those along the value chain who will participate in the development of the new infrastructure and services. The policy has to be implemented within a relatively short time, to ensure that the process is efficient, especially for users and consumers, who should be satisfied at the added value ensuing from the adoption of this new technology.

Evaluation criteria

A. The rationale for the migration from analogue to digital broadcasting

B. Models for developing a public policy on the transition to TDT

C. Lessons learnt and best practices in countries that have completed the process

Countries have various reasons for ordering migration from the present analogue systems to digital ones. The transition from terrestrial analogue to digital television was started in 1998. The main reasons for the change are:

1. improve image, video and audio quality;
2. endeavour to broaden the choice of programmes by offering greater variety in terms of content and quality;
3. increase reception modes (mobile, portable);
4. integrate the network from the production to the consumer stages;
5. increase the types of services that can be offered by the same television or radio station;
6. foster the development of future services;
7. optimize costs;
8. help reduce greenhouse gas emissions thanks to the significant decrease in the consumption of electrical energy by radio stations;
9. free spectrum for other telecommunication services (digital dividend).

Public policy for migration to TDT has been implemented using one of two models. The first consists in maintaining the analogue system while a parallel digital system is built, with the loan of an additional channel to start digital transmissions. This model protects the position of those presently in the broadcasting market and entails a high transition cost for both operators and users/consumers. The second model is based on widening the range of programmes on offer and creating more competition for pay-TV, allowing the entry of new players. It does not force suppliers to offer high-definition television but rather promotes the introduction of new channels in the same bandwidth. The cost for users/consumers is lower. Perhaps the most

important feature of this model is that it separates infrastructure from content on the basis of telecommunication legislation.

The United States and Canada are among the first countries to have adopted a policy for migration to TDT, alongside Germany, Norway, Denmark, Spain, Belgium, Croatia, Estonia, Latvia, Slovenia, Cyprus, France, Serbia, Israel and Japan. All have completed the process and currently have digital television systems operating on all technological platforms (terrestrial, satellite and cable), either as a free-to-air service or by subscription. Their experiences have provided input for the information compiled on the steps to be taken in the migration and on the best practices of the Member States that have established different planning models.

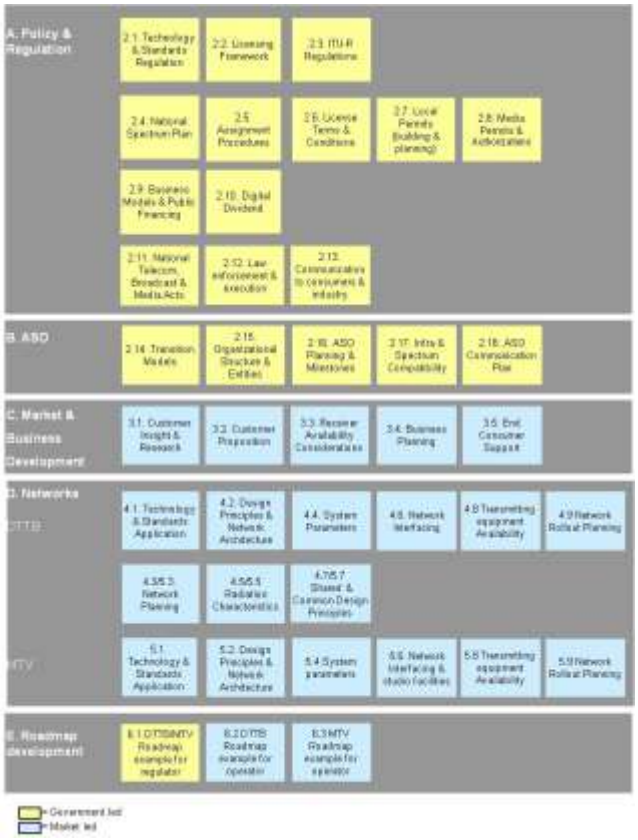
ITU, in a joint effort with the Korea Communications Commission and with the help of three TDT experts, drew up a major document to help Member States in the Africa region establish their own transition strategies.[18]

Table 5 lists the five main areas identified in the ITU guidelines as factors of a successful transition to TDT.[19]

[18] *Guidelines for the transition from analogue to digital broadcasting*, available free of charge on the ITU website.

[19] The guidelines contain information and recommendations on policy, regulation, technology, network planning, consumer alerts and business plans for service providers, and content for the introduction of TDT and mobile television. For Member States of the Americas that have not yet started the process of transition to digital television, the guidelines provide useful pointers for the development of their country's migration plan.

Table 5. Factors relating to the transition to TDT



Source: ITU.

The list below describes the points in common observed in the best practices of the various processes for planning the transition to TDT.

a) Identify the real purpose of carrying out the transition and clearly document it so that the various parties involved have legal and security certainty that the process will be carried out in accordance with the planned schedule and conditions.

b) Select the standard and acknowledge the benefits and limitations it may entail for the migration, include justification for the integration of multiple platforms (DTH, cable, IPTV, mobile TV) supporting the transition process.

c) Create an independent system for evaluating compliance that includes laboratory and proprietary tests guaranteeing performance and interoperability.

d) Acknowledge the implications of implementing a standard that is different from that selected by neighbouring countries, including different frequency blocks for the use of channels. Towns in border areas have close business, social and cultural ties, which is why this factor also needs to be considered when taking a decision.

e) Provide users with ongoing training throughout the process so that they understand and buy into it. Some countries set up transition forums, for example Impulsa TDT in Spain, France Télé Numérique in France, and DigitalUK in England.

f) Establish transparent subsidies so that digital television easily penetrates urban and rural areas. Best practices in this area have been found in those countries that included an entire package comprising receiver, set-up box, cables and remote control unit without which the new systems cannot be used. Provide special schemes for low-income people.

g) Make equipment and devices available to the general public in timely fashion and at an affordable cost. Receivers and transmitters should have clear technical specifications, including middleware.

h) Indicate the type of receiving antennas and the type of transmission that will prevail in the new systems, so as to provide a better quality of service and ensure problem-free co-existence with the nearby receiving stations of other users.

i) Plan the technological developments that will allow the user to interact with the system and select pay-per-view programming (conditional access systems (CAS) and digital rights management (DRM)).

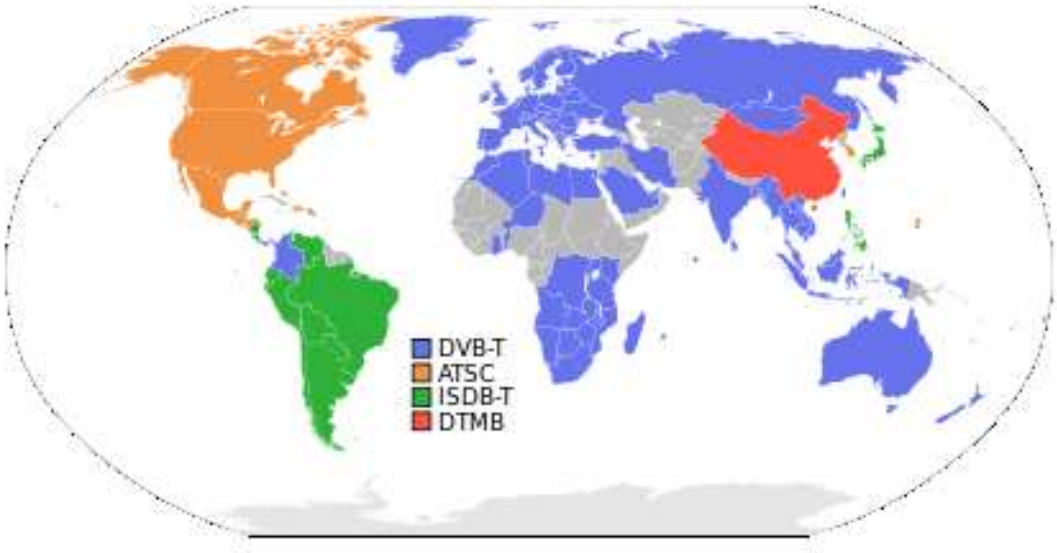
j) Organize dissemination and advertising campaigns on TDT and digital television using public-private strategies.

Developments in the region

In the Americas, most countries have already chosen the standard they will use for the transition to TDT. Worldwide, the standards available on the market are DVB/T, ATSC, ISDB-T and DMB-T/H. Figure 1 shows where the four standards have been adopted around the world. It shows that at least three of the four standards available on the market were selected by at least one country in the Americas. The United States, Canada, Honduras, El Salvador and Mexico selected the ATSC standard, Colombia and Panama opted for the DVB-T standard, and Costa Rica, Nicaragua, Brazil, Uruguay, Bolivia, Argentina, Peru, Chile, Ecuador, Venezuela and Paraguay selected the ISDB-T standard.

Argentina, Brazil, Canada, Mexico and the United States are the only countries currently transmitting digital TV signals. The remaining countries are assessing the technological alternatives or have yet to decide to launch the process.

Figure 1



Source: Wikipedia 2011.

Northern zone

In the United States, digital TV covered all market segments (satellite, cable and radio). The Federal Communications Commission (FCC) coordinated the process, the aims of which were to improve picture and sound quality, to include new services and to allocate new spectrum for public security and mobile wireless services. To meet those objectives, Congress authorized the use, by licence, of a second, 6-MHz channel for all existing broadcasters to construct their digital infrastructure. The second channel was used simultaneously to transmit programming on the analogue channel during the transition phase. Once the migration had been completed, the second channel reverted to the government. In addition, the FCC allocated channels 52 to 69 to the wireless mobile service, eliminating those frequency blocks from the television broadcasting service and thus recovering over 100 MHz that are currently being used for public security services and wireless business services.

The process was planned with the schedule and actions below.

Table 6. Chronology of events in the transition to digital television (United States)

Date	Action
1987	FCC launches a consultation on advanced television
1991	The industry competes for the United States standard
1996	The Grand Alliance adopts the ATSC standard for TDT
1996-97	Congress authorizes an additional channel for every television broadcaster and establishes the transition end date
1997	FCC adopts the rules of service and creates the table of allocations for additional channels
1998	The first TDT station goes on air
1999	The four largest stations (ABC, CBS, Fox and NBC) install their digital systems
2002	FCC issues the voluntary plan for the industry and publishes the TDT tuner terms of reference
2003	FCC issues the plug-and-play and broadcast-flag orders, deadline for non-commercial stations to install their new infrastructure
2004	Deadline for TV stations to broadcast at maximum power, Consumer Education Initiative
2005	Channel selection phase, Congress evaluates the transition end date
2006	Congress establishes an end date for the transition (17 February 2009) and creates the Converter Box Subsidy Programme
2006-07	FCC prepares the TDT table of allocations
2007-08	FCC finalizes the TDT table of allocations using a random process and the procedures for the construction of applications
2008	FCC demands TDT support for consumers from broadcasters and pay-TV providers (cable and satellite), manufacturers and others
2008-09	FCC concentrates on consumer-awareness campaigns
2009	Congress extends the end date by a further three months, to 12 June 2009

FCC established a new regulatory framework for digital channels. Every TV station obtained a licence for one 6-MHz channel offering 19.4 Mbit/s. The operator was required to transmit at least one standard video channel. It could also engage in high definition, multicasting, data casting, mobile digital television and other transmissions. If the operator uses part of the licensed channel for subscription services, it has to pay the government 5 per cent of its gross revenues from the provision of such services.

Cable TV systems have to transmit local channels broadcast in their areas of coverage. Flexible mechanisms have since been introduced to meet this obligation. As a rule, cable television operators have coordinated with broadcasters to make the transition to TDT on both platforms.

Satellite TV operators (digital broadcasting systems), together with broadcasters, have agreed to the carry one, carry all concept. The United States has determined that high-definition

transmission of radio signals will be launched between 2009 and 2013. Satellite TV operators are not obliged to carry multicast subchannels.

In the United States, almost 115 million households have one or more television sets, of which only 11 per cent have access to free-to-air television. To date, 97.8 per cent of users have TDT, a converter or some other digital platform.

Table 7 summarizes the approximate costs incurred by the various players in the migration to TDT.

Table 7. Summary of estimated costs of the transition to digital TV (United States)

Operators – advertising campaign	USD 1.2 billion
Operators – infrastructure	USD 10 billion
Each TV station – high-definition equipment and studies	Between USD 1 and 2 million
FCC – educational campaign	USD 129.5 million
National Telecommunications and Information Administration (NTIA) coupon programme (subsidies)	USD 1.4 billion

Source: compiled using FCC data

FCC considers that the planned process has been a success and that the only follow-up required is resolving any interference that may arise.

Canada is the second country in the Americas to have completed the TDT migration process. It adopted the ATSC standard in 1997. In 2002, after having closely scrutinized the process implemented in the United States, the Canadian Radio-television and Telecommunications Commission (CRTC) decided to publish its rules for the transition. The main difference between the Canadian and US processes was the absence of a deadline for the closure of analogue stations. The Canadian government first left the decision up to the market. On realizing the poor results in terms of penetration, it set an analogue cut-off date. The Canadian process was also different in that CRTC allowed new operators to enter the market, and they obtained digital channels when existing operators showed no interest in obtaining an additional channel.

The Canadian government stressed that the channel was to be used chiefly for high-definition transmissions. It also insisted on the distribution of Canadian content, imposing a mandatory 50 per cent Canadian content for high-definition transmissions.

Mesoamerican zone

In Mexico, the transition to TDT began in 2004. The process was devised and carried out by the Communication Subsecretariat of the Communications and Transport Secretariat (Subsecretaría de Comunicaciones, Secretaría de Comunicaciones y Transportes, SCT). A government-industry committee was based on the model used in the United States and Canada. The date originally agreed for the analogue shutdown was 2021, obliging licence-holders to

delay introduction of the digital channel. In 2006, the Mexican Congress published amendments to the federal statutes on radio and television and on telecommunications in which the obligation to delay introduction of the channel was omitted. Months later, the Supreme Court declared some of the articles approved by Congress to be unconstitutional. In 2010, the president issued a presidential decree moving the date of the "analogue blackout" forward to 2015. That decision was held up for over a year by a December 2010 constitutional dispute. It was recently resolved by the Supreme Court, which upheld it. In early May 2012, the Federal Telecommunication Commission (Comisión Federal de Telecommunications, COFETEL)[20] issued a new transition policy, providing for a staggered shutdown of analogue signals over the coming three years whenever, one month before the date set, 90 per cent of households in the town concerned had a digital receiver.

COFETEL asked Congress to allocate funds to subsidize converters or decoders. It considers that the subsidy should be MXN 500 (about USD 40) for the procurement of digital converters and MXN 250 (USD 20) for antennas, for a total of MXN 17.33 billion (approximately USD 1.33 billion), not including the costs of a media campaign. As 2012 is an election year for president, state governors and members of parliament, the request was turned down. COFETEL will start the staggered programme in Tecate and Tijuana in 2012 and plans to conclude it on 31 October 2016. Independently of the political aspects that have hung over the transition to TDT, COFETEL considers that it is feasible to achieve the transition because the penetration of pay-TV is steadily growing.

Southern zone

Argentina chose the ISDB-T standard. The institutions involved in the TDT transition process are the Ministry of Federal Planning, Public Investment and Services and its Advisory Board on the Argentine Terrestrial Digital Television System (Consejo Asesor del Sistema Argentino de Televisión Digital Terrestre), the Secretariat of Communications, the National Communications Commission (Comisión Nacional de Comunicaciones), the Argentina Company for Satellite Solutions (Empresa Argentina de Soluciones Satelitales, AR-SAT), the Federal Authority for Audiovisual Communication (Autoridad Federal de Servicios de Comunicación Audiovisual) and the State-run broadcaster, Radio y Televisión Argentina. In August 2009, a decree was issued establishing the TDT transition process, which is to be implemented over ten years. Argentina's TDT Advisory Board is coordinating the development of the platform, which will be designed by AR-SAT. The platform was declared a public service in Decree No. 364/10. The Advisory Board drew up the measures for its implementation and approved the operating rules and strategic plan. It also drew up the Operational Plan for Access to Equipment for Free-to-Air Digital Television Reception (Plan Mi TV Digital), whereby the government guarantees that

[20] Broadcasting functions were transferred by law from the Communications Subsecretariat to COFETEL in 2006, when Congress approved the reform of the Federal Radio and Television Act (Ley Federal de Radio and Televisión) and the Federal Telecommunication Act (Ley Federal de Telecomunicaciones).

citizens and institutions that run the risk of being excluded from the transition process enjoy no-cost access to receivers.

Brazil started testing TDT standards in 1994. SET (Brazilian Television Engineering Society, or Sociedade Brasileira de Engenharia de Televisão) and ABERT (Brazilian Association of Radio and TV Broadcasters, or Associação Brasileira de Emissoras de Rádio e Televisão) met to define the adoption of a standard. In 1998, the telecommunication regulatory body, ANATEL, became the process coordinator.

Broadcast technology in Brazil is concentrated on the deployment of digital television. The Brazilian Digital Television System (Sistema Brasileiro de Televisão Digital, SBTVD) project was launched in order to analyse the deployment alternatives for the successful provision of digital television in Brazil. In 2006, the Brazilian government chose the ISDB-T standard, which incorporates the technological innovations considered relevant by the Brazilian government and the technical specifications of which should facilitate the following functions:

1. High-definition and standard definition digital television
2. Simultaneous digital transmission for fixed, mobile and portable reception
3. Interactivity

On 2 December 2007, the first Brazilian time-division duplexing (TDD) system started commercial operations in Sao Paulo, and by mid-2008 Brazil had 10 commercial broadcasters operating in the city.

The launch date for TDD transmissions was moved forward. Today, 49 per cent of Brazil's inhabitants have digital coverage. Interest in the new technology has spurred various broadcasters to invest earlier than required by law and to start digital transmission before the deadline.

Since the start of transmissions, market prices for digital signal receivers have gradually fallen. They fell even more quickly during the first half of 2010, with the approach of the FIFA World Cup.

Table 8. General TDT characteristics by country

Country	Standard	TDT policy launch date	% digital penetration	Analogue television shutdown date
Northern zone				
United States	ATSC	1997	97.8%	2009
Canada	ATSC	2002		2011
Mesoamerican zone				
Mexico	ATSC	2004	13.2%	2016
Guatemala	Being assessed			
El Salvador	ATSC			2019
Honduras	ATSC			2022
Costa Rica	ISDB-T			2018
Nicaragua	ISDB-T			
Panama	DVB-T			
Cuba	Being assessed			2014
Dominican Rep.	ATSC			2015
Andean zone				
Colombia	DMB-T/H			2017
Venezuela	ISDB-T?			2018
Peru	ISDB-T			2020
Ecuador	ISDB-T			
Bolivia	ISDB-T			2024
Southern zone				
Paraguay	ISDB-T			
Brazil	ISDB-T			2016
Uruguay	ISDB-T			2015
Chile	ISDB-T			2017
Argentina	ISDB-T			2019
Caribbean zone				
Antigua & Barbuda				
Bahamas	ATSC?			
Barbados	ISDB-T			
Belize				
Dominica				
Granada				
Guyana				
Haiti				
Jamaica				
San Kitts and Nevis				
Santa Lucia				
Saint Vincent and the Grenadines				
Suriname				
Trinidad and Tobago				

Source: ITU, DTC and the 2012 websites of the regulatory authority of each country

The remaining countries are in the process of evaluating the standard and strategies used in countries that have concluded the migration process with a view to implementing their public policy for the transition to TDT.

There are other experiences to share. The United Kingdom, using a different strategy, changed user perception. In 1998, the subscriber television platform used the name "OnDigital" for its dissemination campaign, later changing it to "ITVDigital". Both campaigns initially failed because of the high cost of content and the low number of subscribers. Later, the BBC, Sky and Crown Castle formed a consortium called Arqiva. The consortium acquired the platform and renamed it "Freeview". This had a positive impact on users, who had previously perceived subscription-based television as the same as pay-per-view television. The words "free" and "view" automatically implied that there would be no subscriptions. Today, Freeview has sold 55 million receivers and is present in 90 per cent of households. It is only a concept; it does not operate TV channels or provide services. Arqiva handles transmissions and network multiplexing in order to optimize coverage and bandwidth. The Digital Television Group (DTG) brings together the industry's broadcasters, operators, manufacturers, regulators and sellers. It develops and maintains the technical specifications, running conformance tests of manufacturers' receivers. Lastly, Digital UK provides support to consumers and helps them through the transition.

Hong Kong launched TDT in January 2008 with its two free-to-air TV broadcasters, ATV and TVB. The regulatory authority issued new licences 18 months later, to promote competition. The platform used is China's DMB-T standard. Digital television laboratories have been set up that issue seals of conformance for receivers and confirm that their evaluation was satisfactory and the equipment interoperable. Today, Hong Kong has more than 1.5 million receivers in 60 per cent of households.

The transition to digital television has been marked by platform convergence, which, in the long run, could be transparent for the end user.

3 Broadband access and uptake in urban and rural areas

In addition to identifying the degree of broadband penetration in the region, as described below, this section analyses the enabling environment or broadband ecosystem in order to guide activities for ensuring that the ecosystem exists in all the subregions identified. The results will facilitate the establishment of priorities for the projects presented and the areas requiring attention, and parameters for defining their impact.

In finding and analysing the information, the following criteria, drawn from various ITU and World Bank[21] recommendations and the broadband ecosystem put forward by the ITU-

[21] ICT Toolkit.

UNESCO Broadband Commission for Digital Development,[22] were used to ascertain the state of the broadband enabling environment in the region.

Evaluation criteria

1. Planning

One key element, at country and, if possible, subregional level, is the existence of broadband plans drawn up together with multiple stakeholders, at the highest level, accompanied by implementing mechanisms and medium-term financial commitments. In this respect, this section endeavours to identify existing broadband plans by country, in the light of the above criteria.

2. Regulatory environment

Another key element is the existence of a conducive regulatory environment, which implies transparent regulatory processes, an advisory body, flexible mechanisms for dispute settlement (mainly in regard to interconnection), flexible and transparent (one-stop) licensing procedures, easy access to rights of way, promotion of optimum use of infrastructure and open and non-discriminatory access to it, traffic exchange points, network neutrality and social coverage mechanisms.

This section refers to some aspects of the regulatory environment, but does not deal with it in its entirety, as the topic is the subject of a specific study.

3. Essential infrastructure

The existence of telecommunication backbones and frequency availability are crucial factors of broadband deployment. They ensure, first, connection to regional backbones, and secondly, the existence of backbones for deployment to remote, hard-to-reach or low-return areas.

In this respect, this section identifies existing regional or national backbones, strategies for sufficient resources to ensure their sustainable operation, the availability of frequencies for the provision of cellular broadband, and the existence of access to submarine cables or satellite output.

4. Universal access

Irrespective of the existence of appropriate infrastructure, skills and regulations, ensuring service provision requires strategies and action guaranteeing service countrywide and to all inhabitants, if we consider broadband to be a basic service and a right.

In this respect, the existence must be ascertained of basic infrastructure for the deployment of last-mile services to such places, of regulatory mechanisms facilitating cooperation among

[22] Broadband Commission for Digital Development, A 2010 Leadership Imperative: Towards a Future Built on Broadband, ITU-UNESCO, 2010.

numerous operators based on economies of scale, and of programmes to foster and develop capacities for network deployment and sustainability in marginal areas.

5. Demand incentives and uptake capacity

While the above points have to do with the deployment of broadband networks, this point is related to broadband use and sustainability, i.e. to the capacity to make practical use of broadband in specific development and well-being processes.

This point comprises chiefly two interrelated areas: capacity building and content generation. It implies transforming the traditional schemes for providing basic services (health, education and government) into digital services, and generating capacity to use, design, maintain and develop ICT applications.

These five points were considered when ascertaining the state of the region as a broadband ecosystem. In the light of the information available in the short time in which the study was conducted and of the parallel studies being conducted in the region, this study concentrates on points 1 (planning) and 3 (essential infrastructure), and broaches certain aspects of points 4 (universal access) and 5 (demand incentives).

Broadband plans in the Americas

As of 2012, only the United States, Costa Rica, Ecuador, Peru, Brazil and the Dominican Republic had specific plans for the deployment and use of broadband. Most countries, especially those in Central and South America, have incorporated plans for broadband development into other plans or agendas, or, as a first step, have recognized the importance of expanded access to telecommunications for improving development. The rest, basically those located in the Caribbean, have no national plans.

CITEL's Permanent Consultative Committee I maintains an updated Technical Notebook that contains a description of the main technologies used for broadband access. The Notebook is built on information provided by CITEL members and is entitled *Broadband Access Technologies* (the Notebooks were instituted by CITEL resolution PCC.I/RES.142(XV-01)). Although the Technical Notebook has not yet been approved by CITEL members, it is neutral and therefore serves as a quick reference for all access technologies currently on the market. CITEL also has an updated Technical Notebook on the region's broadband policies, pursuant to resolution PCC.I/RES. 172 (XVII-10), in which the Member States agreed to monitor broadband policies. The Notebook is based on a survey, with the following countries having provided information to date: Argentina, Brazil, Chile, the Dominican Republic, Honduras, Panama, Peru and Venezuela.

The broadband plans of the countries of the Americas were analysed using the following criteria:

- Were they formulated at the highest political level?

- Are they accompanied by implementing mechanisms and medium-term funding commitments?
- Do they provide for mechanisms of ongoing consultation with a broad range of stakeholders from the private sector, civil society and various national government jurisdictions and agencies?
- Do they set ambitious but realistic goals?
- Do they spell out the responsibilities of an executive body?
- Do they treat broadband Internet the same as other public services from the regulatory point of view?
- Do they encompass service to rural, remote or low-return areas?

Northern zone

North America is the most advanced region, although it is lacking in policies to allow underprivileged sectors to benefit from the service. Following a broad consultation among public, private and civil society players, the FCC published *Connecting America: The National Broadband Plan*, an exhaustive document that meets all the above-mentioned criteria except ongoing consultation with those involved in the sector.

Canada does not have a broadband plan but rather various strategies formulated and implemented over the years, making it one of the most advanced countries when it comes to this technology. All the strategies deal with broadband as a service requiring regulation, and grant financial support for its extension to rural areas, a costly undertaking for such a large and sparsely populated country. Canada needs to redouble its efforts to cover remote areas, and to this end has discussed the relevance of drawing up a broadband plan.

Although the United States and Canada have made considerable progress when it comes to broadband access, they need to reinforce their strategies for reaching remote or less privileged sectors of the population. The United States has already launched its broadband plan, whereas Canada is considering doing so and continues to pursue strategies established several years ago.

Mesoamerican zone

A review of the documents obtained from the government of each country shows that only the Dominican Republic and Costa Rica have broadband plans in this zone. Both were drawn up at the highest political level. The Dominican Republic's Broadband Rural Connectivity Project (Proyecto Conectividad Rural de Banda Ancha) dates from 2008 and has progressed thanks to the joint efforts of the public and private sectors to bring telephony and Internet access to remote areas. Those efforts will be supplemented by the Caribbean Regional Communications Infrastructure Programme (CARCIP), the aim of which is to support the efforts of all countries in the Caribbean region to promote the development of national and regional broadband networks and their productive use, through measures intended to foster the supply of and

demand for ICT services in the region.[23] In the case of the Dominican Republic, extending broadband infrastructure includes improving connectivity with its neighbour, Haiti. The programme is to be approved in 2012 and will probably include the development of a broadband plan that will then be implemented with the private sector.

In Costa Rica, the National Broadband Strategy (Estrategia Nacional de Banda Ancha) is very comprehensive and meets all the above-mentioned criteria, except that it does not define the responsibilities of the executive body.

None of the remaining countries of Central America have a specific broadband plan.

In March 2012, Mexico's Communications and Transport Secretariat launched Agenda Digital MX, one of the aims of which is to bring broadband Internet access to all Mexicans. It subsequently defined activities to strengthen broadband and ICTs (Acciones para el Fortalecimiento de la Banda Ancha and las TCI), which touch on all aspects of infrastructure provision for telecommunication development, the regulatory environment and the momentum for social connectivity.

In Panama, the National Authority for Government Innovation (Autoridad Nacional para la Inovación Gubernamental) produced the document entitled *Red Nacional de Acceso Universal a Internet* (National Network for Universal Access to Internet), which contains implementing and financing mechanisms for expanding broadband and views access to it as a public service.

The government of Guatemala has implemented the Programme for Rural Economic Development (Programa Desarrollo Económico desde lo Rural), one of the subcomponents of which deals with connectivity and is the responsibility of the Telephony Development Fund (Fondo para el Desarrollo de la Telefonía).

Nicaragua is in the process of inviting tenders for its broadband plan, which will have six fundamental aspects: 1) telecommunications, 2) regulation, 3) information security, 4) content, 5) research and 6) development and universal service.

ETECSA, the Cuban telecommunications firm, has embarked on an analysis of broadband uptake during the new licensing period.

Neither Honduras nor El Salvador have taken initiatives with regard to broadband or have a broadband plan, although both are participants in the regional project entitled Mesoamerican Information Highway (Autopista Mesoamericana de la Información, AMI), the goal of which is to provide Mesoamerica with more connectivity at a lower price by means of fibre optics and submarine cables.

[23] "Profile of the Dominican Republic in the Caribbean Regional Communications Infrastructure Program (CARCIP)" , presented by the delegation of the Dominican Republic at the XX Meeting of Permanent Consultative Committee I: Telecommunications/ Information and Communication Technologies (ICT), 16 to 19 May 2012, Buenos Aires, Argentina.

In conclusion, the Mesoamerican zone presents an uneven picture in terms of the existence of broadband plans or initiatives to foster broadband uptake. Because the countries and economies involved, with the exception of Mexico, are small, they would benefit from support for the preparation of comprehensive broadband plans. Meanwhile, they could update their initiatives in the light of new technologies or review the goals set, since they have met them. Certain international funding bodies have expressed the intention to support them, examples being the IDB project Broadband Development for Competitiveness and the ITU initiative Broadband Deployment in the Americas. The IDB also finances the Mesoamerican Project, one of the objectives of which is to conduct studies of the impact of broadband in the region. The study results will provide valuable input for the definition of effective plans enabling broadband to be a driver of development in the economies concerned.

Andean zone

In Peru, the Transport and Communication Ministry recently launched the 2011-2016 National Broadband Development Plan (Plan Nacional para el Desarrollo de Banda Ancha 2011-16). The plan is very complete and includes goals and implementing mechanisms. The Telecommunication Investment Fund (Fondo de Inversión en Telecomunicaciones, FITEL) is in charge of its financial administration. The plan also recognizes access to broadband as being a public service and provides for service to rural, remote and low-return areas. Lastly, it establishes which players are involved in the sector but makes no provision for consultative mechanisms and does not define the functions of the regulatory body.

Ecuador's Telecommunications and Information Society Ministry has published the National Broadband Plan (Plan Nacional de Banda Ancha), which meets all the above-mentioned criteria except mechanisms for consultation with sector stakeholders.

Under the 2008-2019 ICT National Plan (Plan Nacional de TCI 2008-2019), Colombia's Ministry of Communications sets goals for broadband uptake accompanied by implementing mechanisms and financial commitments, defines the functions of the implementing body, treats broadband Internet access the same as other public services from the regulatory point of view, and provides for service to rural, remote or low-return areas.

Venezuela does not have a broadband plan. The National Telecommunication Commission (Comisión Nacional de Telecomunicaciones) administers the Universal Service Fund (Fondo de Servicio Universal), which finances related projects.

Lastly, Bolivia's National Digital Inclusion Plan (Plan Nacional de Inclusión Digital) refers simply to the importance of broadband.

On the one hand, the Andean zone has taken major steps towards laying the groundwork for broadband uptake, in the form of specific or sector plans that cover the subject in great detail. There are few mechanisms for consultation among the stakeholders involved, which are key to realizing schemes that are of benefit to both private investors and the population, including

people living in unprofitable or low-return areas. On the other hand, there is no comprehensive planning in Venezuela or Bolivia, which could benefit from support from ITU's Deployment of broadband in the Americas project.

Southern zone

Brazil is the only country in the southern zone that has a plan, ANATEL's National Broadband Plan. The plan meets all the above-mentioned criteria but has no mechanisms for ongoing consultation with a wide range of private players, civil society members and various national government jurisdictions and agencies.

In Chile and Argentina, Chile's Ministerial Committee for Digital Development (Comité de Ministros para el Desarrollo Digital de Chile) and Argentina's Commission for Planning and Strategic Coordination of the National Telecommunication Plan (Comisión de Planificación and Coordinación Estratégica del Plan Nacional de Telecomunicaciones) drew up the 2007-2010 Digital Strategy and Argentina Conectada, respectively. Both meet the criteria except when it comes to mechanisms for consulting with sector stakeholders.

In Paraguay, the National Telecommunication Commission (Comisión Nacional de Telecomunicaciones) developed the Paraguay 2013 Conectado initiative and the Universal Service Funds as an implementing and financing mechanism. Based on the information available, Paraguay has set ambitious goals, deals with broadband Internet access the same way as other public services from the regulatory point of view, and plans to provide service to rural, remote or low-return areas.

Uruguay has no broadband plan or full-scale initiatives, but it has a well-developed infrastructure and one of the most important ICT educational plans, the Plan Ceibal, which is considered to constitute best practice by various international bodies. It is linked to broadband deployment strategies specifically to connect all schools.

The countries in the Southern zone have constructed solid strategies for broadband development, although all fail to provide for ongoing consultation among the sector's participants.

Caribbean zone

Lastly, when it comes to the countries of the Caribbean, Trinidad and Tobago has been working on a broadband plan since 2007. Granada, Saint Lucia and Saint Vincent and the Grenadines are also in the process of joining CARCIP, along with the Dominican Republic. Haiti has expressed interest in joining and is seeking IDB funding. It is hoped that more countries will join in the future. CARCIP will serve to plan broadband development at national and regional level.

CARICOM, which is made up of Antigua and Barbuda, the Bahamas, Barbados, Belize, Dominica, Granada, Guyana, Haiti, Jamaica, Montserrat, San Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago, acknowledges that several of its members

have implemented their own national ICT policies and have made progress in terms of implementing strategic plans.[24] CARICOM is also drawing up the Regional Digital Development Strategy, which refers to the importance of broadband but provides no detail on uptake. The development of a concrete regional broadband plan is being discussed with ITU Broadband Commission for Digital Development, said plan to include financial and deployment strategy models in line with the economic characteristics of each country.

Thus, various regional efforts are being made in the Caribbean to encourage the use of ICTs, although there are no specific, detailed plans for broadband uptake.

The size of each economy and country of the Americas is reflected in that country's telecommunication sector and in its determination with regard to broadband uptake. Thus, North America has effective broadband plans or series of plans. Central America has made serious efforts, but in some countries the subject remains nascent (e.g. Honduras and El Salvador) and in others the policy is dispersed in various documents and statutes, as in the case of Mexico. In the Andean zone there are solid plans (Peru, Colombia and Ecuador) and also countries in which planning lags behind (Bolivia and Venezuela). In the Southern zone, the major countries and economies have made solid plans. The criteria used to analyse the plans were met to varying degrees, but it is striking that only Costa Rica, Argentina and Chile considered and established mechanisms for ongoing consultation and dialogue among sector participants.

[24] Draft Connect the Caribbean Position Paper, March 2012.

Table 9. Status of broadband plans in the Americas

Zone	Country	Plan	Diffuse initiatives	Subject being analysed	Subject not addressed
Northern zone	United States	X			
	Canada		X		
Mesoamerican zone	Costa Rica	X			
	Mexico		X		
	El Salvador			X	
	Guatemala		X		
	Honduras			X	
	Nicaragua			X	
	Panama		X		
	Dominican Republic	X			
Caribbean zone	Antigua Barbuda			X	
	Bahamas			X	
	Barbados			X	
	Belize			X	
	Dominica			X	
	Granada			X	
	Guyana			X	
	Haiti			X	
	Jamaica			X	
	San Kitts and Nevis			X	
	Saint Vincent and the Grenadines			X	
	Saint Lucia			X	
	Suriname			X	
	Trinidad and Tobago			X	
Southern zone	Argentina		X		
	Brazil	X			
	Chile		X		
	Paraguay		X		
	Uruguay			X	
Andean zone	Bolivia			X	
	Colombia		X		
	Ecuador	X			
	Peru	X			
	Venezuela		X		

Source: compiled on the basis of the information available and analysed

3. Essential infrastructure

This section seeks to identify the region's needs with regard to essential infrastructure, i.e. backbone, backhaul and local networks. On the basis of the information available, priority areas

are identified on which the governments of each zone are working, with a view to fostering regional synergies and support.

The situation varies throughout the region. Some countries are concentrating their activities on increasing capacity and extending existing backbone, backhaul and local networks in order satisfy growing demand or reach low-return areas with no access. Others need to create regional backbones and submarine cable connections so as to have the basic infrastructure needed to deploy backhaul and local networks. In the Caribbean zone, all States, with a few exceptions, are in the process of planning the development of essential infrastructure.

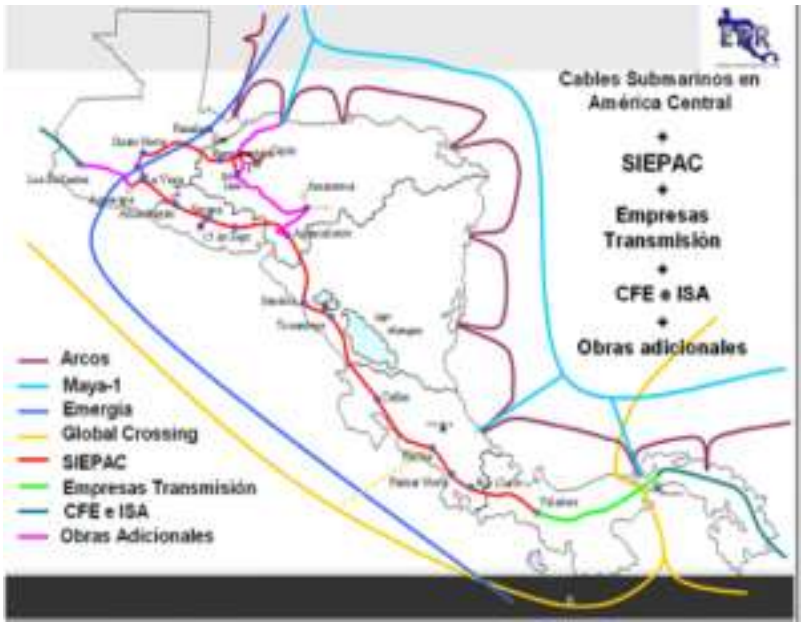
Northern zone

The United States and Canada have ongoing plans for the development of telecommunication infrastructure and have installed a high-capacity fibre-optic backbone network throughout the territory. The main drivers of this development have been universities, research centres and telecommunication network operators. The infrastructure is in turn interconnected with networks in Europe, Asia, Africa and the rest of the Americas via submarine cables. Academic circles have also developed a large bandwidth infrastructure for research and education. Canarie in Canada and Internet2 (UCAID) in the United States take part in government programmes to support the development of broadband networks in their respective countries and thereby provide access to urban areas with no access and remote rural areas. Canarie and Internet2 are connected to the two subregional academic initiatives: RedCLARA (Latin American Advanced Networks Cooperation) in Latin America and CKLN's C@ribNet in the Caribbean.

Mesoamerican zone

Backbone networks are planned in four specific parts of the zone (Mexico-Central America, the Dominican Republic, Colombia and Cuba), and their infrastructure is therefore analysed separately.

Figure II



Cables submarinos = Submarine cables in Central America
Empresas … = Transmission companies
Obras adicionales = Additional works

Source: www.redcasiepac.com.

Figure II shows the IDB-funded Mesoamerican Information Highway, which will link Mexico, Colombia and Central America through a fibre-optic backbone supported principally on the Central American Electrical Interconnection System (Sistema de Interconexión Eléctrica de los Paises de América Central, SIEPAC). In Mexico, it is connected to the Federal Electrical Company (Compañía Federal de Electricidad, CFE) and in Colombia, to UNASUR. The Central American Electricity Market, which uses 12 of the 36 fibre-optic cables for its control, is already operational. It would appear that all the technical concerns relating to the start of business operations of the fibre-optic telecommunication backbone to be operated by REDCA have been resolved.

Another infrastructure in the same zone was acquired by RedCLARA and constitutes the backbone for Central America's National Research and Education Networks (Redes Nacionales de Investigación and Educación, RNEI).[25] It has two dark fibre wires running from Tapachula (Mexico) to Guatemala (330 kms), from San Salvador to Managua, Nicaragua (651 kms) and from San José, Costa Rica to Panama (995 kms). It is a dense wavelength-division multiplexing (DWDM) network with a 2.5-Gbit/s lambda that can be expanded to various 10-Gbit/s channels with little investment. This platform is suitable for use in education, health and government services and in disaster response.

[25] The RNEI are described in Section 4 below, Reduction of Internet access costs.

Mexico's SCT invited tenders in 2010 for two dark fibre wires for the CFE's 22 000-km fibre-optic network, to heighten the backbone's competitiveness. The SCT has announced that it plans to invite tenders for two more wires in order to increase backbone capacity availability and offer more services.

In 2010, the SCT's Information and Knowledge Society Coordinating Office (Coordinación de la Sociedad de la Información and el Conocimiento) launched a new project, the National Network to Promote Bandwidth (Red Nacional para el Impulso de la Banda Ancha, RedNIBA). The project also uses a capacity of 10 Gbit/s over the entire CFE backbone and is entrusted with providing support for the development of education, health and government networks, the academic network, Mexico's RNIE (CUDI) and State networks.

In this respect, a regional connectivity strategy must encompass cooperation between initiatives in order to complete existing backbone trajectories and to link full use of these networks so that they are sustainable.

Backbones are being deployed in the Dominican Republic under CARCIP, which aims to support the efforts of all countries in the Caribbean zone to promote the development and productive use of national and regional broadband networks through measures aimed at fostering the supply of and demand for ICT services in the zone.

In terms of infrastructure, the programme plans a national fibre-optic network to connect 155 municipalities and municipal districts and to interconnect various points in Haiti and other regional networks, such as C@ribNET.[26] The deployment of this backbone is awaiting World Bank support and will be implemented, it is hoped, by means of a public-private partnership.

Cuba lags far behind the other countries in terms of telecommunications, despite the government's efforts to build a national fibre-optic network. The main problem it faces is the lack of outlets to international networks, given that the submarine cable linking it to the United States has been damaged and the only remaining link is by satellite. To compensate, Cuba and Venezuela have commissioned the binational company Telecomunicaciones Gran Caribe to build a 550-km submarine cable linking the two nations. The cable will triple existing capacity and will provide more efficient and economical connection than satellite.

As in Mexico and Central America, RedCLARA represents an alternative for connecting to the island's research networks. Plans are to incorporate it as an associate of the network, although it is already collaborating in several research projects.

Cuba is no doubt one of the candidates for the support being provided to strengthen communications. That support could be used to eliminate the digital divide between it and the other countries in the zone.

[26] C@ribNET is a physical network founded on the initiative of the Caribbean Knowledge and Learning Network (CKLN), the equivalent of RedCLARA.

The deployment of backhaul networks, local networks and frequencies is a challenge shared by all countries in the region, in particular with regard to the regulatory aspects of interconnectivity and shared infrastructure, and obtaining rights of way for network deployment.

In the Mesoamerican zone, the Mexican government intends to support the provision of broadband services to rural and inadequately serviced areas. These areas either have no broadband infrastructure or the existing broadband operator is unable to meet market demands for want of sufficient returns. They are home to approximately 32 million people. The services are to be provided by a public-private partnership using fibre-optic rings.

The extensive penetration of mobile telephony in Latin America (88 per cent in 2010) and the strong growth in mobile broadband in the region (45 per cent of Internet users in 2010) make this a promising means of achieving universal broadband service in the region. Countries like Nicaragua, Guatemala, El Salvador and the Dominican Republic have more mobile than fixed broadband access.[27]

Given that the future in terms of universal broadband coverage is in mobile broadband, spectrum allocation for this use is deemed essential in the so-called Mesoamerican zone. El Salvador and Guatemala have developed a spectrum allocation policy that has reduced costs compared to countries that have taken no such measures.[28]

The use of the 700-MHz band for mobile broadband represents an important resource for the ongoing uptake of such services. CITEL's Permanent Consultative Committee I is working on an agreement for new allocations for mobile and fixed services with a view to their regional harmonization.

Andean and southern zones

The backbone networks in these zones run through two landlocked countries which therefore have no direct outlet to a submarine cable. This is the biggest challenge for backbones in the zone. Bolivia and Paraguay, the two countries concerned, are seeking to connect their fibre-optic backbones in order to improve the business conditions for access to a submarine cable. This makes it crucial for both countries to be able to extend their backbones to the border.

In terms of regional networks, the UNASUR (Union of South American Nations) project to construct a South American fibre-optic ring connecting the fibre-optic networks of the countries making up UNASUR (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay and Venezuela) stands out. The project is in the development stage, but the IDB, the Development Bank of Latin America (CAF), the Banco de Desenvolvimiento de Brasil and the Plata Basin Fund (FONPLATA) have all offered funding. It is

[27] Flores and Mariscal, *Oportunidades y Desafíos de la Banda Ancha Móvil en América Latina*, CIDE Working Paper No. 267, 2012.

[28] *Ibid,* p. 24.

hoped that the ring will increase broadband speed and reduce access costs. The project also encompasses other activities such as traffic exchange points, content production and two new submarine cables to connect Brazil with the United States and Europe.

Most of the region's countries are implementing ambitious plans to expand their backbones. In this respect, Colombia's Plan Vive Digital plans to expand submarine cables and to provide 700 of the 1 101 municipalities with fibre-optic access under a public-private partnership development contract.[29]

Ecuador, for its part, is working on the construction of the National Transmission Network, and plans to add 1 850 km of optical fibres to its existing network, of which it had deployed 1 400 km by 2009.

In Peru, the national fibre-optic network does not cover 142 provincial capitals, only the coastal region. The plan is therefore to deploy a second fibre-optic network linking the 195 provincial capitals, and subsequently to develop projects for fibre-optic or radio-link transport to the districts.

Brazil probably has one of the most ambitious broadband plans to connect rural Brazil. The government is implementing various activities through the State corporation Telebras, for example stipulating coverage obligations for licence-holders so as to reach all municipalities. In order to lower costs and increase connectivity, Brazil intends to lay two more submarine cables and connect with the United States and Europe. It also recently signed an agreement with the government of Angola to connect Fortaleza with Luanda.

For Argentina, one of the key aspects of the Argentina Conectada strategy is the creation of the federal fibre-optic network, a first step in the effort to connect at least 1 700 places and, by 2015, 97 per cent of the population, the remaining 3 per cent benefiting from satellite coverage.

Uruguay has an excellent physical fibre-optic network, copper pairs and cable modem, owned by the State-run corporation ANTEL. It is endeavouring to increase the density of the fibre-optic network by deploying fibre-to-the-building.

Guyana plans to construct a 50-km fibre-optic network for the implementation of its e-government programme.

Paraguay plans to build a 750-km fibre-optic network to connect the Misiones, Itapuá and Ñeembucú departments.

RedCLARA also has very high-capacity coverage in the area comprising Brazil, Argentina and Chile, which is the corridor for the Southern zone's astronomical observatories. It plans to make Paraguay, one of the countries with the biggest infrastructure problems because of its geographical location, part of the network. As stated above in the section on the Mesoamerican

[29] See Beltrán et al., *El Plan Colombiano para Crear un Ecosistema Digital*.

zone, RedCLARA provides an alternative means of incorporating health, education and government services.

As stated earlier, projects for backbone deployment are accompanied by the deployment of backhaul and local networks, which are described below.

Colombia, in addition to the deployment of optical fibre within the Vive Digital plan, has started to review spectrum caps in order to provide mobile Internet services. It has also started allocating 30 MHz in the 1 900 band and has made allocations in the 1 700-2 100 MHz and 2 500 MHz bands.

Uruguay is also re-arranging its spectrum in order to release frequencies for mobile broadband.

Peru is also considering broadening its invitations to tender and reviewing band caps that may be used for mobile broadband. Once it has deployed backbone covering the capitals, it plans to connect districts with fibre or radio links.

Brazil is no doubt one of the most advanced countries when it comes to backhaul and local networks. It has managed to extend network coverage for broadband services and now covers the 5 565 municipal capitals.

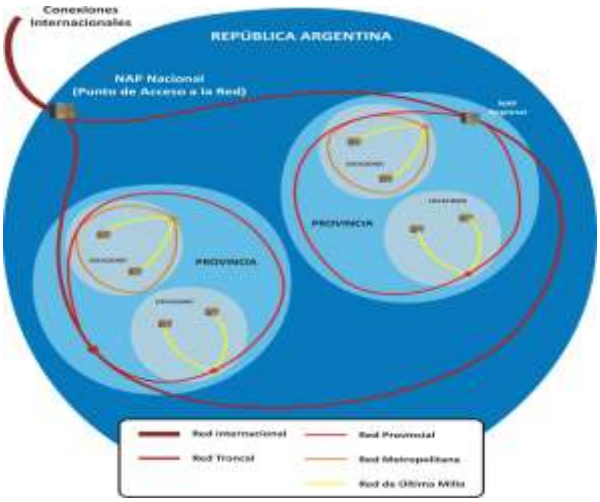
Figure III

3.439 sedes que recivieron el backhaul = 3 439 capitals that received backhaul
2.125 sedes que ya tenian la infraestructura = 2 125 capitals that already had infrastructure
5.565 sedes de municipalidades = 5 565 municipal capitals
Municipios = Municipalities
Año = Year

Source: ANATEL Prep-Connect Mexico, 2012.

Argentina, which has planned the federal fibre-optic network, has decided to create last-mile networks connected to a metropolitan network. The last-mile networks are to be developed via telecommunication micro-operators. Projects are therefore being developed to buttress and improve existing networks, scale up networks so as to raise performance parameters, facilitate technical assistance to last-mile players and promote financing programmes.

Figure IV. Federal fibre-optic network project – Argentina

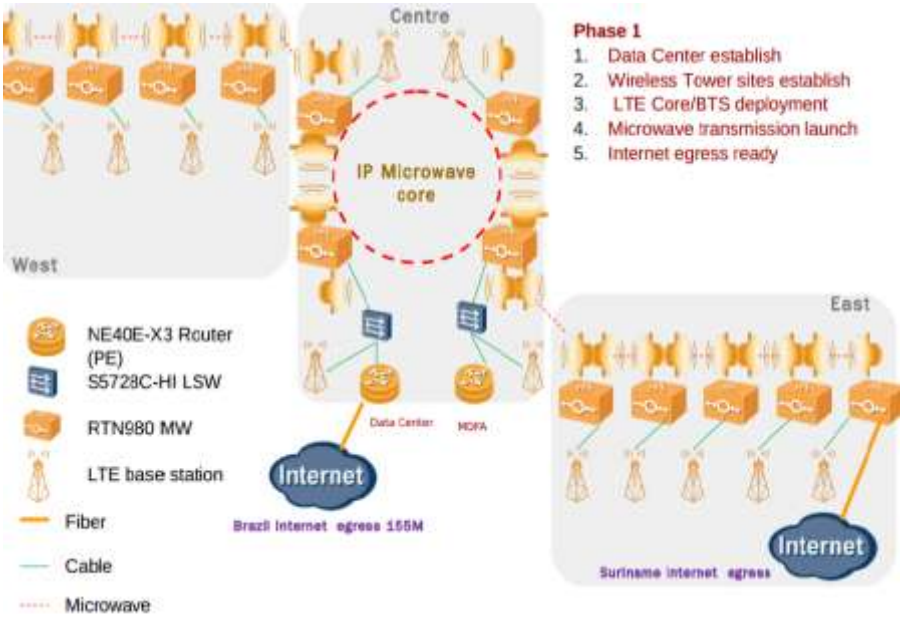


Conexiones internacionales = International connections
República Argentina = Argentina
NAP nacional (punto de acceso a la red) = National network access point
NAP regional = Regional network access point
Provincia = Province
Localidad = Place
Red internacional = International network
Red troncal = Backbone network
Red Provincial = Provincial network
Red metropolitana = Metropolitan network
Red de última milla = Last-mile network

Source: Argentina Conectada national plan.

Guyana is considering a scheme of backhaul and local networks comprising 56 wireless sites, 55 TDD-LTE sites and 55 microwave hubs, as set out below.

Figure V. Configuration of backhaul and local networks in Guyana



Source: Office of the President of Guyana, Project document, 2006-2012.

Lastly, Paraguay's last-mile infrastructure allows for wireless and cabled access through multiservice access nodes.

Caribbean zone

Analysing the basic infrastructure in the zone implies understanding how the countries concerned are organized with respect to telecommunications/ICT and the role played by the different organizations in this regard.

CARICOM, the main administrative and technical body bringing together the community of Caribbean States, has established a strategy for converting the community of States into a single ICT space. For that purpose, it has set two principal goals: 1) to define a modern regulatory framework and an open and accessible infrastructure that can provide access anywhere at affordable prices; and 2) to guide the industry and the Member States in the use of ICTs for sustainable and social development.[30]

The Caribbean Association of National Telecommunication Organisations (CANTO), a regional business organization of telecommunication operators set up to facilitate the development of ICT solutions for the benefit of its members, plays an important role in telecommunication policy and regulation and in the construction of a regional network of industry leaders.

Lastly, the Caribbean Telecommunications Union (CTU) is an international treaty organization in charge of intergovernmental telecommunication policy. It has a mandate to develop telecommunications in the zone. It is considered the zone's main facilitator of ICT policies and best practices, the main source of advice for the zone's governments, a contributor to the

[30] See Caribbean Contribution to CTA Position Paper.

development of ICTs and capacities in the zone and the coordinator of the zone's positions at international forums.

As we have seen, the zone's strategy is to develop an ICT space integrating the countries. Accordingly, only a few countries have their own broadband or infrastructure development plans. In general, infrastructure development is left to the operators, although public-private partnerships are promoted. This is because, of the region's 20 million inhabitants, 14 million are to be found in the Dominican Republic and Haiti, while the rest are scattered over the remaining islands.

Noteworthy among the country initiatives is Jamaica's Universal Access Fund, which seeks to establish a national broadband network with a fibre-optic backbone that uses Metro Ethernet technology, working with the providers LIME and FLOW, on its electricity grid. It has also set up community access points in various places.

The advanced academic network of fibre-optic submarine cables, C@ribNET, along with RedCLARA in Latin America, is a key infrastructure component for the zone's development. Besides the development of applications, it facilitates the integration of academic and research prowess in a single conglomerate. The network already has a backbone, depicted in Figure VI below, and low-capacity connections for all the islands of the Caribbean.

Figure VI: C@ribNET network (CKLN)

Source: CKLN.

The operators are also taking initiatives. These include studies on the present state of broadband by Digicel and the launch of the East-West Cable System linking Jamaica and the Dominican Republic.

The zone is working with ITU's Broadband Commission to develop a broadband strategy incorporating financial schemes and technological and economic alternatives.

Unlike in the other zones, broadband development in the Caribbean is in most cases at the design and development stage of coordination and research for the deployment of basic infrastructure across the zone to make its operation viable.

4 Reduction of Internet access costs

The Internet is the sum of all connections between and among different, administratively independent, public and private networks in a city, a country and the rest of the world: it is a network of networks. Today, telecommunication networks have adopted an Internet communication protocol known as IP.

As applications, services and content are carried using that protocol, there is a need to make more efficient use of networks and their interconnectivity to ensure that communication between two users, whether close together or far apart, is carried out efficiently by improving the quality of the service so that it operates as swiftly as possible and at the lowest possible cost.

Aspects of modern communications made possible by adopting IP are the following (convergence and next-generation networks):

1. Today, traffic can be exchanged between different networks that could not originally speak to each other, using a common communication protocol.
2. Voice communication (telephony) is no longer the sole service for exchanging information on telecommunication networks. Today, people communicate using voice, data, audio, video, images and text, or some combination of them.
3. Content/applications/services can be stored in root servers anywhere in the world. Mirror servers can also be set up to provide quicker access from any given location.
4. Any Internet user can become a developer of content/applications/services.
5. They are mainly two-way services, and the trend is for one-way services to become two-way.
6. Users are technologically neutral and expect “anytime, anywhere, anything” access.
7. Internet broadband access has become essential for being connected.

Public policies for developing countries' broadband access plans are geared to establishing a national trunk network that can provide a nearby web access point for the general population, so that everybody is able to demand or supply content/services/applications. Governments that promote the development of inclusive infrastructure of this kind, with the participation of the public and private sectors, operator networks, national research and education networks (NRENs), Internet service providers (ISPs) and society in general can eliminate the digital divide in access to modern communications, while simultaneously creating a communications ecosystem.

From the network engineering standpoint, the most efficient way of carrying traffic to network users from its origin to its destination is along the most efficient route the network can find. Current Internet topology requires re-engineering so that network resources can be used efficiently to deliver information and reduce access and transport costs.

Ever since the Internet was created, studies have been carried out on the most efficient way of establishing global connectivity. Different initiatives have arisen whose names have changed over time but which essentially refer to the same principle. They relate to the exchange of traffic between networks at common points where a significant number of users or different networks are concentrated, known as access points. In the 1990s, they were called network access points (NAPs). Today they are known as Internet exchange points (IXPs). These are physical sites bringing together different access providers, content/service/application providers, network infrastructure providers and end users having an autonomous system (AS).[31]

The main purpose of an IXP is to establish an agreement for the exchange of traffic in which the parties voluntarily determine how they will interconnect. When applicable, agreements also provide for payments for such exchanges. As a rule, though, an effort is made to balance out traffic so that the demand matches the supply. This means that no payments are required for the exchange of traffic, a concept known as "peering".

IXPs can be as complex as their members wish and can cover functions beyond the exchange of traffic. In developing countries they are used to decongest traffic exchanged locally in services such as e-mail, text messaging, information retrieval from databases and webpages stored in local servers. This redistribution of traffic frees up routes to other destinations so that the network will not become unnecessarily congested, to the detriment of communication between users.

Exchange traffic between networks has grown substantially for the reasons described in the seven points listed above. Routine data traffic over the Internet is joined by traffic from traditional voice networks (telephony), audio and video (television), text messaging and other new applications such as services for social networks and software platforms (cloud computing, virtual private networks, etc.).

The Internet Society (ISOC)[32] undertook the task of summarizing the benefits of locally routing Internet traffic through an IXP in the following points:

- Substantial cost savings are made by eliminating the need to put all traffic through the more expensive long-distance links to the rest of the world.
- More bandwidth becomes available for local users owing to the lower costs of local capacity.
- Local links are often up to ten times faster because of the reduced latency in traffic, which makes fewer hops to get to its destination.

[31] Wikipedia defines this as a collection of Internet Protocol (IP) networks which have a common, independent routing policy. This reflects the key feature of an autonomous system. It manages its own traffic that flows between it and the other autonomous systems making up the Internet. An autonomous system number (ASN) is assigned to each autonomous system, which is a unique identifier of its networks in the Internet.

[32] *Promoting the Use of Internet Exchange Points (IXPs). A Guide to Policy, Management and Technical Issues.* Mike Jensen, Internet Society Reports, 2008.

- New local content providers and services which rely on high-speed low-cost connections become available, further benefiting from the broader user base available via the IXP.
- Internet providers have more options for sending upstream traffic to the rest of the Internet, making for a smoother and more competitive wholesale transit market.
- The presence of an IXP helps to encourage more local content development and creates an incentive for local hosting of services.
- The cost of installing an IXP is significantly lower than leasing from large operators in developing countries which, in general, exercise monopolies in supplying links.
- The topology of the IP network is improved and there is more efficient routing which helps decongest the network.

IXPs have been established globally with different institutional structures, some public and some private, some for-profit and some not-for-profit. These organizations have been capable of managing IXPs with an even-handed, neutral approach to the benefit of their members.

The international trend is for governments to refrain from laying down technical or regulatory requirements for the functioning of an IXP, although it is true that in some countries the regulatory authority has intervened by instituting mechanisms to force operators to participate in IXPs. This has occurred mainly because vertically-integrated operators, which generally have substantial power in access and transport networks, have no incentive to level the playing field for competition. However, governments that have not intervened can also carry out positive actions to favour competition and benefit end users if they promote greater development of IXPs through measures such as overseeing competitive pricing for dedicated links and wireless communication, which are essential to ensure that those concerned can obtain an inexpensive connection to an IXP.

Development in the region

In 2009, at the XVth meeting of Permanent Consultative Committee I (Telecommunications) of the Inter-American Telecommunication Commission (CITEL), the representatives of the governments of the Americas adopted Resolution PCC.I/RES. 160 (XV-09) to promote the development of IXPs in the region. The countries resolved to promote the installation of IXPs both nationally and subregionally and to spur the development of local content. The United States, Brazil and Argentina have adopted different operating models to establish new network topologies with contributions from ISPs, NRENs, operators, content providers and others.

For its part, the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) stated at the 2009 Internet Governance Forum that access to the Internet is a value-added service. For that reason, the authorities have been unable to intervene in a regulatory capacity to establish conditions to promote a topology tailored to new demands for broadband and more equitable access at affordable prices.

ITU recently held a workshop in Geneva on 23 and 24 January 2012 on the subject "Apportionment of Revenues and International Internet Connectivity", with a Latin American perspective. It examined the main reasons why countries have been unable to achieve national and international broadband connectivity. It mentioned the following causes:

- The markets in countries with competition concentrated in just one or a very few operators that control interconnection generally maintain high access prices.
- Because of the global crisis, investment has been low in recent years and the future for new projects by telecommunication operators is uncertain.
- Operators of Tier 1 networks (T1) have resolved their interconnection costs, since they work on the basis of peering, which is equivalent to the “bill and keep” concept used by telephone networks. In consequence, they are not generally willing to invest, particularly in regions with low population densities or scant purchasing power.
- Tier 3 (T3) ISPs do not have their own infrastructure that they can invest in to expand into zones not served by other operators and, in most cases, they are required to pay high interconnection (transit) fees.
- The average cost of 1 Mbit/s in OECD countries is one-tenth the average cost of 1 Mbit/s in Latin American and Caribbean countries.
- The average monthly cost of 1 Mbit/s in terms of gross domestic product (GDP) per capita in Latin America in 2011 is 15 per cent while for OECD countries it is 0.5 per cent.
- Upload and download speeds in relation to cost are in most cases three times higher in the OECD countries than in Latin America and the Caribbean.

The results of the workshop echoed some of ISOC's findings on the benefits of installing national and regional IXPs. The workshop’s recommendations are in line with the Connect Americas Summit, given that its central theme is cooperation within and between countries. The recommendations are summarized below:

- To call upon governments, multilateral financial institutions, the private sector, civil society (NGOs), and so on to propose and implement regional backbone infrastructure.
- To promote the development of regional networks to increase dramatically the capillary action of Internet access through broadband in the countries.
- To support non-profit organizations such as ISP associations in promoting the development of IXPs in all regions as a solution that can be rapidly and inexpensively deployed with optimum results.
- To urge governments to intervene in the market, where necessary, to modify commercial practices that affect competition.
- To promote the establishment of mirror servers in order to reduce traffic in general and international traffic in particular.

- To create local content, mainly by region, since it has a major influence on the relevance of applications and the community's buying into those applications.

Of the 35 countries, there is confirmation that just 12 have at least one IXP. The United States and Brazil are virtually the only two countries with significant domestic Internet penetration. The other countries have been very timid in establishing a comprehensive national strategy.

Table 10 indicates the how many autonomous systems and IXPs each country has.

Table 10. Autonomous systems and IXPs in the Americas region

Country	Total autonomous systems registered in the American Registry for Internet Numbers (ARIN) or the Latin American and Caribbean Internet Addresses Registry (LACNIC)	NAPs or IXPs
USA and Caribbean islands	23 460	86
Canada		5
Brazil	1 526	20
Argentina	333	7
Mexico	267	
Chile	149	1
Colombia	103	2
Panama	95	1
Venezuela	63	
Ecuador	51	3
Guatemala	30	
Uruguay	31	
Costa Rica	27	
Honduras	24	
Peru	23	2
Bolivia	17	
El Salvador	17	
Nicaragua	17	1
Paraguay	15	1?
Dominican Republic	14	1
Haiti	10	1?
Trinidad and Tobago	8	
Cuba	6	1
Belize	6	
Guyana	2	
Suriname	1	

Source: Prepared by the authors, based on 2012 data from LACNIC and ARIN

The traffic exchanged in the IXPs has increased at sites that have become consolidated as cooperation organizations.[33] Most graphs available at IXP portals report rises in traffic at peak times.

In all the countries of the different regions, the members of IXPs and users have expressed their satisfaction with the attainment of the objectives for which this infrastructure was built. In

[33] Traffic graphs for different periods can be consulted for North America at https://www.euro-ix.net/north-america and for Latin America at https://www.euro-ix.net/latin-america.

some countries, the infrastructure has even attracted small and medium-sized enterprises (SMEs) or non-profit institutions unrelated to telecommunications, among them health centres, educational institutions, municipal offices, state government offices and SMEs that participate in local traffic and have found this cooperation arrangement to be a viable alternative for their communication requirements. The development of local content and hosting in local servers has also increased as a result of the improvement in response time and in the quality of servers that IXPs have contributed to local communication.

Development by country

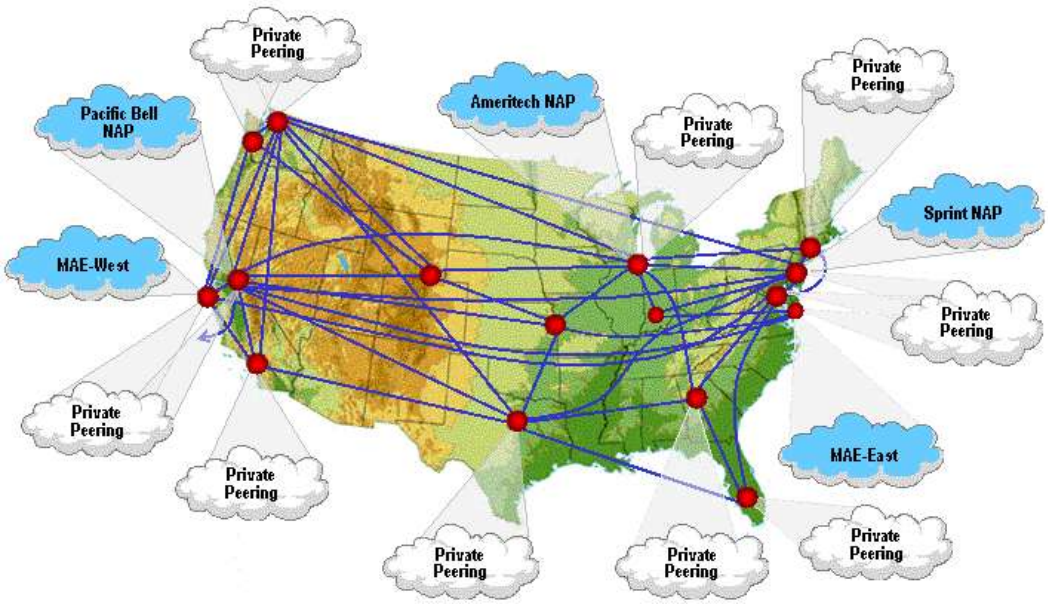
Northern zone

The United States authority that defines public science and technology policy, the National Science Foundation (NSF), established the NSFNET network. It was built as a backbone for academic research and education institutions. It requires very high-capacity broadband, connectivity with different national and international networks and a robust infrastructure to carry the research and technology development projects of virtual research communities distributed geographically around the country and abroad. In 1989, two federal internet exchange (FIX) points were created to strengthen local traffic, one in the eastern part of the country and one in the west. Shortly afterwards, the first commercial Internet exchange (CIX) point was established to separate academic from commercial traffic. In 1992, metropolitan area exchanges (MAEs) began to be built as traffic exchange points. Figure VII shows the main distribution of academic and public and private IXPs.

Principal nodes:

1. Sprint NAP: Pennsauken, New Jersey
2. Ameritech NAP: Chicago, Illinois
3. MAE East: Washington, D.C.
4. MAE West: San Jose, California
5. Pacific Bell NAP: San Francisco, California

Figure VII. IXPs in the United States



Source: http://www.infocellar.com/networks/Internet/nap-ixp.htm

At present, close to 90 IXPs are operating around the United States, almost all of them providing commercial services. These IXPs have extended their frontiers to Europe and Asia.

Canada has developed its IXP infrastructure coordinated by the Canadian Internet Registration Authority (CIRA). This institution issues domain names and IP addresses for the ".ca" suffix. CIRA advises and provides technical support for ISPs, research and education networks, communities and other types of content/application/service users and public and private networks to enable them to build their own IXPs in their localities. CIRA provides them with a series of services offering timely and reliable technical support. The research and education networks benefit from the IXPs because they can, in turn, become suppliers of cloud computing services for their local community. Figure VIII shows the traffic on one Canadian IXP (TorIX) over a one-year period. This IXP has more than 150 members and its exchange of traffic averages 45 Gbit/s a year. With these volumes, it is very likely that the cost of local transactions will fall and that Internet access can be offered wholesale, which benefits IXP users who can obtain Mbit/s Internet access at a much lower cost.

Figure VIII. Toronto Internet Exchange (TorIX)

Source: TorIX

Mesoamerican zone

Nicaragua is the only country in this region with an IXP in operation. No information is available on its makeup.

Andean zone

In Colombia, ten ISPs joined together in an agreement and built a NAP in 1997. They use open peering for national routes. The NAP is administered by the Colombian Information Technology and Telecommunication Association [Cámara Colombiana de Informática y Telecomunicaciones] (CCIT). As it grew, it included a redundant alternative site and established a security subcommittee to cooperate on aspects of a computer emergency response team (CERT)/computer security incident response team (CSIRT), and to evaluate mechanisms for the transition to Internet Protocol version 6 (IPv6). The NAP has been operating since March 2008 in Bogota and is treated as a tax-free zone. The services it offers are box and cabinet co-location, remote hands/smart hands, energy, MSISDN resolver service (MRS) and peering. The operators participating in the Colombian NAP are BT, Telefónica, Synapsis, Telmex, ETB, Global Crossing, Diveo, Internexa, IFX, Columbus and UNE (under negotiation).

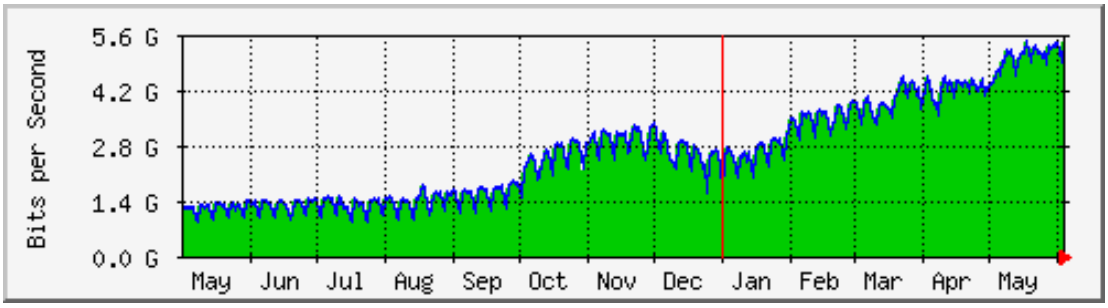
Southern zone

Brazil has participated very actively in developing the Internet. In 1995, it established an Internet Management Committee [Comitê Gestor da Internet] (CGI.br) to involve society in the management, administration, development and use of the web. One of CGI.br's projects was the PTT Metro project in 2004, for the creation of direct traffic exchange points in the main cities. The government's objective was to establish neutral points independent of commercial suppliers, offering high-quality service. The Brazilian government has considered regulatory intervention necessary to level the playing field among competing operators. Apart from requiring interconnection services, peering and IP transit networks, it has requested that at least one IXP be co-located in each of the local service areas of the telephone numbering plan at the dominant telephone system operators' interconnection points. All IXPs are operated by

CGI.br. As part of the regulatory strategy, the government has strengthened its regulations to avoid discriminatory treatment in the exchange of traffic through peering, which includes secondary and traffic peering. For Brazil, the deployment of this infrastructure has led to a reduction in costs for local traffic exchanges which has been passed on to users and has brought about an improvement in quality of service. Internet traffic in the country has grown by 800 per cent and, through IXPs, good penetration into the interior of the country has been achieved.

In 1989, Argentina established the Argentine Internet Association [Cámara Argentina de Internet] (CABASE), made up of ISPs, data centres, solution and content providers, and other industries. These enterprises created the CABASE NAP in 1997 to exchange traffic efficiently. The NAP was located in downtown Buenos Aires under a cooperation and self-governance model. The costs and investments are prorated among its members, with operating regulations, a manual of rules and procedures, and agreements that are renewable every five years. Its decisions are taken by vote, with each member having the right to speak and to vote. The CABASE NAP is a neutral carrier. It has agreements with non-members, provided that their participation is not contrary to the interests of members. The agreements among members were multilateral until two years ago; now they may also be bilateral (between two members). However the CABASE NAP does not promote them actively. Its achievements include heavier e-commerce traffic and growth in the development of local content. The following figure shows month-on-month increases in traffic. However, comparing this figure against the one for the Canadian IXP, the difference between the behaviour of a mature NAP and a fast-growing one is evident.

Figure IX. Buenos Aires NAP traffic



Source: NAP Buenos Aires

Chile has interconnected nine IXPs (PIT Entel, PIT IMPSAT, NAP ENTEL, NAP Chile, NAP Telefónica, PIT AT&T LA, Equant, PITChileSat, PIT Intercity and PIT Manquehue Net). The benefits include low connection costs, low access costs to MetroEthernet, good quality domestic traffic and some private agreements or models for inexpensive domestic traffic. The Chilean government has issued three technical standards for the development of the country's IXPs: Resolution 1483,[34] which sets out the procedure and time-frame for establishing and accepting

[34] Website with regard to IXP regulations: www.subtel.gob.cl/prontus_subtel/site/artic/./req_tec_trafico.PDF.

connections between ISPs; Resolution 669, which establishes quality-of-service indicators for Internet access services and a system for publishing them; and Resolution 1493, which amends Resolution 669 of 2001. The NAPs are also expected to provide good-quality auxiliary services, such as data centres and high transmission capacity, to achieve the objectives of low-cost traffic exchange.

Caribbean zone

Haiti was obliged to build an IXP in November 2007, after being hit by Hurricane Noel, one of the most devastating storms of the century. The Haitian ICT Development Association [Association Haïtienne pour le développement des TIC] (AHTIC) established a management committee to organize policies and procedures to launch the infrastructure. The main ISPs reached an agreement and in early 2008 the physical interconnection was completed. A few months later, they had already exchanged Internet traffic. The IXP has already encountered an emergency and the backup procedure was performed successfully. An ongoing problem is the lack of administrative resources to provide legal security for the participants. The radio communication company HAICOM offered its installations to house the IXP.

In July 2008, the Dominican Republic began operating the Caribbean NAP which is located in the Santo Domingo Cyberpark. This NAP is connected to the NAP of the Americas by an STM-1 submarine cable. It is operated by Terremark, a company that is, in turn, connected to other NAPs on the mainland and operates a network with more than 130 telecommunication clients. The company created a "virtual market" with a technology platform to develop IP solutions in response to the needs of the Caribbean public and private sectors. The services it offers include box and cabinet co-location, remote hands/smart hands, energy, MRS and peering.

An initiative to reduce Internet costs through cooperation among national research and education networks is proposed below.

National and regional research and education networks

National research and education networks (NRENs) are public or private non-profit organizations whose purpose is to facilitate cooperation among institutions of higher learning and science and technology research centres of the countries they serve. With the involvement of their members, they build dedicated communications networks that use leading-edge technology. A wide range of telecommunication and ICT services can be integrated into them to promote teamwork and cooperation among the institutions, technological progress and the creation of knowledge in a wide variety of disciplines.[35]

The UNESCO International Institute for Higher Education in Latin America and the Caribbean (UNESCO-IESALC) views these networks as strategic interlocutors with governments for bringing about the technological evolution of research and education in national institutions as

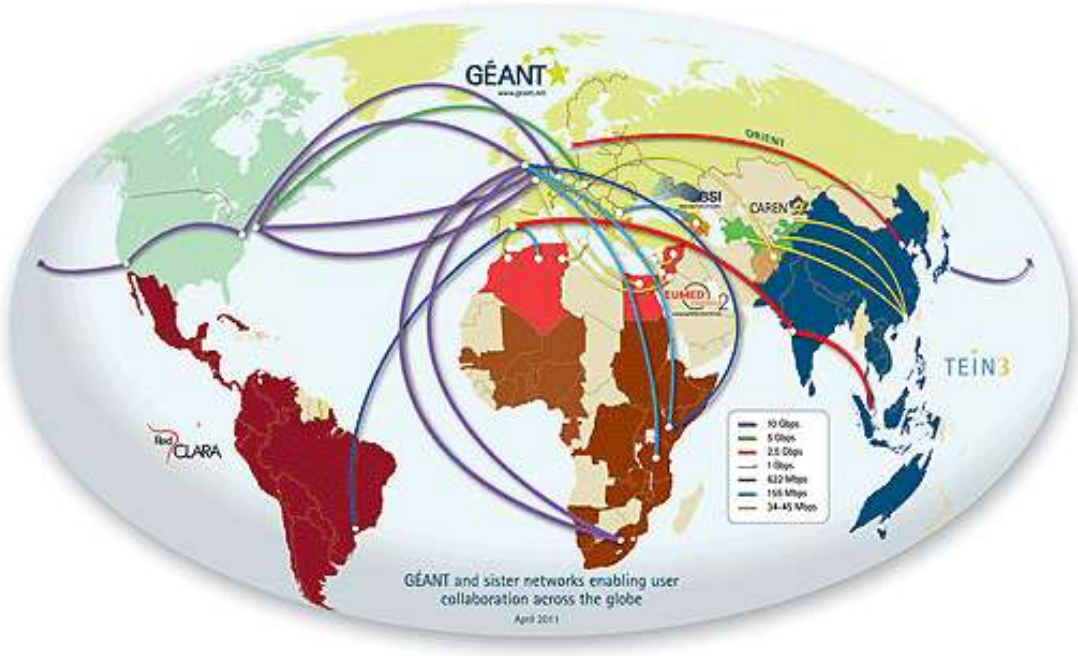
[35] See http://alice2.redclara.net/images/ALICE2/documents/libro_blanco_espanol.pdf.

well as internationally. They are natural infrastructures for experimenting with the technological development of communications and ICTs. They bring together all knowledge disciplines with the same objective – the use of technology in academic, educational, scientific and technological work, which is why they are an important link in the quest for technological solutions for the development and social coverage of telecommunications/ICTs.

The study known as SERENATE prepared for GEANT, the pan-European data network, states that "National governments should be aware that research and education networking in their country, and in particular their National Research and Education Network organisation (NREN), is an asset for economic growth and prosperity. It is a source of innovation and provides fast and widespread technology transfer to society and industry."

These national networks form regional clusters, notably GEANT in Europe (http://www.geant.net), APAN in the Asia-Pacific (http://www.apan.net), Internet2+LambdaRail and CANARIE in North America (http://www.Internet2.edu), RedCLARA in Latin America (http://www.redclara.net) and, more recently, C@ribNET in the Caribbean. These clusters are interconnected through agreements and telecommunication links, forming a worldwide education, research and development network that is parallel to and separate from the Internet and constitutes a touchstone for the development of the future Internet and a very valuable tool for anyone who wishes to work on behalf of the development of science, technology and innovation, using the tools of the knowledge society, that is, communications networks. Figure X shows the regional networks.

Figure X. Regional research and education networks



Source: https://edutechdebate.org/research-and-education-networks/the-role-of-nrens-in-national-development/

In Asia, Europe and North America (more recently in the Caribbean), government telecommunication/ICT authorities interact closely with NRENs, aware that technological developments in convergence were created through networks of this kind. The rest of the world is discovering how to establish such collaboration.

The United States is the founder of advanced networks and has networks with very high capacity and leading-edge technology that connect its main universities and research centres. Internet2 (UCAID) and LambdaRail represent this national effort. Canada is the second country in the region with a high-capacity NREN that is financed by the Canadian government and known as CANARIE (Canadian Network for the Advancement of Research, Industry and Education). The networks in the Northern zone draw their members' research and industry together.

In the Latin American countries, the NRENs are recent (not more than 15 years old). Ten years ago, through the ALICE and ALICE2 projects, the European Union financed the development of RedCLARA (Latin American Advanced Networks Cooperation [Cooperación Latino Americana de Redes Avanzadas]), which interconnects most of the region's NRENs. Several years ago, the European Union financed the Caribbean Knowledge and Learning Network (CKLN) initiative to promote construction of C@ribNET and the integration of NRENs in the Caribbean countries.[36]

Figure XI. RedCLARA[37] and C@ribNET[38]

Source: RedCLARA and CKLN, 2012.

These networks are fully developed with the IPv6 protocol and research on the evolution of that protocol is tested in them. No documentary information could be found, but it is clear that the operators, ISPs, content providers and users of public and private networks can benefit by

[36] The world network of NRENs can be seen at a glance at http://en.wikipedia.org/wiki/National_research_and_education_network.

[37] Topology of RedCLARA in 2012: http://www.redclara.net/index.php?option=com_content&view=article&id=51&Itemid=422&lang=es (consulted 3 June 2012).

[38] Presentation by Kenneth Sylvester of CKLN at the first preparatory meeting of Connect Americas for the Caribbean, Trinidad and Tobago, 22 and 23 March 2012.

cooperating with these academic and research networks, which are able to analyse, develop and test the hardware and software necessary for better connectivity and topology of communications networks and, consequently, to make efficient use of the web. This could lead to a further reduction of Internet costs. NRENs can also help to bring down costs if there is willingness to share the expense of laying optical fibre in regions where connectivity is not fully developed. An actual case was presented by RedCLARA as a project in the Connect Americas database for the Mesoamerican region.

5 Human capacity building on ICTs, with emphasis on persons with disabilities and people living in rural and marginal urban areas

Characteristics of this target population in the region

As mentioned at the outset, those living in rural areas account for 35 per cent to 40 per cent of the region's total population. This group includes some 33 million indigenous people for whom the Human Development Index (HDI) ranks lowest in all countries. ITU has a special initiative for indigenous peoples, and both the Plan of Action and Declaration of Principles of the World Summit on the Information Society single them out as a high-priority group.

Latin America had a poverty rate of 31.4 per cent in 2010 and an extreme poverty rate of 12.3 per cent. In terms of poverty alleviation, women are a priority since they have higher mortality rates.[39]

Figure XII. Indigenous population in the Americas

Source: http://www.google.es.

México = Mexico; Panamá = Panama; Perú = Peru; Surinam = Suriname; Guyana Francesa = French Guiana; Brasil = Brazil; Canadá = Canada; Estados Unidos = United States; Canadá = Canada

The following table provides figures on persons with disabilities.

[39] See eLAC2015.

Table 11. Persons with disabilities in Latin America

Country	Number of persons with disabilities	Percentage of the total population
Argentina	2 217 500	6.80
Bolivia	741 382	9.26
Brazil	10 000 000	6.00
Chile	958 500	6.39
Colombia	4 992 000	12.00
Costa Rica	363 480	9.32
Ecuador	1 636 800	13.20
Guatemala	1 887 000	17.00
Honduras	700 000	14.00
Mexico	10 000 000	10.00
Nicaragua	593 880	12.12
Peru	7 882 560	31.28
Uruguay	495 000	15.00
Venezuela	2 370 000	10.00

Source: "La Discapacidad en América Latina" (Disability in Latin America), Armando Vásquez

About half of the population with disabilities in the region is of working age (between 2 250 000 and 2 956 000 people). However, the high levels of poverty and unemployment among the general public and the clear link between poverty and disability exacerbate the situation of persons with disabilities, since most are unemployed or excluded from the labour market. Demographic trends and social poverty and health indicators show that the number of persons with disabilities and the impact of disability on individuals, their families and communities is on the rise.

This is the target population for the ITU special initiative alluded to above.

What do we mean when we speak of human capacity building and assisting vulnerable groups?

When we speak of capacity building, we are referring to a very broad concept. However that concept has to be delimited to make the objective attainable and enable goals and parameters for action to be established.

To achieve its telecommunication development goals, the region needs enough professionals to meet the challenges it faces in areas such as the deployment of networks, changeover to digital, development of rural communications, emergency response and so forth. In other words, capacity should be commensurate with addressing the region's development priorities and main challenges, and each of the regional initiatives proposed here requires attention to capacity building (based on the specific needs of each of these groups) to address them.

With respect to vulnerable groups (people living in rural and marginal urban areas, indigenous peoples, women and persons with disabilities) capacity needs to be created for the use of technologies, and training programmes need to be offered to provide those groups with access

to information and tools for their education and economic and social development. Capacity must be developed in that population and in business, industry, the private sector and, above all, government agencies, to place those tools within their reach.

Building capacity for the rural population and indigenous peoples

With regard to people living in rural areas, the public policy recommendations contained in the module developed under the ITU "Connect a School, Connect a Community" initiative[40] call for a comprehensive plan to be prepared. In other words, capacity building cannot leave out a single aspect of the ICT production and development chain. A comprehensive training policy covers the capacity needed for interaction with the community for its use of ICTs, the installation, provision and maintenance of service, the development of applications and the development of equipment tailored to communications of this kind, as well as policies and regulations that contribute to its delivery. This capacity, or access to networks that already have it or are developing it, should be present in rural and indigenous communities.

Most broadband plans for the region only include capacity building to enable these communities to use technologies. It is difficult to sustain the services since there are no people on-site to carry out preventive maintenance or to repair simple breakdowns. This is a common problem in the region and explains why as many as 70 per cent of digital centres installed in rural areas experience service disruptions. One of the few plans in the region that provides for capacity building for telecommunication micro-operators is Argentina Connected (Argentina Conectada).

Since 2005, in cooperation with the Indigenous Fund, ITU has developed a training programme that offers a minimum of three courses a year for indigenous people in the region, which has been highly successful. However, it is mainly targeted to the use of ICTs for learning purposes. Since 2011, a three-course programme has been developed and offered to more than 200 indigenous people, which has taught them how to manage projects (planning, development, implementation and monitoring). The programme was largely developed to respond to the needs and interests of indigenous communities and its end goal is to provide training to enable those communities to self-sustainably develop projects. Women accounted for nearly 45 per cent of total enrolment in 2012. Furthermore, in response to a request by the Summit of Indigenous Communications in Abya Yala (the Americas), CITEL has designed a project for comprehensive training of indigenous technicians to service and develop broadcast media and last-mile networks that operate in their localities, which are generally remote and lack basic services.

People with disabilities

Access to telecommunications and ICTs means:

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40 See http://connectaschool.org/es/itumodule/14/330/es/ind%C3%ADgenas/educaci%C3%B3n/sociales/econ%C3%B3mica/desarrollo/introducci%C3%B3n/.

- Work
- Education
- Information
- Entertainment
- Business
- Transport
- Independence
- Privacy

Capacity building in this regard has a variety of interdependent facets:

1. Capacity to undertake proper design of technological equipment and tools that can be used by persons with disabilities
2. Training for students and teachers to support people with disabilities
3. Training for public servants in designing policies for those groups
4. Capacity to use ICT so that people with disabilities can gain access to services offered to the general public.

Isolated efforts can be observed in the Americas to make telecommunication services accessible to persons with disabilities. However, the task is both difficult and costly.

The United States has made great strides through regulatory actions.

Table 12. Legal framework for disability access (United States)

Year	Legislation
1973	Federal agencies are required to procure and provide accessible technologies.
1982	Telecommunications for the Disabled Act. Compatibility for people with difficulty in hearing; provision of inexpensive specialized equipment.
1988	The Hearing Aid Compatibility Act mandate expanded to all types of telephones. Establishment of a federal relay service system.
1990	Mandate to extend telecommunication relay service nationally.
1990	Mandatory closed captioning on all television monitors measuring 13 inches or more.
1996	The Telecommunications Act is expanded to include the following: Section 255: Telecommunication access for disabled persons. Section 713: Video programming accessibility, mandatory closed captioning.
2011	Communications and Video Accessibility Act: • Requires access to advanced telecommunications (VoIP, electronic messaging, videoconferencing). • Internet browsers built into mobile phones must be accessible. • Hearing aid compatibility for advanced communications devices. • Update relay services included in VoIP. • Funding for the deaf-blind equipment distribution programme. • Reliable and interoperable access to next generation 911 services.

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	• Video programming that is closed-captioned on television must be closed-captioned when distributed on the Internet. • Emergency information on video accessible to the deaf and visually impaired.

Source: "An Overview of U.S. Disability Access Communications Law", a paper presented on 24 April 2012 at ITU.

Support for implementation

The region has the most extensive and one of the most efficient networks of ITU Centres of Excellence, which works in accordance with the priorities of governments, in coordination with CITEL. The strengthening of this network should continue, making it the main driver for implementing capacity-building strategies.

The region's indigenous peoples have been developing a variety of education initiatives, some of which can be found in their universities or in intercultural universities, designing communications training programmes that could take advantage of these processes.

Telecommunication micro-operators are essential as receivers and suppliers of training in remote areas.

Most broadband plans in the region and the eLAC2015 plan include training in productive development for SMEs, and this synergy should be tapped.

More than 2.5 billion people (or roughly 40 per cent of the earth's population) live in rural or remote parts of developing countries where telecommunication access is still very limited, according to an ITU world survey on rural communications. It is precisely communications in these areas that are of fundamental importance for the ITU membership.

Part Two

Telecommunication/ICT development projects in the Americas region

Various government agencies and national and regional development banks in the Americas are supporting projects in most of which the telecommunication/ICT component has been crucial in obtaining loans or grants. Some projects, as listed below, are intended to strengthen physical infrastructure. Others centre on applications in health, government, education and other areas, which can be accessed by computer or a mobile broadband device. Making information accessible to different economic groups facilitates their primary tasks and motivates them to develop new applications to achieve positioning beyond their traditional territory. The projects have been classified using the five regional initiatives.

Topic 1. Connectivity and access

1.1 Broadband

1.2 Reduction of Internet access costs

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
IDB	Central American optical fibre network	To complete construction and operate a trunk fibre optic-data transmission network (36-fibre OPGW cable), strung on the SIEPAC electric power transmission line.	Mexico, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama and Colombia
IDB	Broadband development for competitiveness	To support the development of national broadband plans collectively by the telecommunication authorities of Panama, Costa Rica, Honduras, El Salvador and Guatemala.	Panama, Costa Rica, Honduras, El Salvador and Guatemala
IDB	Development of the Honduran telecommunication sector	To help create the conditions for organization of the telecommunication sector by improving the regulatory framework and establishing a digital agenda and the institutional capacity to manage it.	Honduras
IDB	Digital agenda and broadband in the state of Yucatan	To design and develop a digital agenda for the state of Yucatan and deploy a state broadband network.	Mexico (Yucatan)
IDB	Mesoamerica project	To conduct studies on the impact of broadband in the region.	Mesoamerican zone

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
IDB	Research studies	To investigate the development of telecommunications through the following studies: – The economic impact of broadband in Latin America and the Caribbean on economic growth, productivity and employment (at the macro level). – Guide to technical, economic and regulatory aspects relating to the development of broadband services. – The impact of regional interconnection on regional and global integration (UNASUR).	The Americas
World Bank	Infrastructure and connectivity	To provide technical assistance and loans to develop rural connectivity infrastructure in Chile.	Chile
ECLAC @LIS2	Broadband for growth and equality	To hold a regional dialogue on broadband.	Latin America and the Caribbean
CITEL	PCC.I: Working Group on Development and Working Group on Policies and Regulation	To develop the Technical Notebook on policies for broadband development in the Americas region. To develop a study on international Internet connectivity in the Americas region.	The Americas
CIRPTT	Development of ICT applications	To develop *mFisheries*, an application to make the most of opportunities to improve the means of subsistence.	Caribbean, with an implementation focus on Trinidad and Tobago
CTU	ICT Roadshow in the Caribbean	IXP. National ICT plans. Committees for IPv6.	Caribbean
DIRSI	Knowledge generation	To monitor and compare broadband tariffs and perform a comparative analysis of national broadband plans.	The Americas
DIRSI	ICTs and development	To investigate telecommunication development through the following studies: – Evaluation of the impact of adopting broadband through household surveys. – Evaluation of the impact of broadband in schools on student performance. – Feasibility studies and demand estimates.	The Americas

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
*info*Dev	Innovation, technology and business development	To develop regulatory capacity, studies and partnerships to facilitate broadband access.	The Americas
*info*Dev	EdutechDebate.org	To promote a substantive debate on how low-cost ICTs are relevant for education systems in developing countries for students, teachers and communities.	The Americas
*info*Dev	*Broadband strategies toolkit*	To support users, particularly in developing countries, in identifying the challenges for developing broadband, analysing potential solutions and providing practical examples of countries that have addressed broadband-related matters.	The Americas
*info*Dev	Role of ICTs in post-conflict resolution	To study the role of ICTs in contributing to and speeding up economic recovery after conflict resolution.	The Americas
RedCLARA	Advanced academic networks (ALICE2)	To use advanced academic networks as part of a social telecommunication policy.	Latin America and the Caribbean
ITU	Broadband deployment in the Americas	To support the authorities of the countries of the Americas in the design and implementation of policies and programmes for large-scale access to broadband, with a view to attaining universal service objectives.	The Americas
ITU	Broadband deployment in the Caribbean	To support the authorities of Caribbean countries in designing and implementing policies and programmes for large-scale access to broadband, with a view to attaining universal service objectives.	Caribbean

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
ITU	Reduction of Internet costs by promoting the use of IXP	To establish new IXPs in the region, particularly in countries where there are none. The project's goal is to have at least one IXP in each Latin American and Caribbean country. To establish and strengthen a collaborative partnership between ITU and entities interested in working with it on topics relating to the Internet in Latin America and the Caribbean. To obtain a consensus in the region on the benefits of IXPs, not only for Internet and broadband access but also for their socioeconomic impact.	The Americas
USAID	Use of broadband in Colombia	To provide technical assistance for Compartel, Colombia's social telecommunication programme, in designing its next strategic plan and make good use of the USD 12 billion from the "*Living Digitally*" (*Vive Digital*) programme.	Colombia
USAID	Global broadband and innovation programme	To improve socioeconomic outcomes and expand access to voice and wireless broadband services and facilitate innovations that make them more accessible, thereby contributing to development.	The Americas

Topic 2. Digital inclusion

2.1 Indigenous peoples and communities

2.2 Microtelcos

2.3 Protection and strengthening of ICT service users

2.4 Telehealth

2.5 Human capacities

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
IDB	Mobile Citizen	To promote the development of solutions based on the innovative use of mobile telephones to resolve serious problems in low-income communities.	Chile, Peru, Argentina
IDB	Videobooks in sign language in Argentina (part of Innovation Lab)	To create a website where deaf children in Argentina can find children's books read by deaf readers in sign language.	Argentina
World Bank	Rural telecommunication development	To increase access and reduce the cost of rural telecommunication services in Nicaragua.	Nicaragua
World Bank	Rural telecommunication development		Colombia
World Bank	ICTs and competitiveness, and backbone network in rural areas		Peru
World Bank	Telecommunication and ICT development		CARIP
ECLAC	Plan Ceibal	To progress towards the information and knowledge society from a social and educational standpoint by providing students with computers.	The Americas
ECLAC	SOS Telemedicine for Venezuela, Faculty of Medicine of Central University of Venezuela (Universidad Central de Venezuela) (UCV)	To design, develop, implement and launch a telemedicine system which, in the space of three years, connects remote primary care centres to specialists at the Central University of Venezuela, with a view to improving national public health system outcomes.	Venezuela

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
ECLAC	Latin American Network of Institutional Repositories of Scientific Documentation	To build a network of repositories of scientific documentation. To promote work in countries in the initial stages, based on the progress made in the project, and to have an impact on innovation by improving the quality and quantity of science and technology production.	The Americas
CIRPTT	Deployment and evaluation of ICT applications in marginal communities	To deploy and evaluate *mFisheries* to facilitate and evaluate physical and logistical access by low-income users (inshore fishermen) to improve their means of survival.	Caribbean, with an implementation focus on Trinidad and Tobago
CTU	ICT Roadshow in the Caribbean	To include local needs for the deployment and use of ICTs (large-scale involvement, youth, community development, innovation).	Caribbean
DIRSI	Generation of knowledge and generation of capacity	To study the microtelco model. To study demand.	The Americas
*info*Dev	Transformation	To use ICTs to attain development objectives (health, education, combating poverty).	Latin America and the Caribbean The Americas
*info*Dev	Regulation	To use seed funds and research to improve the regulatory environment.	The Americas
*info*Dev	mLabsWorld	To bring together the international virtual community of mobile infrastructure and network developers.	Latin America and the Caribbean
*info*Dev	mobile @BOP Study	To study the potential of "mobile" applications to improve the standard of living of the people at the bottom of the pyramid.	Latin America and the Caribbean
*info*Dev	Report mobile 4D		Latin America and the Caribbean
*info*Dev	Mobile microwork challenge	To quicken the market for applications that offer microwork, using cellular telephones, and channel it towards meeting development goals.	Latin America and the Caribbean
*info*Dev	Map of knowledge of the virtual economy		Latin America and the Caribbean

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
LACNIC	Amparo Project	To develop and spread original educational content by regional experts in information security and CSIRT/CERT creation and management.	The Americas
OAS	Training in the use of ICTs	To offer workshops for teachers and government officials with a hands-on approach to the incorporation of ICTs in their areas of activity.	The Americas
OAS	Strengthening installed capacity of governments, NGOs and educational institutions to serve their communities better	To design and implement programmes and mechanisms for institutional support and the transfer of know-how in the countries of the region, so that ICTs can be adopted and embraced.	The Americas
PAHO	Health and action plan strategy	To assure the sustainable development of the health systems of the member countries.	The Americas
PAHO	Public e-health and equity in Latin America and the Caribbean	To develop a virtual community of medical practitioners. To promote innovation in e-health. To promote the use of innovative e-health solutions.	The Americas
Latin American and Caribbean network of telecentres	Digital literacy campaign	To conduct a digital literacy campaign for women by establishing sustainable telecentres and providing training at them.	The Americas
SELA	e-health and telemedicine	To contribute to regional dialogue through the exchange of experiences and good practices relating to the use of ICTs in medical and health services, with particular stress on innovation, new tools and supports, interoperability, harmonization and standards, within the framework of Latin American and Caribbean regional integration.	The Americas
ITU	School connectivity plans	To design national connectivity plans in schools to deploy broadband and support pilot projects. To provide training for teachers based on the recommendations of the "Connect a School, Connect a Community" initiative toolkit.	The Americas/ Worldwide

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
ITU	School connectivity plans	ITU has developed a national connectivity plan for Nicaragua (five pilot schools).	The Americas
ITU	Special initiative for indigenous people	(a) To create a global indigenous portal for equitable and self-sufficient development; (b) to provide access to and use and understanding of ICTs; (c) to develop ICT awareness by organizing events and exchanging experience; and (d) to provide training (online courses) for indigenous people promoting ICTs, based on tradition and self-sustainability.	The Americas/ Worldwide
ITU	School connectivity	To promote online and face-to-face activities to build capacity among Latin American policy-makers, advisers, specialists, technical experts and government authorities relating to policies and regulation of school connectivity, including schools in rural, urban and isolated areas, and targeting vulnerable and disadvantaged groups.	The Americas/ Worldwide
ITU	Non-ionizing radiation and health protection	To study the difficulties in deploying wireless networks and associated infrastructure owing to social concern or anxiety regarding electromagnetic radiation and to propose solutions.	El Salvador, Honduras and Panama

Topic 3. Emergency communications

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
World Bank	Regional communications infrastructure for the Caribbean	To establish emergency communications in the Caribbean, aligned with infrastructure development.	Caribbean
CIRPTT	Suite of ICT applications for security at sea	To develop *mFisheries*, a mobile web rescue application to monitor emergencies and incidents at sea.	Caribbean, with an implementation focus on Trinidad and Tobago
CIRPTT	Open data ICT applications	To use open data in ICT applications for marine safety.	Caribbean, with an implementation focus on Trinidad and Tobago
CITEL	Report on the use of telecommunications in disaster prevention and mitigation. PCC.I-GTD	To develop a Technical Notebook on the use of telecommunications in disaster prevention and mitigation, working initially on an analysis of the presence of emergency response plans in the region.	Latin America and the Caribbean
COMTELCA	Integrated regional emergency communications system	To establish an integrated regional emergency communications system for the members of COMTELCA, establishing and strengthening national telecommunication emergency plans. To design a regional coordination mechanism based on the Tampere Convention.	Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, and the Dominican Republic
RedCLARA	ALICE2	To explore the possibility that advanced academic networks can cooperate in disaster monitoring and prevention and feed information to early warning systems.	Latin America and the Caribbean
ITU	Telecommunications for emergencies and climate change	To provide ITU's assistance for the countries in each region in disaster preparedness, early warning and how to respond to facilitate recovery. Similarly, to assist the countries in the use of ICTs as trainers so as better to adapt to climate change and mitigation of its impact.	The Americas/ Worldwide

Topic 4. Broadcasting (transition to digital radio and television)

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
CIRPTT	Academic programmes in telecommunication engineering	To develop a programme curriculum.	Caribbean
CITEL	PCC.II	To coordinate the exchange of information, capacity building and support for States in specific radiofrequency activities under regional initiatives.	The Americas
CITEL	Digital television and radio	To develop digital television and digital radio on the user side so that they can obtain subsidized or free television decoder boxes.	Panama
ITU	Support for the digital transition in the Caribbean	To assist the Caribbean countries in moving from analogue to digital transmission through the development and promotion of harmonized guidelines (policy and regulation, economic aspects, market and business development, technologies and networks).	Caribbean

The above projects are in execution, while the projects listed below are proposals:

Topic 1. Connectivity and access

1.1 Broadband

1.2 Reduction of Internet access costs

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
Panama	National broadband strategy in Panama	To encourage the industry to increase the capacity and speed of broadband services for users and to lower the cost, so that many more people have access to this important tool.	Panama
ITU/ COMTELCA	National broadband plan	To develop a public broadband policy for each country, consistent with a regional public policy for the widespread use of broadband. To define the minimum capacity and speed required to provide broadband services. To evaluate different access technologies in order to propose solutions that will allow Latin America to achieve the same penetration indicators as developed countries in the next ten years.	Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama
ITU/ COMTELCA	Connecting the Americas: the Mesoamerican information highway	To establish complementary infrastructure to develop the Mesoamerican information highway, including telecommunication hotels.	Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama

Topic 2. Digital inclusion

2.1 Indigenous peoples and communities

2.2 Microtelcos

2.3 Protection and strengthening of ICT service users

2.4 E-health

2.5 Human capacities

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
Panama	Connecting the country	Based on the Access and Universal Services Act, to bring ICTs and basic telecommunication services to sectors with difficult access and areas where operators do not provide the service for whatever reason, through cellular telephone or LTE systems, for example.	Panama
Panama	Telemedicine	To have the necessary means and resources to outfit most health centres in areas with accessibility problems with all the technology they need to connect immediately to the main centres and to coordinate or develop medical tests and consultations and procedures to cure or save lives without the need to transfer the patient.	Panama

Topic 3. Emergency communications

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
ITU	Telecommunications for emergencies and climate change	To provide ITU's assistance for the countries in each region in disaster preparedness, early warning and how to respond to facilitate recovery. Similarly, to assist the countries in the use of ICTs as trainers so as better to adapt to climate change and mitigation of its impact.	The Americas/ Worldwide

Topic 4. Broadcasting (transition to digital radio and television)

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
Panama	Digital television and radio	To develop digital television and digital radio on the user side so that they can obtain subsidized or free television decoder boxes.	Panama
ITU/ COMTELCA	Digital television and its impact on the citizenry	To establish the use and allocation of the 700 MHz band.	Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama

Several projects were also identified in regard to innovations in the use of ICTs. Owing to their importance for the region's ongoing sustained development, the following list was prepared of projects to promote innovation:

Additional Topic. Innovation in the use of ICTs

Institution	Programme (area of activity and objectives)	Project (specific objectives)	Geographical scope
*info*Dev	Entrepreneurship Programme for Innovation in the Caribbean	To promote innovation, employment and value in micro-, small, and medium-sized enterprises through technical assistance and financing.	Latin America and the Caribbean
*info*Dev	iDisc: ICT enabled innovation	To provide free, practical information for incubators and other organizations engaged in business development.	The Americas
LACNIC	FRIDA programme	To promote ICT innovation in the region through financing for research projects, training and awards for outstanding initiatives.	The Americas
LACNIC	+ Raíces programme	To install mirror copies of DNS root servers in the LACNIC region.	The Americas
LACNIC	6Deploy programme	To install laboratories for training in IPv6 for Latin American and Caribbean technicians.	The Americas

Part Three

Recommendations

Each of the regional initiatives has been analysed to determine the status of telecommunication/ICT development in the Americas region. A series of recommendations can be drawn from this analysis to serve as the basis for consolidating telecommunication/ICT development at three levels: national, regional and global.

Emergency communications

1 There is no collaborative relationship between the agencies in charge of dealing with emergencies and telecommunication/ICT ministries. Joint efforts should be promoted to provide the countries with comprehensive emergency communications systems to support all the tasks entailed in early warning, information, training, dissemination, direction and reconstruction that could arise during the three stages of a disaster.

Actions required:

Telecommunication/ICT ministers should recognize the need to draw up standardized emergency communications plans involving all the stakeholders affected by any emergency.

The telecommunication/ICT sector should be in contact with academics and researchers to learn about projects they are carrying out in regard to natural disasters and emergency situations, so that cooperative mechanisms can be established to develop applications that can help restore communications to keep the public informed before, during and after a disaster or emergency, using fixed and mobile terrestrial, satellite and submarine networks.

Countries should develop a mechanism to support the integration, standardization and sharing of data relating to natural disasters and emergency situations and establish national repositories for its joint management through authenticated access.

Mechanisms should exist, recognized by the parties involved in a natural disaster or an emergency situation, for cooperation in the event that a disaster or emergency straddles borders.

2 Work should be done with the national emergency authorities to include communications in emergency management and harmonize general emergency response plans with national telecommunication emergency plans in the three stages of emergency communications (prevention, warning and disaster).

3 Local radio stations and community centres should be trained in how to react during an emergency (e.g. Guatemala Asodigua Telecentre).

Broadband development

4 Support should continue for the countries of the Caribbean and Central America to develop national and even regional broadband plans. If efforts are made in parallel, they should be capable of developing joint projects for economies of scale that individual projects could not enjoy.

Actions required: In countries that have no plan but have separate initiatives, a coherent plan should be drawn up that includes the criteria established in the present analysis to ensure a comprehensive approach to broadband development in their territories.

Public-private partnership should be promoted for the expansion of broadband infrastructure, following the principle of technological neutrality.

5 Countries should establish and operate mechanisms for ongoing consultation with a broad array of private players, civil society and different government jurisdictions and agencies, to help find solutions than can benefit private investors as well as the public at large.

6 Continued emphasis should be given to bringing broadband to remote and marginal areas, recognizing that even the North American countries have had to pay special attention to this aspect.

7 Digital agendas and broadband plans should include specific development objectives and strategies to promote education, recognition of cultural diversity, healthcare and other aspects.

8 Mechanisms should be established to devise impact indicators to evaluate the plans.

Mesoamerican zone

9 Adequate backbone networks and submarine cables must be in place to facilitate the deployment of other networks and services.

10 Caribbean countries (the Dominican Republic and Cuba) need to complete their submarine cable connections, and the Dominican Republic's backbone network needs to be established. That will make it possible to design and deploy backhaul and local networks.

11 The Connect Americas Summit could serve to assure financing for submarine cable projects and backbone networks that are in an advanced phase.

Actions required: Establish the agreements necessary to allocate funds for the design and implementation of backhaul networks and actions to make better use of that infrastructure, including use of the mobile broadband spectrum.

12 Since the Mesoamerican information highway is being developed successfully, looking forward to 2015 it is recommended that full use be made of it through programmes to develop

last-mile networks to connect isolated areas, complementary networks, communications hotels and so on.

13 In the case of Mexico, support should be provided for strategies to develop backhaul networks and work on rights-of-way to facilitate the deployment of such networks in areas that are still without coverage.

14 The existence of a regional backbone network such as RedCLARA is an important alternative for connecting countries that do not have sufficient external connectivity to provide essential services for development, such as research services. Making Cuba part of RedCLARA and making the Dominican Republic part of C@ribNETnet could be supported by the summit.

Andean and Southern zones

15 As in the Mesoamerican zone, it is essential to establish trunk network infrastructure to assure coherent development in this area. Of primary importance is support for landlocked countries in their connections and their development of trunk lines, to ensure that they have submarine cable access at competitive costs.

16 The South American optical-fibre ring is a project that could bring large benefits to the region and therefore joint steps can be taken to support it or to continue the deployment of backbones by the countries that have not yet completed this stage, such as Guyana.

17 In most cases countries are making progress in strengthening their backbone infrastructure, but the last mile continues to be a challenge. The strategies for these networks differ but most include the use of mobile broadband frequencies which means that the harmonization of frequencies and regulatory aspects are areas calling for special attention.

18 Given the progress made in deploying backbone infrastructure in most of the countries, efforts can be focused on social coverage, using innovative approaches to provide economies of scale, such as those proposed by Argentina, and actions to ensure the existence of a broadband ecosystem in specific areas, together with technological development, capacity building and content development.

Caribbean zone

19 Work should be done on a regional plan and on specific plans for every country, leading to the design and implementation of a regional trunk network, with subsequent support for operators to extend it to local networks and backhaul networks.

20 Given the progress in C@ribNET and its potential to serve academic institutions and emergency communications, which are highly important for this zone, synergies should be sought that would ensure the incorporation of the programmed countries.

Digital broadcasting

21 The process of transition to digital television should include all stakeholders (manufacturers, consumers/users, regulatory authorities, industry/service providers).

22 Generation of content in digital format in the subregions.

23 Countries that have not yet begun the transition should review the latest technologies.

24 All the countries should have at least made a start on their transition by 2015.

Reduction in Internet costs

25 Countries have not installed interconnection points. They could benefit from the experience of the United States, Canada, Brazil and Argentina which have solved the problem of local traffic in different ways (costs are reduced and more attractive offers can be made for purchasing bulk Internet services, peering agreements, etc.).

26 Different organizations and entities working with different clients on common issues should work in coordination and jointly for the benefit of the countries and the region's population. For example, ISOC, LACNIC and ITU can offer their strengths and know-how to promote initiatives such as the creation of new IXPs.

Capacity building, accessibility for vulnerable groups

27 A regional diagnosis should be made of the region's capacity in respect of each of the initiatives and a strategic plan should be devised, not just to cover shortcomings but also to produce experts to address them.

28 Since current capacity-building policies for rural and indigenous areas do not include comprehensive plans, there is a need to disseminate ITU Recommendations and encourage the training of civil servants and other interested audiences and individuals so they can change public policy.

29 Integrated ongoing training plans should be designed for indigenous people and others living in rural zones which comprehensively address the operation, functioning and administration of networks tailored to their realities, so that their communication requirements can be met through economies of scale.

30 Governments and operators need training to develop policies and equipment adapted to the needs of persons with disabilities, with a clear focus on these groups.

31 Countries should receive backing in designing and supporting capacity-building programmes for persons with disabilities.

National research and education networks (NRENs)

Countries should view NRENs as assets for achieving a higher degree of development in the region.

32 Synergies should be established with national research networks.

33 High-priority areas for connectivity should be identified in the region.

34 Cooperation between communication networks and research and education networks is necessary in order to establish early-warning systems for disaster prevention in specific geographical areas.

35 Mechanisms for cooperation between academia, industry, government and civil society should be established to build the capacity of society in general to respond to natural disasters.

36 NRENs can be viewed as part of a social telecommunication policy to support connectivity and be integrated in the information society strategy.

37 NRENs can be viewed as the link between ICTs and research, development and innovation.

38 NRENs can serve as an appropriate place in formulating public policy to promote information society strategies.

39 Legal and regulatory frameworks should be neutral with respect to the operation of NRENs.

Other

40 Virtual mobile operators and telecommunication cooperatives should be allowed to enter the market.

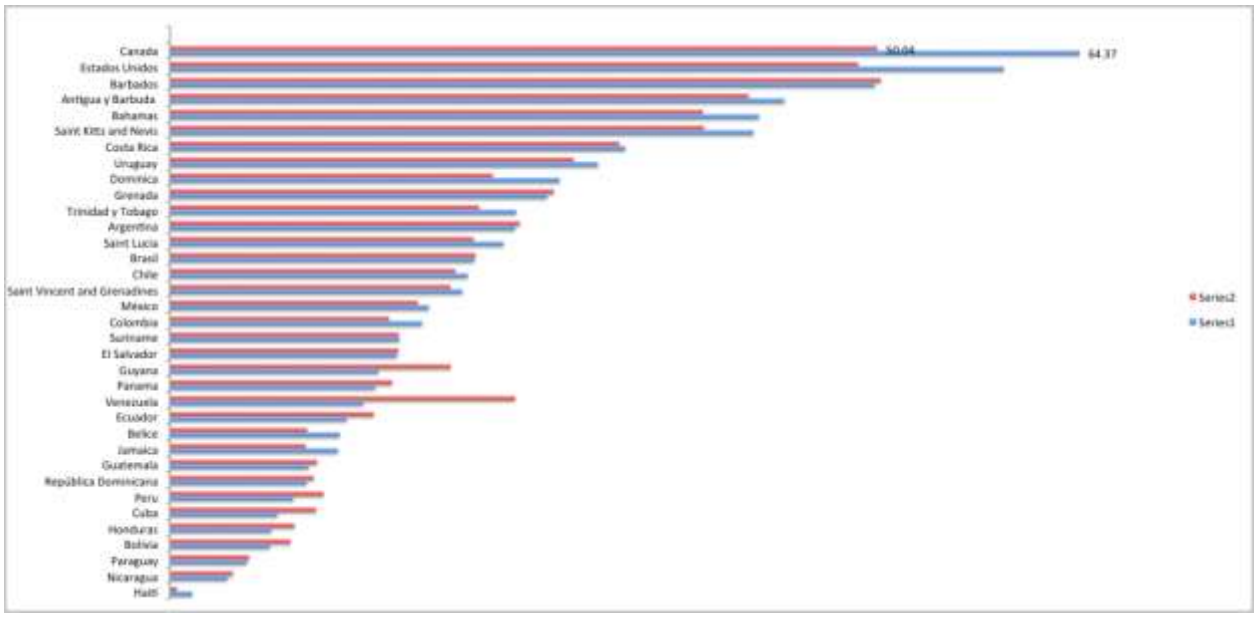
Telecommunication indicators

The development of telecommunications/ICTs in the region has been uneven. However, virtually all the trends observed have been the same.

The number of fixed-line telephone subscribers per 100 inhabitants has generally increased, but not significantly, while in some countries it has even diminished. The number of mobile telephone subscribers in all countries in the region has increased significantly, with a clear trend towards replacing fixed voice services or increasing mobile access.

Internet subscriptions have also grown in number in all the countries of the region, although penetration of Internet and broadband is lower than desirable in most cases.

Fixed-line telephone penetration per 100 people, 2005 to 2010



Source: Prepared by the authors, based on data from Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010, ITU.

Estados Unidos = United States; Antigua y Barbuda = Antigua and Barbuda; Trinidad y Tobago = Trinidad and Tobago; Brasil = Brazil; México = Mexico; Belice = Belize; República Dominicana = Dominican Republic; Haití = Haiti

In the United States and Canada, the fixed-line penetration rate has fallen in recent years, which is evidence of the worldwide trend towards the use of mobile voice services. This trend is confirmed by the increase in the number of mobile service subscriptions in Canada and the United States of 34 per cent and 30 per cent, respectively, in five years.

In the Mesoamerican zone, fixed-line service penetration figures per 100 inhabitants fall far below than the nearly 50 per cent rate observed in the Northern zone. Mexico has the highest penetration of this service, at 17.54 per cent, which is lower than the figure reported for 2005. With the exception of Mexico, all other countries in the zone saw an increase in their fixed service penetration per 100 inhabitants between 2005 and 2010.

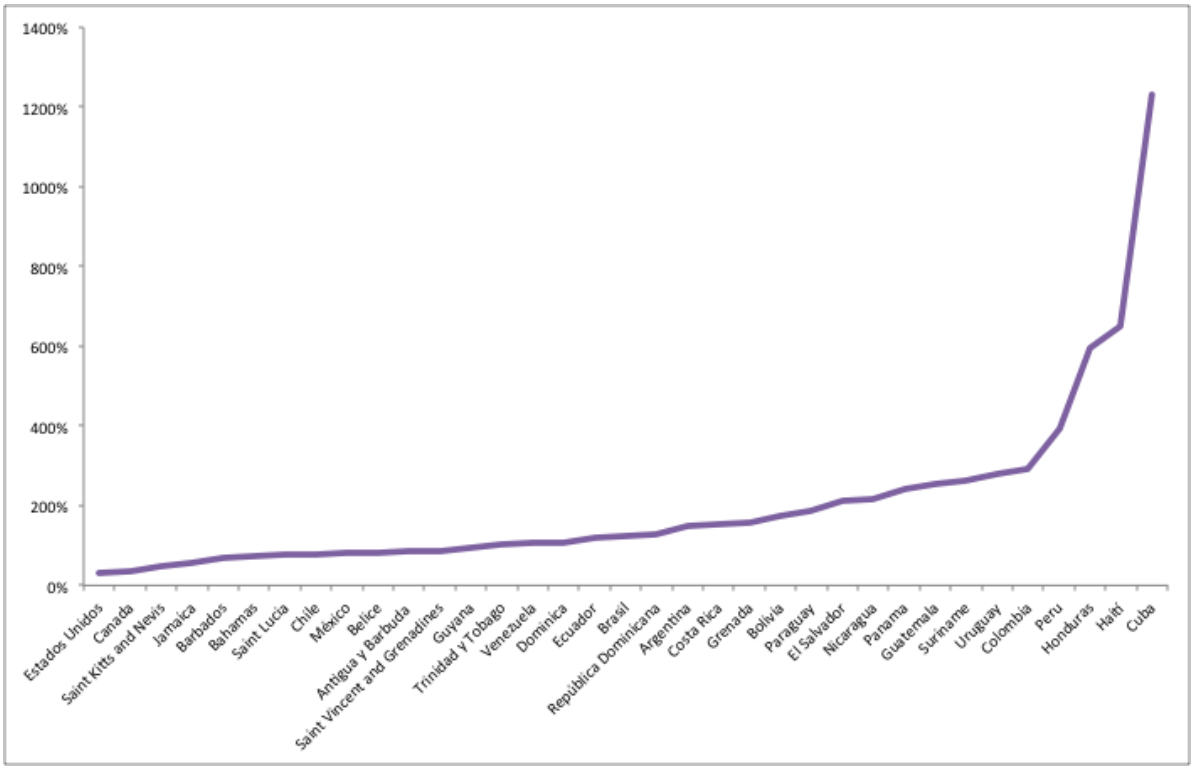
On average, the countries of the Caribbean zone have a fixed-line service penetration rate of close to 24 per cent per 100 inhabitants while in the Mesoamerican zone the average rate is just 14 per cent. Only Belize (9.72 per cent), Haiti (0.50 per cent), Jamaica (9.60 per cent) and Suriname (16.19 per cent) have fixed-line telephone penetration rates lower than Mexico's, which is the country with the highest rate in the Mesoamerican zone. Like the United States and Canada, most of the countries in this region have seen a drop in fixed-line subscriptions per 100 inhabitants.

In the Andean zone, fixed-line telephone subscriptions per 100 inhabitants are trending upwards, except in Colombia where the fixed-line penetration rate was lower in 2010 than in 2005. The percentages are much lower than those observed in the Northern zone.

With the exception of Paraguay, the fixed-line penetration rate per 100 inhabitants in the Southern zone is one of the highest rates in the Americas, excluding the United States and Canada. With the exception of Uruguay, the fixed-line penetration rate per 100 inhabitants was higher in 2010 than in 2005.

Throughout the Americas a significant increase in mobile telephone subscriptions per 100 inhabitants can be seen. The growth in mobile subscriptions from 2005 to 2010 gives an idea of the impact of mobile services on serving the region's communication needs.

Growth in the number of subscriptions per 100 inhabitants, 2005 to 2010



Source: Prepared by the authors, based on data from *Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010*, ITU.

Estados Unidos = United States; México = Mexico; Belice = Belize; Antigua y Barbuda = Antigua and Barbuda; Trinidad y Tobago = Trinidad and Tobago; Brasil = Brazil; República Dominicana = Dominican Republic; Haití = Haiti

The United States and Canada are the countries with the smallest increases in subscriptions per 100 inhabitants from 2005 to 2010. The increases in the vast majority of cases exceed 100 per cent, with penetration levels of more than 100 per 100 inhabitants.

With regard to fixed Internet subscribers, the figures have grown considerably in Canada and in the United States. Fixed broadband penetration rates per 100 inhabitants are close to 30 per cent in both countries.

Fixed wired Internet and fixed broadband subscriptions

	Fixed wired Internet subscriptions		Fixed Broadband subscriptions		Fixed Broadband subscription per 100 hab	
	2005	2010	2005	2010	2005	2010
Zona Norte						
Canada	8,880,000	10,953,000	7,004,000	10,139,000	21.70	29.81
Estados Unidos		89,090,000	51,156,000	85,723,000	17.23	27.62

Source: Prepared by the authors, based on data from *Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010*, ITU.

Estados Unidos = United States

Fixed broadband penetration rates in the Mesoamerican zone are still very low. However, as shown in Figure 1 below, the increase in registered Internet lines from 2005 to 2010 is very positive, with growth of more than 100 per cent in all cases, except for El Salvador, Guatemala and Nicaragua for which no information is available.

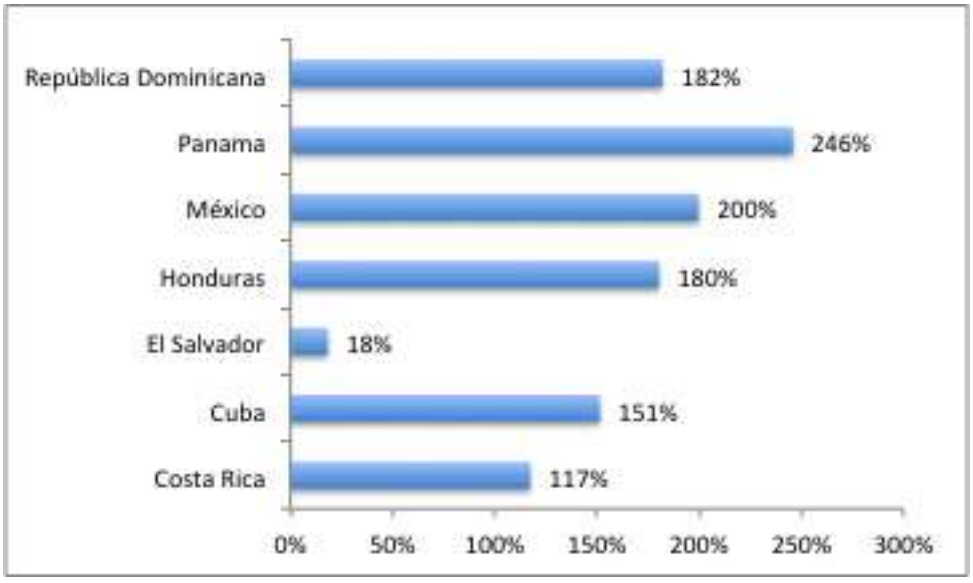
Fixed wired Internet and fixed broadband subscriptions

	Fixed wired Internet subscriptions		Fixed Broadband subscriptions		Fixed Broadband subscription per 100 hab	
Zona Centro	2005	2010	2005	2010	2005	2010
Costa Rica	125,000	271,512	44,914	288,236	1.04	6.19
Cuba	15,958	40,097	1,946	3,706	0.02	0.03
El Salvador	127,410	150,505	42,314	175,274	0.70	2.83
Guatemala			27,106	259,000	0.21	1.80
Honduras	25,820	72,360		76,000		1.00
México	3,882,000	11,629,000	1,922,000	11,325,000	1.81	9.98
Nicaragua	23,385		10,534	47,600	0.35	0.82
Panama	82,472	285,070	17,567	275,639	0.54	7.84
República Dominicana	134,545	379,286	60,674	360,039	0.65	3.63

Source: Prepared by the authors, based on data from *Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010*, ITU.

Zona Centro = Central zone; México = Mexico; República Dominicana = Dominican Republic

Figure 1. Growth in Internet lines, 2005 to 2010



Source: Prepared by the authors, based on data from *Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010*, ITU.

México = Mexico; República Dominicana = Dominican Republic

With regard to Internet subscriptions in the Caribbean, fixed broadband Internet penetration has been clearly on the rise, while fixed wired Internet subscriptions have grown more slowly and have even fallen in Guyana, Barbados and the Bahamas.

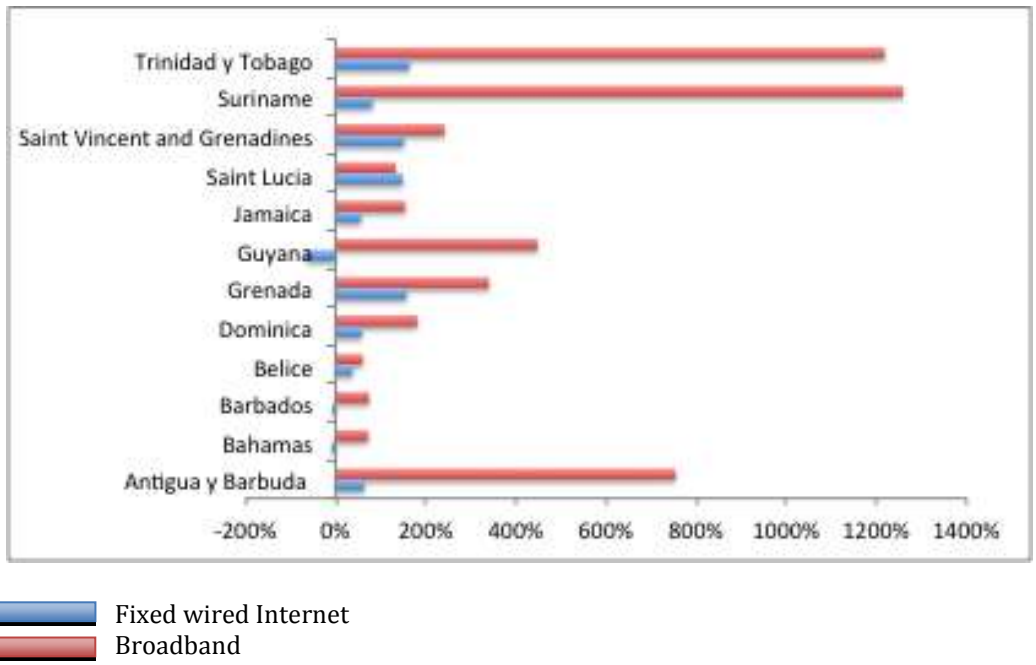
Fixed wired Internet and fixed broadband subscriptions

	Fixed wired Internet subscriptions		Fixed Broadband subscriptions		Fixed Broadband subscription per 100 hab	
Zona Caribe	2005	2010	2005	2010	2005	2010
Antigua y Barbuda	8,957	14,618	787	7,119	0.94	8.03
Bahamas	27,211	24,702	13,382	24,702	4.19	7.20
Barbados	66,217	60,964	31,942	56,190	11.81	20.56
Belice	6,837	9,384	5,022	8,915	1.79	2.86
Dominica	6,021	9,500	3,400	9,391	4.93	13.86
Grenada	5,620	14,437	3,222	14,437	3.14	13.82
Guyana	48,000	16,407	2,000	11,193	0.27	1.48
Haití	100,000					
Jamaica	73,572	114,561	45,000	112,201	1.68	4.26
Saint Kitts and Nevis			6,500	14,600	13.22	27.86
Saint Lucia	8,250	20,509	8,300	20,180	4.97	11.58
Saint Vincent and Grenadines	5,084	12,769	3,647	12,502	3.35	11.43
Suriname	6,959	12,611	1,107	15,672	0.22	2.99
Trinidad y Tobago	65,000	171,095	10,803	145,208	0.82	10.81

Source: Prepared by the authors, based on data from *Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010*, ITU.

Zona Caribe = Caribbean zone; Antigua y Barbuda = Antigua and Barbuda; Belice = Belize; Haití = Haiti; Trinidad y Tobago = Trinidad and Tobago; Fixed Broadband subscription per 100 hab = Fixed broadband subscriptions per 100 inhabitants

Figure 2: Growth in the penetration of fixed wired Internet and fixed broadband per 100 inhabitants, 2005 to 2010



Source: Prepared by the authors, based on data from *Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010*, ITU.

Trinidad y Tobago = Trinidad and Tobago; Belice = Belize; Antigua y Barbuda = Antigua and Barbuda

The Andean zone countries have followed the same trend as elsewhere in the Americas. Fixed wired Internet and fixed broadband penetration has grown significantly. However, the levels of broadband penetration per 100 inhabitants continue to be very low.

Fixed wired Internet and fixed broadband subscriptions

	Fixed wired Internet subscriptions		Fixed Broadband subscriptions		Fixed Broadband subscription per 100 hab	
Región Andina	2005	2010	2005	2010	2005	2010
Bolivia	61,963	113,982	8,723	95,937	0.10	0.97
Colombia	773,000	2,676,000	127,000	2,594,000	0.30	5.60
Ecuador	137,330	485,108	26,786	197,890	0.20	1.37
Peru	833,209	924,511	352,622	911,635	1.28	3.14
Venezuela	637,000	1,801,000	356,000	1,556,000	1.34	5.37

Source: Prepared by the authors, based on data from *Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010*, ITU.

Región Andina = Andean zone; Fixed Broadband subscription per 100 hab = Fixed broadband subscriptions per 100 inhabitants

Fixed broadband penetration per 100 inhabitants in the Southern zone is the highest in the Americas, alongside some Caribbean countries (excluding the United States and Canada).

Fixed wired Internet and fixed broadband subscriptions

	Fixed wired Internet subscriptions		Fixed Broadband subscriptions		Fixed Broadband subscription per 100 hab	
Zona Sur	2005	2010	2005	2010	2005	2010
Argentina	2,417,000	3,995,000	927,000	3,862,000	2.40	9.56
Brasil	4,364,000	20,992,000	3,234,000	13,226,000	1.74	6.81
Chile	906,000	1,819,000	709,000	1,788,000	4.35	10.45
Paraguay	60,000	156,919	56,000	28,147	0.09	0.44
Uruguay	174,735	374,880	48,539	367,480	0.81	10.91

Source: Prepared by the authors, based on data from *Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010*, ITU.

Zona Sur = Southern zone; Brasil = Brazil; Fixed Broadband subscription per 100 hab = Fixed broadband subscriptions per 100 inhabitants

Clearly, fixed broadband penetration levels per 100 inhabitants in the Americas are relatively low compared to Europe, some Asian countries, and the United States and Canada, where penetration is close to 30 per 100 inhabitants. It should be noted that Saint Kitts and Nevis and Barbados have fixed broadband penetration levels of over 20 per 100 inhabitants.

With regard to fixed services, penetration levels are far below 100 per cent and some contradictory trends can be seen. If we compare the change in penetration from 2005 to 2010, opposing trends may be observed in some countries. The United States, Canada, Mexico, Costa Rica, Antigua and Barbuda, the Bahamas, Belize, Dominica, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Colombia, and Uruguay saw reductions in their fixed-line telephone penetration rates, while the rest of the region's 35 countries saw increases in that rate per 100 inhabitants from 2005 to 2010.

As for mobile telephone penetration rates, all the countries in the Americas increased their penetration rates per 100 inhabitants from 2005 to 2010 and, in the vast majority of cases, the increase was significant, reaching rates exceeding 100 per cent.

Mobile broadband subscriptions 2010

Country	Total subscriptions
Bolivia	105[3]
Brazil	20 628[3]
Chile	1 444[3]
Colombia	1 110[3]
Dominican Republic	276[3]
Ecuador	1 323[3]
Mexico	360[7]
Paraguay	175[3]
Peru	267[8]
Trinidad and Tobago	7[3]
United States	163 705[7]
Venezuela	2 535[3]

Source: Prepared by the authors, based on data from *Yearbook of Statistics – Telecommunication/ICT Indicators 2001-2010*, ITU.

The ITU *Yearbook of Statistics* for the period 2001 to 2010 does not contain information on mobile broadband subscribers in 2010 for all of the region's 35 countries. The data that do appear indicate that in 2010 the number of mobile broadband subscriptions was higher in countries such as Mexico, Paraguay, Peru, the United States and Venezuela. In the rest of the countries listed, the number of fixed broadband subscriptions exceeds the number of mobile broadband subscriptions.

ICT Development Index (IDI)

The world has experienced significant growth in the use of ICT services. The ICT Development Index (IDI) is a composite of 11 benchmark indicators to monitor and compare the development of ICTs among countries. The IDI is prepared by the ICT Data and Statistics Division in ITU's Telecommunication Development Bureau. In 2011, the division published an index including the following countries of the Americas:

Country	Regional ranking 2010	Global ranking 2010	IDI 2010	Global 2008	IDI 2008	Global ranking 2008-2010
United States	1	17	7.09	17	6.55	0
Canada	2	26	6.69	20	6.42	−6
Barbados	3	41	5.83	33	5.47	−8
Uruguay	4	54	4.93	51	4.21	−3
Chile	5	55	4.65	54	4.14	−1
Argentina	6	56	4.64	53	4.16	−3
Trinidad and Tobago	7	61	4.36	56	3.99	−5
Brazil	8	64	4.22	62	3.72	−2
Venezuela	9	65	4.11	61	3.73	−4
Panama	10	66	4.09	67	3.52	1
Costa Rica	11	70	3.99	69	3.45	−1
Mexico	12	75	3.75	74	3.26	−1
Colombia	13	76	3.75	71	3.39	−5
Suriname	14	82	3.52	78	3.09	−4
Peru	15	83	3.52	76	3.12	−7
Jamaica	16	85	3.41	79	3.06	−6
Ecuador	17	88	3.37	88	2.87	0
Dominican Republic	18	93	3.21	89	2.84	−4
Guyana	19	95	3.08	93	2.73	−2
El Salvador	20	98	2.89	101	2.57	3
Paraguay	21	99	2.87	97	2.66	−2
Bolivia	22	102	2.83	102	2.54	0
Honduras	23	106	2.72	104	2.42	−2
Cuba	24	107	2.69	98	2.62	−9
Guatemala	25	108	2.65	108	2.39	0
Nicaragua	26	114	2.31	113	2.09	−1

Source: Prepared by the authors, based on data from *Measuring the Information Society 2011*, ITU.

Part Four

A. The Millennium Development Goals and the World Summit on the Information Society

Information and communication technologies (ICTs) are an indispensable tool to enable States to comply effectively and expeditiously with the Millennium Development Goals.

The efforts being made to offer broadband to the population of the Americas region coupled with digital education will enable the people of the continent to make maximum use of this tool and its applications. We will see an increase in countries' output and productivity thanks to the proven linkage between broadband penetration and growth in the economy and productivity. Broadband will also bring about improvements in areas related to the Millennium Development Goals. Thanks to digital education, ICT applications facilitate universal education; gender equality by enabling women to join the workforce as telecommuters; better health through remote diagnosis; environmental sustainability thanks to applications such as "smart grids;" and global partnership through a reduction in communications barriers.

Millennium Development Goals in the Americas region

MDG 1: Eradicate extreme poverty and hunger

As the following table shows, an average of 63 per cent of the population of the Americas lives in urban areas, which still leaves a large proportion (37 per cent) in rural areas, which are often marginal and severely lacking in living standards. The outcomes table for 2010 prepared by ECLAC, with information from participating agencies, reports insufficient progress in Latin America and the Caribbean. Different measures must be taken to attain the goal, since it may be missed if current trends continue.

Telecommunications/ICTs can help to eradicate extreme poverty since, thanks to broadband coverage, people isolated from the main services available in urban areas can gain some access to those services.

By keeping communities connected, governments will have tools for identifying the geographical situation and needs of these people, which will facilitate the adoption and implementation of more targeted social programmes.

Country	Urban (per cent)	Unemployment (per cent)	GDP per capita (PPP)
Cuba	75	3.8 (2011)	9 900 (2010 est.)
Saint Kitts and Nevis	32	4.5 (1997)	16 400 (2011 est.)
Barbados	44	12	23 600 (2011 est.)
Saint Vincent and the Grenadines	49	15	11 700 (2011 est.)
Costa Rica	64	6.5	11 500 (2011 est.)
Bolivia	67	9.2	4 800 (2011 est.)
Guyana	29	11	7 500 (2011 est.)
Jamaica	52	12.7	9 000 (2011 est.)
Belize	52	13.1	8 300 (2011 est.)
United States	82	9.1	48 000 (2011 est.)
Brazil	87	6	11 600 (2011 est.)
Grenada	39	25	13 300 (2011 est.)
Argentina	92	7.2	17 400 (2011 est.)
Canada	81	7.4	40 300 (2011 est.)
Mexico	78	5.1	15 100 (2011 est.)
Colombia	75	10.8	10 100 (2011 est.)
Dominica	67	23	13 600 (2011 est.)
Saint Lucia	28	20	12 900 (2011 est.)
Chile	89	6.9	16 100 (2011 est.)
Paraguay	61	6.6	5 500 (2011 est.)
Panama	75	4.5	13 600 (2011 est.)
Venezuela	93	7.3	12 400 (2011 est.)
El Salvador	64	7	7 600 (2011 est.)
Guatemala	49	4.1	5 000 (2011 est.)
Nicaragua	57	7.3	3 200 (2011 est.)
Uruguay	92	6	15 400 (2011 est.)
Antigua and Barbuda	30	11	22 100 (2011 est.)
Peru	77	7.7	10 000 (2011 est.)
Dominican Republic	69	13.3	9 300 (2011 est.)

Source: Prepared by the authors, based on data from the *CIA World Factbook*.

MDG 2: Achieve universal primary education

The Americas region has achieved high primary school enrolment, but at the current rate it is unlikely to meet the goal. In most cases, more than 85 per cent of the population is literate. Countries that have lower literacy rates have very scattered rural populations living in areas where access is difficult. Distance education could be an alternative that would increase the number of grades completed by boys and girls alike. Some countries have not increased their education spending to improve schooling in urban and rural areas. A comprehensive plan for classroom education coupled with distance education could bring benefits. Although literacy in the Americas region is very high, levels of public spending on education as a percentage of GDP are low. Thanks to the use of telecommunications/ICTs and their applications in distance education, governments could make their spending on education more efficient and achieve better penetration. NRENs could assist in the development of low-cost applications such as learning tools, online courses, distance training for teachers and so forth so that both teachers and students can benefit from the use of telecommunications/ICTs, have access to education at all times and have more and better content in the appropriate languages.

Levels of schooling in the Americas

Country	Spending on education/GDP (per cent)	Literacy (per cent)	Primary school completed
Cuba	13.60	99.8	male: yes — female: yes
Saint Kitts and Nevis	9.6	97.8	male: yes — female: yes
Barbados	6.7	99.7	male: yes — female: yes
Saint Vincent and the Grenadines	6.6	96	male: yes — female: yes
Costa Rica	6.3	94.9	male: yes — female: yes
Bolivia	6.3	86.7	male: yes — female: yes
Guyana	6.1	91.8	male: yes — female: yes
Jamaica	5.8	87.9	male: yes — female: yes
Belize	5.7	76.9	male: yes — female: yes
United States	5.5	99	male: yes — female: yes
Brazil	5	88.6	male: yes — female: yes
Grenada	4.9	96	male: yes — female: yes
Argentina	4.9	97.2	male: yes — female: yes
Canada	4.9	99	male: yes — female: yes
Mexico	4.8	86.9	male: yes — female: yes
Colombia	4.8	90.8	male: yes — female: yes
Dominica	4.7	94	male: yes — female: yes
St. Lucia	4.5	90.1	male: yes — female: yes
Chile	4	95.7	male: yes — female: yes
Paraguay	4	94	male: yes — female: yes
Panama	3.8	91.9	male: yes — female: yes
Venezuela	3.7	93	male: yes — female: yes
El Salvador	3.6	81.1	male: yes — female: yes
Guatemala	3.2	69.1	male: yes — female: yes
Nicaragua	3.1	67.5	male: yes — female: yes

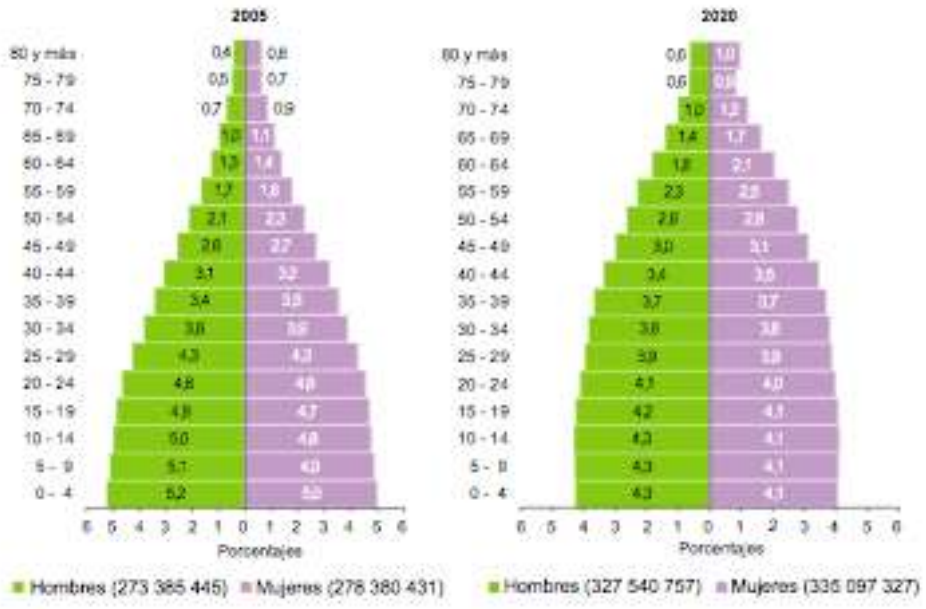
Country	Spending on education/GDP (per cent)	Literacy (per cent)	Primary school completed
Uruguay	2.9	98	male: yes — female: yes
Antigua and Barbuda	2.7	85.8	male: yes — female: yes
Peru	2.7	92.9	male: yes — female: yes
Dominican Republic	2.3	87	male: yes — female: yes

Source: Prepared by the authors, with data from the *CIA World Factbook.*

MDG 3: Promote gender equality and empower women

The countries of the Americas have achieved parity in the numbers of girls and boys enrolled in primary school. Girls have the opportunity to obtain an education in the same circumstances as boys, which prepares them better to join society. Women's participation in the workforce in the Americas can be promoted with telecommunications/ICTs thanks to the mobility offered and the possibility of working from home given the accessibility and communication offered by broadband.

Latin America: Total population estimates and projections by gender and five-year age increments, 2005 and 2020 (as percentages)



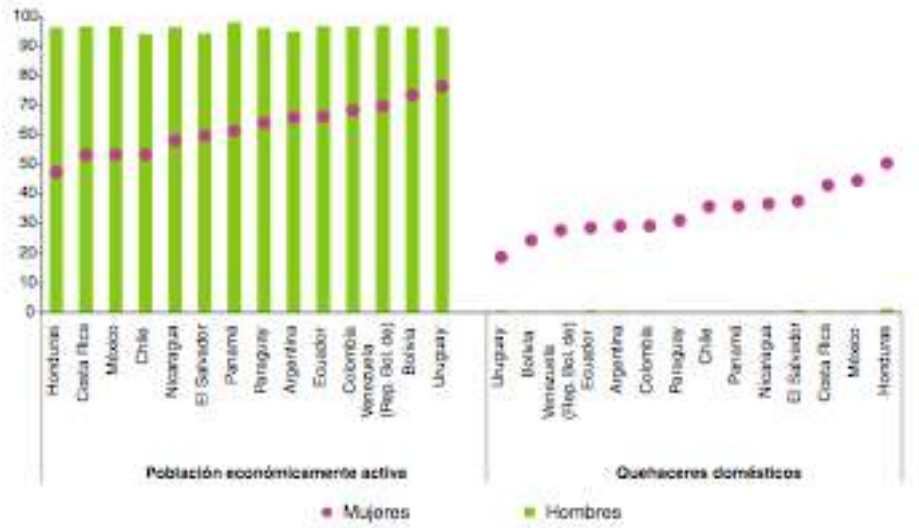
80 y más	80 and over
Porcentajes	Percentages
Hombres	Men
Mujeres	Women

Source: *Estadísticas para la Equidad de Género: Magnitudes y Tendencias en América Latina*, (Statistics for gender equity: Magnitude and trends in Latin America), Vivian Milosavljevic, ECLAC, 2007.

As for the number of women holding paid jobs, the Americas come close to the goal of achieving gender equality and empowering women. However, as regards the participation of women in

legislative assemblies, they are still only modestly represented. Unless the trend changes, it will be very difficult to attain this goal.

Figure VI.4: Latin America (14 countries). Prevalent labour status of men and women in the 25-to-49-year age group, national totals, circa 2002 (as percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on household survey data from the countries in question

Note: For more information, see Table 31 in the statistical annex

Población económicamente activa = Economically active population
Quehaceres domésticos = Unpaid domestic work
Mujeres = Women
Hombres = Men

Source: *Estadísticas para la Equidad de Género: Magnitudes y Tendencias en América Latina*, (Statistics for gender equity: Magnitude and trends in Latin America), Vivian Milosavljevic, ECLAC, 2007.

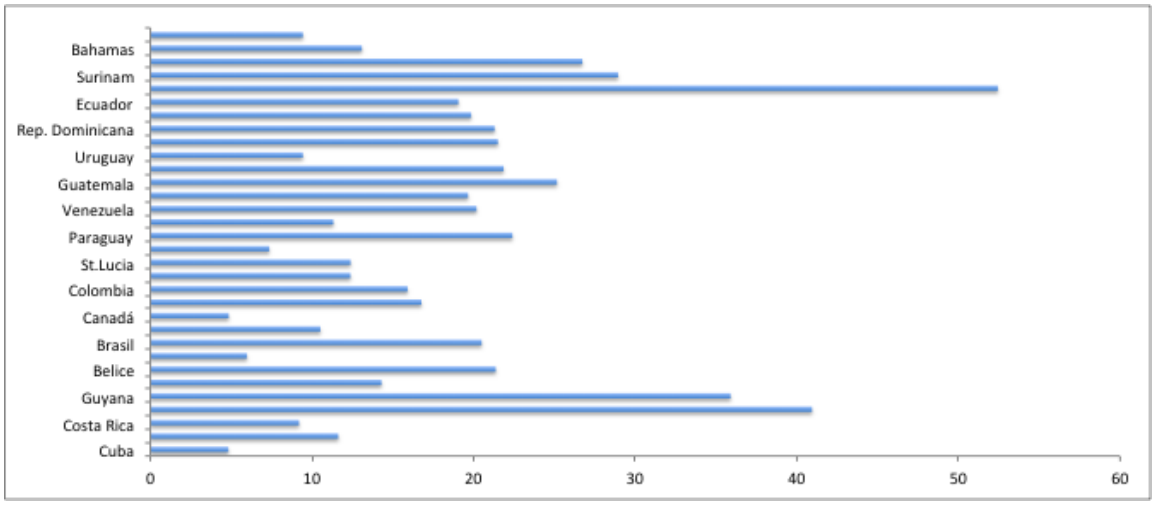
In these two aspects, women can use telecommunications/ICTs to prepare themselves better and to develop skills that will allow them to compete for higher-level jobs and expand their presence in legislative assemblies, since seeing men and women together in decision-making positions is a key for building an inclusive society.

MDGs 4 and 5: Reduce child mortality and improve maternal health

The information that can be provided for physicians and families in general about reproductive health is highly important for lowering infant mortality rates and improving maternal health. The situation in the Americas is improving, since the infant mortality rate has fallen in most countries, except in one or two countries in particular where the index remains higher than the regional average. The countries in this situation have highly dispersed populations living in rural or marginal urban areas. The support that telecommunications/ICTs can provide is cooperative work between telecommunication specialists and physicians, nurses and other hospital and health-unit personnel, who can be trained to offer distance services such as

telemedicine. It is already feasible to track high-risk pregnancies through the use of satellite technologies in remote areas, where mobile units can be sent equipped with the instruments necessary to care for pregnant patients. It is also feasible to build continuing education and distance-training networks for hospital and health-centre staff, to keep them up to date. Patient records can be managed in cloud computing databases. These clinical files can be reviewed by physicians in different places, provided the owner of the file authorizes physicians to consult them. Actions of this kind could eliminate the risks run by pregnant women today and provide physicians with alternatives for the timely resolution of emergencies. Progress in e-health offers an opportunity for reducing infant mortality and improving maternal health.

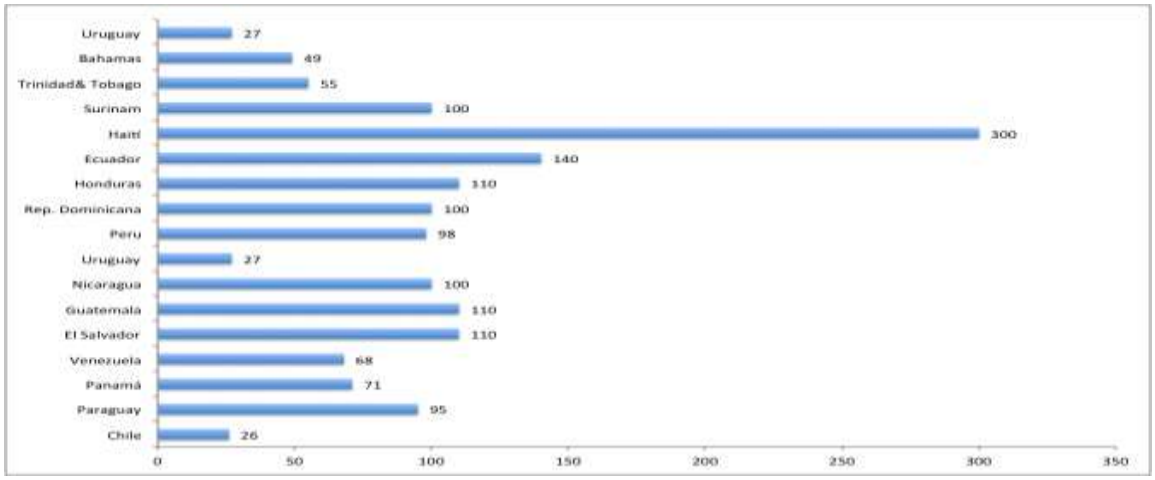
Infant mortality per 100 live births



Source: Prepared by the authors, with data from the *CIA World Factbook*.

Surinam = Suriname; Rep. Dominicana = Dominican Republic; St. Lucia = Saint Lucia; Canadá = Canada; Brasil = Brazil; Belice = Belize

Maternal mortality per 100 000 live births



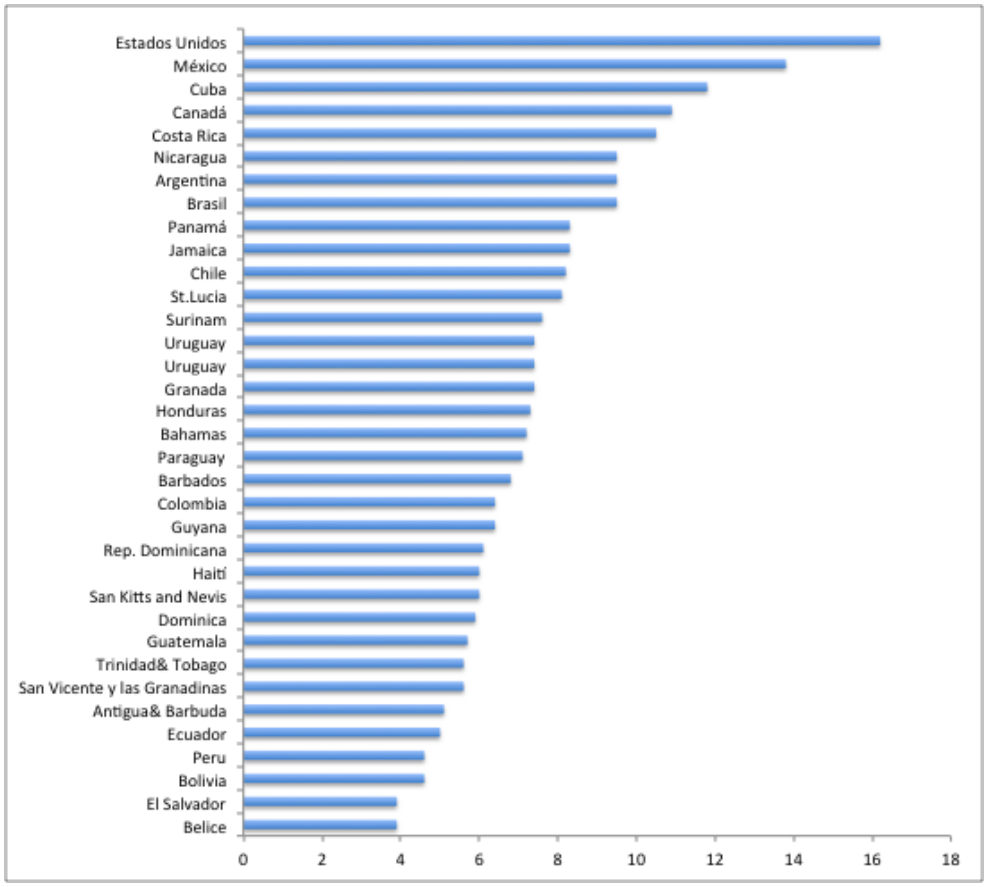
Source: Prepared by the authors, with data from the *CIA World Factbook*.

Trinidad y Tobago = Trinidad and Tobago; Surinam = Suriname; Haití = Haiti; Rep. Dominicana = Dominican Republic; Panamá = Panama

MDG 6: Combat HIV/AIDS, malaria and other diseases

The share of spending on healthcare as a percentage of GDP has increased in almost all countries of the Americas. This has made it possible to carry out healthcare programmes for people with no insurance coverage. It has also allowed high-risk contagious diseases to be monitored and controlled. However, recurring bacterial and viral diseases are still found in some countries. The figures on progress towards MDG 6 are moderate, but when compared with other regions, the trend has been positive. Telecommunications/ICTs can support the investigation of existing cases and monitoring of people who carry such diseases, to establish a strategy for disease eradication. News bulletins for the healthy population about the causes of these diseases and their prevention are also useful. Mobile services can provide inexpensive applications that can circulate quickly amongst the public. Regional cooperation is important in the exchange of information on the growth or spread of contagious diseases so that steps can be taken to prevent epidemics.

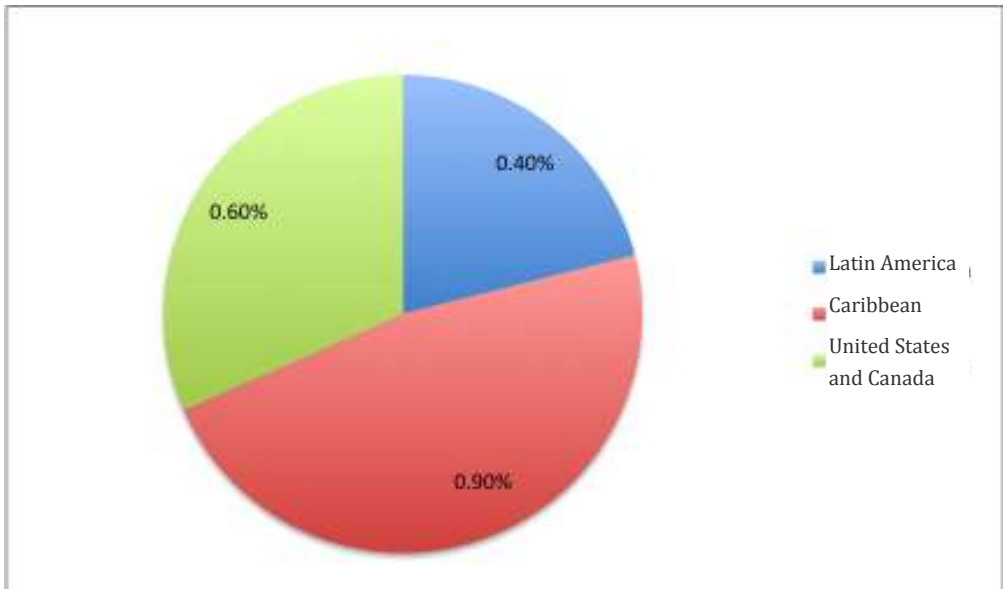
Healthcare spending as a percentage of GDP (2009)



Source: Prepared by the authors, with data from the *CIA World Factbook*.

Estados Unidos = United States; México = Mexico; Canadá = Canada; Brasil = Brazil; Panamá = Panama; St. Lucia = Saint Lucia; Surinam = Suriname; Granada = Grenada; Rep. Dominicana = Dominican Republic; Haití = Haiti; San Kitts and Nevis = Saint Kitts and Nevis; Trinidad y Tobago = Trinidad and Tobago; San Vicente y las Granadinas = Saint Vincent and the Grenadines; Antigua & Barbuda = Antigua and Barbuda; Belice = Belize

Percentage of population in the 15-to-49-year age group living with HIV/AIDS



Source: Prepared by the authors, with data from AVERT (http://www.avert.org).

Most common diseases in the region

Country	Diseases	Country	Diseases
Belize	Diarrhoea, hepatitis, dengue	Uruguay	Diarrhoea, dengue and malaria
Ecuador	Diarrhoea, dengue	Suriname	Diarrhoea, hepatitis A, typhoid, dengue, leptospirosis
Antigua and Barbuda	Diarrhoea, hepatitis A, typhoid, dengue, malaria, yellow fever	Saint Lucia	Diarrhoea, hepatitis A, typhoid, dengue, malaria, leptospirosis
Saint Vincent and the Grenadines	Diarrhoea, hepatitis A, typhoid, dengue, malaria, leptospirosis	Chile	Diarrhoea, hepatitis A, typhoid, dengue, malaria, leptospirosis
Guatemala	Diarrhoea, hepatitis A, typhoid, dengue, malaria, leptospirosis	Brazil	Diarrhoea, hepatitis A, typhoid, dengue, malaria, yellow fever, leptospirosis
Dominican Republic	Diarrhoea, hepatitis A, leptospirosis	Argentina	Diarrhoea, hepatitis A, typhoid, dengue, malaria, leptospirosis
Colombia	Diarrhoea, hepatitis A, typhoid, dengue, leptospirosis	Nicaragua	Diarrhoea, hepatitis A, typhoid, dengue, malaria, leptospirosis
Barbados	Diarrhoea, hepatitis A, typhoid, dengue, malaria, leptospirosis	Costa Rica	Diarrhoea, hepatitis A, typhoid, dengue, malaria, leptospirosis
Grenada	Diarrhoea, hepatitis A, typhoid, dengue, malaria	Canada	Diarrhoea, hepatitis A, typhoid, dengue, malaria, leptospirosis

Source: Prepared by the authors, with data from the *CIA World Factbook*.

MDG 7: Ensure environmental sustainability

The Americas have been recognized as one of the world's key regions in terms of the services rendered by its ecosystems. It is also one of the regions most vulnerable to climate change. This is compounded by the fact that many of its cities have grown without strict "green" planning or adequate solid waste management systems, which has resulted in solid waste being dumped into water or soil which thereby becomes contaminated, to the detriment of goods and services produced by ecosystems.

Adaptation by the countries to a "green" strategy places pressure on the use of public and private resources. The region does not have the infrastructure needed to provide good quality of life and competitiveness, which leads to individual decisions which are generally inefficient. Aside from a few recognized exceptions, the countries of the Americas have no innovative strategies to address the problem of climate change and their use of technology is nascent. Little use has been made of cooperation between academic and research networks on the one hand, and government and industry on the other. Links of this kind could promote the development of inexpensive technological applications that could be used to reduce environmental impact in the region.

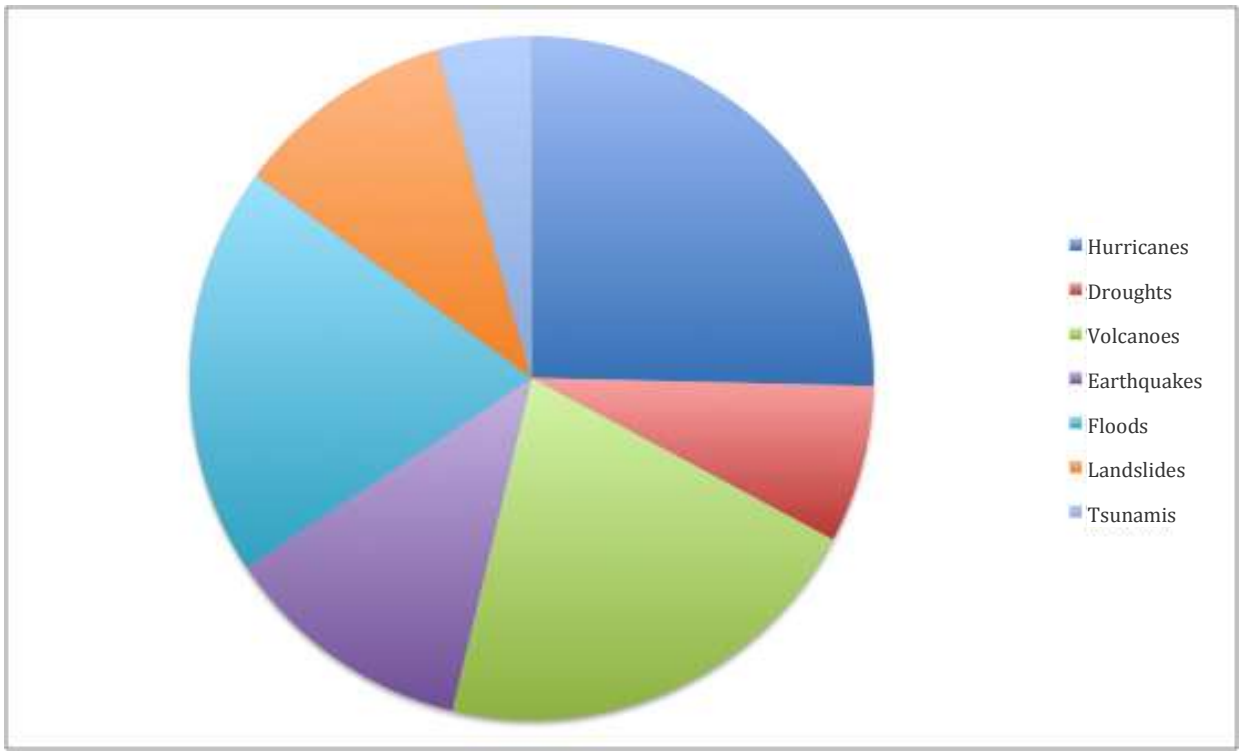
Except for the United States and Canada, the countries of the Americas largely depend on primary sectors that make intensive use of natural resources and land, and on industries based on natural resources that are generally very sensitive environmentally.

The Americas region is vulnerable to natural disasters, as it lies within a geographical zone prone to seismic movements, has a sizeable number of active volcanoes that periodically threaten the population, and a lengthy hurricane and tropical storm season that can be devastating.

As already mentioned when discussing emergency communications, telecommunications/ ICTs are indispensable infrastructure and tools for ensuring safety as well as environmental sustainability.

The commonest natural disasters in the Americas exhibit the following trends:

Main natural disasters observed in the region



Source: Prepared by the authors, with data from the *CIA World Factbook*.

It also needs to be pointed out that several countries report that their forest cover is dwindling. The countries that suffer from some degree of deforestation are Cuba, Costa Rica, Bolivia, Guyana, Jamaica, Brazil, Argentina, Mexico, Colombia, Saint Lucia, Paraguay, Panama, Venezuela, El Salvador, Guatemala, Nicaragua, Antigua and Barbuda, Peru and the Dominican Republic.[41] Aware of this situation, the countries have joined international agreements to develop long-term strategies to protect the hardest-hit areas and reforest them. The indicator for MDG 7 has improved somewhat. Innovative strategies are required to turn the trend around and attain the goal. Clearly, telecommunications/ICTs should be an indispensable tool in developing new strategies and a start has been made on cooperation between government and academic initiatives in the Mesoamerican zone on early warning of natural disasters and on sharing infrastructure to reduce deployment costs. In the Caribbean, C@aribNET can be an important asset in developing joint projects to mitigate the vulnerability of ecosystems.

MDG 8: Develop a global partnership for development (Internet)

A group of indicators has been established under Mexico's leadership through its Federal Telecommunication Commission (Comisión Federal de Telecomunicaciones). It also heads up the System of Regional Telecommunication Indicators (Sistema de Indicadores Regionales de Telecomunicaciones) (SIRTEL) project which is fed information from all members of the Latin American Telecommunication Regulators Forum (Foro Latinoamericano de Entes Reguladores de

[41] No information was available for some countries and therefore the list is incomplete.

Telecomunicaciones) (REGULATEL), financed by @lis2. The indicators are also aligned with those contained in ITU's ICT database. The indicators are available on a technology platform to which access is available to feed the database and consult it electronically. The target for the number of Internet users in the region has been met. However, the countries that are below the regional average need to implement their plans to deploy broadband and establish infrastructure such as IXPs as well as cooperation with NRENs to achieve greater penetration in the short term.

B. Main principles agreed on in WSIS

As is evident from the preceding sections, the countries of the region are very actively promoting the deployment of infrastructure and implementing public policies and programmes to permit them to mainstream telecommunications/ICTs into their development plans as tools to enable and promote the economic, social, political and cultural sectors. In May 2012, Argentina, Colombia and the United States were awarded prizes for implementing projects concerned with strategies geared to development, and other countries have shared their success stories in a book published by ITU entitled *WSIS Stocktaking: Success Stories 2012.*

The principles that govern discussion on achieving the objectives of WSIS can be summed up as follows:

- C1. The role of governments and all stakeholders in the promotion of ICTs for development
- C2. Information and communication infrastructure: an essential foundation for an inclusive information society
- C3. Access to information and knowledge
- C4. Capacity building
- C5. Building confidence and security in the use of ICTs
- C6. Enabling environment
- C7. ICT applications: benefits in all aspects of life
- C8. Cultural diversity and identity, linguistic diversity and local content
- C9. Media
- C10 Ethical dimensions of the information society
- C11. International and regional cooperation

The Colombian project is based on Action Line C3 (Access to information and knowledge) and is called "Computers for Education: A Path to Knowledge". It is a programme implemented by the Ministry of Information and Communication Technology to narrow the regional and local digital divide in isolated areas with difficult access. The programme brings ICTs to children and trains teachers in their use, as education supports. One of its objectives is to improve the quality of public education. It is also environmentally friendly, since it uses old, reconditioned computers. It helps to reduce CO_2 emissions by recycling the computers, saving on the need for new equipment.

The Argentine project is based on Action Line C7 (ICT applications: benefits in all aspects of life). It offers an application associated with an automated network of weather stations developed by the University of La Punta, which represents civil society. Scientists, farmers and others use the data, which have been compiled in repositories, for more precise planning for climate change and its positive and negative consequences for their individual activities. The network of weather stations collects and broadcasts data captured in real time. The information is used by scientists to produce applications intended to meet critical needs in the San Luis area of Argentina.

The United States project is the Ruhanga application (RealTime Remote Health Monitoring). It is a software application that uses cloud computing combined with wireless technologies. The system monitors patients with terminal illnesses who have little or no mobility or are confined to their rooms. The system includes a patient report system, a physician system, a central intelligent processing system and a live video streaming system, which enables live interaction between the patient and physician using their mobile phones.

For Action Lines C1 to C11, the document also describes other successful projects carried out in other parts of the world that could serve as examples of development strategy for the countries of the Americas.

Most countries in the Americas (and others as well) have designed strategies to speed up the deployment of broadband infrastructure, but since penetration is relatively low and mobile broadband requires technological changes and a larger number of frequencies, governments could seek partnerships with NRENs. The latter could join in the effort, whilst maintaining their functions as academic and research networks. In the United States, Canada and Brazil, the strategy is comprehensive. Today, the networks known as Internet2, CANARIE and RNP cooperate closely with telecommunication/ICT authorities and industry in joint innovation projects. They also develop advanced applications in these networks to address aspects such as telemedicine, e-health, distance education, remote instrument management, etc.

Several objectives of the Geneva Plan of Action focus on education. The countries of the Americas are preparing initiatives to bring telecommunications/ICTs into education processes, but much remains to be done. Emphasis must be placed on consolidating the achievements in primary education in countries that are close to attaining the MDGs. Secondary and higher education should be medium-term objectives to build the knowledge of people who will form the workforce in the decades to come. The third objective of the WSIS Geneva Plan of Action establishes that the countries should connect institutions of higher education and research centres. In the Americas, there are only four countries that have not yet attained this objective. It must be reiterated that NRENs can become key players for social and cultural development.

Part Five

Least developed countries

In the Americas region, Haiti is the only country classified as a least developed country (LDC). Although Haiti has been included throughout this study, further comments are called for owing to its unique situation.

According to ITU, one of the characteristics of small island states is their vulnerability to environmental events and external economic shocks.

When we talk about digital inclusion, the situation in such countries is different, even from that of other developing countries. In recent years, penetration of mobile telecommunication services in such countries has grown significantly at rates of up to three digits, narrowing the gap between small island states and other developing countries. However, the digital divide between them and the rest of the world is still very wide. This is particularly evident in next-generation technologies such as fixed and mobile broadband Internet services and third-generation cellular technology.

Haiti's situation is interesting nonetheless. Haiti and the Dominican Republic are the only countries in the Caribbean with an IXP, which is evidence of Haiti's intention to give priority to developing a national telecommunication infrastructure.

Development of telecommunications/ICTs in Haiti

The telecommunication sector in the country has seen positive growth rates since 1995. Haiti has the following operators today:

- NATCOM. The company launched 3G services in August 2011 at the national level. NATCOM is developing DSL, and 3 000 kilometres of fibre have been laid throughout the country.
- DIGICEL. This company developed the GSM mobile network. It now has more than 2 million subscribers and has just obtained a licence to offer 3G services.
- COMCEL. This GSM operator has 1.5 million subscribers and plans to develop its 3G network to compete with NATCOM.

The National Telecommunication Board (Conseil National des Télécommunications) (CONATEL) has received four applications for licences to offer 4G services in the 700 MHz band. However, the spectrum must be reallocated before any auctions can be conducted. The 700 MHz band is currently used for analogue broadcasting (UHF).

Two companies have already obtained DTV licences. Haiti has adopted the ATSC standard, which is a natural step since it has a NTSC analogue system. It expects that its first digital transmission will be made in December 2011.

WiMax service is available in Haiti. The island has five licensed operators: ALPHA COMMUNICATION NETWORK, ACCESSHAITI, MULTILINK and HAITI DATA NETWORK.

Bibliography

Jordán, Valeria, Hernán Galperin and Wilson Peres (eds.), Fast-tracking the digital revolution: Broadband for Latin America and the Caribbean, United Nations, Santiago, Chile, 2011.

Hudson, Heather E., Connecting the "Underserved": Broadband Strategies and Lessons from North America, (online at http://www.ptc.org/ptc11/images/papers/upload/Hudson_Heather_Paper.pdf).

Connect the Caribbean Position Paper, March 2012.

Presentation by the Dominican Republic delegation to the XXth meeting of CITEL Permanent Consultative Committee I (Telecommunications/Information and Communication Technologies), on the Dominican Republic profile in the Caribbean Regional Communications Infrastructure Programme (CARCIP), 16 to 19 May 2012, Buenos Aires, Argentina.

Presentations by participants in the XIXth meeting of CITEL Permanent Consultative Committee I, 30 August to 2 September 2011, Mar del Plata, Argentina.

Presentations by participants at the "Connect the Americas" Round Table Discussion, 1 and 2 March 2012, Washington, D.C., United States.

Documents presented by the national delegations at the XXth Meeting of CITEL Permanent Consultative Committee I (Telecommunications/Information and Communication Technologies), 16 to 19 May 2012, Buenos Aires, Argentina.

Digital broadcasting

Presentations

Myra Moore, DTC-DTV Transition Group, "DTT in Latin America, Caribbean and around the World," CTU Spectrum Management Meeting, 2 and 3 April 2012.

Colin Prior, Director of International Sales, Strategy and Technology, ITU-AIDB-ABU Regional Workshop, Hanoi, 23 and 24 May 2011.

CLARA

Rodrigo de la Parra C., Marco de Referencia Normativo de las Políticas Regionales que Impactan a las Redes Avanzadas. Informe de Análisis Comparativo por Sector (Regulatory reference framework of regional policies having an impact on advanced networks. Comparative Analysis Report by Sector), May 2010.

A Deployment Strategy for Internet Exchange Points as part of a National Broadband Plan, Daniel B. Cavalcanti danbrc@gmail.com, Proceedings of the fifth ACORN-REDECOM Conference, Lima, 19 and 20 May, 2011.

Second Training Workshop on Advanced Networks, 2004, CEDIA Internet 2, Guayaquil, Ecuador.

LACNIC XI, NAP CABASE Argentina, Gabriel Adonaylo gabriel.adonaylo@comsat.com.ar 28 to 30 May 2008.

Demographic bulletin

Latin America and the Caribbean: *Population Ageing 1950-2050*, ECLAC.

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