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BY THE SMART SUSTAINABLE DEVELOPMENT MODEL ADVISORY BOARD

SMART SUSTAINABLE DEVELOPMENT MODEL

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Smart Sustainable Development Model

A report by the Smart Sustainable Development Model Advisory Board

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This report was prepared by members of the Working Groups on Policy, Regulation and Advocacy; Infrastructure and New Technologies; and Financing, Partnerships and Business Models (www.itu.int/en/ITU-D/Initiatives/SSDM/Pages/default.aspx) launched by the International Telecommunication Union (ITU), Telecommunication Development Bureau (BDT) in 2012 to explore innovative and collaborative ways of harnessing the full potential of ICTs for the benefit of all worldwide.

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Preface

It is with great pleasure that I present this report by the Advisory Board of the Smart Sustainable Development Model (SSDM) initiative. The main objective of the SSDM initiative is to bring a human face to information and communication technology (ICT) through recognizing its important role in the realization of sustainable development and saving lives in times of disasters.

In the past 12 months the Advisory Board has been working very hard looking at the current status of policy and regulatory frameworks, infrastructure and technologies, financing, partnerships and business models. This report documents and reflects the in-depth understanding of development models that utilize ICTs to anticipate, prepare, and act on risk scenario to protect people, assets, ecosystems, and save lives when disasters strike.

I would like to thank the Hon. John Nasasira, Minister of ICT, Uganda, who is the Chairman of the Board, Mr. Jose Manuel Toscano, Director General, International Telecommunications Satellite Organization (ITSO), who is the Vice Chairman of the Board, and all Board members for their excellent efforts in compiling this report. There is so much promise in the work of the Board going forward.

I strongly believe that telecommunications and ICTs are critical to saving lives as well as integrating communities and countries into the global economy particularly as we enter the post-2015 development era.

Brahima Sanou

Director
Telecommunication Development Bureau
International Telecommunication Union

Acknowledgements

This report documents the achievements of the three working groups of the Smart Sustainable Development Model (SSDM). In response to both the challenges and the opportunities from information and communication technology (ICT) contributions to political, social, economic and environmental development, the reports of the working groups support the work of ITU by recommending ways forward within the framework of the SSDM.

ITU would like to thank the SSDM Chairman of the Board of Directors, Hon. John Nasasira for his exceptional direction resulting in the publication of the working group achievements. ITU would also like to thank the Chairmen of each working group for their guidance and excellent efforts in compiling the reports.

The Chairmen of the working groups are: Ms. Donna Bethea-Murphy of Iridium Communications Inc. Chairman of the Infrastructure and New Technologies working group; Mr Flavien Bachabi of Intelsat, Chairman of the Financing, Partnership and Business Models working group; and Mr Christian Roisse of Eutelsat IGO, Chairman of the Policy, Regulation and Advocacy working group.

ITU would like to thank the members of each working group for their hard work and commitment in producing the contents of this report. The full list of working group members can be found in Annexes 2-4 of this report. This broad base of public sector participation representing different sectors allowed this SSDM report to benefit from a cross-section of views and interests. Without the active involvement of all of these stakeholders, it would have been impossible to produce a report such as this, reflecting the overall position of ICT development and conditions of each topic while also representing international best practice.

The activities that led to the publication of this report have been implemented under the overall direction the BDT Project Support and Knowledge Management (PKM) Department and has further benefited from comments of the BDT ICT Applications Division, and Regulatory and Market Environment (RME) Division.

Foreword

Information and Communication Technologies (ICTs) are serving as the most important driving force behind countries' economic and social integration into the wider global community. In light of the huge changes that are taking place and mindful of the need to shape them in ways that best reflect the aspirations of the individual country societies each with their unique heritage, the Director of the Telecommunication Development Bureau (BDT) of the International Telecommunication Union (ITU) established the Smart Sustainable Development Model Initiative (SSDM). The initiative is an international, multi-stakeholder platform that seeks to link ICT for Development (ICT4D) with ICT for Disaster Management (ICT4DM) leading to sustainable development and optimal use of resources while minimizing additional financial investments and in particular, by making the use of excess satellite capacity. This initiative was launched during the ITU TELECOM World held in Dubai in 2012.

To implement this initiative, the Director of BDT invited experts from government, private sector and academia to form the first SSDM Board. It was an honour for me to be endorsed as the Chairman of the SSDM Board by the members at the Board's first meeting. I would like to take this opportunity to thank the Director of BDT for this initiative.

The Board held its first meeting in October 2013. At this first meeting, the Board agreed to set up three working groups to study the current status of ICT policy, regulation and legislation, financing, emerging technologies, infrastructure, and business models available that can help in determining ITU's focus on linking ICT development to disaster preparedness and response to emergencies worldwide. These working groups are 1) Policy, Regulatory and Advocacy; 2) Infrastructure and Technologies; and 3) Financing, Partnership and Business Models.

The aim of the SSDM is to mobilize infrastructure put in place for social services and local communities for disaster response in emergencies thereby achieving the Millennium Development Goals (MDGs). As such, it was necessary for the working groups to study and prepare a report on the current status of each topic selected as agreed at the first Board Meeting.

In line with this study, the initiative targets, on one hand, ICT4D and deployment of the crucial telecommunications infrastructure that will bridge the gaps and challenges hindering the ability of countries to leverage science, technology, innovation and culture for sustainable development. On the other hand, it targets ICT4DM, since ICTs play a critical role in the immediate aftermath of disasters. They ensure the timely flow of vital information that is much needed by government agencies and other humanitarian actors involved in rescue operations and assisting people in need. Moreover, integrating ICTs in disaster prediction, detection and alerting would ensure the effectiveness of disaster risk reduction as well as adaptation to climate change.

Despite the efforts being made in this field, more remains to be done and achievements could have a greater impact if a de-fragmented approach is adopted by combining and crowdsourcing experiences. This initiative, therefore, seeks solutions to common problems in a collective manner in order to share information and facilitate collective action to foster accessible, cost efficient and user friendly ICTs for all living in rural and underserved areas prone to disasters.

Hon. John Nasasira

Chairperson, SSDM Board of Directors and

Minister of ICT

Government of Uganda

Executive Summary

The world is threatened by disasters of unprecedented frequency and magnitude that continue to cause massive disruption to developed and developing economies alike. The International Telecommunication Union (ITU) has launched the Smart Sustainable Development Model (SSDM) initiative in order to create a framework for optimizing the use of information and communication technology (ICT) resources for both development (ICT4D) and disaster management (ICT4DM) purposes with the intention that a dual ICT4D and ICT4DM approach may be efficient, cost-effective and timely in utilization of scarce resources. The initiative will also provide a platform for sharing information, expertise, knowledge and best practices.

The SSSDM Initiative has been progressed by detailed evaluation carried out by three Working Groups especially set up for the purpose. They are: the Working Group on Policy, Regulation and Advocacy; the Working Group on Infrastructure and Technologies; and, the Working Group on Financing, Partnerships, and Business Models, respectively.

Policy, regulation and advocacy

Policy, regulation and advocacy will foster equitable access to ICT networks and facilitate the contribution that ICT can make in disaster management and sustainable development processes. After reviewing developments from a legal and regulatory point of view, the report features case studies and best practices in the area. It includes recommendations for developing and implementing a favourable policy and regulatory environment, including the deployment of satellite services. Finally, it elaborates proposals on possible ways of involving stakeholders and appropriate figures to better communicate and promote ICT4DM.

Infrastructure and technologies

While local situations may present unique challenges, many principles are universal in ensuring the right infrastructure and technologies address disaster mitigation and response requirements. The bedrock of these principles remains increasing coordination between those agencies deploying ICT4D and those constructing ICT4DM plans. Wherever possible, infrastructures and new technologies should be deployed that can be utilized in times of disaster *and* in meeting development goals. These technologies are now readily available, and should be immediately considered by governments and stakeholders worldwide. This report reviews ICTs in terms of technologies and applications in this area, addresses the issue of scarce resources and sustainability of ICT4D and ICT4DM taking into account new technologies, and evaluates best practices before making recommendations.

Financing, partnerships, and business models

The report provides a baseline assessment of potential financing mechanisms, partnership models, and business models that would be suitable for creating partnerships for the establishment of ICTs that support ICT4D and ICT4DM. Surveys of several real-life ICT partnerships and a summary of best practices are presented, as well as partnership models, with a focus on recognizing stakeholder interests. A survey of possible financing mechanisms is presented, again in the context of identifying feasible approaches for SSDM partnerships. This leads to a concrete proposal for the establishment of an ICT4DM platform that will be used for preparedness, restoration and recovery of telecommunication capabilities by governments in case of disaster and that can be leveraged for ICT4D partnerships to be based on models growing out of the foundational work in this report. The report concludes with specific next steps to be considered by the SSDM Advisory Board. The reference for this Working Group calls for a special focus on potential partnerships between satellite operators and the public sector.

1 Introduction

The world is threatened by disasters of unprecedented frequency and magnitude that cause massive disruption to developed and developing economies. The International Telecommunication Union (ITU) has launched the Smart Sustainable Development Model (SSDM) initiative in order to create a framework for optimizing the use of information and communication technology (ICT) resources for both development (ICT4D) and disaster management (ICT4DM) purposes. The initiative will also provide a platform for sharing information, expertise, knowledge and best practices.

The SSDM Advisory Board has established a work plan for meeting these objectives that leverages a series of Working Groups whose charter is to research and recommend approaches focusing on a particular aspect of the SSDM framework. The SSDM also seeks to link initiatives that bridge the digital divide with those that support ICT for disaster management.

This report reflects the work of the SSDM working groups that studied the current situation concerning policy, regulations and advocacy; infrastructure and technologies; and financing, partnerships and business models.

2 Report of the Working Group on Policy, Regulation and Advocacy

2.1 Summary

The Working Group on Policy, Regulation and Advocacy, as a subgroup of the Smart Sustainable Development Model (SSDM) Advisory Board, presents in this report its background work on policy and regulatory related matters which foster equitable access to information and communication networks and facilitate the contribution of information and communication technologies (ICT) in disaster management and sustainable development processes. After acknowledging the role of emergency communications, and in particular satellite technology, an overview of the process for establishing ICT use in disaster mitigation, granting of relief and restoration of infrastructure will be presented from a legal and regulatory point of view. The report also features case studies and best practices. It includes recommendations for developing and implementing a favourable policy and regulatory environment, including the deployment of satellite services. Finally, it elaborates proposals on possible ways of involving stakeholders and appropriate figures to better communicate and promote ICT for Disaster Management (ICT4DM).

Section 2.2 provides a background on this subject. Section 2.3 outlines the contribution ICT can make in this area, whilst section 2.4 provides an overview of the process aiming at establishing ICT4D and ICT4DM. Section 2.5 lists the steps required to establish communications in disaster mitigation. Section 2.6 discusses constraints and challenges concerning regulatory, followed by section 2.7 that examines the Tampere Convention which is a treaty that was established to address the numerous regulatory constraints and challenges that serve as obstacles to the provision of telecommunication resources for disaster mitigation and relief operations. Section 2.8 provides case studies from 6 countries. In section 2.9 an overview of best practices is provided. Section 2.10 provides recommendations for developing and implementing a favourable policy and regulatory environment, including the deployment of satellite services; and section 2.11 provides recommendations on specific advocacy actions.

2.2 Background

According to ITU[1] data on global ICT for Development (ICT4D) over the period of 2003-2013, high speed networks have become an increasingly indispensable part of the global infrastructure. While ICT are shaping the development of countries and communities, the initiative of the SSDM aims to establish a reference point which will indicate how to best translate the expertise that exists within the field of ICT4D into the realm of ICT4DM, thereby providing both social and economic benefits to affected areas.

Given the notable recrudescence of natural and man-made disasters over the last few decades, it is becoming increasingly critical to provide a system which will help States, Administrations and organizations to best handle these incidents when and where they occur and to initiate, develop or improve their ability to prepare for potentially disastrous situations. As disasters can never be fully prevented, it is important to minimize the loss caused by such events and to be able to address the ensuing problems immediately within the first few hours that they occur. Internationally, disaster management has been recognized as a key requirement towards achieving the UN[2] Millennium Development Goals[3] by the specified target of 2015.

ICT can save lives in disaster situations. However, regulatory barriers exist that make it difficult to deploy equipment when it is needed. Such barriers include licensing requirements to use frequencies, restrictions on importing equipment and limits on the movement of humanitarian teams, and can significantly delay the deployment of satellite services. Therefore, it is essential to create a favourable policy and regulatory environment, which would enable communications to be restored in an efficient and timely manner.

2.3 Contribution of ICT in disaster management and sustainable development

Disasters not only result in the dramatic loss of life and property but also disrupt the normal functioning of an economy and society. The basic principle of normality is suddenly irrelevant and existing rules, processes and procedures for organizing life cannot be applied.

Recognized experts in the field of disaster response who are ready to intervene 24/7 anywhere internationally, such as *Télécoms Sans Frontières*[4] (TSF), a leading emergency telecommunication non-profit organization, or the UN Development Program, a pioneer in ICT4D initiatives since the Rio Earth Summit in 1992, maintain that the top priority in a disaster is to reach the affected destination and to set up communication facilities as quickly as possible with the main objective of saving lives.

The UN Development Program, defines a disaster as a social crisis situation occurring when a physical phenomenon of natural, socio-natural or anthropogenic origin negatively impacts vulnerable populations, causing intense, serious and widespread disruption of the normal functioning of the affected social unit. Disaster management involves preparing, warning, supporting and rebuilding societies when natural or man-made disasters occur. Disaster risk reduction is an integral part of social and economic development, and is essential if development is to be sustainable for the future.

A disaster management cycle involves five phases during which ICT play a crucial role. From the starting point of the disaster, the first phase is to provide a response and implement action plans (saving lives, preventing property damage and preserving the environment). The recovery phase aims to establish an environment for the restoration of normality. The mitigation phase refers to any activity which could limit the potential of a hazard arising or reduce the possibility of a hazard turning into a disaster, and involves taking anticipatory measures to avoid future dangers. The prevention phase is about preparing plans so as

1 ITU: International Telecommunication Union.

2 UN: United Nations.

3 www.un.org/millenniumgoals/

4 www.tsfi.org/en/presentation/action/48-organisation-humanitaire-durgence

to avoid the occurrence of a disaster and the preparedness phase concerns the provision of a response to a potential disaster, such as the implementation of early warning systems and capacity building so that the population could be in a position to react appropriately.

In all phases of the disaster management cycle, ICT are able to instantly facilitate rapid communication and ensure a flow of information. They have the potential to revolutionize disaster management, for example, in the immediate aftermath of a disaster, when the need for telecommunications is greatest. Unfortunately in most cases, not only are ICT services disrupted, but often existing telecommunication networks are seriously damaged or destroyed (e.g. land lines destroyed, GSM[5] antennas damaged and/or GSM networks saturated). Sometimes disasters occur in areas where there was never a robust or reliable telecommunication system. Furthermore, following a disaster, when limited communication services are functional, they can become over-saturated, slowing down the ability for local organizations to provide assistance to the affected communities. Effective disaster management relies on a thorough integration of emergency plans at all levels of government, together with non-government involvement. In addition, the vital role of ICT in disaster management and emergency situations is recognized internationally through the legal recognition embodied in the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations[6]. Furthermore, the role of ICT is accepted as being of paramount importance and is acknowledged by all stakeholders which provide a response to disaster situations.

ICT comprise several technologies which provide significant assistance in the disaster management phases. For example, earth exploration satellites are crucial for the prediction and detection of potential climate hazards. When a disaster is imminent, the use of all technologies and media is required to ensure that the maximum number or people and administrative bodies receive the necessary information (radio, television, telephone, fixed, mobile, maritime and satellite services). Whilst acknowledging the need for technology neutrality, the major stakeholders involved in the prevention and preparation for emergencies and the provision of an immediate response all agree that the most efficient technology is space based. Satellites have the flexibility to respond rapidly and provide cover to extensive areas where there may be only limited land-based infrastructure.

2.4 Overview of establishing ICT4D and ICT4DM

The process for establishing ICT4D (i.e. disaster mitigation, the granting of relief, restoration of infrastructure) requires a holistic approach and broadly involves three specific elements; people (whether individuals or entities), technology, and rules and regulations. Disaster management is by no means an activity that can be performed by a single entity. Instead it requires active and committed participation and co-operation from a wide cross section of stakeholders. Additionally, it is being increasingly recognized that disaster management processes can be significantly improved with the use of ICTs. However, without an appropriate policy, administrative and legislative framework, governments will find it difficult to utilize either people or technology in times of disasters. This section seeks to highlight the key stakeholders involved in ICT4D and ICT4DM, the steps required to establish communication in disaster mitigation and the type of policy and regulatory framework required to take advantage of ICT4D and ICT4DM.

2.4.1 Key stakeholders

Initiatives for ICT4D and those for ICT4DM involve many different stakeholders from several sectors (public, private, civil society) and at different levels (international, national, local). Each type of

[5] GSM: Global System for Mobile

[6] The Convention is discussed in section 2.7

stakeholder plays a specific role in the initiative and also has a role to play both in defining policies and regulations and also in advocacy. It has been proven that involvement of all stakeholders is key to the success of partnerships created with the purpose of defining policies or regulations favourable to ICT4D and/or ICT4DM.

The public sector has been the major force behind most ICT policy and national ICT strategy initiatives over the last decade. However, it is becoming increasingly clear that the success of ICT4D and ICT4DM policies cannot be met without the active participation of civil society, the media and the private sector. The involvement of a wide range of stakeholder groups enables the development of a more comprehensive analysis of policy issues than any single stakeholder group can achieve on its own.

2.4.2 International organizations

Many United Nations entities are involved in ICT4D and ICT4DM include: the UN Office for the Coordination of Humanitarian Affairs; the UN Development Programme; the World Food Programme in particular through the Emergency Telecommunications Cluster; the UN High Commissioner for Refugees; the World Health Organization; the United Nations Information and Communication Technologies Task Force; the World Summit on the Information Society; the United Nations Children's Fund; the United Nations International Strategy for Disaster Reduction; the United Nations Platform for Space-based Information for Disaster Management and Emergency Response; the United Nations Institute for Training and Research Operational Satellite Applications Program and so on.

In 1996, the European Commission's Humanitarian Aid and Civil Protection Directorate General (ECHO) launched a specific disaster preparation programme called “DIPECHO” with the aim of mitigating the impact of natural risks. The programme involves close collaboration between European humanitarian aid organizations, UN agencies, local NGOs[7] and the national authorities of the countries affected. Today, ECHO is the leading provider of global humanitarian funding.

The ITU also participates in ICT4D and ICT4DM at many levels. It is involved in various partnerships to aid countries affected by natural disasters and has provided assistance by deploying satellite mobile phones and terminals for disaster relief operations in numerous countries. In addition, the ITU provides direct assistance to countries in the areas of policy, regulation, technology and design of national emergency telecommunication plans and drafting of standard operating procedures, as well as disaster preparedness, early warning, dissemination of understandable warnings to those at risk, disaster relief/response and telecommunication network rehabilitation in the aftermath of disasters. The ITU World Radiocommunication Conference Assembly, the ITU-T[8] and ITU-D[9] have in recent years developed guidelines, studies, reports and recommendations on the use of ICT for disaster preparedness, mitigation response and recovery. Through ITU-D, the ITU is also leading ICT4D initiatives such as the m-Powering Development for a Better Tomorrow initiative and the ITU Academy. Furthermore, the ITU sixth World Telecommunication Development Conference (WTDC) in April 2014 had as an objective the establishment of work programmes and guidelines for defining telecommunication development questions and priorities and to provide direction and guidance for the work programme of the ITU-D over the next four-year period.

Other international organizations are involved in ICT4D and ICT4DM initiatives, including: the International Amateur Radio Union, the International Committee of the Red Cross, the International Federation of Red Cross and Red Crescent Societies, and the World Bank Independent Evaluation Group. All such organizations have a role to play in the definition of policies, regulations and in advocacy.

7 NGOs: non-governmental organizations.

8 ITU-T: Telecommunications Standardization Sector.

9 ITU-D: Telecommunications Development Sector.

However, the ITU is of particular importance in its role as the international regulatory organization which can issue standards and guidelines.

2.4.3 Policy and decision-makers at national government levels

National governments usually lead policy and regulation efforts around ICT4D and ICT4DM. They are also often involved in regional organizations and activities to develop partnerships, policies or frameworks to help disaster management in their region. For example, the Ministry of Internal Affairs and Communications of Japan organized jointly with the ITU the Symposium on Disaster Communications in Sendai in March 2012, and the Ministry of Information and Communication Technologies of Colombia organized with the ITU the ITU Multi-stakeholder Forum on Emergency Telecommunications in Bogota in July 2012. As an example of a national initiative lead by the government, following the earthquake and tsunami in Japan in March 2011, the Ministry of Internal Affairs and Communications of Japan sought to aggregate with other entities in Japan data and lessons learned about the response of Japan's networks and telecommunication infrastructure, existing plans and processes to the disaster and to initiate steps to be better able to use ICT to respond to future disasters.

At a national level, various ministries may be involved in the policy-making process such as the Ministry with responsibility for Communications, the Ministry of Internal Affairs, the Ministry of Civil Protection or Social Action, the Ministry of Public Health, the Ministry of Scientific Research and Innovation, depending on the aspect of ICT4D and ICT4DM that the government seeks to develop and the responsibilities of the various ministries.

National regulators also play a key role in the process, both as stakeholders in ICT4D and ICT4DM initiatives and more importantly as regulation-makers; regionally, they are sometimes involved in coordination processes. For example, the Agence des Télécommunications de Côte d'Ivoire organized in November 2011 a Workshop on Saving Lives Through Emergency Telecommunications, the Emergency Communications, Climate Change, e-waste and Cyber Security Awareness Workshop in November-December 2011 was organized in Lusaka with the Zambia ICT Authority and the Mongolian Information, Communication Technology and Post Authority was the host of the ITU Asia-Pacific Regional Multi-stakeholder Forum on Emergency Telecommunications in Ulaanbaatar in July 2011.

The participation of policy and decision-makers at national government level is critical for successful ICT policy outcomes. They can provide resources, including funding and documentation, and their role will be critical for the implementation and follow up of policies. Regulators are also essential to play a referee role in balancing public access objectives with profitability of the private sector, provide a platform and technical expertise during the discussions of various policy and regulatory issues and develop regulations that translate policies into actions.

2.4.4 Public representatives (Parliamentarians)

Parliamentarians are also essential to provide high-level leadership and pass legislation arising from an ICT policy process. Their involvement is important to lobby their colleagues and support the evolution of laws and legislation that give effect to the policies adopted and their application. They can monitor the implementation of policies and regulations, including scrutinizing policy-makers and making them accountable for follow-up actions.

2.4.5 Civil society organizations and NGOs

Many NGOs are participating in ICT4DM or ICT4D initiatives. For example, NetHope, founded in 2001, is a consortium of 35 international NGOs that specializes in improving IT connectivity among humanitarian organizations in developing countries and areas affected by disaster. Its humanitarian development, emergency response, and conservation programmes are in place in 180 countries worldwide; for example TSF, an NGO, can intervene anywhere in the world within 24 hours to provide emergency telecom services. NGOs play a role in advocacy thanks to their lobbying activities and media coverage, and also ensure that government commitments are adhered to and that processes deliver agreed outcomes.

Think tanks and research-oriented organizations can also analyse issues and provide background knowledge to all stakeholders. In the building of national policies, one of the most valuable contributions from civil society is its ability to link ICT policy issues to broader development and livelihood issues.

2.4.6 End-user beneficiaries

The involvement of consumers and consumer groups is important to make sure that consumer rights and needs are put on the table in a more visible manner. Consumers in certain countries may include the diaspora, who is an important user of ICT within the country.

Community-based organizations such as women's groups, cooperatives, and faith-based organizations should also be involved in ICT policy deliberations, in order to ensure that local challenges and equity issues are factored into ICT policy-making. End-user beneficiaries are not limited to consumers; they also include private companies, small and medium enterprises, schools, universities, farmers, etc.

The involvement of the demand side is key to enable potential beneficiaries to understand how they can indeed use ICT to prepare and respond to disasters and enhance their life experiences. Only through involvement of the demand-side will the wasteful implementation of high profile, yet invariably under-utilized or indeed entirely failing, projects be avoided.

2.4.7 National and global private sector companies

To date, many ICT4D and ICT4DM initiatives have been driven by the international private sector. Global corporations and industry sector associations (for example the Global VSAT Forum[10]), conduct or help in some of these initiatives by, among other actions, donating equipment, satellite space segment, or providing training to technicians (for example, a VSAT training at the Pacific Endeavor event in 2012). When defining a policy, the private sector brings to the table a culture of initiative, innovation, implementation and risk-taking that is critical for implementing successful policy outcomes. Open consultation process involving a wide array of private sector players in the development of policies and regulatory instruments, is key with this regard.

Various technologies need to be represented, including satellite operators and service providers, land earth station operators, telecommunication operators and service providers, GIS[11] and remote sensing operators, radiocommunication equipment providers, etc. Providers of other support services such as transportation of equipment, utilities providers, equipment maintenance providers, and security personnel should not be forgotten.

The involvement of incumbent telecommunication operators in ICT policy is important to ensure that the use of existing resources is maximized and local capacity is built to improve the contributions to disaster recovery and social objectives of ICT policies, such as universal access.

2.4.8 Academics, researchers and civil servants

This group plays a role in gathering evidence in support of specific key ICT policy issues. In some countries, they would also form a permanent core of second-level players unaffected by changes in political office and decision-makers.

Other stakeholders may be involved, such as the media, international aid agencies (IRDC[12], USAID[13], and ACICIP[14]), development banks, philanthropic foundations, civil servants, etc. When talking about ICT4DM,

[10] VSAT: Very small aperture terminal.

[11] GIS: Geographic information systems.

[12] IRDC: International Development Research Center (Canada).

[13] USAID: United States Agency for International Development.

the national police, civil guard and fire-fighters are key players and may also be involved in the process of definition of a policy.

2.5 Steps to establish communications in disaster mitigation

ICT are used in all phases of the disaster management process but can also be of enormous benefit even before disaster strikes. ICT, when used in conjunction with careful planning and an informed and engaged community, can greatly reduce the calamities, suffering, and loss of life and property that occur in many disaster scenarios. Listed below are key steps that can be taken to use ICT in ways which can mitigate the devastating effects that natural or man-made disasters can have upon communities.

2.5.1 Step 1: Risk identification

The first step toward reducing the impact of a disaster is to identify and assess the potential risks a region is likely to face. Such an analysis requires an investigation into which risks are most likely to affect individuals most severely and how such risks will interact with a region's infrastructure. ICT can play a significant role in highlighting risk areas, vulnerabilities and populations that could potentially be affected, particularly by facilitating data analysis and the assessment and dissemination of information. Technologies such as remote sensing based satellite systems, seismographic networks, and deep ocean sensors (e.g. tsunami early warning systems) can be instrumental in predicting when natural disasters may impact a region and provide detailed information regarding the nature of the disaster and how to protect investments and mitigate damage. ICT can also be used at a more local level to gather historic knowledge of events such as floods and droughts that have occurred in the past to assess a region's vulnerabilities and to help determine priorities for reducing risk. Methods of risk identification include:

- Periodic national assessments conducted to gain a broad understanding of risks faced by various geographical regions.
- Interviewing local populations to obtain an accurate understanding of events that may indicate disaster risk.
- Developing a database containing access to information regarding disaster trends and impacts of a region[15].

2.5.2 Step 2: Reducing underlying risks

After a region's risks and vulnerabilities have been successfully identified, measures can be taken to reduce the risk such vulnerabilities might cause. This can be done by engaging in activities such as the following:

- **Conducting threat and vulnerability assessments and reinforcing critical facilities.** Risk types vary dramatically by location and require specific mitigating actions based upon the needs of the region. For example, vulnerability assessments such as those employed by the Pan

American Health Organization are often utilized throughout Latin America to reduce the risk posed to drinking water and sewage systems in the event of a disaster.[16] Data gained from ICT assist in assessing the strengths and weaknesses of the facilities' infrastructure in the context of its environment and allows

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14 ACICIP: Advisory Committee in International Communications and Information Policy (US State Department).

15 Many disaster databases have been made available to the public, such as the Centre for Research on Epidemiology of Disasters' (CRED) EM-DAT system, a global database that contains information regarding more than 17 000 disasters that have occurred throughout the world from 1900 to the present. www.unapcict.org

16 www.paho.org/usa/

for the employment of risk reduction measures to guard against water and sewage systems being compromised if a disaster were to occur.

- **Developing or enforcing land use zones.** There are many instances where certain areas are known to be unstable or prone to flooding, earthquakes and landslides. For example, regional authorities in Switzerland[17] have developed hazard maps to indicate areas where it is safe to undertake construction. Such maps utilize three land zones which indicate where construction may be undertaken without restriction, where building can occur in accordance with certain safety measures, or not at all. The use of such a system, when adequately enforced, can prevent sensitive infrastructure such as telecommunication centres or residential areas from being built in areas known to be prone to the effects of disasters and therefore reduce loss of life.

2.5.3 Step 3: Preparedness and early warning systems

It is critical that communities be able to quickly and efficiently respond in the event of a disaster. ICT in the form of early warning systems can make populations aware of impending hazards, thus reducing damage and saving countless lives. Early warning "is not only the production of technically accurate warnings but also a system that requires an understanding of risk and a link between producers and consumers of warning information, with the ultimate goal of triggering action to prevent or mitigate a disaster."[18] As a result, communities are prepared to respond to the threat of disasters quickly and efficiently. Alerting technologies can provide invaluable public warnings to individuals and disseminate potentially life-saving information. A listing of ICT applications that are instrumental in the early warning process as well as their advantages and disadvantages can be found in Annex 6.

Because of the enormous importance such ICT applications can play in the disaster response and mitigation process, the providers of such critical infrastructure should participate in training exercises involving disaster response scenarios and develop plans to deliver deployable communications and health resources to affected areas when disasters occur. Preparedness steps include:

- Using GIS technology to locate vulnerable infrastructure and determine evacuation routes.
- Developing alternative and backup communications solutions should primary capabilities become unavailable.
- Allocating financial and economic tools to create a safety net that can be used in the event of a disaster.
- Ensuring that sufficient relief supplies are ready to be distributed in the event of a disaster.
- Developing partnerships with nations willing to provide assistance through agreements such as the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations (see section 2.7).
- Creating a favourable policy and regulatory environment that enables the timely and efficient deployment of services. A strong ICT infrastructure cannot function effectively unless it exists within a framework that is conducive to its operation. It is important that a country establish regulatory and legal regimes which allow for the development of a strong ICT infrastructure and the rapid response to disaster situations. Such measures would include adopting methods of

[17] More than 6% of the land in Switzerland is prone to slope instability. www.geo.unizh.ch/~chuggel/riskcourse/lateltin_ch_landsl05.pdf

[18] IFRC, World Disasters Report 2009: Early Warning and Early Action, Geneva: IFRC, 2009, p. 17, www.ifrc.org

supporting electronic transactions for e-government[19] and e-business, increasing the awareness of information security threats and establishing methods of safeguarding data, and creating acts and regulations that provide legal recognition of electronic signatures.

2.5.4 Step 4: Knowledge management and education

Enhancing awareness and visibility of disaster risk is a key step towards setting in motion the economic, social, and political commitment needed to reduce it. The promotion of risk awareness in vulnerable communities is an integral step in mitigating disaster risk and implementing risk reduction techniques. Making available resources such as training materials, videos, and research studies can assist in raising awareness. Media agencies can also assist in increasing public knowledge of disaster mitigation initiatives.[20] Additionally, involving local communities in the disaster mitigation process helps to humanize issues which can seem technically complex and more effectively motivate individuals in powerful ways that can inspire positive change. The following are a few measures which can be taken to help enhance awareness of disaster mitigation strategies:

- Translation of disaster risk information into dialogue with communities.
- Empowerment of local communities by increasing their capacity to create and implement risk reduction measures.
- Facilitation of the exchange of disaster management information and expertise.

ICT, when used in conjunction with local knowledge and community involvement can tremendously increase the effectiveness of disaster mitigation strategies and significantly reduce loss of life and property.

2.6 Regulatory constraints and challenges

An enabling policy and regulatory environment is important for countries to be able to take advantage of the synergies between ICT4D and ICT4DM.

As attention is given to deployment of new technologies and modernizing infrastructure, incorporating disaster risk reduction directly into national ICT development or broadband plans, frameworks or projects could help ensure that regulations or policies meet both ICT4D and ICT4DM requirements, supporting sustainable development objectives. Moreover, it is important to consider how some policies or regulations may serve as unintended barriers to the deployment and adoption of certain technologies and services, particularly in rural or remote areas and in times of disaster. In addition, regulatory practices could impact the forming of innovative partnerships between stakeholders to bridge ICT4D and ICT4DM.

There are a number of existing national regulatory best practices that promote disaster preparedness and the rapid deployment of equipment and services for disaster relief efforts; however, these should be broadened and integrated with ICT4D strategies. This section provides a review of licensing and regulatory best practices and challenges to enable the SSDM.

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[19] E-government is defined as 'the employment of the Internet and the world-wide-web for delivering government information and services to the citizens.' United Nations Department of Economics and Social Affairs. "United Nations E-Government Survey 2012".

[20] Reuters AlertNet is an example of an ICT/media that provides early disaster warning on an international scale. The overall objective of AlertNet is summarized in its tagline 'Alerting humanitarians to emergencies'. www.reuters.com/subjects/AlertNet

2.6.1 Regulatory and licensing considerations

Effective disaster management requires instant communication between first responders, relief workers and citizens. The most effective – and sustainable – response, therefore, is enabled through communications devices and tools that are readily on hand in affected areas and which are familiar to stakeholders. Regulatory and licensing considerations, therefore, are not necessarily specific just to the deployment of certain technologies when a disaster strikes, but they should also help to facilitate preparedness and establishment of robust and redundant infrastructures. In this regard the consideration should be given to the following:

- Incorporating disaster risk reduction and disaster communications considerations into ICT development plans. Countries developing national broadband plans or ICT development strategies should take account of their possible exposure to natural or man-made disasters and to ensure any regulatory components of such plans enable use of diverse technologies both before and during times of disaster.
- Adopting simple, transparent and non-discriminatory authorization procedures and licensing conditions for ICT services, including new technologies. Ideally, technologies available for disaster management will have dual uses for development activities. Reduction of the administrative burden associated with licensing supports the development of competition and innovation by making it easier for service providers to enter the market.
- Facilitating testing and type approval requirements by recognizing foreign type approvals.
- Ensuring spectrum plans and strategies associated with ICT4D take account of diverse radiocommunications requirements for supporting disaster management.
- Developing procedures to efficiently address interference considerations and coordination requirements when allocating spectrum.
- Easing requirements for landing rights or restrictions on use of specific ICT resources to maximize the number and kind of networks available to rural communities prior to, and during, times of crises. Regulations should offer flexibility.
- Removing requirements for in-country gateways if none are needed for the functioning of portable terminals or handsets.
- Facilitating the trans-border flow of end-user equipment.
- Facilitating (and sometimes creating) partnerships, such as private-public-partnerships, with aid-donors, governments, ministries and NGOs. Regulators have a role as a partner for ICT development and disaster mitigation in this respect and can further facilitate and extend partnerships with schools and local communities through ICT development projects.
- Collaborating with stakeholders in the development of policies and regulations.
- Considering power supplies and how to ensure continuity of communications when the existing main power supply has been interrupted or is unavailable. Technologies that can be powered by renewable resources should be promoted wherever possible.

While the aim for the SSDM is to develop resilient and redundant services and infrastructures, it is often the case that a natural disaster will damage infrastructure and cause an interruption of services. In such cases, disasters often require rapid deployment of additional ICT equipment, or temporary authorization for use of existing equipment. Delays in licensing can prevent access to, and activation of, critical technologies in times of disaster. Best practices to enable rapid deployment of ICT for disaster response include:

- Developing licensing procedures and class or temporary licenses for short-term or emergency use, for all applicable ICT services. This includes elimination of local incorporation and capitalization requirements and performance bonds as a condition for issuance of a license for short-term or emergency use.

- Establishing licence-exempt regulations for ICT services for disaster response, including satellite dishes and handsets operating in accordance with the relevant Resolutions or Recommendations adopted by ITU-R.
- Increasing the ability for foreign service providers or operators to provide services in a country in times of disaster response, including assessing whether licensing regulations can be streamlined to cover only the service provider and not the ICT or satellite system itself.
- Designating a government contact in the local government who has the authority to authorize temporary importation during a disaster event. This would include spectrum and equipment licensing for technologies such as cellular, satellite, broadband, wireless, HF and LMR. Having clear points of contact is critical when a disaster strikes.

2.6.2 Taxation

Countries should ensure that the partnerships they seek to encourage between ICT4D and ICT4DM initiatives are not discouraged by taxes or other financial penalties. In fact, it has been shown that for every unit of reduction in taxation on ICT, there is a positive multiplier effect on GDP growth. Best practices to consider include:

- Establishing customs duties and possible waivers of duties for equipment imported in emergency response scenarios.
- Analysing import and export rules and their impact on rapid import of equipment.
- Ensuring that tax regimes are aligned with national ICT development goals, including those relating to closing the digital divide.
- Ensuring that taxation of airtime or use of ICT services for development or disaster management purposes does not serve as a deterrent to adoption by citizens and other non- government stakeholders.

2.7 The Tampere Convention

Over the past decade, the global community has suffered many natural disasters and the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations [21] (the Convention) was created to address the numerous regulatory constraints and challenges that serve as obstacles to the prompt and efficient response to such events. The Convention supplies a legal framework for the use of telecommunications in the provision of international humanitarian assistance while safeguarding the interests of the host country. The Convention calls on States and other entities such as humanitarian organizations to streamline the disaster relief process by waiving regulatory barriers and developing procedures that maximize access to life saving telecommunication systems.

The Convention takes a unique approach to mitigating the obstacles that stand in the way of rapid disaster relief operations by providing a flexible framework that each nation can employ and adapt according to its own telecommunication infrastructure, capacity, and unique needs. The Convention calls for State Parties to, "in conformity with their national law, reduce or remove regulatory barriers to the use of telecommunication resources for disaster mitigation and relief" by addressing the primary factors

[21] Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations, art.3, June 18, 1998, ICET-98 [hereinafter Tampere Convention], available at www.itu.int/ITU-D/emergencytelecoms/Tampere_convention.pdf [hereinafter Tampere Convention]. For the list of members see Annex 7.

that impede the rapid and effective deployment of telecommunication equipment during times of emergency such as licensing requirements for allocated frequencies, taxation, and the lack of efficient access to scarce resources.[22]

Under the oversight of the United Nations Emergency Relief Coordinator who serves as the Operational Coordinator of the Convention[23], State Parties are to "cooperate among themselves and with non-State entities and intergovernmental organizations", in accordance with the provisions of the Convention to "facilitate the use of telecommunication resources" in carrying out disaster response and mitigation efforts.[24] The key issues the Convention addresses are discussed below.

2.7.1 Telecommunications assistance

Article 4 of the Convention provides that a State Party that requires telecommunication assistance as a result of a natural disaster may request aid "from any other State Party, either directly or through the operational coordinator."[25] The State so requested may then determine whether it will render assistance and if so, the scope, "terms, conditions, restrictions and cost, if any, applicable to such assistance."[26] It is important to note that under the Convention, a State Party reserves the right to reject any assistance offered pursuant to its existing national policy.[27]

2.7.2 Privileges and immunities

In order to further facilitate and encourage the smooth provision of aid during times of disaster, the Convention calls for a State requesting assistance to provide the "necessary privileges, immunities, and facilities for the performance of their proper functions" such as granting aid workers "immunity from arrest, detention and legal process including criminal, civil and administrative jurisdiction of the requesting State Party" regarding "acts or omissions specifically and directly related to the provision of telecommunication assistance."[28]

2.7.3 Taxation

Many countries have high tax rates in relation to telecommunication equipment, making the transfer and purchase of such material difficult. To address this issue, the Convention provides that requesting State Parties grant those providing telecommunication assistance "exemption from taxation, duties or other charges, except for those which are normally incorporated in the price of goods or services, in respect of the performance of their assistance function or on the equipment, materials and other property brought into or purchased in the territory of the requesting State Party for the purpose of providing telecommunication assistance" under the Convention.[29] Article 5(c) additionally grants immunity from "seizure, attachment or requisition of such equipment, materials and property" relating to the provision of relief.[30]

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22 Tampere Convention, Art. 9.

23 Id. at Art. 2.

24 Id. at Art. 3.

25 Id. at Art. 4(1).

26 Id. at Art. 4(3).

27 Id. at Art.4 (5).

28 Id. at Art. 5 (1)(a).

29 Id. at Art. 5(b).

30 Id. at Art. 5(c).

2.7.4 Licensing requirements

The licensing requirements of telecommunication equipment also provide a significant obstacle to disaster relief and mitigation efforts. Accordingly, under the Convention, requesting State Parties are to ensure that the "telecommunication equipment brought into its territory pursuant to [the] Convention" is "expeditiously licensed" or where necessary "exempt from licensing in accordance with its domestic laws and regulations."[31]

2.7.5 Payment or reimbursement of costs or fees

Every nation has its own financial and infrastructural limitations as it relates to providing and coordinating disaster relief efforts. Taking this fact into consideration, the Convention allows State Parties to "condition the provision of telecommunication assistance for disaster mitigation and relief upon agreement to pay or reimburse specified costs or fees…."[32] To facilitate this process, the operational coordinator develops, "in consultation with the State Parties, a model payment and reimbursement agreement that may provide a foundation for the negotiation of payment and reimbursement obligations."[33]

2.7.6 Scarce resources and other constraints

The Convention suggests that regulatory barriers such as the issue of scarce resources be addressed by making revisions to currently existing regulations to address the issue; "exempting specified telecommunication resources from the application of those regulations during the use of such resources for disaster mitigation and relief"[34] providing "pre-clearance of telecommunication resources for use in disaster mitigation and relief, in compliance with those regulations"[35], and recognizing "foreign type approval of telecommunication equipment and/or operating licenses."[36]

Additionally, the trans-border movement and use of telecommunication equipment has often created regulatory obstacles that impede the ability to rapidly distribute much needed telecommunication equipment during an emergency. The Convention seeks to mitigate these obstacles by suggesting that each State Party, at the request of any other State Party and as permitted by its own national law "facilitate the transit into, out of and through its territory of personnel, equipment, materials and information involved in the use of telecommunication resources for disaster mitigation and relief."[37]

Following the Treaty's ratification by 30 countries, the Convention came into force in January 2005. As of this writing, there are 47 parties and 60 signatories to the Convention. In spite of the moral pressure the Convention imposes on nations to ratify the agreement, and although the global community understands the importance of tools designed to ensure the efficient and well-coordinated deployment of disaster relief mechanisms, a number of nations have expressed reservations to the Convention. A summary of the reservations certain nations have expressed toward the Convention can be found in Annex 8.

The Convention does not profess to resolve all of the obstacles that occur in the provision of telecommunication resources in the context of humanitarian relief but is viewed instead as "the best

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31 Id. at Art. 5(2).

32 Tampere Convention, supra note 4 at Art. 7 (1).

33 Id. at Art.7(4).

34 Id. at Art.9 (b).

35 Id. at Art.9 (c).

36 Id. at Art.9 (d).

37 Tampere Convention, supra note 1 at Art. 9 (4).

compromise possible at the time of its adoption".[38] Although imperfect, the Convention, when effectively applied, has been instrumental in addressing and mitigating many of the problems encountered throughout the disaster relief processes and the provision of telecommunication assistance. For example, the Convention is the first international legal agreement that extends its privileges to relief workers who are "not otherwise diplomats or attending diplomatic conferences."[39]

Additionally, a State may desire to reassert its role as the primary provider of services and welfare for its people, and may prematurely terminate relief programmes. Similarly, some relief providers may terminate their aid suddenly and without a thorough consideration of the effect of their withdrawal.

Although the Convention allows for a party to terminate its aid at any time simply by providing notice in writing, Article 6 addresses the issue of premature termination by stating that State Parties must consult with each other in order to bring about the "expeditious conclusion" of assistance while weighing and considering "the impact of such termination on the risk to human life and ongoing disaster relief operations."[40] The Convention's requirement that a State consider the impact of aid termination helps ensure an orderly transition.

To conclude, the Convention recognizes "that telecommunications are essential to dealing with disasters, not just because telecommunications infrastructure is most vulnerable to disasters, but also because reliable telecommunications are a critical underpinning of all other mitigations and relief efforts."[41] Even without global participation, the Convention still provides highly significant benefits. The Convention successfully creates a framework that allows for the provision of telecommunication assistance to States in need in a manner that respects State sovereignty, but also encourages the international community to work together in recognition of the interconnectedness of the world community and the mutually beneficial results of providing support, connectivity, and assistance to nations in need.

2.8 Case studies

The case studies relevant to policies, regulations and advocacy and an overview of relevant best practices will help identify key issues and requirements that may support national governments and national disaster management authorities in their disaster management planning exercises and preparedness efforts.

2.8.1 National case studies

It Is governmental responsibility to introduce and implement laws and regulations to establish a national disaster relief policy and response plans across multiple governmental agencies. Such laws and regulations should support pre-deployment of equipment that could be used during disaster response, facilitate the cross- border movement of such equipment and help in quick and speedy customs clearance, availability of technical support and manpower, etc.

Case studies highlighting these issues that are relevant to policies and regulation to facilitate disaster management and sustainable development are listed below.

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38 See Struzak, Ryszard, (2000) Evaluation of the U.N. Office for the Coordination of Humanitarian Affairs Project on Emergency Telecommunications with and in the Field. Available at www.ryszard.struzak.com/UN_OCHA_Rprt_2000.pdf.

39 Id. at xxxii.

40 Tampere Convention, supra note 4 at Art. 6.

41 Dr. Marco Ferrari, Deputy Head, Swiss Agency for Development and Cooperation, Humanitarian Aid Department, Statement at the World Summit on the Information Society: Easing the Way to Disaster: The Tampere Convention (Feb. 22, 2005).

2.8.1.1 Japan

Following the earthquake and tsunami in Japan in March 2011, the Ministry of Internal Affairs and Communications and other concerned entities in the country, sought to aggregate data and lessons learned from the disaster. They included evaluating how Japan's networks/telecommunication infrastructure and existing plans/processes responded to the disaster and the initiation of steps to be better able to use ICT to respond to future disasters. A study group was formed to consider communications for a future large scale disaster. The group focused on issues related to:

- Network congestion.
- Measures in the event that base stations or relay stations are damaged.
- Future network infrastructure and disaster resilience.
- The manner of future internet utilization considering internet usage during the earthquake.

The case of Japan is an example of best practice as the country clearly reflected on what the disaster had taught them and what it could teach other countries. In a statement made at WTDC in April 2014[42]

H.E. Mr Masahiro Yoshizaki, Vice-Minister for Policy Coordination of Japan acknowledged the wide range of support received from all over the world and stated that his country's policy emphasis was now on prevention and preparedness. He stated that Japan was planning to share its experiences, knowledge and technologies with other countries and to cooperate with them in capacity building. In March 2013, Japan hosted the ITU-D Study Group 2 Rapporteur Group meeting on utilization of telecommunications/ICT for disaster preparedness, mitigation and response. In the same month, Japan and the ITU co-hosted a symposium on disaster communications in Sendai, the city hit by the earthquake. In February 2014[43] the World Bank and Japan established a partnership to improve disaster risk management in developing countries[44].

2.8.1.2 Burkina Faso

Burkina Faso was hit by major flooding in 2009, which helped strengthen the political will to put in place an effective national mechanism for disaster prevention and response. As a result, the government of Burkina Faso has taken steps through various decrees and regulations to establish its national civil protection policy and response plans across multiple agencies of the government.

2.8.1.3 People's Republic of China

China's Ministry of Industry and Information Technology officially released its twelfth emergency communication five-year plan in 2011. Based on an assessment of the effectiveness of past emergency communications, combined with predicted requirements for future situations, the plan sets out the guiding ideology, basic principles, development goals and major tasks for emergency communication over the next five years.

The plan puts forward five development goals:

- Under an emergency situation, there should be an ability to submit information initially at, or above, the county-level administrative divisions. On-site command and communication abilities should achieve 90% or above within 12 hours of receiving an incident report.

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42 www.itu.int/en/ITU-D/Conferences/WTDC/WTDC14/Pages/item.aspx?ItemID=1009

43 www.worldbank.org/en/news/press-release/2014/02/03/world-bank-and-japan-partner-to-improve-disaster-risk-management-in-developing-countries

44 www.gfdrr.org

- The establishment of a unified command, well-coordinated emergency communication command system, and build safe and reliable means of emergency communication command.
- The formation of an integrated orbital-aerial-terrestrial emergency communication security capabilities to improve public communication network survivability.
- The improvement of the emergency deployment ability of security teams, so that each team can independently address 2 concurrent events.
- The construction of an advanced technical support system, and the industrial chain support.

2.8.1.4 Côte d'Ivoire

The Ministry of Post, Telecommunication, Information and Communications of Côte d'Ivoire formed a national committee charged with developing a draft national strategic plan for emergency telecommunications by June 2012. This plan was due to include:

- The definition of the means of transmission and communication procedures for rapid deployment of these means.

The management of priority communications and proactive alerts.

- A clear definition of the roles of all stakeholders and national coordination mechanisms and international cooperation.
- The mechanisms by which various stakeholders use emergency telecommunication resources.
- The establishment of a permanent forum for consultation among stakeholders to regularly assess the operational action plans and provide recommendations for improvement.
- Geographic information systems to offer reliable information on population distributions and risk areas in order to predict damage.
- Mechanisms for raising awareness and informing people about the existence and use of telecommunication facilities in case of emergency.

2.8.1.5 Cameroon

Cameroon established a National Committee on Emergency Telecommunications (NETC) in which all emergency telecommunication stakeholders are represented. The NETC, which is part of the National Committee for Disaster Management, is a platform for multi-stakeholder consultation responsible for facilitating the implementation of Cameroon's National Plan for Emergency Telecommunications. As part of the plan development process, Cameroon reviewed recent disasters experienced in the country and their impact, as well as sought to develop understanding of the vulnerability, or resilience, of telecommunication infrastructures to such disasters.

2.8.1.6 Democratic Republic of Congo

The Government has established provisions in operator licenses that require operators to facilitate relief teams to use their networks during a disaster. In addition, regulations have been established concerning the holding, circulation and use of satellite terminals such as Iridium, Thuraya, and Inmarsat, including by State officials and non-governmental organizations and humanitarian associations. These telecommunication resources have helped disaster management improve significantly, for example, by helping mitigate the effects of an Ebola outbreak in 2008 compared to a similar outbreak in 1995.

2.9 Overview of best practices

The following guidelines list some of the essential and important best practices on policies and regulations that improve and facilitate the support and help provided during disasters and emergencies.

2.9.1 Telecommunications are integral to disaster management

It is important for the Government to understand and note the role that telecommunications and particularly satellite communications play in saving lives and coordinating relief efforts while formulating policies and regulations. The main considerations while formulating the policies and regulations are:

- Making telecommunication infrastructures more resilient to disasters, especially in developing countries where infrastructure is more susceptible to breakdown.
- Ensuring uninterrupted flow of information and communications. Diversity and redundancy in communication medium and technologies as well as network capacity is also needed.
- Continuously reviewed and updated plans to take into account of changes and upgrades in technology.

2.9.2 Enabling regulatory framework

The implementation of an enabling regulatory and policy framework is important to ensure that the response to emergency and disaster events is not hindered and is facilitated to the fullest extent.

2.9.3 Multi-stakeholder response

The policies and regulations should encourage and facilitate a coordinated response in the event of a disaster from all the stakeholders including government, private sector, NGOs, general public, etc.

2.9.4 National disaster plan

All stakeholders need to engage in the development of a national disaster telecommunication plan, policies and regulations.

2.9.5 Preparedness / pre-deployment

The national policies and regulations should recommend and encourage pre-positioning and pre-deployment of subscriber equipment, planning for excess capacity requirements as well as focusing on additional power over the affected areas and training of personnel.

2.9.6 Satellite connectivity

Many countries include satellite communications systems as a component of national disaster telecommunication plans, policies and regulations. Satellite connectivity plays an important role in supporting disaster response and relief efforts, given its ubiquitous and mobile coverage and its applications which are easy to use, transport and deploy anywhere.

2.9.7 Enabling public communication

National policies and regulations should empower the general public to actively engage in disaster response, such as through increased use of social media and mobile phones. Emergency telecommunication planning should take account of the ways in which citizens communicate information.

2.9.8 Public warning and alerts

As witnessed during recent natural disasters, public warning and alert systems are critical to help save lives. Depending on the types of disasters and the communication needs of populations, a variety of systems, predominately satellite based, have been implemented.

2.9.9 Regional emergency communications plans and systems

Because disasters can affect multiple countries, regional collaboration is critical. It is important for regional telecommunication associations to have plans and systems in place to cater for disaster

management and relief. Regional collaboration also helps if the affected country is not in a position to support the disaster relief activities on its own.

2.9.10 Interoperability

The interconnection and interoperability between divergent systems and organizations is an essential element during disaster management and relief activities. Policies and regulations should underscore the importance of interoperability.

2.10 Recommendations

The positive effects of ICT are far reaching; from the social and economic benefits gained through universal service to its role within the lifesaving functions of disaster mitigation and relief technologies. While natural disasters cannot be prevented, the effects can be minimized through proper warnings and disaster recovery procedures. In this regard, ICT can have a profound effect on individuals, communities, and nations as specific technological solutions can be utilized in all the phases of disaster management, that is, disaster preparedness, reduction, mitigation and post-disaster rehabilitation. However, without a favourable regulatory framework within which to operate, the benefits that ICT can provide are significantly reduced.

To ensure optimal utilization of ICT for enhanced disaster relief communication and management responses, governments, policy makers, intergovernmental organizations and service integrators are urged to take measures to ensure that ICT are supported and that their usage and development are encouraged. Although many steps have been taken to assist countries in developing and implementing disaster planning and mitigation measures[45], many barriers that prevent the efficient use of ICT in the context of disaster preparedness and the deployment of services remain. Some recommendations for creating a favourable regulatory and policy framework are listed below.

2.10.1 Credentialing and licensing requirements

Decreasing compliance requirements and custom tariffs regarding the import and export of equipment used for disaster response is a must. Obstacles to the provision of ICT resources which are required for disaster response should be addressed. ICT equipment must be easily transported across borders. Lowering customs tariffs will prevent unreasonable restriction on the importation of ICT equipment. Additionally, reducing visa and credentialing requirements for emergency response personnel and simplifying licensing requirements relating to disaster relief would help ease the disaster mitigation process and ensure that assistance can be provided quickly and expeditiously.

2.10.2 Spectrum management

Ensuring efficient spectrum allocation through promoting transparency by adopting non-discriminatory spectrum management policies **is highly recommended.** Spectrum is not an inexhaustible resource. It is therefore important that appropriate consideration be given to the process of spectrum allocation to ensure that ICT, especially those provided and supported by satellite services, are able to perform effectively and without causing or encountering interference. In this regard national policies and/or regulations should clearly address the allocation of spectrum to accommodate emergency services.

Consultation with the public regarding spectrum management decisions that are likely to affect service providers can provide interested parties with an opportunity to participate more fully in the decision-making process, thus allowing for a more transparent and responsive regulatory environment.

[45] A list of best practices set forth by various nations is available at: www.itu.int/ITU-D/treg/bestpractices.html

2.10.3 Policy, legislation and regulation including the Tampere Convention

2.10.3.1 Encouraging the ratification and use of the Tampere Convention

The Convention establishes a legal framework that helps facilitate the streamlining of the disaster relief process provides suggestions on how to overcome regulatory barriers and allows nations to tailor their disaster relief operations according to their own unique needs. National policies and regulations should recommend and encourage pre-positioning and pre-deployment of the equipment for disaster management and disaster relief.

2.10.3.2 Harmonizing international regulatory standards and practices

Measures should be taken to ensure the harmonization of spectrum for broadband wireless access as well as the interoperability between network equipment and terminals used by vendors. Doing so can greatly streamline licensing and international disaster response and coordination.[46] Similarly, national plans and policies should include and implement diversity and redundancy in communication media and technologies.

2.10.3.3 Participation in the ICT industry: intellectual property, privacy and e-security

Such a regulatory regime, when adequately enforced, promotes trust in ICT applications, encourages its use and stimulates international participation and cooperation.

2.10.3.4 Regular revisions

Policies should be re-examined periodically to ensure that they are adapting to the evolving nature of ICT services and the specific needs of end users. In some countries there are several pieces of legislation that govern or support disaster relief communication and management responses. Steps should be taken to harmonize, rationalize and strengthen the existing legislative framework to, among other things:

- Prevent overlapping or inconsistent allocation of roles and responsibilities.
- Take into account international best practices.
- Adequately address current trends and emerging technologies.

All stakeholders (if possible even relevant and concerned foreign entities) should be engaged in the development of these policies, regulations and practices. In addition, regional telecommunication associations should have an increased role in disaster management response, and have plans/systems in place to cater for disaster management and relief.

2.10.3.5 Potential organizations (e.g. NGOs) seeking to assist when disasters strike

Organizations should communicate their willingness to assist long before disaster strikes. It is critical that relevant parties have clear points of contact in the event that assistance is needed and understand in advance how incoming emergency communications capacity, equipment and experts will be authorized and established in the event of a disaster.

2.11 Recommendations on specific advocacy actions

A hazard cannot be stopped but it can be prevented from becoming a disaster. According to the United Nations Secretary-General Mr Ban Ki-moon "the more governments, UN agencies, organizations, businesses and civil societies understand risk and vulnerability, the better equipped they will be to

[46] www.itu.int/ITU-D/treg/bestpractice/2005/best_practices_e.pdf at 4.

mitigate disasters when they strike and save more lives". As hazards occur in a geographically defined area, local and national rules apply thus potentially creating barriers to entry. It must be stressed that it is only if a State calls for international assistance that it is possible for stakeholders within the sphere of disaster relief to intervene. Internationally, while most countries recognize the paramount importance of ICT in saving lives, access to the country may be simply prohibited for political reasons on grounds of sovereignty.

Following the UNESCO definition[47], advocacy is the deliberate process, based on demonstrated evidence, to directly and indirectly influence decision makers, stakeholders and relevant audiences to support and implement actions. In practice it can take several forms such as lobbying, public relations, social mobilization, campaigning, policy development, awareness raising, empowerment, media work or communications. The basis of advocacy actions should be knowledge. If knowledge management is about getting the right information to the right people at the right time, knowledge of what ICT can bring to disaster management and sustainable development is paramount to the success of advocacy actions. In this section not only advocating for the ratification of the only international existing regulatory instrument for telecommunication assistance will be presented but also other approaches will be presented as these could serve as tools to serve an overall and international ICT4DM strategy.

2.11.1 Tampere Convention: Provision of Telecommunication Resources for Disaster Relief

In the light of ICT4DM and as referred to in section 2.8 above, the Convention calls on States to facilitate the provision of immediate telecommunication assistance and to mitigate the impact of a disaster, including both the installation and operation of reliable, flexible telecommunication services. In addition, the Convention addresses the importance of removing or relaxing regulatory barriers which impact the use of telecommunication resources for disasters, such as licensing requirements to use allocated frequencies, restrictions on the importation of telecommunication equipment, as well as limitations on the movement of humanitarian teams.

As previously indicated[48] there are 47 parties and 60 signatories to the Convention. The ITU Study Group on utilization of ICT for disaster noted that “entry of satellite terminals and other related equipment provided by ITU has been well facilitated by all countries affected by disasters. The majority of those countries that have facilitated the deployment of ITU equipment have already ratified the Convention”[49]. Given its benefits, it is important to create awareness of the Convention and to promote its ratification by a larger number of countries. The United Nations Secretary-General is the Depository of the Convention and the United Nations Emergency Relief Coordinator is the Operational Coordinator under the Convention, working closely with the ITU. In this role the ITU is contributing to the promotion of the Convention in the international arena where key expert stakeholders are present and representing States.

For example, the ITU Plenipotentiary Conferences adopted, at their 2006 and 2010 meetings, Resolution 36 on telecommunication/information and communication technologies in the service of humanitarian assistance, in which it invited Member States “to work towards their accession to the Tampere Convention as a matter of priority”, and urged Member States Parties to the Convention “to take all practical steps for the application of the Tampere Convention and to work closely with the operational coordinator as provided for therein”.[50] Furthermore the ITU World Telecommunication Development Conference adopted, in 2002, 2006, 2010 and 2014, Resolutions requesting the

47 www.unicef.org/evaluation/files/Advocacy_Toolkit.pdf

48 https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXV-4&chapter=25&lang=en

49 www.itu.int/dms_pub/itu-d/opb/stg/D-STG-SG02.22-2010-01-PDF-E.pdf Art 6.4

50 https://www.itu.int/dms_pub/itu-r/oth/0B/06/R0B060000170001PDFE.pdf & www.itu.int/pub/S-CONF-ACTF-2010/en

Telecommunication Development Bureau "to support administrations in their work towards the implementation of the Tampere Convention".[51]

2.11.2 Promoting the importance of the lessons learned approach

In the light of section 4 of this report, it is important to stress the importance of sharing the experience(s) on how a particular country faced a disaster or an emergency situation. Countries which have suffered major recurring disasters are in a preeminent position to share their experiences and knowledge. Not only is it vital to provide detailed descriptions of the implementation of a specific policy during a particular operation, but the lessons learned through its implementation should also be presented from both a success or failure point of view. Auditing how a disaster situation is best handled may be challenging because of:

- The large number of intervening stakeholders (both at the national or international level).
- Whether, once international assistance is obtained, the focus for assessment should be on policy, infrastructure, technology or co-operation.
- The consecutive question of neutrality (technological or diplomatic).

2.11.3 Promoting education and knowledge

Given the role of ITU-D (cf. m-Powering Development for a Better Tomorrow initiative and the ITU Academy) a catalogue or a community driven database could be put in place in order to collect best practices which would serve as best promotion actions for advocating ICT4DM. Through the overall work of ITU and its focus on ICT and its implementation this knowledge would serve as a means to highlighting what the future challenges might be and what changes are needed for creating an overall international disaster management strategy.

While education and advocacy work in conjunction there is, as indicated in the UNDP Blue Book[52], a difference between the two types of communications. Education communications, on the one hand, are about spreading knowledge, information and expertise to an audience with a focus on teaching and helping others understand their needs. Advocacy communications, on the other hand, persuade, request and demand solutions, often very specific ones, so that such a communication is focused on one message, one goal and the actualization of that goal. In this respect, advocacy communication sets out to change opinions based on attitudes and mobilizes others to action. For example, TSF[53], with the funding of ECHO, was able to organize a six month telecommunications and information technology training programme which took place in the spring and summer of 2013 on 3 continents and involved 34 countries, 66 international NGOs and 115 emergency workers. The transfer of knowledge and skills within participating organizations will result in enhancing the capacity of local emergency workers to respond and enable a faster deployment of emergency telecoms in crisis situations. In the above mentioned example, DIPECHO's advocacy is aimed at mainstreaming disaster risk reduction and development cooperation.

2.11.4 Empowering individuals to become advocating agents

Considering the very high level of members composing the SSDM Advisory Board and, as is done at the UN level for the Millennium Development Goals[54], each and every participant could engage in targeted advocacy actions through the acknowledgment of the paramount importance of partnerships. In chapter

51 www.itu.int/ITU-D/isap/WTDC-02FinalReport/Section4/Resolutions/Res034.pdf

52 www.undg.org/archive_docs/6813-Blue_Book__a_hands-on_approach_to_advocating_for_the_MDGs.pdf

53 www.tsfi.org/en/action/emergency-response/200-formation-aux-telecommunications-durgence-sur-trois-continents

54 www.un.org/millenniumgoals/advocates/index.shtml

7 of the UNESCO advocacy toolkit, in addition to the recognition of the individual advocating role (i.e. the right person to achieve the right goal at the right time), it is stressed that advocacy requires the building of relationships (personal, public and institutional) and the securing of partnerships to help organize people and groups to achieve the set goal.

3 Report of the Working Group on Infrastructure and Technologies

3.1 Summary

This chapter offers a baseline survey of the infrastructures and new technologies that are available to support disaster management that could also be used for ICT development. It identifies intersects and attempts to point to smart, sustainable development models. Although every country faces unique challenges in matters of development, disaster preparedness and response, many principles are universal in the matter of ensuring that the right infrastructure and new technologies can address disaster mitigation and response requirements. The bedrock of these principles is increasing coordination between those agencies deploying ICT4D and those constructing disaster management and disaster communications management plans. Wherever possible, infrastructures and new technologies should be deployed that can be utilized in times of disaster *and* in meeting development goals. These technologies are now readily available, and should be immediately considered by governments and stakeholders worldwide.

Section 3.2 provides a background to the area. Section 3.3 presents an overview of ICTs in terms of technologies and applications in this area. Section 3.4 describes the importance of stakeholders, while section 3.5 discusses, and lists, the new technologies. Section 3.6 addresses the issue of scarce resources and sustainability of ICT4D and ICT4DM taking into account new technologies. Section 3.7 identifies the infrastructure requirements for new networks. Section 3.8 provides best practices and conclusion. Recommendations are presented in section 3.9.

3.2 Background

There are a number of initiatives by governments, United Nations agencies, non-governmental organizations, private sector and other stakeholders, that seek to bridge the digital divide between rural and urban areas. However, such Information and Communication Technology (ICT) development strategies in rural areas do not fully link ICT for Development (ICT4D) and ICT for disaster management (ICT4DM). Yet telecommunications/ICTs are capable of driving development as well as providing tools for preventing, mitigating, preparing and responding to disasters.

Designing effective policies and delivery mechanisms capable of creating a balance between institutional, economic, social and environmental dimensions can address the current challenge of telecommunications/ICT resources of existing and new infrastructures, including those which might not be optimally used for disaster prevention, preparedness, mitigation and response. This compromises sustainable development. For example, in countries where natural disasters are frequent, there is an opportunity to incorporate ICT infrastructure and technologies into overall development strategies that can be used to support disaster response and are resilient to the effects of natural disasters.

Such an approach can help ensure critical connectivity for the disaster response phase, and to mitigate the cost of rebuilding or reconstructing networks following disasters. The prioritization of sustainable infrastructure and technology solutions should begin at the planning phase, incorporated into national broadband and ICT development plans as well as national disaster preparedness plans.

The objective of this evaluation is to provide background information on ICT infrastructure and new technologies in support of the overall Smart Sustainable Development Model (SSDM) Initiative. The report will survey the landscape of existing and emerging technologies for disaster management and consider their application for overall development, with an aim of identifying intersections, best practices, and

recommendations for advancing smart and long-term sustainable development strategies with respect to infrastructure development.

3.3 ICTs: technologies and applications

3.3.1 ICT for Development (ICT4D)

ICT's are critical for social and economic development and supporting achievement of the Millennium Development Goals. ICTs can be used to support activities and initiatives related to education, healthcare, government services, and commerce, and ICTs and e-applications increasingly are incorporated into development strategies and policies.

The value of ICTs for development and economic growth has underscored the importance of telecommunications and ICT infrastructure development, particularly in developing countries and remote and rural areas where there often exists a 'digital divide'. As countries seek to invest in ICT development, what are the most appropriate options for infrastructure and new technologies? What is the right balance of infrastructures and technologies that will meet the specific geographic, economic or social challenges facing a country or region, including the challenge of climate change? In this regard, there also has been increased recognition of the need to integrate sustainable development strategies into ICT development. Sustainable approaches would take into account resource efficiency as well as resiliency to the impacts of natural disasters.

3.3.2 ICT for Disaster Management (ICT4DM)

ICTs are critical for disaster management. Natural disasters globally are increasing both in frequency and potential impact, making ICT development even more relevant and urgent. Not only have there been more disasters, but the scale has worsened. If ICT infrastructure is lacking, or does not withstand the effects of a disaster, response and relief efforts will be delayed. Further, import of equipment to support relief efforts and then restoration of damaged or destroyed infrastructure can be costly both in the rebuilding and in the impact of the loss of connectivity on affected communities. Telecommunications/ICT connectivity is vital at all phases of disaster management: preparedness, alert/early warning, mitigation and risk reduction, response, and recovery. ICTs are used for:

- Disaster prediction and detection (weather satellites, tsunami monitors, submarine cable sensors, climate change monitoring).
- Early warning and alerting (cell broadcast, sensors, M2M).
- Collecting data and information (situational awareness, disaster damage assessments, prioritization of resources, search and rescue).
- Dissemination and exchange of information between parties such as government officials, relief workers, citizens, media (closed user groups, one-to-one, one-to many, social media).

3.3.3 Disaster detection and early warning

Disaster detection and early warning capabilities are made possible by drawing from various sources that include telecommunication and meteorological satellites, radar and telemetry, remote sensing, and submarine cables and other maritime sensor systems. Once a disaster is detected, telecommunications/ICTs then can be used to disseminate information quickly before a disaster strikes, allowing people to take the necessary steps to mitigate the impact of the disaster.

For example, in the days before Hurricane Ivan hit Jamaica, authorities broadcasted messages, to alert the public and allow them to prepare and evacuate. In addition to this, the international community was kept well informed via the world media, which prompted governments to pledge their assistance, even before the storm struck. Mobile satellite enabled tsunami monitors joined with cellular broadcast networks also helped alert citizens in Japan in advance of the tsunami, giving crucial lead time for evacuation.

3.3.4 Mitigation and risk reduction

Having ICT infrastructure and technologies in place for detection, early warning and alerting also contributes to the mitigation and reduction of risks often associated with disasters. Further, having ICT systems in place to support disaster response activities, resilient networks, and layers of redundancy can minimize any delays or gaps in connectivity, which also help to reduce risks to the public and the overall impact of a disaster. Taking account of disaster response infrastructure and technology requirements well in advance of a disaster contributes to disaster risk reduction.

3.3.5 Disaster response

Disaster management activities must be expertly coordinated, efficient, and timely, in order to be effective. support. ICTs are especially important in underdeveloped countries, which are generally more vulnerable to the impacts of disasters. According to Mrs. Asenath Mpatwa, the senior advisor of ITU Regional Office for Africa, the absence of ICTs in underdeveloped countries has led to increased calamities, suffering, and loss of life and property due to poor communication.

In order to support effective deployment of ICTs, there is a need for robust systems, training, sharing of best practices, and the ability to modify systems to respond to changed needs in special circumstances. It is also important to consider the various users of ICTs following disasters. With the increased use in mobile telecommunications, citizens are more reliant on mobile devices to obtain information and communicate. For disaster response and relief, infrastructure and technology planning must consider how to ensure continuity of operations for government, public safety officials, and relief workers, but also how to relay messages to the public, and to allow citizens to regain contact with family and friends.

Satellite technology is especially crucial when it comes to disaster response, particularly when neither land lines nor terrestrial antennas are available to provide access to communication services. Satellites are removed from the zone of disaster damage on Earth, which makes satellite communications key for emergency services as well as serving as a layer of redundancy for terrestrial infrastructure. Satellites can also provide regional, national and even global coverage, making them especially useful in remote and rural areas and in challenging areas (such as mountains), giving satellites an advantage when it comes to rapid deployment of communication services after a disaster.

For example, in 2010, the ITU joined an international effort to provide humanitarian assistance to Haiti, which was just devastated by a 7.0 magnitude earthquake. Along with destruction of buildings and infrastructure, telecommunication links were damaged. ITU immediately deployed over 40 satellite terminals and another 60 units with broadband ability, contributed by private sector partners, to help re-establish basic communication links and support response. Disaster relief and response agencies also typically incorporate satellite systems into their response plans, and governments and businesses will include satellite technologies to offer a layer of redundancy to their telecommunication operations.

More recently, in 2013 the Philippines were hit by a powerful typhoon which caused critical damage to the Philippines telecommunication infrastructure, making assessment of the damage difficult. In response, the ITU dispatched emergency telecommunication equipment to all the severely affected areas. This included 50 Thuraya satellite phones equipped with GPS, 30 Iridium satellite phones, 20 Inmarsat Broadband Global Area Network terminals, and a Qualcomm CDMA base station. This equipment was used to help ensure that essential telecommunication services could be quickly provided, to launch support for search and rescue services, and to help families re-establish contacts.

3.3.6 Recovery

Re-establishing communications is a critical in disaster management to ensure timely dissemination of authoritative information to government entities and aid agencies involved in recovery and rehabilitation efforts. Disaster management plans and ICT development plans should also take steps to consider the potential impact of a disaster on infrastructure, and incorporate plans to allow for speedy recovery and restoration of critical networks.

It is evident that ICTs are critical for disaster management. Given that developing countries, and in particular least developed countries (LDCs), Small Island Developing States (SIDS), disabled persons and those with special needs, and people living in remote and rural areas are all disproportionately impacted by disasters, and therefore, closing the Digital Divide is urgent. While increasing ICT access and availability is an overall development objective, it is important that such strategies can also help support disaster management objectives.

This report puts forward a review of infrastructure and new technology options that can offer services both for development and in times of disaster. As much as possible, when new infrastructure and services are deployed, disaster communications requirements should be considered to help contribute to overall sustainability.

3.4 Key stakeholders

Planning for, building out, and utilizing ICT infrastructure and technologies involves diverse stakeholders including government, industry, NGOs, and citizen users. This section identifies the roles of various stakeholders in both ICT development and disaster communications in order to help identify intersections that can foster smart sustainable development initiatives.

Table 1: The role of various stakeholders

	ICT Development Plans and Strategies	ICT Deployment and Training	Disaster Preparedness and Response
Government Agencies			
Communications Ministry	Developing ICT development plans and policies, including spectrum	Develop incentives for ICT deployment; foster capacity building initiatives	Support role of communications in disaster response.
National Regulatory Authorities (NRAs)	Supports policy and strategy development	Create and manage licensing and authorization regimes for infrastructure and technologies, including spectrum	Support licensing and authorization of technologies for disaster response
Disaster Management Agency	Identifies requirements for technologies and services for disaster management to support development of ICT strategies and policies	Incorporates technologies into disaster management plans; supports training for first responders and citizens in using technologies for disaster response	Incorporates technologies into disaster management plans; identify communications needs/requirements
Citizen users	Identify priorities and needs for development and ICTs.	Incorporate ICT tools into daily life; participate in training; drive demand for new technologies.	Often serve as de facto “first responders” in a disaster
First responders and volunteers	Identifies requirements for technologies and services for disaster management to support development of ICT strategies and policies	Incorporate technologies into disaster response plans; participate in training.	Incorporate technologies into disaster response plans
UN	Promotes role of ICTs in	Promotes role of ICTs in	Supports disaster relief and

	ICT Development Plans and Strategies	ICT Deployment and Training	Disaster Preparedness and Response
	development strategies	development strategies, and supports development of ICT infrastructure and services; supports capacity building initiatives	response efforts; supports recovery efforts
NGOs and relief workers	Identifies requirements for technologies and services for disaster management to support development of ICT strategies and policies	Incorporate technologies into disaster response plans; participate in training.	Incorporate technologies into disaster response plans
Local government agencies	Identifies requirements for technologies and services to support development of ICT strategies and policies	Deploys technologies to support delivery of government services; supports training	Incorporates technologies into disaster management plans; identifies community needs/requirements; supports response
Private sector	Develops new technologies and services to meet customer needs; advocates for technology and infrastructure deployment	Lead on deployment of infrastructure, technologies and services; provides training support for users/customers	Develops new technologies to meet emergency requirements; deploys technologies/services for disaster response; rebuilds/repairs damaged infrastructure.

3.5 New technologies

Telecommunications/ICTs are considered a critical tool for advancing social and economic development, yet also are instrumental for supporting disaster mitigation and response. In promoting sustainable development, it is important to understand how to best utilize or deploy ICTs that will meet dual objectives of advancing ICT4D, while also considering connectivity, resiliency and redundancy for ICT4D or times of disaster. When evaluating infrastructure and technology requirements, governments, communities and organizations must therefore understand user communication requirements, the baseline of available and emerging technologies and services that can meet those requirements, underlying infrastructure and spectrum requirements to support the deployment of certain technologies and services, and the suitability of those technologies, services or infrastructures to certain geographies or circumstances. Countries, communities and organizations may look for solutions that make use of existing network infrastructure, or consider investing in new or expanded infrastructure. To support the development of smart sustainable development recommendations, this report provides information on a wide range of technologies and services based on the predominant infrastructure type.

Annex 9 provides a complete catalogue of new technologies examined for this report, including regular service applications and disaster applications, user groups, deployment considerations, and associated case studies. Here we have summarized the impact of each technology as a survey of new tools available for both ICT4D and ICT for Disaster Management to assist for infrastructure assessment and planning purposes.

3.5.1 Amateur radio

Benefits of Amateur Radio include its associated resources of designated spectrum and trained volunteers. Amateur radio services can be used in any area with an active population of radio amateurs, and is uniquely suited to situations in which other communication networks have been disrupted. Amateur radio is not a commercial service and involves a community-driven response to disasters.

- **Automatic Packet Reporting System (APRS):** APRS utilizes a map display to track responders and mapping affected areas. Data is ingested into the APRS Internet System (APRS-IS) and distributed globally; it should be noted that usage of APRS-IS requires infrastructure for Internet access.
- **WSJT, WSJT-X and WSPR:** Open-source software has been developed to communicate using weak-signal or other areas of spectrum. Usage of this technology requires access to a personal computer.

3.5.2 Broadcast

Broadcast messages can be distributed through mobile and fixed telecommunication services as well as via the Internet. These messages are critical in order to provide early warnings of an emergency, or provide information regarding relief efforts to the public. The supply of these one-to-many broadcast messages can be augmented through software. Cellular broadcast can allow for transmission of alerts or SMS's to citizens in affected areas – not just limited to disaster warnings, but could be used more broadly to broadcast messages of community importance. Additionally there are traditional broadcast media transmissions through radio and television including via satellite. Television and radio are still important mediums through which to deliver critical information, although electricity outages or infrastructure damage may limit use of these systems to affected areas in the immediate aftermath of a disaster.

- **Safety Confirmation and Broadcast Message System:** Service allows public agencies to confirm the safety of agency personnel and dispatching persons as needed. It serves as a closed user group, utilizes cloud computing services and can therefore rely on mobile and/or fixed telecommunication services.
- **Area Mail:** Often used for early warning broadcast to mobile phones via telephone operators.

Broadcast can be limited to phones in a defined geographic area. Requirements include mobile phones and an installed application; mobile networks prepared to support cell broadcast service, and coordination with message senders.

3.5.3 Fibre and submarine cable access

The more than 300 undersea fibre optic cable systems form the backbone of the Internet. Increased demands for bandwidth intensive services, such as high speed internet and video, have placed increased priority in development of broadband fibre networks and increasing number of submarine cable landings, particularly in developing countries. However, not all coastal nations are yet connected to submarine cables. Particularly in remote and rural areas, building of fibre is cost-intensive, which may impact the sustainability aspects of deploying terrestrial infrastructure. Furthermore, natural disasters can often be disruptive to terrestrial fibre networks or submarine cable landings. Some developed countries have several layers of redundancy built in on submarine cable access – however, this may not be as feasible for developing countries. Terrestrial fibre networks can be critical in carrying the data volumes required to support disaster response and recovery, however, as they are subject to damage during a disaster, redundancy options are needed to ensure continuity of operations. Fibre and submarine cables can be utilized not only for broadband access and communications, but also for observation, such as early warning in relation to seismic shifts or natural resource mapping.

- **Green Cable:** This technology is dual-purpose, in terms of having communication capability and observation capability. In other words, it can be used not only for seismic and tsunami monitoring, alerting, and early warning purposes, but also for communication purposes such as

back-up communication route in case of disasters. This technology is uniquely suited to areas which require both seismic and tsunami risk management and secured connectivity. To promote the Green Cable, ITU-T, WMO (World Meteorological Organization) and UNESCO Intergovernmental Oceanographic Commission (UNESCO/IOC) established a joint task force (JTF). The JTF, composed of experts from the science, engineering, business and legal communities, is now operational.

3.5.4 Public protection and disaster relief (PPDR)

PPDR systems utilize dedicated spectrum and communication systems to provide voice and data services specifically for public safety agencies and closed group uses. These are useful especially in cases when there is insufficient network capacity due to a large scale public event, disaster, or lack of reliable communication systems due to other reasons. As PPDR systems are used to generally support public safety concerns – such as by police and fire – they may be used both before and during a disaster. However, such systems are not generally available to the public.

- **Mitsubishi Helicopter Satellite Communication System (HSA40):** This can be used for patrol functions of all kinds as well as for disaster management. It enables transmission of real-time aerial video from helicopters and bi-directional voice and data communication between airborne and base stations. It utilizes airborne station and utilizes standard helicopter power source; leverages satellite broadband connectivity.

3.5.5 Satellite

Satellite-based services offer many advantages, particularly for remote and rural areas where terrestrial infrastructure is limited. In addition, satellite provides flexibility to extend the service footprint based on market demand, instantly and easily. In addition to serving as a solution for rural access, satellite services can short-term solutions for emergency response, or be utilized for redundancy. Seeking increased use for satellite communications to be incorporated into development activities – such as via a telemedicine unit, connecting schools, or M2M services – could increase sustainability and help lead to decreased relative costs of satellite deployments.

Satellite technology plays a fundamental role before, during and after disasters. For instance, satellite emergency telecommunications alert mass populations, conveying information that is necessary for important decision-making during all phases of a disaster. Once a disaster occurs, the first thing that is needed is the ability to exchange information in a quick and timely manner and satellite technology is ideally suited for that. Satellite technology is crucial when it comes to disaster management, particularly when neither land lines nor terrestrial antennas are available to provide access to communication services.

Satellites are ideally suited for disaster responses compared to terrestrial and cellular networks since they are not vulnerable to catastrophic events on Earth. For example, satellites are independent of the local terrestrial environment. Hurricanes, earthquakes, floods and fires may damage the infrastructure of terrestrial and cellular networks within minutes, while satellite technology remains untouched and ready to assist in the response. Furthermore, there is no need for civil works and the service can be used in areas difficult to reach, which gives satellites a speed advantage when it comes to rapid deployment of communication services. Those specific characteristics of satellite technology make satellite communications key for emergency services but also as a backup to terrestrial infrastructure. For those reasons, satellite technology is frequently used in cases of disasters, and without it, preparedness and relief efforts would be thwarted drastically, as illustrated in the examples below.

In 2010, the ITU joined an international effort to provide humanitarian assistance to Haiti, which was devastated by a 7.0 magnitude earthquake. Along with destruction of buildings and infrastructure, telecommunication links were also broken. Within 24 hours of the earthquake, the ITU immediately deployed over 40 satellite terminals and another 60 units with broadband ability to help coordinate logistics for search and rescue teams and re-establish basic communication links. Re-establishing

communications is a critical tool in disaster management to ensure timely dissemination of authoritative information to government entities and aid agencies involved in rescue and rehabilitation efforts.

Another significant example of satellites helping during a disaster was in Japan, which experienced in 2011, a 9.0 magnitude earthquake and subsequent tsunami. This disaster knocked out most cellular and landline phone service in the affected areas. ITU dispatched satellite phones equipped with GPS to help facilitate search and rescue efforts. Telecommunication carriers supplied 1151 units of mobile communication equipment and 938 satellite phone units at no cost. Over 100 portable power generators and 22 mobile base station trucks were also provided. Without the use of satellite phones communication would have been non-existent.

More recently, satellite technology also played an integral part in the relief efforts of the typhoon that struck the Philippines in late 2013. The typhoon tore through the Visayas region of central Philippines causing considerable damage to the Philippines telecommunication infrastructure which also affected the ability to provide a rapid assessment of the damage. Consequently, the ITU deployed satellite communications equipment to help re-establish communications that were vital for search and rescue. This equipment included 50 Thuraya satellite phones equipped with GPS, 30 Iridium satellite phones, 20 Inmarsat Broadband Global Area Networks terminals and a Qualcomm CDMA base station. All of the equipment could be charged via automotive batteries, with a solar panel as a back-up source of power. In addition, the ITU also sent communication experts to the Philippines to train the first responders on the equipment and for logistical support.

From the above-mentioned examples, one can see how useful satellites are and how satellite technology is crucial in emergency situations given its unique technological characteristics, the cost efficiency, and fast delivery service.

Satellite service options include:

- **Mobile Satellite Services (MSS):** These can be relied on for voice, data, Internet, and dispatch communications in the absence of functional terrestrial communication networks. They are often used for coordination and tracking of global networks of volunteers or first responders. MSS can be best leveraged in the immediate aftermath of a disaster, making it desirable to have handsets prepositioned for preparedness. MSS can be utilized in combination with battery-powered mobile earth stations and/or solar chargers. Portable satellite broadband terminals can be compacted to the size of a backpack. MSS provide Internet access, VOIP, TETRA backhauling, Wi-Fi, and telemedicine applications among others. MSS can also be used to broadcast or to receive sensor information and can be used for emergency response coordination or environmental alerting via remote transmitters. New applications allow for integration of user smart phones with MSS network connectivity. Other new products on the market (ESOMPS) combine mobility with higher bandwidth availability, suitable to address the needs throughout the full disaster management cycle.
- **Fixed Satellite Services (FSS):** Often used for broadband, CPN, VOIP, and IP connectivity utilizing VSATs deployment. They typically require an electricity power source and coordination with a government liaison or a vendor for deployment. FSS coverage area is finite per unit, but can be leveraged, particularly in remote and rural areas that have limited terrestrial infrastructure, to support connectivity to communities, schools, hospitals, etc. FSS can also offer back-haul capabilities to support wireless network deployments where building of fibre can be cost prohibitive.
- **M2M:** M2M applications can be used to broadcast a message to an unlimited number of devices in a single transmission. They are used to track, monitor and manage data needed for tracking assets, smart energy management, fleet management, monitoring remote infrastructures, supporting emergency operations. While there are terrestrial mobile M2M applications, MSS M2M applications offer additional benefits of being able to operate even in circumstances when terrestrial networks may run into challenges, such as conflicts, natural

disasters, challenging locations (including the poles and surrounds) or prohibitive infrastructure costs.

- **Smartphone connectivity:** New MSS applications are being deployed that allow satellite connectivity for any individual with a smartphone, and is best for one-to-one communication. The MSS device that connects to the smartphone does not require constant access to electricity.
- **MDRU (Movable and Deployable ICT Resource Unit):** A vehicle-type information hub designed to utilize satellite, terrestrial, or mobile/fixed networks in order to meet the ICT demand/supply gap following a disaster. An MRDU is typically used as a way to offer connectivity to user terminals in the area and offer services to evacuees, local government, police, and even private companies. The facility requires preparation of the unit in advance.

3.5.6 Terrestrial mobile / mobile broadband

Citizens, government agencies and first responders utilize terrestrial mobile or mobile broadband as an integrated, routine communication tool and mobile broadband access is important for overall development. The ability to reach key stakeholders regardless of their location via mobile is increasing as additional applications and uses are developed. Citizens are also increasingly using social media applications and other Internet applications to communicate information during times of disasters. Applications for both ICT4D and ICT4DR require resilient communication networks and terrestrial mobile or mobile broadband networks often experience disruption in times of disaster, affecting citizens' abilities to communicate. Infrastructure can be (relatively) costly to deploy in rural and remote areas

- **IPASOLINK:** This utilizes 60 GHz and 70/80 GHz radio technologies for extending mobile communication services to remote areas, or for backhaul connectivity of 3G and 4G mobile services in the wake of damaged fiber networks. It can be used between public facilities or to link to a disaster stricken area via a portable kit.
- **Telematics Service with Internavi System:** This system collects driving information of vehicles with Internavi-equipped systems, through mobile broadband. It can provide road managers with information regarding road blockages, and users with information on how to avoid destroyed roads or traffic jams. Telematics deployment requires user terminals and mobile broadband.

3.5.7 Wi-Fi

Wi-Fi can be used as a stand-alone local communication tool between Wi-Fi ready devices in the absence of other working networks; or, as a method for extending access to Internet as delivered by terrestrial or satellite networks. This makes the technology versatile, enabled by basic networking equipment. Moreover, dedicated spectrum is not needed in order to communicate between user terminals.

- **NerveNet:** This technology consists of base stations, configured either on a permanently installed or ad hoc temporary basis. This is uniquely suited to local data sharing when other communication networks fail. NerveNet is also utilized on a daily-use basis for message broadcast by government and organizations. It is also capable of gathering data from sensors, and scales to up to 100 base stations.

3.5.8 Broadband

Broadband access is an important component for advancing development and is increasingly relied upon for communication of all kinds, by governments, first responders, and citizens alike. In regions where there is broadband access and there is redundancy for network disruptions following disasters, there is an opportunity to utilize increasing numbers of cloud computing software tools both on a routine basis and also for incident response coordination. Infrastructure can be a combination of fibre, terrestrial mobile, and satellite.

- **WIPAS:** This fixed wireless broadband access can be used to extend the reach of a fibre network to a remote area; additionally, it can be used for building-to-building local communication or quick recovery of a fibre network when damaged in a disaster. WIPAS is independent from geographical features and is robust against disasters. For use in emergency, it requires a power generator.
- **Emergency Management Support System:** This system utilizes a cloud computing platform to share real-time information and updates inside a local government, both for routine use and in times of disaster. It requires an Internet connection to access the server, and can be accessed via mobile or PC. It can be used for many-to-many communication.

3.6 Current situation: scarce resources and sustainability

Consideration of sustainability also includes consideration of efficient and effective use of scarce resources, such as spectrum, satellite capacity and power supply. Spectrum is a limited resource, but underpins many technologies and applications both for daily communications and for disaster response. When evaluating spectrum planning, consideration should be given to the Smart Sustainable Development Model objectives, taking account of those infrastructures and technologies that require spectrum that will address both ICT4D and ICT4DM. Successful strategies will include a mix of various technologies and services to ensure diversity and flexibility in communications response – and spectrum planning should take this into account

Satellite capacity can be similarly limited, but operators are often able to reconfigure capacity where demand is highest, such as during a time of a disaster. Recent and upcoming launches of new high bandwidth satellites equally address this. In accordance with the smart sustainable model, development projects or activities utilizing satellite capacity, such as a VSAT or ESOMPs connecting a school, could be

leveraged in time of a disaster when that capacity is not likely being used to support education. Mechanisms could be established through closer collaboration with development and disaster management officials to share resources and select technologies and infrastructures which can benefit disaster response scenarios.

Power supply is an often a challenge for both development projects, particularly in remote and rural areas, and for disaster management. In some cases, such as the Japanese earthquake and tsunami, certain telecommunication infrastructures were able to withstand the damage of the disaster, but outages resulted from a loss of power supply. Sustainable solutions to ICT4D and ICT4DM will take account of power requirements and take advance steps to incorporate energy efficient options, solar or renewable power sources, and back-up power supplies to support any outages of critical systems during times of disasters.

3.7 Identification of infrastructure requirements for new networks

In examining the new technologies above, and considering the possibility of implementing new communication technologies or networks, it is important to consider the right combination of infrastructure investment associated to support these technologies. While it is easy to see what infrastructures each technology depends upon, a deeper analysis must be done at the planning level. ITU-T has started investigation on how ICTs contribute to disaster relief activities and how telecommunication infrastructures by themselves enhance resilience and recovery. Details are given by referencing the Focus Group on Disaster Relief Systems, Network Resilience and Recovery. The following descriptions are based on the snapshots of the group activity.

3.7.1 General objectives of network resilience and recovery

Preventing, mitigating, or circumventing congestions in emergency situation and minimizing disruption to communications in the event of damage to infrastructures are two major objectives of network resilience and recovery (NRR).

Communications infrastructure has become more fundamental to society not only as a means of providing traditional telephone service, but also as a medium for delivery of all manner of information and services provided by government, businesses, and other stakeholders.

During states of emergency such as major natural/man-made disasters, the telecommunication infrastructure also provides a means of confirming people's safety status through emergency calls and emergency priority-line phones, and provides a necessary means of communication for the maintenance of basic administrative functions such as police and fire departments. The telecommunication infrastructure is essential in ensuring individual and national safety and well-being.

At the time of a disaster, there may be a surge in voice calls over telephone and mobile phone networks for safety confirmation and information exchange in the disaster area. Network congestion has been a prominent issue in the event of disaster, and can be addressed by leveraging the latest technologies and new user behavior.

It is also essential to restore the telecommunication infrastructure swiftly. Mobile base stations, local switches and transmission cables may undergo major damage in disasters. In order to respond effectively to post-disaster emergency situations, verify the safety of individuals, facilitate information-gathering, and provide means of communication, infrastructures should be recovered by employing every possible means.

From the viewpoint of network resilience and recovery the above two issues are considered fundamental and crucial.

3.7.2 Approaches to achieve the objectives

Telecommunication infrastructure is important for society and daily life, and there are many measures, including existing and proven ones as well as those under study and newly developed ones, to maintain stable communication both for normal use and emergency scenarios. Approaches to achieve the NRR objectives can be summarized as follows:

Redundancy: for equipment and functions that may likely be damaged, extra capacity or capabilities are prepared in advance and activated in need, or used in normal operation.

Congestion control: the rapid increase of voice calls at the disaster causes the call traffic congestion by the overload of the switching equipment control. To detect this congestion and control the traffic some functions will need to be implemented. Mitigation of the congestion or circumvention of the congested route may also be valid tactics.

Repair: systems are maintained and ready for repair purposes, such as switching equipment and transmission facilities, multiple routes of transmission facilities, spare equipment, and materials necessary to restore temporary connectivity (emergency restoration construction, installation of temporary telecommunication lines, electric power supply).

Substitute networks: damaged equipment and facilities may be substituted by multi-purpose facilities or simulated by available resources.

3.7.3 Classification and landscape of network resilience and recovery measures

NRR measures can be classified into two categories: (1) target or effective time phase related to the disaster and (2) relevant network parts. NRR technologies and measures useful during each phase or in relation to each part of the network are summarized in Table 2.

1) Time phase of the disaster
    a) Before disaster
    b) At or during disaster
    c) After disaster
2) Parts of the network

a) Satellite network
b) Core network
c) Fixed access
d) Mobile access e. Internet access

Table 2: Landscape of network resilience and recovery measures

Phase and approach Parts of the network	Preparedness before disaster	Response and relief at and during disaster	Recovery and reconstruction after disaster
	Network resiliency (Redundancy and congestion control)		Network recovery (Substitute networks and repair)
Satellite	Increase in switching capacity at the satellite		Portable earth station to reach the satellite Mobile base station with satellite entrances
Core network	Spares for switching equipment and transmission facilities Multiple routes of transmission facilities Installation of fault detection device Installation of congestion detection and traffic control function Installation of automatic fire alarm and extinguisher system Secure facilities to a stable structure Stable outdoor facilities and solid building to prevent damage Increase in switching capacity Emergency priority voice calls Flexible allocation of network resources (including relevant processing resources)		Spares for switching equipment and transmission facilities Materials for makeshift connectivity (emergency restoration construction, installation of temporary telecommunication lines, electric power supply) Emergency restore equipment (outdoor line trunk accommodation units, temporary repeater) Movable and deployable resource units
Fixed access and terminal equipment	Offload of voice calls to other means (text messages, e-mail, Internet, storage-type media for emergency situations, packet communications） IP phones		Special toll-free public phones Satellite mobile phones Shifted resources from other stations (laying in cable from other areas and out- rigging of network facilities) Underground multipurpose duct of cables
Mobile access and terminal equipment	Offload of voice calls to other means (text messages, e-mail, Internet, storage-type media for emergency situations, packet communications） Mobile IP phones Sending SMS over the data transmission network		Large-zone (long-reach) mobile base stations Mobile and compact base stations, (including femtocells) Satellite mobile phones
Internet access	Increase in line capacity for ensuring Internet connectivity Bandwidth control Distributed Internet exchanges (IXs) and data centers over a wider geographical area Mirror sites		Free access to wireless LAN and Internet including in evacuation centers Autonomous network construction for continuous communication (delay tolerant networking, local wireless mesh network with portable advanced wireless base station)

Phase and approach	Preparedness before disaster	Response and relief at and during disaster	Recovery and reconstruction after disaster
Parts of the network	Network resiliency (Redundancy and congestion control)		Network recovery (Substitute networks and repair)
Electric power supply	Spare power supply Backup generators or batteries		Power-supply vehicle

There is a general relationship between the time phase of the disaster and the approaches to be taken as shown at the top of the table. Before the disaster, network infrastructure should prepare for the expected (or possible) disaster by implementing redundancy and relevant control mechanisms. Once the disaster occurs, the infrastructure should manage the physical damage caused by the disaster – with the awareness that some disasters may recur. Immediately after the disaster, the network should handle the surge of traffic with available resources, which may be fewer than under normal operations. During response and recovery, the infrastructure should again provide communication services by fixing damaged facilities and/or installing new resources that substitute the original infrastructure or provide alternative communication measures.

3.7.4 Network resilience

There has already been significant work regarding switching equipment capacity, emergency priority calls, backup systems, multiple routes of transmission facilities, and IP phones to address network congestion issues, especially those that occur unpredictably, post-disaster. However, the topic of flexible assignment of network processing resources is under more recent development. Flexible reconfiguration of communication processing resources refers to shifting from normal use to emergency use, and can maximize the use of limited resources to prioritize support in indispensable communication services during a disaster. This supports the concept of relating ICT4D and ICT4DR and makes the networks more sustainable.

3.7.5 Network recovery

After a disaster, it is essential to restore affected network facilities as soon as possible. However, it may take significant time to repair them. Innovative technologies are needed to recover telecommunication infrastructure as much as possible. The following technologies from the catalogue in this report are under development, and require additional discussion.

1) Movable and deployable resource units (MDRU): These are suitable for situations in which key network facilities have been destroyed and there is a communication black-out. They are prepared as a transportable package and sent to the disaster area. They support movable-and-instantaneously-deployable ICT resources and are expected to work together with the remaining ICT facilities including user terminals.

2) Portable burst-mode Erbium-Doped Fiber Amplifiers (EDFA) for post-emergency recovery of optical fiber links in remote areas. They can be used to enable the swift re-connection of surviving fiber links to optical fiber networks or provide a means of by-passing damaged network infrastructure.

3) Delay Tolerant Networking (DTN): It is possible to implement DTN over Wi-Fi enabled devices such as tablets or smartphones to achieve a network where each mobile terminal is able to send delay tolerant message to other terminal in a multi-hop fashion.

4) Local private wireless mesh networks based on de-centralized mesh architecture: Local private wireless networks based on de-centralized mesh architecture are effective ways to avoid any network blackout.

3.8 Overview of best practices

Although each country faces unique challenges and characteristics in both development and disaster preparedness and response, many principles are universal in ensuring smart, sustainable development of ICT infrastructure and new technologies which take account of disaster mitigation and response requirements. The bedrock of these principles is increasing coordination between those agencies deploying ICT4D and those constructing disaster management and disaster communications management plans. Wherever possible, infrastructures and new technologies should be deployed that can be utilized in times of disaster in addition to meeting development goals. Specific best practices include the following:

1. ICT development plans, national broadband plans and other strategies by telecommunication regulators should seek to invest in infrastructures that are both multi-purpose and resilient in the face of the natural disasters most frequently faced in individual national geography.
2. Consideration is needed to both resiliency of infrastructure to the effects of disaster, but also redundancy. Countries should consider how continuity of operations will be ensured if primary infrastructure is damaged or destroyed or to take account of network capacity considerations for demand spikes immediately following a disaster. Satellite communications can be especially critical in the aftermath of disasters and to provide primary, redundant and backhaul links to provide services to remote and rural areas.
3. When developing an ICT development plan, government agencies should ensure that there is coordination and consistency with the aims of the Member State's disaster management plan, supporting development of the technologies – whether primary or redundant – which are expected to be used in response to or recover from a disaster.
4. Disaster management plans should be reviewed regularly to accommodate new technologies and their applications for disaster response and recovery. Technology-neutral policies must be put in place, to the extent possible, in order to ensure the effectiveness of the disaster response efforts.
5. Countries should consider the new technologies listed in the Catalogue, and evaluate the underlying infrastructure requirements for deployment of these technologies. Differing countries, geographic environments, and risk level for certain types of disasters would lead to different choices in technology and infrastructure deployment.
6. When a new technology is incorporated into a disaster management plan, cross-training should occur with other relevant stakeholders, such as NGOs and relief workers, local government agencies, and the private sector.
7. Countries should ensure that there are enabling regulatory and policy environments, including consideration of spectrum and satellite capacity requirements and licensing frameworks, to allow for prepositioning and rapid deployment of technologies and services.
8. One of the most important assets in managing any disaster response or recovery effort is 'information'. In today's telecom/ICT environment, citizens demand greater and faster access to information via ICT devices, particularly in the aftermath of a disaster. Infrastructure and new technology considerations should take account of how to ensure that not just disaster response officials but also citizens have access to information needed.
9. Smart Sustainable Development initiatives should consider how to provide effective public warning via resilient technologies. Public warning and alert systems are critical to help save lives. Depending on the types of disasters and the communication needs of populations, a variety of systems have been implemented. Collaboration with meteorological and weather mapping organizations that monitor conditions or seismic activity via satellite or other means can help support public warning systems.

10. Smart Sustainable Development models should take account of power requirements as well as independent power sources to ensure continued functionality in the event of a failure of the power grid. Consideration should be given to use of solar power or other renewable resources.

11. Public-private partnerships and other innovative business models can be effective in identifying ways to deploy smart sustainable infrastructure and new technologies.

12. Disaster mitigation planning must be tailored to the specific needs of each region. Although the infrastructural capacity and ability to respond in the event of a disaster varies significantly by nation, it is the responsibility of the international community to respond in times of need and be prepared to come to the aid of a nation willing to accept assistance.

13. The resource of the amateur radio service should continue to be utilized as new technologies are developed. For the most part, amateur radio operators have more than a passing interest in the art and science of radio and many make important contributions of a scientific nature and have developed new technologies to aid in disaster communications. However, the best asset the amateur radio service brings to emergency communications transcends technology. It provides skilled people "on the ground" who can communicate using whatever technology is available.

14. New technologies are more diverse and interoperable. Assessments of technology and infrastructure options should consider performance or functional requirements vs. specific equipment requirements, or to consider how diverse technologies may be interchangeable and flexible for multiple uses.

3.9 Recommendations

This report recommends that the Advisory Board consider the following actions:

1. In order to increase the utility of existing infrastructure in Member States, refer for continued study the development and disaster applications of the most versatile new technologies referenced in this report.

2. Study further the infrastructure needed to support new technologies in the Catalogue particularly focused on the following:

   - Movable and deployable resource units (MDRU).
   - Portable burst-mode Erbium-Doped Fiber Amplifiers (EDFA).
   - Delay Tolerant Networking (DTN).
   - Local private wireless mesh networks.
   - Satellite communication applications that can be used both for development and disaster response.

3. Ensure that plans to utilize ICTs in the disaster response and mitigation context are updated regularly to take into account of regional changes, technological upgrades and advancements.

4. Prepare, maintain and update the list of best practices regarding the deployment and use of telecommunication equipment to disaster affected areas implemented by international organizations, governments, NGOs, and private companies.

5. Maintain and update the list of telecommunication/information technologies that can be utilized for disaster prevention, disaster resilient infrastructure, and early recovery from disaster.

6. Convene workshops for all relevant stakeholders on developing ICT development plans and national disaster management plans consistent with the Smart Sustainable Development Model.

7. Encourage governments to introduce policies to enhance network operators' preparedness against disasters.

8. Facilitate pre-deployment of terminals and end-user equipment and training of first responders on new technologies.

9. Ensure awareness among the first responders on the functionalities and capability of space based technologies and platforms.

10. Conduct capacity, resource, and technology assessments and if necessary develop partnerships with nations willing to provide assistance should disaster strike through agreements such as the Tampere Convention.

11. Ensure the availability of spectrum, which is an essential, critical and scarce resource, for all technologies that are dependent on such resource during times of disasters.

12. Support mechanisms to incorporate Smart Sustainable Development Model objectives as developing countries consider ICT development strategies.

13. Determine feasibility of using any spare capacity available during times of disaster that could be made available to different regions and analyze technical solutions.

14. Encourage operators and service providers to continue developing innovative technologies and applications that will help meet Smart Sustainable Development Model objectives.

These recommendations offer steps to advance knowledge and understanding of the Smart Sustainable Development Model and methods by which countries and organizations can begin to incorporate sustainable development objectives and disaster management priorities into its ICT infrastructure development plans.

4 Report of the Working Group on Financing, Partnerships, and Business Models

4.1 Summary

A baseline assessment covering researching, and recommending, to the Advisory Board potential financing mechanisms, partnership models, and business models that would be suitable for creating partnerships for the establishment of ICTs that support both sustainable development and disaster preparation and management is presented by the Working Group on Financing, Partnerships, and Business Models.

A background on ICT4D and ICT4DM partnerships is followed by the enumeration of stakeholders in such partnerships. A survey of several real-life ICT partnerships is presented in order to explore possible models for the SSDM initiative, followed by a summary of best practices as discussed in the literature on the subject. Partnership models are then discussed, with a focus on recognizing stakeholder interests. A survey of possible financing mechanisms is presented, again in the context of identifying feasible approaches for SSDM partnerships. Based on the group's assessments, a concrete proposal is presented for the establishment of an ICT4DM platform that will be used for preparedness, restoration and recovery of telecommunication capabilities by governments in case of disaster and that can be leveraged for ICT4D partnerships to be based on models growing out of the foundational work in this report. The report concludes with specific next steps to be considered by the SSDM Advisory Board. The reference for this Working Group calls for a special focus on potential partnerships between satellite operators and the public sector.

This chapter presents an initial summary of the Working Group's findings based on research and discussion of various real-world examples, models, and studies that have attempted to identify best practices and key success factors. The literature on these subjects is extensive and given the time and resource constraints on the Working Group team, it was impossible to conduct exhaustive research. Nonetheless, an attempt has been made to provide enough of a representative sampling in order to

be able to put forth recommendations to the Advisory Board that will stimulate discussion and directional feedback for further exploration.

Section 4.2 of this report provides background on the concepts of partnerships, specifically in the realm of deploying ICTs for development and disaster management, and identifies potential stakeholders in such partnerships. Sections 4.3 and 4.4 address real-world examples of partnerships in the ICT4D and ICT4DM arenas, as well as the best practices to be considered in developing models for SSDM. Section 4.5 explores some of the motivating factors that drive participation in partnerships. Section 4.6 turns to the mechanisms for financing partnerships and, providing a survey of some existing models, as well as exploring more innovative approaches.

In sections 4.7 and 4.8, the Working Group has attempted to synthesize the information gathered in the preceding sections and summarize best practices for partnership models and financing mechanisms that seem to have the most potential for succeeding in initiatives that attempt to marry ICT4D and ICT4DM. Section 4.9 describes the result of a survey that was conducted to identify potential financing mechanisms currently available. A specific proposal is put forth for creating a global operational platform for disaster management interventions. The report concludes with recommendations to the Advisory Board for additional avenues of exploration and next steps.

4.2 Background

In order to explore financing and partnership models that may provide an effective framework for initiatives that support both sustainable development and disaster management through the deployment of ICTs, it is first necessary to understand these two complementary objectives.

4.2.1 ICT for Development (ICT4D)

One of the classic definitions of sustainable development is as follows[55]:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- The concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and
- The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

Sustainable development rests on the triple pillars of economic growth, environmental protection, and social equality. Arguments have been made that focusing solely on economic growth will not necessarily address the needs of the most marginalized communities or move the needle in reducing poverty[56]. Rather, effective development must also focus on alternative social and political agendas.

Deployment of ICTs can address a broad array of essential needs and thereby enable progress along each of these pillars. The needs that ICT4D initiatives can address span the realms of education, health care, food production and stability, financial infrastructure, environmental monitoring, promoting dialogue on sensitive social and cultural issues, and disaster preparedness.

Satellite technologies can play a crucial role in the delivery of ICTs for development. Two key elements of infrastructure for successful deployment of ICTs are electricity and connectivity. Satellites are a good

[55] World Commission on Environment and Development (WCED) (1987) Our common future. Oxford: Oxford University Press, p. 43.

[56] Kleine, D. and Unwin, T. (2009) Technological revolution, evolution and new dependencies, what's new about ICT4D? Third World Quarterly, 30(5), 1045-67.

alternative for providing connectivity to rural populations, where deployment of terrestrial-based infrastructure may be costly and unreliable. Some of the major benefits of using satellite technology include reception via small antennas (VSATs), instantaneous connection, economical consumer equipment, and the ability to deliver Internet, TV, voice communications, and radio.

4.2.2 ICT for Disaster Management (ICT4DM)

Disaster management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response, and recovery in order to lessen the impact of disasters. There is no country that is immune from disaster, though vulnerability to disaster varies. Any disaster can interrupt essential services, such as the provision of health care, electricity, water, transportation and telecommunications. The interruption can seriously affect the health, social, and economic networks of local communities and countries. Disasters have a major and long-lasting impact on people long after the immediate effect has been mitigated. Local, regional, national, and international organizations are all involved in mounting a humanitarian response to disasters. Each will have a prepared disaster management plan. These plans cover prevention, preparedness, relief and recovery.

It is well-recognized that space-based technology and solutions are effective tools to support disaster alert as well as disaster relief and response activities. The role of space-based technologies (satellite communication and radio-navigation) in disaster management is critical in order to improve the timely flow of crucial information needed for appropriate assistance to be delivered before, during and after the disaster.

The satellite industry offers a wide variety of communication and navigation services and solutions such as satellite phones, VSATs and other broadband terminals, GPS receivers, backhaul, tele-centers, etc., for use during disaster events for emergency telecommunications. The private sector can quickly deploy and provide resources, expertise, and essential services. In the early stages of disaster relief, critical communication infrastructure is supported and operated by the satellite industry. At times of natural disasters, such capabilities set the satellite industry apart from other sectors and industries. The industry helps people communicate and connect in tough times and plays a great humanitarian role in helping to save lives.

4.2.3 Partnership concepts

In order to identify stakeholders in partnerships for ICT4D and/or ICT4DM initiatives, it is necessary to first establish the rationale for, and definition of, the term partnership.

Traditionally, models for development aid have been focused on the concept of “Bilateral Donors” and “Recipients,” wherein governments partnered with other governments for the delivery of aid in support of specific development outcomes. In the 1990s, however, governments began looking increasingly to the private sector for the efficient and cost effective delivery of services that had traditionally been provided by the states themselves. This was particularly the case in the realm of ICTs, where the private sector was driving the increasingly rapid advancement of these technologies. As part of this trend, the satellite telecommunication industry witnessed the privatization of several intergovernmental consortia during this era. This era also ushered in a proliferation of public-private partnerships (PPPs).

This trend of including the private sector also impacted the models for providing development aid, such that by the end of the millennium, the United Nations’ Millennium Development Goals[57] included as MDG8 a goal to create “a global partnership for development.” One of the targets of this goal reads: “In cooperation with the private sector, make available benefits of new technologies, especially information

[57] www.un.org/millenniumgoals/global.shtml

and communications." The formulation of this goal also signals a shift from the "Bilateral Donor" and "Recipient" concept to one of joint government partnerships with shared objectives.

The importance of ICTs in development was further advanced in the first decade of the 21st century as these technologies became viewed as critical enablers to development. Forums such as the World Summit on the Information Society (WSIS) created strong advocacy for deployment of ICTs in order to "bridge the digital divide." In 2001, the Organization for Economic Cooperation and Development's Development Assistance Committee (DAC) included the following in the preamble to a policy statement entitled "Rising to the Global Challenge: Partnership for Reducing World Poverty":

Developing countries must assume leadership and formulate effective national strategies for reducing poverty. These strategies should integrate economic, social, environmental, and governance concerns within a comprehensive approach to development at the country level. We pledge to help them meet this challenge, in partnership with civil society, the private sector and multilateral institutions.[58]

Recent trends in partnerships for development have recognized the importance of including civil society organizations, such as non-governmental organizations (NGOs) and industry associations, in partnership structures. Inclusion of such entities, as well as increasing the focus on the roles of multilateral donors and foundations can enhance partnerships by ensuring the buy-in needed to achieve sustainability and by making sure that the needs of the communities being served are well understood. This expansion of partnership stakeholders has led to a move away from the PPP terminology toward the concept of multi-stakeholder partnerships (MSPs). In 2003, the Global Knowledge Partnership (GKP) commissioned a report on MSPs and their contribution to development for the WSIS. This report defines multi-stakeholder ICT partnerships as:

> *…alliances between parties drawn from government, business and civil society that strategically aggregate the resources and competencies of each to resolve the key challenges of ICT as an enabler of sustainable development, and which are founded on principles of shared risk, costs and mutual benefit.*[59]

Thus, the universe of stakeholders in potential SSDM partnerships includes the following categories: international bodies, national governments, civil society organizations (non-governmental organizations (NGOs) / non-profit entities (NPEs)), humanitarian charities and foundations, and private sector companies. These categories are elaborated in the following paragraphs.

4.2.4 International bodies

International bodies can fill a number of roles in SSDM partnerships, from inter-governmental coordination, to funding, to collection and dissemination of information, to establishment of standards and policy. Some international bodies involved in the ICT4D/ICT4DM arena include:

- United Nations Development Program (UNDP)
- United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER)
- United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP)
- United Nations Office for the Coordination of Humanitarian Affairs (OCHA)
- United Nations Educational, Scientific and Cultural Organization (UNESCO)

[58] www.oecd.org/development/povertyreduction/1895254.pdf - Policy Statement by the DAC High Level Meeting upon endorsement of the DAC Guidelines on Poverty Reduction, Paris, 25-26 April 2001

[59] GKP (Global Knowledge Partnership) (2003) Multistakeholder Partnerships: Issue Paper, Kuala Lumpur: Global Knowledge Partnerships.

- United Nations Global Alliance for ICTs and Development (GAID)
- International Telecommunication Union (ITU)
- European Commission (EC)
- Commonwealth Telecommunications Organization (CTO)
- World Bank and various international development banks
- International Finance Corporation (IFC)
- United Nations World Food Programme (WFP) Emergency Telecommunications Cluster (ETC)
- United Nations Institute for Training and Research's Operational Satellite Applications Programme (UNOSAT)
- Organization for Economic Development and Cooperation – Development Cooperation Directorate (OECD-DAC)

4.2.5 National governments

National governments that sponsor and fund humanitarian development activities can play key roles in SSDM partnerships. A small sample of those engaged in ICT4D/ICT4DM activities includes:

- United States – United States Agency for International Development (USAID)
- Canada – International Development Research Centre (IDRC)
- Luxembourg – Ministry of Foreign Affairs, Directorate for Development Cooperation
- United Kingdom – Department for International Development (DFID)
- Sweden – Swedish Program for ICT in Developing Regions (SPIDER)
- Netherlands – International Institute for Communication and Development (IICD)
- Switzerland – Swiss Agency for Development and Cooperation (SCD)

In addition, national governments are key players in partnerships as recipients of development assistance. In this role, it is critical that they create a policy, planning, and regulatory framework that enable the success of such partnerships. Such a framework includes establishing national disaster relief policy and response plans across multiple agencies of the government, as well as supporting pre- deployment of equipment that could be used during disaster response, facilitating the cross-border movement of such equipment, and helping to ensure streamlined customs clearance, availability of technical support and manpower, etc.

4.2.6 Civil society organizations (NGOs / NPEs)

Civil society organizations can bring specific expertise to partnerships for ICT4D and ICT4DM initiatives, helping to ensure sustainability and understanding of the needs of the targeted aid recipients. In the SSDM domain, these organizations include such entities as Nethope, Telecoms Sans Frontières, the International Amateur Radio Union (IARU), the International Committee of the Red Cross (ICRC), the ICT4D Collective, and the Global VSAT Forum (GVF).

4.2.7 Humanitarian charities and foundations

Charitable organizations and foundations can provide sustainable funding to SSDM partnerships. These may either have specific charters related to the dissemination of ICTs or they may be more general in scope, but with the ability to fund specific partnerships where the objectives are consistent with their mission.

4.2.8 Private sector companies

As previously noted, the private sector plays a critical role in ICT4D and ICT4DM partnerships. The SSDM initiative is focused primarily on partnerships that involve satellite technologies for the deployment of ICTs. In that context, the types of private entities would include satellite operators, equipment manufacturers, teleport operators, system integrators, etc.

4.3 Survey of real-life partnership examples and best practices

There are numerous examples of partnerships that have been forged to accomplish specific objectives in the domain of ICT4D and ICT4DM. The literature in this area is extensive, and many sources point out the difficulty of even agreeing a single well-accepted definition of "partnership." This section reviews a small, but hopefully representative sampling of such partnerships. It also presents the findings of several studies that have attempted to identify best practices or keys to success in the implementation of ICT4D and/or ICT4DM partnerships.

4.4 Partnership examples

4.4.1 ITU partnerships

The ITU and the private sector have specific partnership arrangements in place that involve provision of airtime, bandwidth, terminals, applications and technology solutions by the private sector for disaster management, whereas ITU supports the arrangement through deployment on ground, transportation, technical support and manpower, coordination and supervision of the relief activities. The private sector's contribution can be in the form of cash, but mostly it is of in-kind contributions, consisting of airtime, bandwidth, terminals, applications and solutions. The ITU currently has different types of agreements and arrangements in place with a number of entities from the private sector including but not limited to satellite operators, terminal manufacturers, solution providers, technology leaders, NGOs, etc.

In 2002, the ITU established the ITU Framework for Cooperation in Emergencies (IFCE), a framework for delivering emergency telecommunications to humanitarian organizations for disaster management, consisting of clusters focused on technology, financing and logistics. In support of this framework, the ITU has forged partnerships via agreements and memoranda of understanding (MOUs) with various governments, private companies, and civil society organizations. Some of the ITU's partners in this initiative include the Government of Japan, Iridium Satellite LLC, Thuraya, Inmarsat, and the International Amateur Radio Union (IARU).

In addition to the initiatives in the disaster management arena, the ITU has also forged partnerships in the development domain, including the furthering of communications technologies in such applications as Earth observation and telemedicine.

4.4.2 Emergency.lu

Emergency.lu is an ICT4DM partnership between the Luxembourg Government (Ministry of Foreign Affairs, Directorate for Development Cooperation) and three Luxembourg companies (SES, Hitec, Luxembourg Air Ambulance). It was created on 1 June 2011, when the Luxembourg Government entered into a service agreement with the participating companies, and operations began on 1 January 2012. The "solution" includes ground equipment and satellite capacity that is, in effect, "owned" by the Luxembourg Government, and the companies work as service providers in order to rapidly deploy emergency satellite-based telecommunication infrastructure in the event of a disaster. The companies are paid a monthly retainer fee plus additional performance-based fees in the event of an emergency use of the service. The Luxembourg Government, in cooperation with the ITU's IFCE, provides the service as a contribution to the Emergency Telecommunications Cluster (ETC), an association ("cluster organization") of the UN's ICT Humanitarian Emergency Platform.

The ETC provides vital IT and telecommunication services to help humanitarian workers carry out operations efficiently and effectively, and ultimately to save lives. Within 48 hours of a disaster occurrence, the ETC provides basic security communications services and shared voice and internet connectivity to humanitarian actors in the field. Timely, predictable, and effective ICT services provided by the ETC help to improve response and coordination among humanitarian organizations, operational security of the environment for staff and assets, and decision-making through timely access to critical information.

Services are deployed in defined "common operational areas," i.e., areas approved by the Humanitarian Country Team in which the majority of UN agencies and NGOs are based. The ETC has been activated in 25 countries since 2007.

The World Food Programme (WFP) is the Global ETC lead, and normally acts as such at country level as well, to enhance response predictability. The ETC country lead has responsibility for coordinating the deployment and implementation of security and data communications services and also must fulfill the role of "Provider of Last Resort." UN agencies and programmes, NGOs, stand-by partners, government and other humanitarian organizations partner with the ETC to fulfil its mandate and objectives. In emergency situations, members exchange information and expertise and provide personnel, equipment and solutions. Innovation of information management tools is a priority, and facilitates collaboration and coordination between members, while ensuring staff security in the field.

4.4.3 SATMED Telemedicine Project

As demonstrated in the SATMED telemedicine project, the Emergency.lu infrastructure can be expanded (either through satellite capacity and/or number of terminals) and leveraged to serve the specific requirements of and ICT4D project at an incremental cost, compared to the stand-alone case of the development project.

SATMED is a partnership with the Luxembourg Government and five NGOs. The NGOs include three from Luxembourg: Friendship Luxembourg, *Médecins Sans Frontières*, and *Fondation Follereau*, as well as two German NGOs, Archemed and German Doctors. The NGOs will partner for the development of SATMED, an e-Health platform conceived by SES TechCom and supported by the Luxembourg Government and the Minister for Cooperation and Humanitarian Action. The aim of SATMED is to improve public health in emerging and developing countries, most significantly in isolated areas with poor connectivity. SATMED enables communication between doctors, thus propagating the transfer and exchange of medical knowledge and supporting tools for medical e-learning and e-teaching. An IT cloud infrastructure accessible around the globe facilitates the data exchange between professionals and the setup of a medical infrastructure such as electronic medical records and tele-radiology systems. Technically, the SATMED platform is implemented on Emergency.lu by using its satellite equipment, technology and connectivity. SATMED allows leveraging of satellite connectivity knowledge and satellite capacity to connect even the remotest areas, enabling a real time exchange between medical teams and participants of governmental, institutional, scientific and humanitarian projects worldwide.

4.4.4 UN-ESCAP

An example of a regional partnership for disaster management and relief is the UN Economic and Social Commission for Asia Pacific (UN-ESCAP). The Information and Communications Technology and Disaster Risk Reduction Division (IDD) of the UN-ESCAP assists and supports UN-ESCAP members and associate members through collaborative efforts to better manage natural disasters and the associated socio-economic risks. The IDD works closely with these countries to promote the use of ICTs, including space technologies, so that they may benefit socially and economically. The IDD helps strengthen partnerships between the public and private sectors, as well as other stakeholders to ensure sustainability of programmes and activities which lead to socio-economic development.

4.4.5 NetHope

NetHope is an NGO bringing together the knowledge and power of 41 leading international humanitarian organizations. It can be seen as an ICT4D partnership that provides advice on ICT technology and practices in the developing world and works across its membership solving common technology problems, fostering strong relationships with private industry, and educating the members and the wider humanitarian community worldwide.

NetHope members operate in over 180 countries around the world. NetHope also operates four regional chapters in the following areas: East Africa, West Africa, Sri Lanka and India. NetHope Headquarters are located in McLean, Virginia.

Working with Cisco Systems and British satellite firm Inmarsat, NetHope developed the NetReliefKit, which is a solar powered wireless router that can connect users to the Internet via a satellite uplink. They were distributed for use with nonprofit organizations such as Save the Children, Catholic Relief Services, Oxfam, and Mercy Corps. The kits are meant to be used for relief agencies to coordinate their response efforts.

Connectivity was NetHope's first strategic focus in "wiring the global village" in 2001, and over ten years later it continues to be regarded as a hallmark initiative in helping those in the developing world. This strategic programme initially deployed very small aperture terminal (VSAT) systems to improve communications between organizations and their field offices in remote parts of the world, where infrastructure is limited or absent. Today, NetHope continues to install low-cost solutions in isolated areas by leveraging VSAT, long distance WiFi, optical fibre infrastructure, existing WiMAX systems and mobile networks — like 3G — to improve overall capacity and reduce costs for operations in isolated and rural areas.

NetHope is financed by membership fees based on annual expense level from the organization's most recent fiscal year[60], donations, and private sector (through their corporate social responsibility obligations).

4.4.6 Satellite African e-Health Validation (SAHEL)

An example of an ICT4D partnership, the SAHEL project was funded by the European Space Agency (ESA), the EC, and the Telemedicine Task Force (TTF). The primary partners in addition to the sponsors spanned the domains of private companies, academia, and local charities, and included EADS *Casa Espacio*, SES Astra, *Indra Sistemas*, the UNF3S – *Université Médicale Virtuelle Francophone*, *Le Kinkeliba* (Senegal) and Amref Health Africa (Kenya). This pilot project has been implemented at primary and secondary care centres in Senegal and Kenya, connecting them with reference centres in both countries: National Kenyatta Hospital in Nairobi (Kenya) and the African Telemedicine Centre in Dakar (Senegal).

Significant progress in healthcare has been made thanks to the project where patients in rural areas, most without significant financial resources, had no choice but to travel to major urban hospitals in order to see specialists or for emergencies. Thanks to the SAHEL platform and the satellite connection, doctors at rural centres and remote areas were able to request direct assistance from specialists at reference centres. In addition, the e-learning service provided training for medical staff at small and remote centres,

[60] Extract of the Nethope website www.nethope.org/

Candidate Organization Annual Expenses	NetHope Annual Membership Fees	One-time Initial Fee (50% of Annual Fee)
USD 75 million and above	USD 17 400	USD 8 700
Below USD 75 million	USD 8 700	USD 4 350
1-2 additional Alliance or Federation members	USD 5 800	USD 2 900

adding value to the healthcare offered in these regions. The results of the SAHEL project are enabling a qualitative step in the progressive adoption of telemedicine services in Sub-Saharan Africa. This is expected to translate into a new phase where satellite will play an important role, centred on analysing how to apply to the reality of this region the knowledge acquired and the conclusions obtained from the specific initiatives that have already been carried out.

4.4.7 Satellite Way for Education (SWAY4Edu)

Another example of ICT4D partnerships is the ESA-sponsored SWAY4Edu. One of the initiatives under the umbrella of this partnership aims at developing a satellite ICT solution for effective e-learning services to support education in rural schools in South Africa, dubbed "Space4education." SES is a key partner in the Space4education activities, working in collaboration with the "Rally to Read"/"Read Educational Trust" NGO to provide interactive training courses for local teachers leading to teaching certifications, sessions for intra-school collaboration, and light cyber café outside educational time.

Another initiative under the SWAY4Edu partnership is focused on electoral e-training. In collaboration with ECES (European Centre for Electoral Support) and EFEAC *(Ecole de Formation Electorale en Afrique Centrale*), the Electoral e-training activities aim at creating a core group of local accredited trainers and experts (named "Facilitators") in the Electoral Management Bodies (EMB) of the Community of Central African States (ECCAS) to support the electoral cycles. As a partner in this initiative, SES provided satellite broadband services for the parliamentary elections in Burkina Faso, which took place on 2 December 2012.

SES provided satellite equipment and bandwidth to enable connectivity between the 45 electoral district offices, and the central election office in the capital, Ouagadougou. The system was used for video conferencing, surveillance, Internet access and fast and secure communication of ballots. Satellite technology ensured connectivity for the remote sites in Burkina Faso and had the advantage of quick deployment and immediate coverage and availability. The deployed infrastructure will also be available after the electoral process to provide Internet access to schools, public offices and remote villages. Advantages of satellite technology include rapid, secure data collection, aggregation, transfer and verification; a stable, sustainable communication system between all the sites resulting in the improved security of the electoral process, plus the legacy of a top-tier communication system which can be reused or redeployed.

4.4.8 UN-SPIDER

In its Resolution 61/110 of 14 December 2006 the United Nations General Assembly agreed to establish the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) as a new United Nations programme, with the following mission statement: "Ensure that all countries and international and regional organizations have access to and develop the capacity to use all types of space-based information to support the full disaster management cycle.[61]"

Headquartered in Vienna and with offices in Germany, and China, the UN-SPIDER programme allows for more integrated and fluid communication throughout all phases of the disaster management cycle.[62] It is such an increase in communication that will contribute to disaster mitigation and a reduction in loss of

[61] Committee on the Peaceful Uses of Outer Space Scientific and Technical Subcommittee, Fiftieth session, United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER): proposed workplan for the biennium 2014-2014, Vienna, 11-12, February 2013, available at www.un-spider.org/sites/default/files/Workplan201415.pdf.

[62] Id.

life.[63] Additionally, the UN-SPIDER programme views the acquisition and sharing of knowledge as integral to its mission and has implemented a Knowledge Portal, a website which provides 24/7 access to both technical and general information as well as centralized content regarding space-based solutions to issues involving emergency response and disaster management.[64]

Whereas there have been a number of initiatives in recent years that have contributed to making space technologies available for humanitarian aid and emergency response, UN-SPIDER is the first to focus on the need to ensure access to and use of such solutions during all phases of the disaster management cycle, including the risk reduction phase, which will significantly contribute to a reduction in loss of lives and property.

The UN-SPIDER programme is achieving this by focusing on being a gateway to space information for disaster management support, by serving as a bridge to connect the disaster management, risk management and space communities, and by being a facilitator of capacity-building and institutional strengthening, in particular for developing countries. UN-SPIDER is being implemented as an open network of providers of space-based solutions to support disaster management activities.

Activities in 2012 have mainly consisted in the organization of trainings and workshops to inform on best practices in the area of space-based applications for emergency situations.

4.4.9 UNOSAT

UNOSAT is a technology-intensive programme delivering imagery analysis and satellite solutions to relief and development organizations within and outside the UN system to help make a difference in critical areas such as humanitarian relief, human security, strategic territorial and development planning. UNOSAT develops applied research solutions keeping in sight the needs of the beneficiaries at the end of the process.

UNOSAT's mission is to deliver integrated satellite-based solutions for human security, peace and socio-economic development, in keeping with the mandate given to UNITAR by the UN General Assembly since

1963. Its goal is to make satellite solutions and geographic information easily accessible to the UN family and to experts worldwide who work at reducing the impact of crises and disasters and help nations plan for sustainable development.

4.4.10 Mindset Networks

As a final example of a successful ICT4D initiative involving satellite operators as partners, we look at

Mindset Networks. Mindset Networks is a South Africa-based partnership whose mission is:

To function as a sustainable non-profit organization aimed at the personal, social, cultural and economic development of all people in Africa through the creation, sourcing and delivery on a mass scale of quality and contextually relevant educational material through appropriate media to:

- The primary and secondary educational community.
- The health community[65].

Intelsat is one of the eight founding partners of Mindset and contributes satellite capacity in support of the organization's mission. In all, there are over 30 partners, many from the private sector, but also including civil society organizations and government agencies.

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63 About UN-SPIDER, United Nations, last accessed 1 Jan 2014. www.un-spider.org/about-us/

64 UN-SPIDER Workplan, supra note 4 at 3, The workplan can be found at www.un-spider.org. Id.

65 www.mindset.co.za/about-us/our-vision

Mindset Network's success is partly the result of good governance and strategic partnerships – including partnerships with the public and private sectors. To this end, Mindset follows a corporate governance model which accommodates a Members' Council, Board of Directors, two Financial Review Committees and a Strategic Steering Committee.

Independent, eminent individuals drawn from the educational, socio/political and corporate community serve on the Members' Council and are selected to ensure the integrity of Mindset. The Members' Council functions as a custodian of the core values of the company ensuring strong corporate governance.

The Board of Directors, which comprises representatives of the founding partners, serves to oversee Mindset Network's efficiency in achieving its goals and objectives and to assist in the raising of donor and sponsorship funding. In addition the two Financial Review Committees and Strategic Steering Committee are mandated to oversee accounting and auditing matters as well as executive remuneration and issues of strategy.

4.5 Partnership best practices

The literature on partnership models in ICT4D and ICT4DM includes several survey-based studies that have resulted in the identification of best practices and keys to success in forming and managing partnerships. Several of these best practices are listed here. These can be seen as guiding principles when further work is undertaken on models for SSDM.

In 2005, UNESCO sponsored a study of ICT4D partnerships in the context of the Millennium Development Goals and the WSIS Declaration of Principles. The research was based on an in-depth assessment of a specific ICT4D partnership addressing education in Africa. One of the primary conclusions of the study was that the following seven key practical elements need to be in place for ICT4D partnerships to be successful[66]:

- The first and most important element of all is that partnerships must be based on trust.
- Second, it is important for all partnerships to have a clear focus. Partnerships must actually deliver clearly defined objectives and outputs if they are to be worthwhile, and a fine line needs to be drawn between the efforts involved in shaping partnerships and then utilizing those partnerships to produce an output that is worthwhile for marginalized communities.
- Third, all partnerships must have enthusiastic leaders, who will act as champions for their particular cause.
- Fourth, a frequently-ignored and fundamental element of partnership is the need to focus on sustainability from the very beginning of the design of any activities. Very few ICT4D initiatives across Africa have as yet shown themselves to be sustainable, and most rely heavily on the input of external resources to make them at all viable.
- Following the above, the fifth key element that needs to be in place for successful partnerships is a balance between demand and supply. This is not an easy objective to achieve, but evidence suggests that activities that are supply led, and that do not sufficiently take into consideration the real needs and aspirations of poor communities will rapidly fail.
- Sixth, it is important for partnerships to invest time in networking activities. While such activities are to some extent tied in with reinforcing trust, it is also important for partners to be kept regularly informed of partnership activities.

[66] Unwin, Tim, (2005) Partnerships in Development Practice: Evidence from multi-stakeholder ICT4D partnership practice in Africa, UNESCO Publications for the World Summit on the Information Society.

- Seventh, a final important practical issue is the need for transparency and a sound ethical basis upon which any partnership is formed.

Building upon these fundamental principles, the Commonwealth Telecommunications Organization has published keys to partnership success that, in addition to the above, recommend the following[67]:

- Partnerships that involve only the public and the private sectors (PPPs) are less likely to be successful than those that engage a wider diversity of organizations, and particularly civil society in multi-stakeholder partnerships (MSPs).
- Success of ICT4D partnerships is increased when detailed attention is paid to the local context and the involvement of the local community in partnership implementation.
- It is important for such partnerships to have clear and agreed intended development outcomes, even where constituent partners may themselves have different reasons for being involved in the partnership.
- A supportive wider ICT environment needs to be in place, both in terms of policy and infrastructure, if such partnerships are to flourish and deliver effective development outcomes.
- Engagement of all relevant stakeholders as early as possible in the initiative.
- Consistent monitoring and evaluation of the partnership and its intended outcomes. Again, this must be done from the beginning by ensuring a baseline study exists to enable impact and outcomes to be measured effectively.
- A clear and realistic resourcing framework, whereby each partner is explicit about the resources that they are willing to make available to the partnership, as well as their expectations of the benefits of being involved in the partnership. Mechanisms must also exist for the inclusion of additional partners at stages during the process where new needs are identified.
- A management office and/or partnership broker that will ensure the day-to-day and effective management and delivery of the partnership.

In addition to the above guidelines, which apply generally to all ICT4D partnerships, it is important in formulating a model for SSDM partnerships to specifically look at success factors seen in partnerships for ICT4DM. The following guidelines are extracted from work on this topic sponsored by the ITU: [68]

4.5.1 Enabling environment

An enabling regulatory and policy framework in place is important to ensure that the response to emergency and disaster events is not hindered and is facilitated to the fullest extent.

4.5.2 Multi-stakeholder response

In the event of a disaster, government, private sector, NGOs, citizens must all come together to support and help in responding to a disaster and emergency situation. All stakeholders need to engage in the development of a national disaster telecommunication plan through development of appropriate public private partnerships.

[67] www.cto.int/research-and-consultancy/multi-stakeholder-partnerships-for-ict4d/

[68] Draft Report on Question 22-1/2 (Utilization of telecommunications/ICTs for disaster preparedness, mitigation and response), Document 2/275(Rev.1)-E, Fourth Meeting of ITU-D Study Group 2, Geneva, 16-20 September 2013.

4.5.3 Preparedness / pre-deployment

Advance planning is critical for saving lives. It is important to note that connectivity plays a role in almost every area of disaster response management. The pre-positioning and pre-deployment of the equipment, planning for excess capacity requirements as well as focusing of additional power over the affected areas, training of personnel: all are best implemented when planned in advance.

4.5.4 Satellite connectivity

Satellites play an important role in supporting disaster response and relief efforts, given their ubiquitous coverage, and mobile, easy-to-use and transportable applications that can be used and deployed quickly anywhere. Many countries include satellite communications systems as a component of national disaster telecommunication plans. Satellite connectivity can become an issue; however, as the demand for certain coverages and connectivity will be extremely high when countries are hit by disasters. Therefore, upfront buying of satellite capacity is necessary and desirable to ensure that a minimum demand is satisfied quickly in a time of crisis.

4.5.5 National and regional emergency communications plans and systems

An effective national plan in place can greatly support, facilitate and improve response efforts in the case of a disaster. Because disasters can affect multiple countries, regional collaboration also is critical. Regional collaboration also helps if the affected country is not a position to support the disaster relief activities on its own.

4.5.6 Interoperability

The interconnection and interoperability between divergent systems and organizations is an essential element during the disaster management and relief activities.

4.6 Business models for partnerships

This section presents several perspectives on models for partnerships. It then goes on to explore the interests of the various stakeholders in partnerships, drilling down more specifically into the interests of private sector partners in the satellite domain and non-profit civil society partners in order to understand the business models for motivating partnership participation in these two stakeholder groups.

4.6.1 Partnership models

Partnerships for development and disaster management can build the flexibility of countries and communities through use of varied business arrangements and corporate social responsibility to support communities, local and national governments as well as international organizations in saving lives and livelihoods. The involvement of the private sector in disaster management activities and operations helps in mobilizing resources under joint actions, sustainability/corporate social responsibility as well as knowledge transfer.

There are different kinds of partnership models that are contemplated as well as implemented for activities related to disaster management and disaster relief between the different partners and humanitarian actors. There are arrangements in place between international donor agencies and the satellite industry (consisting of satellite operators and their service distributors and partners), between the international and national NGOs and the satellite industry at different levels and steps, between the regional organizations such as European Union, African Union, APEC, etc. and international donor agencies, etc.

Under these partnership models involving the private sector and particularly the satellite industry, different kinds of business, commercial and operational arrangements are practiced and put in place to support disaster management and relief such as availability of additional satellite capacity and resources in the affected area/region, availability of satellite end-user/ground terminals, technical support and

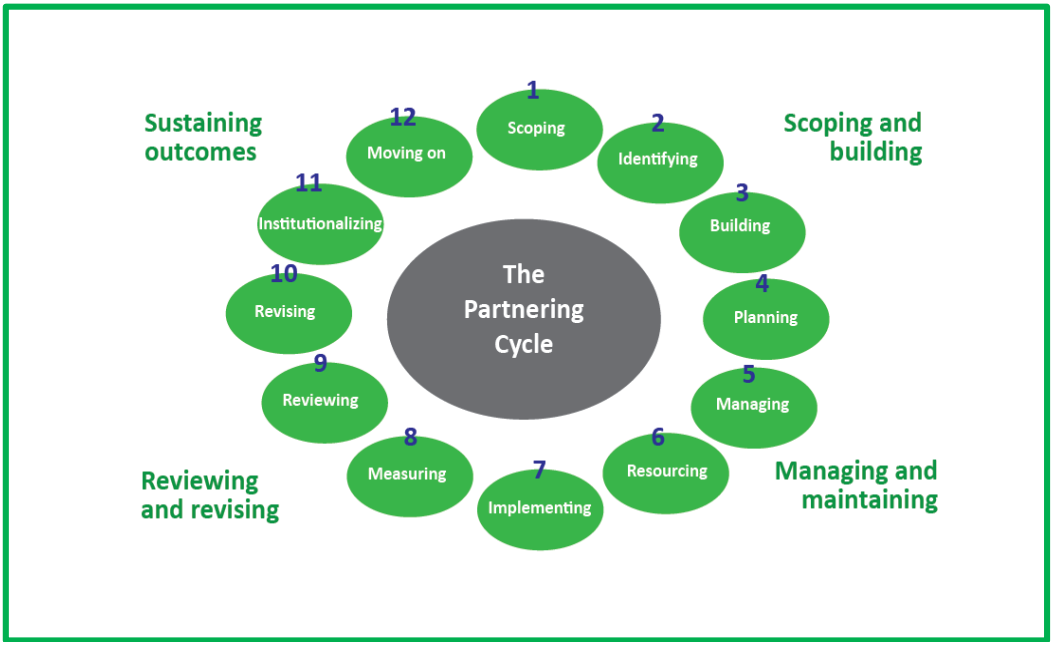
certified technical manpower, increased and focused satellite power over the affected region, customized solutions and applications developed specifically for the disaster management, etc.

When assessing the effectiveness of a partnership model, it is important to make a distinction between focusing on the success and sustainability of the partnership itself versus the success and sustainability of the desired development outcomes. Both perspectives are important, as it is not possible to achieve a partnership's mission without an organizational and governance model that allows the partnership to function successfully. However, to achieve sustainable outcomes requires that missions and objectives be selected carefully and with a full understanding of the local context needed to achieve sustainability. The selection of desired outcomes is often driven by the partners themselves, which may run the risk, especially with private sector funding, of being more focused on business outcomes. There has been a history of well-funded "pilot" projects focused on proving the feasibility and effectiveness of deploying a particular technology in a given region, but often there is no consideration as to how the local community of governments and civil society organizations will be able to fund a scalable expansion of the technology.[69]

One of the classic models that has been used fairly extensively for training in the creation and maintenance of partnerships is that which has been developed by The Partnering Initiative (Figure 1).[70]

This model emphasizes a cyclical approach to achieving development outcomes, where the end of the cycle feeds back into a re-scoping activity that supports the sustainability of the partnership itself.

Figure 1 – The Partnering Initiative's Partnering Cycle (Source: The Partnering Initiative)



As part of a 2005 analysis of an ICT4D partnership for education in Africa, Tim Unwin, Secretary-General of the Commonwealth Telecommunications Organization (CTO) developed a broader framework for designing partnerships that addresses specific roles, contributions, and benefits in multi-stakeholder ICT4D partnerships.

[69] Geldof, M.,Grimshaw, D.J., Kleine, D., and Unwin, T.,(2011) "What are the key lessons of ICT4D partnerships for poverty reduction? London, UK: Department for International Development.

[70] http://thepartneringinitiative.org/

This framework, tailored for ICT4D partnerships in education, is shown in Annex 5 of this report, and has the potential to be a valid starting point for developing partnership model recommendations for SSDM.

4.6.2 Stakeholder interests

Stakeholder interests are critical to the success of any partnership. The following list captures some of the key influencing factors that motivate entities to participate in partnerships, characterized by the three primary classes of stakeholders: private sector, governments, and civil society organizations.[71]

Private partners:

- Global reputation.
- Market penetration.
- Profit.
- Operational cost saving.
- Risk management.
- Access to finance.
- Influencing policy making.
- Access to civil society's knowledge about and closeness to the poor.
- Corporate social responsibility/philanthropy.

Governments (local and national):

- Creating greater efficiency in allocation of scarce resources.
- Faster delivery of commitment to public service improvements in different sectors.
- Association with alleged efficiency of the private sector.
- Access to technical expertise of the private sector.
- Leveraging finance from private sector.

Civil society:

- Shifting from an advocacy role to one of more direct influence.
- Leveraging new resources.
- Faster way to deliver on organization's strategic objectives.
- Access to technical expertise of the private sector Influencing policy-making.

The remainder of this section drills down into more detail on the private sector and civil society motivators for partnership participation, with a focus on the satellite industry.

4.6.3 Incentives for commercial enterprises

Participation in partnerships for development and/or disaster management essentially provides the opportunity for the satellite industry to take the leadership in promoting social contributions, ethical business practices and driving corporate social responsibility to enhance consumer confidence.

[71] Hansen, H. K. (2004) "Shaping Global Governance: knowledge management, modernization by technology and multi-stakeholder partnerships". Paper presented at the International Studies Association Annual Convention.

Commercial enterprises, whether privately held or public, are responsible for creating value for their owners. Public companies have boards of directors with a fiduciary responsibility to ensure that the company creates value for its shareholders. While privately held concerns may have more flexibility in decision-making, depending upon their ownership structure, there is still a focus on bottom-line financials and value creation via growth and improved profitability.

In order to participate in public-private partnerships in support of humanitarian objectives, corporate managers must be able to present a compelling business case that focuses on the benefits to be achieved and how these support the company's vision and mission, in addition to driving improvements in the financial metrics.

Commercial enterprises can partner with governments or non-profits via either cash or in-kind contributions, or a combination of both. In-kind contributions have the greatest potential for mutual benefit, but are limited to domains in which the products and services of the commercial enterprise are well-suited to the needs of the partner humanitarian entity. For example, companies specializing in logistics services are well-suited to provide in-kind contributions to emergency relief organizations. In the case of satellite operators, their knowledge, technical expertise, and network assets (primarily satellite capacity) are a strong match for ICT4D and ICT4DM partnerships.

However, the realities of the satellite industry are that inventories of satellite capacity are finite and limited with long lead times for introducing more supply, and that filling that capacity to the greatest extent possible with paying commercial customers is the key focus in generating top-line revenues. The concept of allocating "spare" capacity to humanitarian initiatives is therefore somewhat elusive, as in order to succeed, satellite operators need to minimize the amount of capacity sitting idle in their fleet at any given time. That said, there is generally always capacity, whether unused or pre-emptible, that can quickly be made available in response to disaster relief initiatives. The capacity thus allocated is generally diverted for a limited period of time, until local networks are restored. While this model works for ICT4DM partnerships, it is not as feasible for ICT4D partnerships, where the need for the capacity is longer term.

Similarly, the technical resources at satellite operators tend to be "right-sized" to support the volume of commercial business at hand while at the same time minimizing costs in order to maximize profitability. In other words, there are not engineers idly waiting to be mobilized during a disaster, nor available to spend a significant time focusing on the implementation of rural networks where the return on investment is minimal.

And finally, while satellite operators offer solutions to their customers that include ground-based network infrastructure, such as remote terminals and connectivity via teleports and hubs, keeping such infrastructure in "stand-by" mode for rapid deployment in an ICT4DM scenario is not cost-effective. Although the satellite operator may own a teleport facility, they are not in the business of manufacturing ground-based network components and must purchase this equipment from third parties, which limits the feasibility of their being able to contribute this type of equipment to humanitarian partnerships.

So what then, could be the motivators for satellite operators in partnering with humanitarian organizations to support ICT4D and ICT4DM objectives?

According to a report by The Conference Board[72], there are five main elements of a business case for humanitarian partnerships. Some of these are more bottom-line focused, while others reflect more intangible benefits.

- Enhancing a company's external reputation.

[72] The Conference Board (2008) Corporate Responses to Humanitarian Disasters: The Mutual Benefits of Private-Humanitarian Cooperation, Research Report R-1415-08-WG

- Uniting employees around a common cause.
- Increasing sales and customer loyalty.
- Identifying possible business opportunities in areas that would otherwise be hard to access.
- Encouraging growth and investment.

In terms of ***enhancing a company's external reputation***, there is a significant amount of "free" publicity that derives from being a visible partner in a high-profile disaster relief operation. There has also been a strong trend in recent years for companies to take a serious approach to the concept of Corporate Social Responsibility (CSR). CSR has become a recognized component of a company's value, and partnering to provide telecommunication services for development and disaster management in the developing world shows a solid commitment to CSR. This type of focus can contribute directly to shareholder perception of value through standardized scoring via mechanisms such as the Dow Jones Sustainability Index (DJSI).

The CSR factor also comes into play in ***uniting employees around a common cause***. Many companies are able to attract and retain top talent by promoting vision and mission statements that attempt to align and motivate their employees around meaningful contributions to making the world a better place. Leveraging commercial products, such as satellite network solutions, in support of concrete initiatives to improve people's lives can be a strong motivator and strengthen the message of the common cause. In addition, employees may have the opportunity to expand their skill sets by learning from their participation in humanitarian initiatives. Some companies have attributed improved scores on employee satisfaction surveys at least in part to their participation in humanitarian partnerships. In addition, the companies themselves can benefit by learning from the strengths of the humanitarian partner organizations in areas such as being agile and adaptable in difficult circumstances.

Although there are many factors that go into a customer's buying decisions, a commitment to CSR can, for some customers, be a discriminator in selecting with whom they want to do business. Thus, humanitarian partnerships can directly contribute to ***increasing sales and customer loyalty***. This can be particularly true for companies, such as satellite providers, who serve commercial customers located or doing business in the developing portions of the world where humanitarian initiatives are being deployed. In some instances, providing support for disaster management or development initiatives can allow companies to ***identify possible business opportunities in areas that would otherwise be hard to access***. Establishing a brand presence via participation in relief or development efforts can be a way to get a foot in the door in markets that are underserved or dominated by competitors.

Finally, humanitarian partnerships in the areas of ICT4D have the potential to ***encourage growth and investment*** in areas benefiting from the initiatives. Successful deployment of ICTs in a sustainable model can stimulate economic growth that is mutually beneficial to infrastructure providers, such as satellite operators, as well as their customers in the region. As economic growth takes hold, the communities being served can attract outside investment to seed continued growth, again allowing the market for satellite operators and their customers in the region to grow. In addition, by "getting in on the ground floor" in providing network infrastructure in rural markets, operators can create both technological and reputational "stickiness" that will ensure that as the markets grow, they become the provider of choice for expanded services. With respect to ICT4DM, if married to ICT4D initiatives that can enhance disaster preparedness and thereby accelerate the recovery process, humanitarian partnerships can have the further benefit of creating resilience in these markets.

These five business case motivators for commercial partners, although very real in their potential, are also very difficult to quantify when a company is making near-term decisions on deployment of resources and is trying to ensure that targets for revenues and profitability are attained. Coming back to some of the challenges outlined earlier, striking this balance between the need to achieve near-term results and making the investment in a humanitarian partnership whose benefits are longer term and less tangible can be enabled by leveraging partnership characteristics and funding elements that help "bridge the gap".

For example, a satellite operator may not be able to provide "free" capacity for a multi-year development initiative, but may be willing to offer it for a discount or on a progressive charge basis that may start out as a no-charge contribution, but for which the fee increases according to a fixed schedule or as project

milestones are achieved. Similarly, in disaster relief efforts, in order to avoid the scramble to identify capacity "after the fact" and the logistics of allocating it to the situation, if the initiative is structured so that the operator is compensated for keeping a dedicated pool of capacity available, even if the compensation is not at market value, that will allow the operator to provide support without having to sacrifice near-term objectives. This is the model in place for Emergency.lu, where dedicated capacity is allocated and paid for by the funding partner – in this case the Luxembourg government.

In addition, as noted earlier, it may not be feasible for the satellite provider to contribute third party ground equipment to an ICT4D or ICT4DM initiative. Thus, a partnership model would need to include as a partner an equipment manufacturer with the ability to contribute remote terminals, uplink/downlink chains, hubs, etc. And depending on the resources of the satellite provider, the partnership may also need to include a teleport operator in order to provide connectivity to terrestrial networks. Here again, the model for Emergency.lu addresses that need by including a telecommunication equipment manufacturer as a contributing member of the partnership.

4.7 Incentives for non-commercial partners

Non-profit enterprises (NPEs) have different goals than a privately held or public commercial enterprise. Typically, NPEs focus on a mandate which outlines its objectives and goals. Public NPEs normally have a wide group of stakeholders and may raise funds from a variety of sources, but the majority of their funding comes from government. Private NPEs also have a wide group of stakeholders but have a narrower scope of funding. If a government is an organization's primary funder and stakeholder then it may have oversight on the NPE in terms of the right of approval of directors nominated to the board or potential review if there is a failure in governance, management or both. On the other hand, a private NPE would not have such limitations. While government can impose some limits on the autonomy of public NPEs, the goals and objective of both public and private NPEs are typically very similar.

In recent years, both commercial entities and NPEs have focused on effective governance. As governance practices have evolved, stakeholders' expectations have grown and now extend to all organizations with public accountability including NPEs. Many NPEs both in the public and private space move beyond basic compliance with regulatory requirements and have adopted governance best practices borrowed from commercial companies as well as those generated by demand from the public and the NPE community.

NPEs play an important role in society and are providing a wide range of services in areas such as health, humanitarian aid, education and social support. All NPEs, both private and public face numerous critical challenges in responding to the growing expectations of their stakeholders, especially as the operating environment grows increasingly complex. Governance deficiencies can damage an NPE's reputation, detract from its fundraising ability and hamper the ability to meet objectives. For a public NPE, lack of governance can lead to government intervention. The objective of good governance is to ensure the organization is able to put forth its best efforts to implement strategies and make the best use of resources.

NPEs are also encouraged to have a formal mandate. The purpose of the mandate is to ensure that no expectation gaps exist between the board, management and other stakeholders with respect to the NPE's role. Most NPEs publish their mandate so it is available to all stakeholders and members of the public. The mandate is a critical component of governance.

The increased focus on governance requires NPEs to carefully weigh any public/private partnerships in support of humanitarian objectives. Such partnerships must meet the requirements of the organization's mandate and acceptance from stakeholders.

Other challenges for NPEs have been identified in a recent report by Deloitte[73]:

- Traditional financial measures and ratios are not always applicable to NPEs that need to measure performance in terms of donations, memberships, grants, total expenses and a variety of non-financial measures.
- NPEs need to explain their performance to stakeholders beyond pure financial results. Integrated reporting is part of the solution.
- Integrated reporting is designed to collate all the relevant data about an organization's strategy, risks and opportunities, risk management, environmental and societal impacts, as well as its financial data and results. Partnerships with others need to be included in such reporting.
- Organizations should present this information in a report that is transparent, on long-term value creation as well as short-term contribution to wellness, and explain how all these elements form a coherent whole.

Partnering with a commercial entity or an NGO can have many benefits for an NPE, but an NPE must carefully consider its mandate and stakeholders and how it conveys such benefits. Proper reporting of any partnership with a commercial entity is critical for an NPE. Partnering with commercial enterprises has to be carefully weighed by the NPE and consideration given to what benefits might arise from such association.

NPEs can certainly bring much benefit to a partnership. Many NPEs focusing on humanitarian assistance can offer significant expertise and "on the ground knowledge" within such partnership. As such, given the expertise of the NPEs, they are an appropriate partner for ICT4D and ICT4DM.

Commercial enterprises may have immediate difficulty in allocating capacity and equipment during the first few hours of a humanitarian disaster. In that case, NPEs can often provide direct assistance given that their networks are already in place and that they have people "on the ground" to immediately respond to any disaster. They can conveniently fill the "gap" until a commercial solution can be developed and put into play. In this manner, a partnership between a commercial organization and an NPE can be of mutual benefit.

The motivators then for NPEs partnering with commercial enterprises to support ICT4D and ICT4DM objectives are many. These could include:

- Enhancing the NPE's reputation to other international organizations and in the commercial world.
- In the case of private and public NPEs, partnering with a commercial enterprise could result in further avenues for funding.
- Allowing the NPE to return to doing what it is best suited to doing in the immediate hours after a humanitarian disaster, knowing that a commercial enterprise has stepped in to provide longer term assistance.
- Partnering with commercial entities does not place an undue financial burden on NPEs often scarce resources.

The key for most NPEs is that partnering with a commercial enterprise can only assist in enhancing its reputation. Commercial enterprises can often provide more financial support and manpower than an NPE can offer. A joint response to humanitarian disaster by an NPE and a commercial enterprise will often result in a better answer to a humanitarian crisis and as such enhance the reputation of the NPE to international organizations within the ICT4D partnership and to the outside world. NPE stakeholders will

[73] Deloitte (2013) The Effective Not-For-Profit Board

be attracted to this enhanced reputation as it will allow the organization seek further funding from government or other private sources.

Partnering with a commercial enterprise can also assist an NPE in training both the employees of a commercial enterprise with their "on the ground knowledge" and to accept training from a commercial operator who may have more expertise that the NPE employee.

Finally, as indicated, an NPE immediately responding to an imminent humanitarian disaster can devote all of its resources to the problem knowing that a commercial enterprise is available to step in to assist for the longer term. For example, amateur radio operators are well suited to respond in times of crisis. They are already "on the ground", have their own equipment and networks and can operate independently of commercial sources. They can provide short term immediate communication relief until such time as a commercial enterprise, such as a satellite operator, can place appropriate longer term communications equipment.

An ICT4D partnership can then address the challenges to its deployment of ICT during times of humanitarian relief. In many cases, the work of an NPE is only practical for a short term and at some point it must rely on a commercial entity for support and for long term sustained assistance. Many ICT4D challenges are complex and require the alignment of a number of resources across both the commercial and non-profit sector. Any multi-stakeholder partnership will only work best when it is in the interest of each party to seek solutions that will satisfy the interest of others in the partnership. The use of commercial and NPEs in ICT4D partnerships are ideal to respond to the need for communications during times of humanitarian relief.

4.8 Survey of potential financing mechanisms

This section aims at reviewing the potential financing mechanisms that could be deployed to guarantee access to essential telecommunications before, during and after disasters and to allow each country to have a prepared disaster management plan in place which allocates sufficient budgets to establish preparedness and recovery in due time. The objective is to give all the population access to alert systems early enough to minimize loss of life and damage – for example by removing people and property from a threatened location and by facilitating timely and effective rescue, relief and rehabilitation. Preparedness is the main way of reducing the impact of disasters. Community-based preparedness and management should be a high priority. A programme aiming at connecting all people to alert systems even in the most remote areas ahead of disasters, could not only allow for rapid alert, way in advance of disasters, to save populations but also serve other objectives of development such as access to e-education and e-health in between disasters. Both objectives could then be possibly combined.

4.8.1 Regulatory

One of the financial mechanisms pointed by ITU for funding SSDM is the **Universal Access Funding Mechanism** which might form a way to achieve the objective of connecting all people to disaster relief systems.

Universal access has been adopted as a policy goal within many developing countries. The underlying concept of Universal Access is to provide availability to telecommunications services at affordable prices to the greatest possible percentage of a population.[74] Achieving universal access stimulates the service industry and results in the expansion of businesses, an overall growth in consumption, distribution, and employment, and visibly contributes to a nation's overall well-being.[75]

[74] ICT Regulation Toolkit, Universal Access: An Overview, International Telecommunication Union, 4, Accessed: 22 January, 2014.

[75] Id.

Universal access is supported by three primary principles: availability,[76] affordability,[77] and accessibility.[78]

Although there are several methods of achieving these goals, the universal access fund has been adopted widely as a mechanism to finance, support, and serves as an incentive for the provision of services to regions traditionally regarded as unattractive to private telecommunication providers.[79]

Universal access funds that are financed through operator levies such as in the case of Peru are relatively easy to administer and attractive to developing countries as they do not require contributions from governments that may have limited resources.[80] For this reason, levies on operators are often the main source of funding for the universal access funds of most developing countries.[81]

Despite penetration rates for mobile voice, universal access has not yet been achieved in many countries where rural and high cost areas remain underserved. While the "mobile miracle" went a long way to addressing the availability and accessibility of voice telephony, mobile alone is unlikely to be a sustainable solution for rural broadband access. The advent of satellite broadband technology for developed and developing countries are likely to deliver more efficient voice and data solutions. Lack of private sector funding available to implement broadband rollouts to all in rural areas threatens to perpetuate the divide, and may necessitate consideration of the use of public funds for facilitating universal access to broadband connectivity and hence to early disaster alerts.

According to the ITU, universal service (US) means that every household or individual in a country has the opportunity for telephone service. Universal access (UA) means that everyone in a community can gain access to a publicly available telephone, although not necessarily in their homes. Historically inclusion related to basic voice (including access to emergency services and access for people with disabilities); today it is increasingly being re-conceptualized to include broadband.

Broadband services have proven already to be an important engine for economic and social development which can contribute to countries realizing their full economic potential. As a result, connecting all citizens should remain a high priority of the international community, national regulators and financial institutions. Satellite services offer many advantages as compared to cable and other wireline infrastructure to fulfill the needs of the developing nations and their citizens. Broadband services delivered via satellite are a critical catalyst to overcoming traditional impediments in expanding service to the developing world and to accelerating the growth of residential and community emergency services combined with Internet access, business-to-business communications, and business-to-consumer services.

ITU defines USFs as follows: "USFs are typically funded via some form of contribution mechanism from telecommunication service providers/operators. In the majority of cases, the operator contributions are in the form of a levy based on a percentage of annual operating revenues. In some countries, the USF fee is not a separate fee, but rather, a portion of an overall annual regulatory fee. The portion of the annual regulatory fee that is apportioned to the USF is sometimes fixed, but in other cases, the USF fee may be

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76 Expressing the fact that service should be provided without geographical discrimination; id.

77 The price of telecommunications services should not be a limiting factor to access; id.

78 Those receiving telecommunications services should be treated in a non-discriminatory manner with regard to service quality and pricing; id.

79 Regulatory and Market Environment, Universal Service Fund and Digital Inclusion for All, Report, September 2013, Telecommunication Development Sector, at 118-119, available at www.itu.int/en/ITU-D/Regulatory-Market/Documents/USF_final-en.pdf

80 Establishment of Harmonized Policies for the ICT Market in the ACP, SADC Toolkit on Universal Access Funding and Universal Service Fund Implementation , Harmonization of ICT Policies in Sub-Sahara Africa (HIPSSA), ITU 2011, at 53, available at www.itu.int/ITU-D/projects/ITU_EC_ACP/hipssa/Activities/SA/CRASA/Toolkit%20Final%20Report.pdf, hereinafter SADC Toolkit.

81 Id.

subject to annual review and calculation. In addition to operator levies, there are frequently other sources of funds including, but not limited to, licensing fees, full or partial proceeds from spectrum auctions, direct contributions from government budgets, contributions from international agencies such as the World Bank, regional development banks, etc."[82]

Today many USFs remain inefficient and arguably ineffective with more than USD 11 billion[83] reportedly waiting to be disbursed. Very few funds appear to disburse everything they collect. This is a lost opportunity for countries to stimulate economic growth. These unused funds could be reinvested in the economy if directed towards increasing access to telecommunication services in rural areas for early warning disaster alerts.

In addition, ITU recommends that a certain amount of work should be carried out to allow these funds to be properly used, among others the underlying regulatory and legal frameworks which in most countries appear not to have been analysed thoroughly (e.g., not technology-neutral or service-flexible, excessively bureaucratic, insufficient oversight, non-transparent processes). The poorly-conceived regulatory frameworks of the USFs can also pose an obstacle to the introduction of the most cost efficient commercial and viable solutions.

Some countries seem to have been successfully deploying USFs fund in rural areas. The cases of Rwanda and Peru will be further reviewed as examples as we try to understand whether the models can be replicated and or really used to accelerate the deployment of solutions for sustainable development and disaster relief in uncovered areas.

4.8.2 The case of Rwanda

The Government of Rwanda (GoR) decided to promote and implement the concept of Universal Access (UA) in the ICT sector since the implementation in 2011 of a law which determines the functioning of the Universal Access Fund (UAF) and the public operator's contribution. The fund is financed by contributions from licensed operators who contribute 2% of their annual turnover net of interconnection payments from all operators. The Regulatory Board has the mandate to manage this fund in a way that favours the spread and take-up of ICTs in designated remote and under-served areas of the country. The ITU notes [84] that the following projects were underway in Rwanda by the end of 2009 namely: 1) Rural Telephony Project; 2) Low prices for Internet connectivity and public access to Internet; 3) One Laptop per Child Program. Rwanda established a competitive bidding process based on the least subsidy requested from qualified bidders (operators and ISPs). Funds have also been allocated through the Ministry of Education (to PC providers for the One Laptop per Child Program).

As some projects require very important investments, the Government of Rwanda (GoR) has also contributed towards making accessible the broadband connectivity in rural areas by subsidizing the layout of optical fibre backbone networks up to district level. The Fund has received numerous grants from international donors, mainly the World Bank. Their contributions formed 68% of the total funding by the end of 2009. The Rwanda Development Board has installed 2 500 km of fibre[85] and the network has been operational since the end of 2010, providing broadband connectivity to institutions in remote and underserved areas.

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82 ITU (2013) Universal service fund and digital inclusion for all (USF Study).

83 GSMA (2013) Survey of Universal Service Funds: Key Findings

84 USF Study p. 55.

85 The Rwanda Development Board was set up by bringing together all the government agencies responsible for the entire investor experience under one roof. This includes key agencies responsible for business registration, investment promotion, environmental clearances, privatization and specialist agencies which support the priority sectors of ICT and tourism as well as SMEs and human capacity development in the private sector.

The Millennium Development Goals (MDG) on data penetration has set the 2015 deadline to have all villages (Imidugudu) connected to broadband services. To achieve the MDGs goals, more broadband infrastructure had to be deployed in Rwanda. The quickest way to implement broadband to meet MDGs has been to use wireless technology (a mix of Wimax and VSATs) as a last mile solution to connect villages and homes.

The Universal Access Fund has been used mainly to connect institutions in rural and remote areas. By June 2012, all districts in rural areas, immigration services at the border posts, national police, some high schools, and all telecenters switched from VSATs to fibre whereby out of 180 Sites subsidized by universal access, 112 sites have already been switched to optical fibre. However, the majority of people located in rural areas do not have yet access to broadband in Rwanda. This still needs to be deployed.

Rwanda Utilities Regulatory Authority (RURA), in collaboration with other concerned institutions, is implementing a considerable number of projects using the Universal Access Fund. Those include among others the use of VSATs to:

- Support ICT literacy in rural areas by providing financial assistance to e-ICT in establishing e-learning (connectivity of secondary schools in remote and rural areas) and e-service centers in rural areas as a way of providing access to affordable ICT services to rural communities.
- Subsidize bandwidth acquisition to the rural communities where fibre is not yet operational to ensure affordable access to Internet services and wider penetration of ICT services in rural area for private and public institutions.
- Support people with disabilities to provide equal opportunity and access to ICTs.
- Subsidize connectivity to 45 sites for the police in rural and remote areas.
- Connect some of the private institutions and local businesses operating in rural and remote areas.

Recent planned digital inclusion projects include connecting all universities using the RWEDNET (Rwanda Education Network), as well as technical secondary schools and colleges, and orphanages.

At this stage there is no financial reporting available to understand either how the money flowed from the USFs to the selected partners or how the technology was selected. Also, the evaluation of the least subsidy proposed by potential bidders has been done according to various unknown technical criteria. One can question the choice of fibre for rural areas. Although it is undeniably a very attractive technology in terms of bandwidth capacity, it needs to be demonstrated that it is the speediest and most cost-efficient one for an efficient and rapid connection of rural areas. Disaster relief is by all means linked to flexibility and rapidity to deploy – satellite telecommunications could undeniably be an essential piece of the solution being pursued.

4.8.3 The case of Peru

Peru has experienced tremendous growth as a result of its telecommunication reform [86] and has seen a substantial expansion in its telecommunication services.[87] For example, the number of telephone lines in service increased by over 270 per cent between December of 1990 and June of 2000[88], and its teledensity has grown from 2.6 in 1990 to 12 as of 2012.[89] Moreover, Peru has seen development in the lower strata of its socioeconomic composition which indicates that the efforts to bring greater access to Peru's rural and low income areas has been successful and is continuing to improve.[90] The structure of Peru's Universal Access Fund provides an excellent framework from which other nations can draw when striving to achieve their own Universal Access goals. The following sections provide a general overview of the structure of Peru's Universal Access Fund.

Peru's *Fondo de Inversión en Telecomunicaciones* (FITEL) was created in 1993 and until recently administered by OSIPTEL, the national regulator. However, FITEL, which is legally separate from OSIPTEL and has its own manager and personnel, reports directly to the Ministry of Transportation and Communications since 2008.

FITEL is an agency established to promote the universal access of telecommunications to low-income, rural regions of Peru by providing subsidies for private telecommunication companies. It achieves this goal through the creation of various pilot projects that seek to bring about connectivity by first providing basic access to public telecommunication services and then working to promote and increasing teledensity availability.[91]

Peru officials that utilize levies for universal access funding made the intelligent decision to revisit the funding structure periodically to ensure that it remains in balance with the country's changing and evolving universal access requirements.[92] Maintaining the same levy for prolonged periods without revisiting it may result in a system that does not meet the countries market realities and policy requirements.[93]

FITEL is financed by imposing a 1 per cent levy of gross operating revenues on all telecommunication providers.[94]

FITEL awards the implementation of telecommunication projects to the private sector through a public and competitive tendering process for all projects where the financing amount is above USD 1 million. As is the case with many universal access and service funds (UASFs), FITEL awards its projects to the bidder that requests the least amount of subsidy. In addition, the bidder must pass eligibility criteria and meet certain technical, legal and financial requirements.

However, FITEL is allowed to use a combination or other selection criteria as required. If the winning bidder is a new entrant to the Peruvian telecom sector, it must obtain a license with the MTC. The license

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86 Supra, note 8.

87 Bernstein, Jeffrey, Information Technology in Peru, Liberalization and Deregulation, last accessed Jan. 23, 2014, www.jsbernstein.com/initeb/liberalization.html

88 Id.

89 CIA World Fact book, Supra note 11.

90 Peru Ministry of Transportation, Communication, Housing and Construction. Fixed Line Telephone Service. www.mtc.gob.pe/Comunicaciones/uect/telefonia_fija.htm, accessed Jan. 22, 2014.

91 Alberto, Supra note 20 at 18.

92 Id.

93 Id.

94 Regulatory Market Environment, Supra note 28 at 109; Peru: Experience of the FITEL payphone Programme, ICT Regulation Toolkit, last accessed Jan. 24, 2014. www.ictregulationtoolkit.org/en/toolkit/notes/practicenote/3143

is non-exclusive and granted for a 20 year period in which the operator has the obligation to provide public payphone services.

FITEL is allowed to fund projects directly if they are pilot projects and do not exceed USD 75 000 for training, process and similar services, and no more than USD 220 000 for goods, equipment and infrastructure.

The country is divided into six tendering regions. Four separate rounds of USF tenders were conducted between 1998 and 2004 and served:

- 213 localities in FITEL I;
- 2 170 localities in FITEL II;
- 2 520 localities in FITEL III; and
- 1 614 localities in FITEL IV.

By way of example, the FITEL II programme was inspired by the *cabinas publicas* and included the provision of 500 public Internet access points in rural areas. It is an example of a competitively tendered telecenter initiatives being undertaken in rural areas of Peru, combining rural broadband services with rural satellite connectivity. *Cabinas públicas* are considered the Peruvian model of access to ICTs, a viable model for universal access in developing countries. The Peruvian model is evidence of the high demand for ICT connectivity coming from low-income groups, particularly in cities. However, there is still considerable territory to cover in the more remote, rural areas of the country.

The FITEL experience provides a perfect example of a successful USF implementation because it took into account the importance of designing projects and key regulatory conditions, especially tariffs and interconnection, as prerequisites for success. Due to the fact that Peru is a mountainous country, most of the projects have been implemented using VSAT technology.

4.8.4 Final remarks on USFs

ITU stresses that "In order to 'future proof' USFs to the greatest practical extent, the underlying legal and regulatory frameworks must be structured so as to ensure that policies and parameters can be modified quickly and effectively to accommodate the need for a new USF vision and respond to rapidly changing and evolving priorities."[95]

Based on their general performance to date, USFs do not appear to be the most appropriate mechanism to achieve universal service and further social and economic development. It would be beneficial for governments to consider whether USFs are appropriate and relevant, or whether alternative policy instruments may deliver better results. The private sector and the public sectors could consider other financial instruments such as PPPs, large deployment projects or voluntary country-by-country yearly insurance fees guaranteeing access to sufficient "always on" satellite capacity and allowing to deliver fundamental broadband services to all including in rural areas.

Because of the specificities of the satellite (full coverage of the territory, asymmetrical connectivity, lower transmission bandwidth) universal service funds have rarely benefited satellite services. In order for this to happen, substantial work must be done together with regulators to promote the ideals of expanded access to services, competition and lower prices, technology innovations, efficient use of public resources, fairness, consistency, timeliness and transparency all within the satellite telecommunication market. Moreover we do not believe that requiring that countries' dominant telecommunication providers subsidize the cost of broadband services primarily by charging higher rates for long distance and international telephone services is still relevant today. Such a system of cross subsidies between different

[95] USF Study,p.120.

services appears to be inefficient from an economic perspective and is difficult (or impossible) to sustain following a conversion to a competitive market.

4.8.5 United Nations (UN)

The United Nations (UN) has long been committed to providing support and assistance to the victims of natural disasters and since the passing of Resolutions 2013 (in 1965)[96] and 2435 (in 1968), it has become clear that the UN is dedicated to the provision of assistance, emergency relief, rehabilitation, and disaster mitigation to the international community.

No single mechanism exists to provide financing and governance coordination across the United Nations system; funding largely depends upon voluntary contributions that are managed by various government frameworks.[97] The United Nations has two primary sources of funding, assessed contributions and voluntary contributions.[98]

Assessed contributions

The United Nations "regular budget" which is approved by the General Assembly for a two year period is funded by Member States that pay toward the United Nations budgets an amount determined by a number of factors including their gross national income, population, and ability to pay.[99] A "ceiling rate" sets the maximum amount that any member state can contribute to the United Nations budget to prevent it from becoming overly dependent on any one nation to finance its projects.[100] As of 2000, the ceiling rate was 22 per cent of the United Nations Budget and the minimum "floor rate" is set at 0.001 per cent.[101] The 2012-2013 budget totaled approximately USD 5.512 billion.[102]

The United Nations peace keeping budget is assessed separately from the regular budget and is used to fund the United Nations global peacekeeping and humanitarian endeavors.[103] In accordance with Article 17 of the United Nations Charter, each member nation is obligated to contribute to this budget an amount contingent upon a similar scale as that used for the assessment of payment amounts to the regular fund but adds a surcharge to the permanent members of the United Nations Security Council member nations.[104] The approved budget for 2013-2014 was USD 7.83 billion.[105] It is interesting to note that although it is understood that peacekeeping contributions are necessary and mandatory, as of 2013, approximately USD 2.20 billion are owed in Member State dues.[106]

Voluntary contributions

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96 Resolution 2034 led the framework for humanitarian assistance for victims of natural disasters as well as disaster relief and mitigation. Id.

97 Financing Peacekeeping, United Nations Peacekeeping, last accessed 1 Jan 2014. www.un.org/en/peacekeeping/operations/financing.shtml

98 Id.

99 As of 2013, the United States contributes 22% of the UN budget, Japan 10.8% of the UN budget, France 5.5% of the budget and United Kingdom 5% of the budget. Id.

100 Weiss, Thomas G. and Daws, Sam eds. (2007) The Oxford Handbook on the United Nations. Oxford: Oxford University Press, at 682.

101 Id.

102 Id.

103 Fasulo, Linda (2004) An Insider's Guide to the UN. New Haven, CT: Yale University Press at 115

104 Financing Peacekeeping, supra note 14.

105 Id.; the top 10 providers of contributions to the UN Peacekeeping budget in 2013 are the United States (28.38%), Japan (10.83%), France (7.22%), Germany (7.14%), United Kingdom (6.68%), China (6.64%), Italy (4.45%), Russian Federation (3.15%), Canada (2.98%), Spain (2.97%). Id.

106 Id.

In addition to Member State contributions, the United Nations projects are funded by a variety of other sources such as NGOs, and private donors. [107] Additionally, many countries will make additional contributions to peacekeeping efforts through the donation of supplies, aid, and personnel.[108]

Events such as the Indian Ocean tsunami of December 2004 served as a catalyst for the United Nations to reform its humanitarian assistance and funding mechanisms.[109] In 2005, the General Assembly passed resolution 60/124 establishing the Central Emergency Response Fund (CERF).[110] CERF is based on a grant[111] component as well as unallocated funds paid-in general contributions from Member States, NGO's, and private donors.[112] These funds are organized as pooled, multi-donor trust funds (MDTFs).[113]

MDTFs can be used for a variety of purposes and can be country specific.[114] MDTFs receive contributions

which are then disbursed by an administrator to various recipients such as NGOs, or the United Nations, depending on their intended purpose.[115]

Additionally, United Nations reform led to the establishment of Emergency Response Funds (ERFs) and Common Humanitarian Funds (CHFs) which are also based on contributions from governments and private donors. [116] Such funds are often used to cover the initial stages of emergency response operations.[117]

The Common Humanitarian Funds are managed by humanitarian coordinators and Emergency Response Funds are managed, in turn, by United Nations Office for the Coordination of Humanitarian Affairs country offices.[118] Many different MDTF regimes exist and sometimes overlap. For example, in some countries such as the Sudan, United Nations MDTFs administered by the Multi-Partner Trust Fund (MPTF) provide assistance. However, the World Bank and the United Nations Department of Political Affairs (DPA) also provide funding and support.[119]

In addition to the general UN funding mechanisms described above, it is useful to look at the funding of specific partnership programmes, two of which were identified in the preceding section: UN-SPIDER and UNOSAT.

Funding for the UN-SPIDER Programme in 2014-2015 will come from both the regular budget of the United Nations and from extraordinary contributions from Member States. The Office has funding agreements covering all or part of the biennium with the Governments of Austria, China and Germany. It

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[107] Id.

[108] Id.

[109]

[110] Id.

[111] The grant component is divided into two segments, one for rapid responses to disaster which accounts for approximately two thirds of the grant element and one for underfunded emergencies which accounts for about one third of the grant element. Central Emergency Response Fund, United Nations, 2012, last accessed 1 Jan. 2014. www.unocha.org/cerf/resources/information-products/annual-reports

[112] See OCHA, "Central Emergency Response Fund life-saving criteria", January 2010, available at: http://ochaonline.un.org/cerf/HowtoApply/CERFGuidance/tabid/5818/language/en-US/Default.aspx

[113] Humanitarian Operations, Supra not 1 at 20.

[114] Pooled Funding Mechanisms, United Nations Development Group. Last Accessed 1 Jan 2014.www.undg.org/content/post-crisis_transition/financing_for_transition/pooled_funding_mechanisms

[115] Id.

[116] Humanitarian Operations, Supra note 1 at 20.

[117] Id.

[118] Id.

[119] Id.

is expected, however, that stronger Member State support will be needed to provide global coverage of the UN-SPIDER programme as it anticipates an increase in the demand for its support services.[120]

UNOSAT received its funding from the United Nation Development Program (UNDP), a programme funded entirely by the voluntary contributions of UN Member States that works to help "build nations that can withstand crisis, and drive and sustain the kind of growth that improves the quality of life for everyone" and strives to help nations achieve the Millennium Development Goals[121].

Additionally, the World Bank and European Commission's Joint Research Centre (JRC) work in concert with UNOSAT to provide satellite data services.[122] The World Bank received funding for the UNOSAT project through the Global Facility for Disaster Reduction and Recovery (GFDRR) and the JRC received funding from the European Union Instrument for Stability.[123] The funding model of UNOSAT could serve as a model for future financing mechanisms for a global and sustainable emergency telecommunication project.

4.8.6 UN Inter-Agency Standing Committee (IASC)

Within the UN agencies, the Inter-Agency Standing Committee (IASC) is certainly key, offering operational responses in case of disaster. The IASC brings together international organizations working to provide humanitarian assistance to people in need as a result of natural disasters, conflict-related emergencies, global food crises and pandemics. By coordinating activities, members improve overall service delivery, share resources, pool analysis and disseminate best practices. Participants use the forum to agree on system-wide policies to achieve a better overall response, while respecting organizations' individual mandates.[124]

Established by UN General Assembly Resolution 46/182 in 1991, the IASC is the only decision-making group that includes UN agencies, the World Bank, the International Organization for Migration and other humanitarian organizations, such as the International Committee of the Red Cross, the International Federation of the Red Cross and Red Crescent Societies, and non-governmental organizations. In other words, the IASC includes many of the largest humanitarian organizations that account for the majority of humanitarian assistance distributed worldwide. Organizations take part in the IASC as members from the UN family, or standing invitees (mostly non-UN organizations)[125].

In fact, the strength and added value of the IASC lies in its broad membership, bringing together all key humanitarian operational actors. "Operational" is defined as having the following characteristics: 1) provision of humanitarian assistance: protection or material aid, and 2) deployment of staff to assist affected populations with immediate needs.

The IASC's overall objective is inclusive coordination, while maintaining a relatively limited number of "members" to ensure functionality and focus. Membership is subject to a continuous review, and new members are accepted on a case-by-case basis. Organizations aspiring to become members are encouraged to contribute to the work of the Subsidiary Bodies in their area of specialization. Thereby, they can demonstrate their real commitment and potential contribution to the IASC. The priorities for

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[120] Id.

[121] The Millennium Development Goals, United Nations Development Program, 2013. Last accessed, 1 Jan. 2014. www.undp.org/content/undp/en/home/mdgoverview.html

[122] The European Commission's Joint Research Centre, United Nations and the World Bank issue a comprehensive building damage atlas for Haiti, European Commission JRC, UNITAR, World Bank, 17 March 2010, last accessed 1 Jan 2014. http://ec.europa.eu/dgs/jrc/downloads/jrc_20100317_newsrelease_haiti_atlas.pdf

[123] Id.

[124] See www.humanitarianinfo.org/iasc/download

[125] Id.

2014-2015 include a study on Humanitarian Financing which should be completed by the end of 2015 and to which we recommend the SSDM Forum be involved.

4.8.7 European Commission (EU)

The EU humanitarian aid is now recognized in the Lisbon Treaty as a self-standing policy in the area of EU external action, bringing a high level of added value. A coherent, complementary and coordinated EU approach to the provision of humanitarian aid ensures that scarce resources are used efficiently to meet identified needs and supports the drive to more effective international humanitarian response. The increase in the number of natural and man-made disasters and their economic impact calls for systematic action at the European level to strengthen preparedness and to enhance response capacities, both inside and outside the EU.

The Commission proposes that crisis response, prevention and management be pursued with the Humanitarian Aid Instrument, and the Civil Protection Mechanism responding to natural and man-made disasters, which will continue as the effects of climate change make themselves felt.

The Emergency Response Coordination Centre (ERCC), operated within DG ECHO, has been set up to support a coordinated and quicker response to disasters both inside and outside Europe using resources from 32 countries participating in the Civil Protection Mechanism. The ERC replaces and upgrades the functions of the previous Monitoring and Information Centre (MIC). With a capacity to deal with several simultaneous emergencies in different time zones, around-the-clock, the ERC is a coordination hub facilitating a coherent European response during emergencies helping to cut unnecessary and expensive duplication of efforts. Based at the European Commission in Brussels, the ERCC is accessible 24/7 and can spring into action immediately when it receives a call for assistance. The ERCC works in close cooperation with national crisis centres throughout the 32 countries participating in the Mechanism (EU 28, the former Yugoslav Republic of Macedonia, Iceland, Liechtenstein and Norway). The ERCC handles over 20 emergencies a year, up from single digit figures in the first few years of its existence. In addition, it monitors many more emergencies.

The ERCC collects and analyses real-time information on disasters, monitors hazards, prepares plans for the deployment of experts, teams and equipment, and works with Member States to map available assets and coordinate the EU's disaster response efforts by matching offers of assistance to the needs of the disaster-stricken country. Better planning and the preparation of a set of typical disaster scenarios further enhance the ERC's capacity for rapid response.

The ERC also supports a wide range of prevention and preparedness activities, from awareness-raising to field exercises simulating emergency response.

The Mechanism can be activated by any participating state seeking prompt international assistance following a major disaster that overwhelms national civil protection capacities. As soon as a request for assistance is received, it can be viewed by all participating states via the Common Emergency Communication and Information System (CECIS). The national contact points then assess their available resources and inform the ERCC whether or not they are in a position to help. The ERCC then liaises between the offering and the requesting country to ensure the prompt delivery of the accepted assistance.

As the use of the Mechanism is not restricted to interventions within the European Union, any third country affected by a disaster can also make an appeal for assistance through the ERCC. Following a formal request for assistance from a third country, different procedures are applied for the activation of the Mechanism. Arrangements for the dispatch of the accepted assistance (delivery, transport, visa requirements, customs, etc.) are made directly between the offering and requesting states. If required, the ERCC may play a facilitating role. Any intervention teams or assistance sent from the EU to a disaster area remains under the direction of the national authorities of the affected country, which has the right to ask European teams to stand down at any time. European teams are subject to local law and should operate in conformity with national rules and procedures governing their work.

To facilitate the technical co-ordination of European civil protection assistance a small team of experts can be dispatched on site by the ERCC. This team will ensure effective liaison with local authorities and any other relevant actors so as to integrate European civil protection assistance into the overall relief effort and facilitate the work of European teams on the ground. Moreover, as they continue to monitor the emergency and assess its development, they can keep the ERCC headquarters updated.

The budget of the ERCC for period 2014-2020 is of EUR 144.65 million (current prices). In addition to the support to the crisis centre, a budget of EUR 6 621 million is foreseen for Humanitarian Aid and Civil Protection.

4.8.8 Humanitarian and media organizations: information aid

For aid organizations involved in disaster response the question of how to communicate both internally and, more importantly, with the people affected by a disaster and in need of help has become increasingly important. The challenge of connectivity is central especially in situations where a disaster has significantly damaged communications infrastructure – from the local radio station to the mobile phone mast – thereby impeding the ability to communicate of both the people affected and of organizations coming to their aid.

Humanitarian organizations involved in disaster response typically factor in connectivity and the ability to communicate as part of their operational needs and costs. The International Committee of the Red Cross (ICRC)'s rapid response deployment mechanism, for example, includes both the deployment of additional IT specialists and equipment as an integral part of the response to sudden-onset disasters or other crises such as a sudden upsurge of armed violence creating significant humanitarian needs. The costs of this are typically included in the funding appeals issued to donors.

Over recent years, humanitarian organizations have also been broadening the range of tools and methods they use to inform and structure their humanitarian response. They now typically include anything from crowdsourcing information by monitoring social media to digitally mapping humanitarian needs with the help of digital volunteers.

Humanitarian actors have also been increasingly focusing on the connectivity and communication needs of populations directly affected by humanitarian disasters. Together with media development organizations and private telecommunication companies, they have been developing the notion of 'information as aid' which describes information as a need that is as essential as food and water to people affected by disaster.

Media development organizations such as Internews have been highlighting the damage to media and communication infrastructure caused by disasters and called for measures to rebuild them as a priority intervention to help disaster victims. Humanitarian organizations, media development organizations and communications companies interested in the notion of 'information as aid' have joined forces in the Communicating with Disaster Affected Communities Network.[126]

4.8.9 Corporate support

For the time being, most organizations involved in these activities have been obtaining funding through their regular donor relationships with governments and corporate supporters and/or have been financed from non-earmarked funds. But there are examples of the corporate sector providing more dedicated support:

The GSMA, for example, states: "The GSMA Mobile for Development Disaster Response Programme will work with mobile operators to determine how they can most effectively support each other and improve

[126] www.cdacnetwork.org/

preparedness and resilience among networks in disasters. The programme will also identify how the mobile industry can best help affected citizens and humanitarian organizations on the ground following a crisis.

Through research and engagement with mobile and humanitarian stakeholders, the GSMA will build a community where it can share best practices and create a robust, coordinated response mechanism to harness the power of the mobile network. The Disaster Response Programme will also make recommendations on the most effective support that the industry can provide to mobile operators, humanitarian actors and affected populations."[127] While not, as such, a financing mechanism, GSMA certainly appears to be a potential source of valuable support.

Individual mobile phone companies have also launched several support initiatives. These include, for example, Trilogy International Partners which has been working with the International Federation of Red Cross and Red Crescent Societies to set up the Trilogy Emergency Relief Application (TERA). This allows the Red Cross and Red Crescent to work with local mobile providers to send SMS to subscribers containing vital information about disasters and how to handle them.

The Vodafone Foundation runs a number of interesting initiatives:

- Instant Network Programme: The Vodafone Foundation is committed to providing assistance in the area of disaster relief. The Vodafone Instant Network Programme aims to deploy Vodafone volunteers and technology in emergencies to provide free communications and technical support to aid agencies and victims and develop new technologies to support the humanitarian community. In conjunction with this, Vodafone continues to support its emergency telecommunication response partners*, Telecoms Sans Frontières* and World Food Programme in their work.[128]
- Vodafone Foundation volunteers: The Vodafone volunteer programme provides Vodafone employees from around the world with specialized training in the area of emergency telecommunication response, including the deployment of Vodafone Instant Network.[129]
- Red Alert: Red Alert is an emergency SMS fundraising programme enabling Vodafone Foundations, Vodafone companies and Vodafone customers to respond to emergencies and disasters. The programme provides the facility for Vodafone employees and customers in21 countries to give free of charge to appeals via SMS in response to disasters and emergencies. Successful Red Alert campaigns were initiated in response to Haiti (2010), flooding in Australia (2011) and the Christchurch earthquakes in New Zealand (2010-2011) amongst many others.[130]

Another interesting example of corporate sector support is Ericsson's partnership with an NGO, Refugees United, which aims to reconnect refugees with their loved ones.[131] Ericsson supported Refugees United with the development and deployment of a mobile phone application designed to help refugees and their families reconnect. Efforts to promote the service in East Africa and, in the near future, the Middle East have also been supported by individual mobile phone companies.

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[127] www.gsma.com/mobilefordevelopment/programmes/disaster-response

[128] www.vodafone.com/content/index/about/foundation/instant_network.html

[129] www.vodafone.com/content/index/about/foundation/instant_network/vodafone_foundationvolunteers.htm

[130] www.vodafone.com/content/index/about/foundation/instant_network/red_alert.html

[131] www.ericsson.com/thecompany/sustainability_corporateresponsibility/enabling_communication_for_all/refugee_recnnection

Potential future sources of support

It may be possible to obtain financial support for projects and initiatives that fall within the scope of this report from funding sources not specifically devoted to supporting connectivity and communication in disaster response. Projects focusing on the connectivity and communication needs of disaster-affected communities and the organizations helping them have successfully won funding from initiatives encouraging innovation in the humanitarian domain such as the Humanitarian Innovation Fund.[132] Deloitte's Humanitarian Innovation Programme appears to offer another interesting avenue to explore. The programme offers pro bono support from Deloitte experts.[133] Innovative projects may also manage to find some space inside the remit of the Knight Foundation's support programme for journalism and media innovation.[134]

In summary, there appears to be strong interest in tackling the problems at the core of the Smart Sustainable Development Model Initiative. The extent and breadth of related initiatives, ideas and pilot projects is impressive as shown by the 2013 World Disasters Report on technology and the future of humanitarian action that was published by the International Federation of Red Cross and Red Crescent Societies. Further research and outreach to stakeholders including foundations and corporate actors would likely show that interesting and innovative pilot projects that enhance the implementation of suitable communications technologies as part of disaster response and prevention could attract broader backing well beyond the limited survey of potential supporters provided in this section.

4.9 Summary, proposal and suggested actions

4.9.1 Summary

We have looked at the concepts of partnerships, as well has how these concepts have evolved in recent decades. We have attempted to narrow our focus to ICT4D and ICT4DM partnerships. In this context, we have identified the key categories of participants in Multi-stakeholder Partnerships (MSPs), providing a representative, though not exhaustive, set of examples in each category.

We next looked at a sampling of real-life partnerships, some that are largely government partnerships that can assist or play a role in MSPs, and some that are good models of MSPs in the ICT4D and ICT4DM domains. Several of these examples will figure into our recommendations for development of models for SSDM. We also surveyed the literature on best practices in ICT4D and ICT4DM partnerships and have enumerated these as a basis for guiding the development of SSDM partnerships.

Following this survey of partnerships, we looked at some of the specific elements and presented some examples of partnership models in the literature on ICT4D and ICT4DM partnerships. We then enumerated some of the motivating factors for various categories of stakeholders and attempted to provide more depth and insight into the business models that motivate participation by private sector and civil society organizations, two stakeholder groups that will be critical to the success of an SSDM model.

Finally, we explored some of the potential financing models for SSDM partnerships. As sustained and assured financing is essential to the success of any partnership, we consider this a crucial avenue of exploration as part of this initiative. We first looked at government, regulatory, and international financing sources. Based on our in-depth discussion of universal service funds (USFs), we are recommending that they not be counted on as a primary funding model for SSDM initiatives, primarily

[132] www.humanitarianinnovation.org/

[133] www.deloitte.com/global/en/pages/about-deloitte/articles/humanitarian-innovation-program.html?id=gx:th:HIP13

[134] www.knightfoundation.org/what-we-fund/innovating-media

due to the difficulty of administering them effectively, although there do seem to be some states that are making strides in managing them efficiently. We looked at some of the UN-based and EC-based activities and how they are funded. We provided a discussion of charitable organizations as funding partners. We had also planned to look at loans and subsidies, such as those afforded by multilateral financing organizations such as the World Bank and various international development banks. In addition, we had intended to address more "out-of-the-box", or innovative funding mechanisms. Due to constraints on time and resources, the Working Group was unable to address these last two topics.

4.9.2 Disaster management and sustainable development platform proposal

In reviewing the partnership models and financing mechanisms surveyed by our Working Group, we have at this time identified the Emergency.lu model of ICT4DM as a successful and workable model that can be adapted and scaled in order to create a broader platform for disaster management. A more detailed description of the Emergency.lu model can be found in Annex 9:5. In order to have global reach and availability, this platform would need to be owned and operated by a multilateral and international anchor stakeholder having the telecommunication knowledge, the capabilities, expertise, and influence to implement the technological, policy, and operational aspects of deploying ICTs for disaster management, such as, but not limited to, ITU. In addition, in a manner similar to the way in which the Emergency.lu resources have been leveraged by the SATMED development initiative, such a platform could form the basis for ICT4D partnerships that would be based on the principles and framework established by the SSDM initiative.

Since 2002, the ITU has provided satellite-based assistance to countries in the aftermath of disasters. The first deployment was in January 2005 in response to the 2004 December South-East Asian earthquake and tsunami. Since that time, the ITU has focused on enhancing its ability to provide telecommunications/ICT services and applications for disaster mitigation at all phases of disaster management – i.e., disaster prevention, disaster preparedness, disaster response/relief, and telecommunication network rehabilitation/reconstruction and to provide telecommunications/ICT to Member States and other entities involved in, or affected by, disasters.

The financing, based mainly on in-kind contributions (equipment, space segment/air-time) and funding from other institutions, requires the ITU to base the support services more on an ad hoc contribution model rather than on a recurrent and stable platform, on which all ITU Member States could rely. Moreover, we understand from the ITU itself that it is a cumbersome and expensive process, since buying capacity on an ad-hoc basis has proven to be much more expensive than anticipating the costs on a longer-term basis.

Based on the ITU's experiences in addressing these needs in an ad hoc fashion, the WG-FPBM recommends that a more stable and long-term operational platform be established for delivering disaster telecommunication relief services at all times and to all places based on the Emergency.lu model. The proposed platform would be dedicated to restoring communications on behalf of and for Governments. As such, it would complement, rather than compete with, the services provided by Emergency.lu and other humanitarian international organizations, whose focus is specifically on supporting NGOs and humanitarian aid organizations.

It is proposed that the global platform be positioned under a particular, different name to underline the stand-alone character of the service. "Global Platform for Recovery and Development (GPRD)" is the proposed working title.

This platform could be implemented in a modular, step-by-step approach allowing the solution to grow over time, e.g.:

1. An elementary model to address a disaster recovery and relief satellite communications solution to be deployed at the request of a participating Government to the Global Platform/anchor stakeholder for periods of up to 6 months;

2. A progressive model to address a sustainable satellite communications solution globally for development purposes for periods of 6 to 36 months; and
3. A sustainable development model to address both the disaster recovery and relief and the connectivity needs of the population on a more stable basis to help development in education, agriculture and health issues, for example.

The owner of the platform and the provider of the services would be an international organization with expertise in emergency response and deployment of ICTs on a global scale. The platform would be made available to participating Governments through a procedure to be established. Models for financing the platform would need to be explored and developed in order that the Governments who utilize the platform would have a stake in its ownership. Since we assume that the Global Platform will be managed by an existing multilateral entity, one avenue to be explored is a potential increase in the fees of the participating members in order to provide a recurrent financial base for setting up the platform.

The WG-FPBM proposal assumes the setup of the platform and the service under the progressive model and the sustainable model and building on the existing infrastructure of Emergency.lu. Such an approach would enable maximum reuse of, and synergies with, the existing Emergency.lu infrastructure by sharing both ground equipment and satellite capacity and the incremental cost for additional applications.

The owner of the platform, in a role analogous to that of the Luxembourg Government in Emergency.lu, would have to set up its own team for management of the deployment priorities and establish the technical and logistical operations through sub-contractors.

Regarding the sub-contracting of service providers for the operation of the platform it is proposed that the platform owner would launch an open call for tender process. The bidding entities would be invited to provide an offer for an end-to-end solution, including satellite capacity and fully managed services. The possibility to reuse the existing infrastructure for humanitarian purposes should be positioned as an advantage.

The retained service provider would procure and offer all relevant elements of the service including equipment and orientation of the service toward the example of emergency.lu. In addition, the retained service provider would provide training to the platform owner's operational team and other support personnel as required.

In addition, we foresee that, as for Emergency.lu, the platform owner will have to enter into complementary agreements for providing quick transportation of satellite telecommunication equipment, utilizing established logistics channels from an existing organization engaged in transport of humanitarian goods and equipment, such as the ICRC.

Table 3 indicates provisional, high level network specifications, including the assumption that a minimum of upfront satellite capacity and some initial equipment would be procured from a turnkey solution provider. The satellite capacity could be shared with emergency.lu when needed and to optimize the Fast Start services. The table includes an estimation of the needs for capacity and equipment at each step of the business model with the long-term objective in mind to deliver also on the need for sustainable development services in these countries.

Table 3 – High Level Global Platform for Recovery and Development Progressive Model

	GPRD Fast Start Start-up Model (Emergemcy.lu) (5 deployable units) 2014-2015	GPRD Progressive Model (10 deployable units) 2015-2016	GPRD Sustainable Development Mod. (50 deployable units) 2017
HUB Platforms	3	3 (partially reusable from e.lu)	3 (partially reusable from e.lu)
Deployable Antennas	Rapid deployable unit (inflatable antennas) (1)	Regular deployable units (standard antenna) (10)	Regular deployable units (standard antenna) (50)
Transponder Capacity in Mbps	4 Mbps	20 Mbps (can be pooled with Emergency.lu)	50 Mbps (can be pooled with other models)
Service Management	End-to-end service management	End-to-end service management (can be shared with Emergency.lu)	End-to-end service management (can be shared with Emergency.lu)
Transportation	Rapid transportation	Fast transportation	Normal transportation
Additional services	VoIP	VoIP	VoIP, e-health, e-education

4.10 Recommendations

While the Working Group believes that we have completed significant foundational work for creating guidelines and recommendations for SSDM partnerships, there is still further investigation and synthesis required. We would recommend, however, that the Advisory Board undertake the following specific next steps:

- Request that the ITU endorse the proposed Global Platform for Recovery and Development platform (as discussed above), and suggest that the ITU establish a dedicated task force consisting of working group members and ITU staff with the objective to further qualify the technical, operational and financing requirements and to come up with a detailed outline of the envisaged service, as well as recommendations for implementation.
- Use the partnership framework developed by Tim Unwin (as presented in Annex 5) to create an "SSDM Partnership Framework," specifically tailored to SSDM partnerships based on the satellite industry as the primary private sector partner.
- Incorporate into the SSDM Partnership Framework the specific stakeholder motivations and incentives outlined in this report.
- Complete the research into financing mechanisms, exploring loans and subsidies, as well as more out-of-the-box and innovative approaches.
- Incorporate the most appropriate financing mechanisms into the SSDM Partnership Framework.
- Develop from the SSDM Partnership Framework a "toolkit" of models, guidelines and best practices for setting up sustainable ICT4D partnerships that would leverage the resources of the Global Platform for Recovery and Development platform.

Annex 1: List of acronyms

ACICIP	Advisory Committee on International Communications & Information Policy (United States Department of State)
CDMA	Code division multiple access (a channel access method used in radio communications)
DIPECHO	Disaster preparedness programme of European Commission's Humanitarian Aid and Civil Protection Directorate General
ECHO	European Commission's Humanitarian Aid and Civil Protection Directorate General
GDP	Gross domestic product
GIS	Geographic information systems
GPS	Global positioning system
GSM	Global system for mobile communications
HF	High frequency
ICT	Information and communication technologies
ICT4D	Information and communication technologies for development (ITU initiative)
ICT4DM	Information and communication technologies for disaster management (ITU initiative)
IRDC	International Development Research Center (Canada)
ITU	International Telecommunication Union
ITU-D	International Telecommunication Union, Telecommunications Development Sector
ITU-T	International Telecommunication Union, Telecommunications Standardization Sector
LMR	Land mobile radio
NGO	Non-governmental organization
SSDM	Smart Sustainable Development Model (ITU initiative)
TSF	Télécoms Sans Frontières (TSF), a leading emergency telecommunication non-profit organization
UN	United Nations
USAID	United States Agency for International Development
VSAT	Very small aperture terminal (a small satellite communications system)
WTDC	World Telecommunication Development Conference (ITU initiative)

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Annex 5: Framework for ICT partnerships

		Demand		Supply				
		End Beneficiaries	Local Partners	Funding Agencies	Private Sector	Civil Society Organizations	Research Institutions	International Organizations
Stake-holders		Local communities; people with disabilities; teachers; health workers; learners	National and regional governments; local private sector; local civil society organisations; religious groups; key individuals	Multilateral and bilateral donors; International Financial Institutions; Charitable foundations	Companies providing hardware, software, networking, content, infrastructure, media organisations	Community action groups; nongovernmental organisations; voluntary organisations; international advocacy and relief agencies; religious groups	Universities; consultancies; knowledge providers; innovators	Global organisations such as UNESCO; GeSCI; UN ICT Task Force
Contributions	Human Resources	– Knowledge of relevant demands – Linguistic skills – Cultural sensitivity – Labour – Knowledge of relevant health and educational initiatives	– Technical support – Indigenous knowledges – Cultural sensitivity – Linguistic skills – Labour – Capacity building skills	– Expertise in 'development' practice – Procurement expertise – Advisory capacity	– Staff skilled in technology – Media skills – Project management skills – Network engineering skills – Training expertise – Research and development skills – Staff secondment – Technical support	– Expertise in delivery of practical activities – Local knowledge and networks – Knowledge of development practices – Project management – Linguistic skills – Advocacy skills – Staff secondment	– Generic research skills – Knowledge of information and resources – Teaching and capacity building skills – Monitoring and evaluation skills – Staff secondment	– Expertise in ICT and 'development' – Expertise in delivery of educational initiatives – Lobbying expertise
	Physical ICT Resources	– Buildings and facilities – Some mobile telephony	– Buildings and learning facilities – Existing content (education, health) – Provision of some existing hardware and software – Telephony	– Some limited video-conferencing facilities	– Hardware (computers, screens, radios, TVs) – Virtual conferencing equipment – Software (Operating systems and programmes) – Networking – Content (digital, online, CD) – Buildings and learning facilities	– Software (Operating systems and programmes) – Content (digital, online, CD)	– Buildings and learning facilities	– Some videoconferencing and on-line learning facilities
	Social Networks	– Local and communal social networks – Indigenous social systems	– Government communication systems – Local business networks (Round Tables)	– Liaison across donor government departments – Links with recipient governments	– Links with other private sector partner networks – Web skills	– Links with global and national civil society networks – Virtual and real networks – Web skills	– Research networks (both virtual and real) – Web skills	– Policy and strategy conferences at global level – Virtual networks
	Physical Infrastructure	– Provision and maintenance of local infrastructures (schools, community centres, health centres)	– Provision of energy systems – Telecommunication systems – Existing educational and health infrastructures (schools and hospitals)	– Delivery of some infrastructure projects (but increasing shift to budget support)	– Construction of physical networks and telephony systems			
	Financial Contributions	– Some limited ability to pay – Helping to ensure sustainability	– National budgets	– Budget support – Project funding	– Provision of resources at reduced profit margins	– Some ability to deliver resources, often in kind and usually project based		– Some resources for specific activities
Benefits of Partnership	Corporate Identity	– Opportunity for enhanced visibility of poverty agendas	– Raised international profile for local businesses and organisations	– Opportunity to deliver on core mission to reduce poverty – Through local partnerships helping to ensure relevance and sustainability	– Delivery on Corporate Social and Environmental Responsibility targets – Raising brand identity internationally – Visible contribution to a country's economy	– Delivery on core mission to reduce poverty through ICT activities	– Increased international visibility – For some, opportunity to deliver on commitment to Knowledge for All	– Opportunity to deliver on core mission to reduce poverty – Through local partnerships helping to ensure relevance and sustainability
	Networking Benefits	– Benefits from information rapidly shared through the partnership – Increased experience of dealing with international organisations and private sector	– Benefits from information rapidly shared through the partnership – Opportunity to influence policies of other partners	– Benefits from information rapidly shared through the partnership – Minimisation of duplication of effort – Enhanced knowledge of activities of other partner categories	– Benefits from information rapidly shared through the partnership – Contacts with governments – Potential new initiatives – Opportunity to shape partnership agendas and activities	– Benefits from information rapidly shared through the partnership – New opportunities arising from working in partnership – Opportunity to shape partnership agendas and activities	– Benefits from information rapidly shared through the partnership – Opportunities for academics to learn more about management systems and practices in other sectors	– Benefits from information rapidly shared through the partnership – Shared implementing of initiatives, thus avoiding duplication
	Economic Returns	– Ability to implement activities impossible without partnership resources – Enhanced local capacity	– Substantial influx of human and technical resources to support delivery of key strategies – Longer term economic benefits from increased involvement of private sector, donors and civil society – Enhanced local capacity	– Shared costs in implementing activities, thus making budgets do further	– Opportunity for increased market share – Opportunity for identifying potential employees – Widening and deepening customer base through building local capacity – Economic growth resulting from enhanced political stability	– Higher visibility in core areas of activity leading to increased income – Potential future synergies with private sector and other funders	– Enhanced visibility in market place for undergraduate and postgraduate students – Opportunity to sell content and benefit from Intellectual Property Rights – Opportunities for experiences to enhance teaching – Development of collaborative funding initiatives	– Shared costs in implementing activities, thus making budgets do further
	R&D Opportunities	– Opportunity to shape international research agendas – Opportunity to benefit from latest research	– Opportunity to shape international research agendas – Opportunity to benefit from latest research	– Opportunities to gain insights from latest research – Chance to identify leading researchers for future initiatives	– Opportunity to experience new challenges for innovation – Staff development opportunities – Research findings that can be used to enhance competitiveness elsewhere	– Enhanced staff expertise through working with other partners – Easier and quicker access to research findings	– Enhanced funding for research activities – Opportunity to link academic research with practice and policy – Emergence of new research ideas – Opportunities for researchers to participate in ongoing activities	– Opportunities to gain insights from latest research – Chance to identify leading researchers for future initiatives

Source: Unwin, Tim, Partnerships in Development Practice: Evidence from multi-stakeholder ICT4D partnership practice in Africa, UNESCO Publications for the World Summit on the Information Society, 2005.

Annex 6: Advantages and disadvantages of selected ICT applications[135]

ICT Application	Advantages	Disadvantages
Cell broadcasting	- Not affected by traffic load - Will not add to congestion - Messages can be differentiated by cells or sets of cells - Greater authenticity of message	- Must be literate - Phone must be switched on - Phone must be set to receive cell broadcasting
GIS and remote sensing	- Continuous monitoring - Spatial presentation of data - Facilitates cooperative effort	- Require high bandwidth - Require high-speed networks - Costly hardware and software - Require skilled professionals - Difficulty capturing qualitative data
Internet/e-mail	- Interactive - Multiple sources can be checked for accuracy of information	- Low penetration rate - Must be literate - Internet content in local languages may be limited
Mobile phone/txt SMS	- High penetration rate - Portable - Relatively low cost	- Must be literate - No indication that message is generated by a legitimate authority - Subject to congestion and thereby delay
Radio	- One-to-many broadcasting - Does not require user to be literate - Portable	- Less effective at night
Satellite communications	- Independent of terrestrial communication network that can be damaged by natural hazards - Covers large footprint - Provides voice and data communications - Can work with solar power	- High cost of systems hardware and bandwidth utilization - Unlikely to work indoors
Telephone	- Does not require user to be literate	- Inadequate penetration rates - Congestion of phone lines during emergencies - Disasters can damage infrastructure
Television	- One to many broadcasting - Does not require user to be literate	- Less effective at night

[135] www.itu.int/ITU-R/index.asp?category=information&link=emergency&lang=en

Annex 7: List of countries that are party to the Tampere Convention[136]

	Participant	Signature	Parties Ratification - Definitive signatures - (s) Acceptance - (A) , Approval - (AA), Accession - (a)
1	Argentina	11 May 1999	5 Jul 2007
2	Armenia		25 Mar 2008 a
3	Barbados		25 Jul 2003 a
4	Belgium		2 Jul 2010 a
5	Bulgaria	22 Sep 1999	20 Jun 2000
6	Burundi	18 Jun 1998	23 Jan 2013
7	Canada	15 Jun 1999	18 May 2001
8	Colombia		12 Jun 2008 a
9	Cyprus	18 Jun 1998	14 Jul 2000
10	Czech Republic	4 Sep 2002	17 Jun 2003
11	Denmark	18 Jun 1998	2 Jun 2003
12	Dominica		26 Dec 2000 a
13	El Salvador	9 Aug 2000	18 Apr 2002
14	Finland	18 Jun 1998	1 Apr 1999 A
15	France		6 Aug 2009 a
16	Guinea		8 Oct 2002 a
17	Hungary	20 Jun 2003	7 Apr 2004
18	Iceland	20 Jun 2003	13 May 2011
19	India	29 Nov 1999	29 Nov 1999
20	Ireland		16 Aug 2007 a
21	Kenya	18 Jun 1998	12 Feb 2003
22	Kuwait	18 Jun 1998	13 Jun 2002
23	Lebanon	17 Nov 1998	27 Jan 2006
24	Liberia		16 Sep 2005 a
25	Liechtenstein		8 Jun 2004 a
26	Lithuania		9 Dec 2004 a
27	Luxembourg		8 Jun 2012 a
28	Montenegro		21 Jul 2010 a
29	Morocco	1 Dec 1998	11 Mar 2003
30	Netherlands	19 Dec 2000	6 Jul 2001 A
31	Nicaragua	18 Jun 1998	18 Nov 1999
32	Oman	19 Aug 1999	16 Apr 2003

[136] Tampere Convention: www.treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXV-4&chapter=25&lang=en

	Participant	Signature	Parties Ratification - Definitive signatures - (s) Acceptance - (A) , Approval - (AA), Accession - (a)
33	Pakistan		30 Jan 2009 a
34	Panama	20 Sep 2001	5 Mar 2003
35	Peru	14 Jan 1999	27 Oct 2003
36	Romania	18 Jun 1998	17 Nov 2005
37	Slovakia	16 Feb 2000	6 Feb 2001
38	Spain		27 Feb 2006 a
39	Sri Lanka	5 Aug 1999	13 Oct 1999
40	St. Vincent and the Grenadines		14 Aug 2003 a
41	Sweden	10 Jun 2003	13 Sep 2004
42	Switzerland	18 Jun 1998	24 Apr 2002
43	Tonga		8 May 2003 a
44	Uganda	28 Oct 1998	5 Sep 2002
45	United Kingdom of Great Britain and Northern Ireland		18 Jun 2003 s
46	Uruguay	13 May 2003	19 Apr 2012
47	Venezuela (Bolivarian Republic of)	3 Apr 2003	13 May 2005

Annex 8: Participant declarations and reservations regarding the Tampere Convention[137]

Participant	Reservation
Colombia	The Government of the Republic of Colombia formulates a reservation to paragraph 3 of article 11, by means of which Colombia does not consider itself bound by either of both of the dispute settlement procedures provided for in paragraph 3 of article 11.
Ireland	Whereas to the extent to which certain provisions of the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations ("the Convention") fall within the responsibility of the European Community, the full implementation of the Convention by Ireland has to be done in accordance with the procedures of this international organisation.
Luxembourg	To the extent to which certain provisions of the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations fall within the area of responsibility of the European Community, the full implementation of the Convention by Luxembourg has to be done in accordance with the procedures of this international organisation.
Montenegro	In accordance with Article 14 of the Tampere Convention on the Provisions of Telecommunications Resources for Disaster Mitigation and Relief Operations, adopted at Tampere, 18 June 1998, the Government of Montenegro declares that this Convention shall not apply to: To the extent to which certain provisions of the Tampere Convention on the Provisions of Telecommunications Resources for Disaster Mitigation and Relief Operations ("the Convention") fall within the area of responsibility of the European Community, the full implementation of the Convention by Montenegro has to be done in accordance with the procedures of this international organization.
Spain	To the extent to which certain provisions of the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations fall within the area of responsibility of the European Community, Spain cannot implement those decisions unless the European Community becomes a party to the Convention.
United Kingdom of Great Britain and Northern Ireland	To the extent to which certain provisions of the Tampere Convention on the Provisions of Telecommunications Resources for Disaster Mitigation and Relief Operations ("the Convention") fall within the area of responsibility of the European Community, the full implementation of the Convention by the United Kingdom has to be done in accordance with the procedures of this international organisation.

[137] ITU, For a list of signatories to the Tampere Convention see https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXV-4&chapter=25&lang=en&clang=_en for a description of the ratification process see www.itu.int/ITU-D/emergencytelecoms/doc/tampere/how_to%20ratify_Tamp_Conv_E.pdf

Participant	Reservation
Venezuela (Bolivarian Republic of)	Reservation made upon signature: Under the provisions of article 11, paragraph 6, of the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations (ICET-98), the Bolivarian Republic of Venezuela makes a specific reservation to paragraph 3 of that article. It therefore does not consider itself bound by arbitration as a means of dispute settlement, nor does it recognize the binding jurisdiction of the International Court of Justice. Reservation made upon ratification: Under the provisions of article 14, paragraph 1, of the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations, the Bolivarian Republic of Venezuela makes a specific reservation to paragraphs 3 and 4 of article 11. Therefore, it does not consider itself bound by arbitration as a means of dispute settlement, nor does it recognize the binding jurisdiction of the International Court of Justice.

Annex 9: Complete catalogue of new technologies

A9.1 Amateur Radio

Amateur radio has a specific technical definition in the International Radio Regulations (RR) of the

International Telecommunication Union (ITU). ITU RR S1.56 defines it as:

"A radio communication service for the purpose of self-training, inter-communications and technical investigations carried out by amateurs that is by duly authorized persons interested in radio technique solely without personal aim and without pecuniary interest..."

The very name of the Amateur Radio Service causes many to equate "amateur" with "unqualified". This is hardly the case. In the context of the RR, "amateur" simply means that these are skilled and trained operators who have a personal interest in both the art and science of radio and in helping people, but do not get paid for the use of their radios, their skills or their time.

Millions of individuals across the world have taken technical examinations and received radio transmitting licences from their national administrations. These individuals have then purchased and maintained communications equipment and antennas and supporting structures to allow them to operate on portions of the spectrum allocated by international regulation to the amateur service. The use of the spectrum and various operating modes by radio amateurs allow them to communicate down the street or around the world which makes the amateur service a true, independent ICT.

Amateur radio operators bring a number of skills to emergency communications:

- The amateur radio service provides a trained cadre of volunteer radio operators, technicians and engineers who can use their considerable skills to augment disaster communication facilities.
- Amateur radio services are offered without charge for the use of their networks, and therefore they have considerable flexibility in rearranging their communications points as they are free of commercial contract constraints.
- Amateur radio operators, while having access to the latest technology, are also able to make do with limited resources, as their equipment and networks are self-owned, but do not generate any income.
- Amateur radio operators lend their time and resources in training others to be licensed in the service and to give the benefit of their knowledge in the installation of communications facilities.

Benefits of amateur radio include its associated resources of designated spectrum and trained volunteers. It can be used in any area with an active population of radio amateurs, and is uniquely suited to situations in which other communication networks have been disrupted.

Technology type	An amateur radio-based system for real time tactical digital communications of information of immediate value in the local area. • all such data is ingested into the APRS Internet System (APRS-IS) and distributed globally for ubiquitous and immediate access. • Any station, radio, or object that has an attached GPS is automatically tracked.
Name of technology	**Automatic Packet Reporting System (APRS)**
Service applications	Along with messages, alerts, announcements, and bulletins, the most visible aspect of APRS is its map display. Anyone may place any object or information on his or her map, and it is distributed to all maps of all users in the local RF network or monitoring the area via the Internet. APRS is also capable of transmitting a wide variety of data, including weather reports, short text messages, radio direction finding bearings, telemetry data, short e-mail messages (send only) and storm forecasts. Once transmitted, these reports can be combined with a computer and mapping software to show the transmitted data superimposed with great precision upon a map display.
Disaster applications	Tracking of responders and mapping of affected areas
Primary user group and format	Amateur Radio Services
Deployment considerations	Infrastructure (for APRS-IS)
Case study or deployment example	Any area with an active population of radio amateurs.
Other	N/A

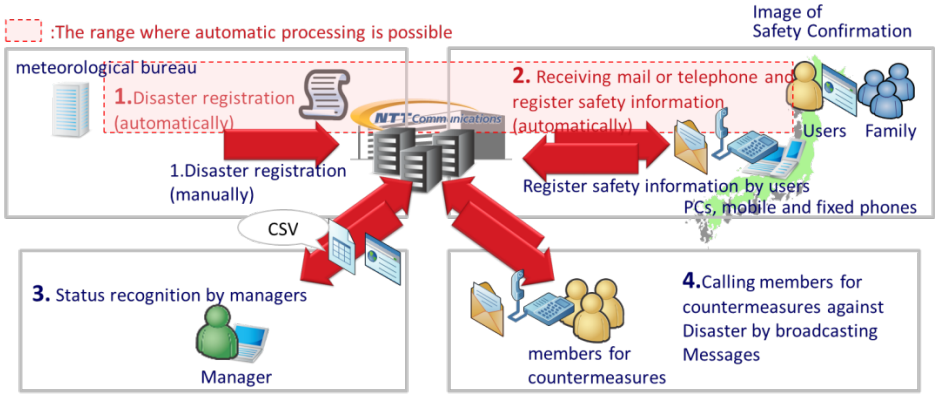
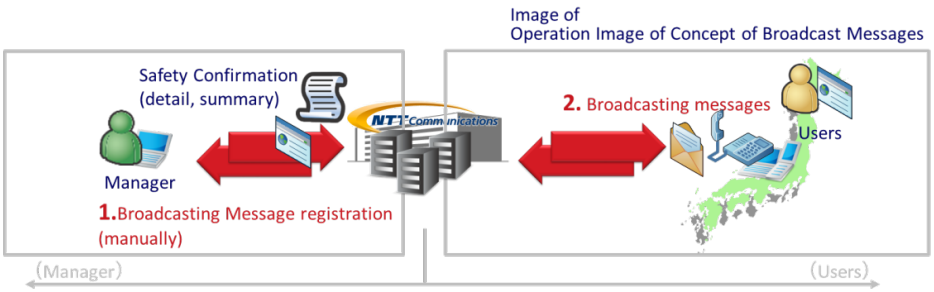
Technology type	A computer program used for weak-signal radio communication between amateur radio operators. • Digital signal processing techniques in WSJT make it substantially easier for amateur radio operators to employ esoteric propagation modes. • The software carries a general emphasis on weak-signal operation and advanced DSP techniques; however, the communication modes rely upon different ionospheric propagation modes and may be used on many different portions of the spectrum.
Name of technology	**WSJT**
Service applications	Some examples of this new technology are the programmes *WSJT, WSJT-X* and *WSPR.* All are open-source programmes designed for weak-signal digital communication by amateur radio. Normal usage requires a standard SSB transceiver and a personal computer with soundcard. Ready-to-run Windows versions of all programmes are available for free download. *WSJT* offers specific digital protocols optimized for EME (moonbounce), meteor scatter, and ionospheric scatter, at VHF/UHF, as well as for HF skywave propagation. The programme can decode fraction-of-a-second signals reflected from ionized meteor trails and steady signals 10 dB below the audible threshold. *WSJT-X* implements JT9, an entirely new mode optimized for weak-signal communication on the LF, MF, and HF bands. JT9 is about 2 dB more sensitive than similar digital modes and uses less than 10 per cent of the bandwidth. *WSPR* (pronounced "whisper") stands for "Weak Signal Propagation Reporter." This programme is designed for sending and receiving low-power transmissions to test propagation paths on the MF and HF bands. Users with Internet access can watch results in real time at WSPRnet.
Disaster applications	Communicating information under weak signal conditions using very simple equipment.
Primary user group and format	Amateur radio services

Deployment considerations	None
Case study or deployment example	• Any area with an active population of radio amateurs. • Philippines 2013
Other	N/A

A9.2 Broadcast

Broadcast messages can be distributed through mobile and fixed telecommunication services as well as via the Internet. These messages are critical in order to provide early warnings of an emergency, or provide information regarding relief efforts to the public. The supply of these one-to-many broadcast messages can be augmented through software.

Infrastructure type	Broadcast; terrestrial mobile / mobile satellite Even in the event of a disaster, public organizations, such as telecommunication companies, electric power companies, hospitals, fire departments and local governments should continue their business as much as possible to be able to save lives of victims. The safety confirmation and broadcast message system is one of the useful tools to help enterprises or local governments realize business continuity plans.
Name of technology	**Safety Confirmation and Broadcast Message System (NTT Communications, Japan)**
Service applications	The safety confirmation and broadcast message services use mobile and fixed telecommunication services and Internet for users and use cloud computing services for server side.
Disaster applications	In the event of a disaster, it is very important to keep business and operational continuity of public organizations, such as telecommunication companies, electric power companies, hospitals, fire departments and local governments for saving lives of victims. For example, telecommunication companies should provide telecommunication services to enable safety confirmation and emergency telecommunication just after disaster, and local government should aggregate information about disaster victims and the situation of affected areas. Safety confirmation for officials or company staffs is important, because managers have to arrange officials or staff for maintaining business operations. In addition, managers have to call officials or staff for maintaining business and sharing correct information which is essential in emergency situations. The safety confirmation and broadcast message service can gather safety information from people in the agency and can broadcast dispatch messages from
Primary user group and format	Mainly public organizations which need business continuity to save victims lives should have information about their agents' availability just after a disaster occurs. These types of public agencies include police departments, fire departments, hospitals, electric power companies, telecommunication companies, and local governments.

Deployment considerations	In order to save victims life in the event of disaster, public agencies such as local governments, fire departments, hospitals and telecommunication companies should maintain operational continuity as far as possible. For such public agencies, a Safety Confirmation and Broadcast Message Service using cloud computing is suitable for confirming the safety of agency personnel and then dispatching available persons to appropriate actions. For operational reasons in an agency after a disaster, managers must confirm the safety of staff, before dispatching available people to appropriate activities. In this sense, the flow direction of notification is "public agency to people in the agency" – essentially a closed user group network. After the requesting safety confirmation, agency staff send their status to management. In this case, the flow direction of the information is "people of the public agency to the agency," so the direction public agency to people in the agency" means bidirectional communication. This service is two part. One part is safety confirmation where the service is shown in Figure A, the second is broadcast massage operation shown in Figure B. Figure A Safety confirmation operation  Figure B Broadcast message operation  The major deployment considerations for realizing the service are shown below: 1) Basic requirements 1-1) High reliability/availability 1-1-1) Data synchronization and redundant server configurations are required for keeping users contact information in case of emergency. 1-1-2) Several secure data centers which are located in different places are required for redundancy in case one data center is damaged, so services can continue in the case of an emergency. 1-1-3) A stable telecommunication network is recommended to for communication between end users and data centers. 1-1-4) Several telecommunication modes, such as e-mail, fixed telephone, mobile phone and short message service, are recommended for communication. 1-2) Security 1-2-1) A secure telecommunication network is required to protect malicious access.
	1-2-2) Privacy information of individuals such as private contact information is required to

	manage securely, since on the cloud computing service stored information includes individual data such as private contact information of officials or staff. 1-3) Easy operation 1-3-1) Easy registration/ update/ deletion for individual information is recommended. 1-3-2) Easy registration methods are recommended to store safety confirmation information by staff even in the emergency situation. 1-3-3) Unified operations for registration of safety information are recommended between terminal types. 2) Requirements of safety confirmation 2-1) Interoperability 2-1-1) Connection information with metrological organization system for automatic disaster registration is required. 2-1-2) Interoperability with a mail server required to send e-mail to users. 2-2) Functions 2-2-1) Safety confirmation request is required to re-send to users who do not respond previous requests. 2-2-2) Safety confirmation of users' families can be optional. 2-2-3) Safety confirmation information searching is recommended under filters such as area and organization. 3) Requirements of Broadcast Message 3-1) Functions 3-1-1) Broadcast messaging is recommended for selected users to collect additional information.
Case study or deployment example	The safety confirmation and broadcast message services can be applied to anywhere because of the use of cloud service.
Other	NTT and NTT Communications proposed safety confirmation and broadcast message services into ITU-T FG DR&NRR, and the use, cases and high-level requirements were included into the draft deliverables.

A9.3 Fibre and submarine cable access

Fibre and submarine cables can be utilized not only for broadband access and communications, but also for observation, such as early warning in relation to seismic shifts or natural resource mapping.

Infrastructure type	Fibre and submarine cable access Dual purpose submarine cable system (communication plus ocean bottom seismic/tsunami sensors) Submarine observation cable system with various sensors
Name of technology	**Green Cable (Fujitsu)**
Service applications	The repeaters for the dual purpose cable have communication module and observation module. Therefore, the cable contributes to narrowing digital divide and disaster reduction. • Submarine observation cable system can be equipped with various sensors for not only seismic/tsunami but also for natural resource mapping and security observation.
Disaster applications	Alerting/early warning
Primary user group and format	Government agencies, academia (universities and institutes) and telecommunication carriers

Deployment considerations	Infrastructure (submarine cable system)
Case study or deployment example	• Areas with seismic and tsunami risk. • Areas where data from ocean bottom is of great importance for climate monitoring, disaster warning and ocean development.
Other	ITU-T, WMO (World Meteorological Organization) and UNESCO Inter-governmental Oceanographic Commission (UNESCO/IOC) established a joint task force (JTF) to promote the dual purpose submarine cable called Green Cable. The JTF, composed of experts from the science, engineering, business and legal communities, is now working actively.

A9.4 Public Protection and Disaster Relief (PPDR)

PPDR systems utilize dedicated spectrum and communication systems for public safety agencies. These are useful especially in cases when there is insufficient network capacity due to a large scale public event, disaster, or lack of reliable communication systems due to other reasons.

Infrastructure type	Satellite, PPDR; broadband; mapping tools
Name of technology	**Mitsubishi Helicopter Satellite Communication System (HSA40)**
Service applications	This transmits high-speed, real-time aerial video of disaster areas from helicopters. It allows bi-directional voice and data communication between airborne and base stations. The helicopter's flight location is displayed and the image superimposed on a map.
Disaster applications	Monitoring; early warning
Primary user group and format	Disaster management/prevention, land/transport management, safety and patrol, coastal safety and patrol, and broadcasting stations
Deployment considerations	Stable transmission of airborne video is permitted by intermittent transmission synchronized with blade rotation. No need for relay stations. Transmissions from helicopters to base stations can be sent from all over the country at the same time. In-cabin equipment of airborne station weighs about 20kg and external equipment about 35kg, excluding camera equipment. Airborne station achieves low-power consumption, enabling operation via standard power source on helicopters.
Case study or deployment example	Already deployment in Japan by Fire and Disaster Management Agency (FDMA) and Ministry of Land, Infrastructure, Transport and Tourism (MLITT)
Other	HSA40 Introduction on Mitsubishi Electric global website: www.mitsubishielectric.com/bu/space/products/hsa/index.html www.mitsubishielectric.com/news/2013/0328.html

A9.5 Satellite

Satellite-based services offer many advantages, particularly for remote and rural areas where terrestrial infrastructure is limited, such as:

- Ubiquitous coverage to all corners of the globe.
- Cost-effective and easy-to-install solutions, even for remote and rural areas.
- No significant ground infrastructure investment required.

- Sustenance of large end-user populations.
- Capability for large network deployments.
- Fixed and mobile applications.
- Reliable and redundant services in the case of a disaster or emergency situation.

Given their unique regional and global coverage capabilities, satellites are able to deliver immediate Internet and broadband connectivity even to remote areas using existing satellite resources, with fixed and mobile applications. This gives the flexibility and capacity to extend the service footprint based on market demand, instantly and easily covering rural areas. Importantly, particularly for developing regions, end-user and community connectivity is possible without huge capital investments or extensive build-out programmes. Once a satellite system is operational, connectivity can be further extended to user locations with easy-to-deploy and install ground terminals. As users increase, economies of scale enable cheaper equipment, making satellite an even more competitive solution since build out is not sensitive to distance or location as with fiber or terrestrial mobile services.

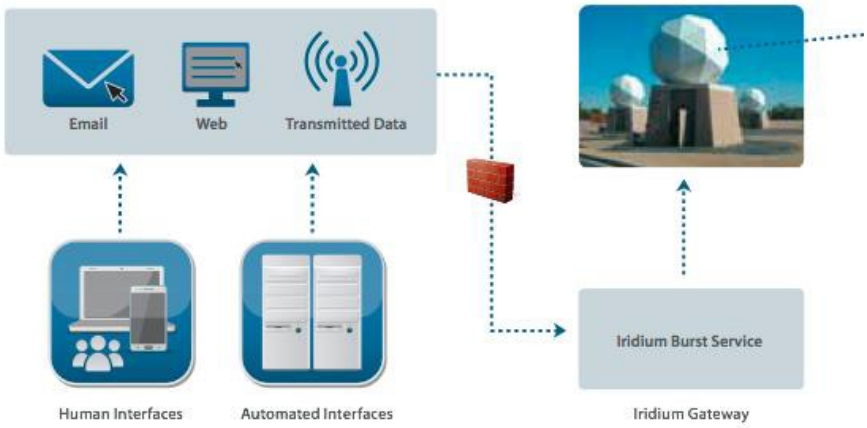
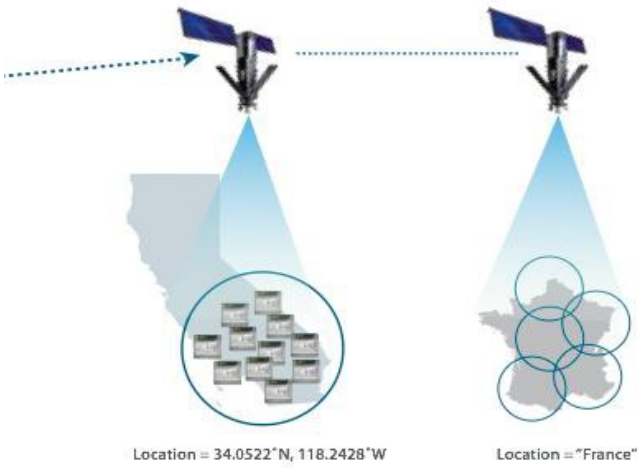
Importantly, satellite networks can provide direct connectivity to remote areas, provide a rapidly deployable, short-term solution for emergency response or relief teams, and enable interoperability among user groups and between different systems and networks. Satellite services are invaluable in developing countries where infrastructure may not have high levels of built-in redundancy to protect it from disasters, and in remote and rural areas where terrestrial networks may not be available. In the case of a disaster, satellite applications offer reliable solutions that should be incorporated in some way into disaster telecommunication management plans.

The following section offers some examples of satellite based deployments for development and disaster response.

Infrastructure type	Satellite
Name of technology	**Mobile Satellite Services (MSS)**
General service applications	• Mobile voice • Short Messaging Service (SMS) • Internet access through handheld terminals • Data services • Push-to-Talk Radio • Dispatch coordination • Asset tracking • Event reporting
Disaster applications	In the relief/response and recovery phase of a disaster, MSS applications can be relied on in the absence of functional, terrestrial communications networks. In addition, MSS is useful for the coordination of global networks of volunteers or first responders. • Emergency response coordination: Locating, tracking the activities of, and communicating with, first responders and volunteers using GPS portals. • Programmable emergency or SOS buttons allowing a coordinated response using the satellite network. • Environmental monitoring and alerting via remote transmitters over widespread areas. • Distribution of information including warnings of impending disasters or announcements of relief provisions. • Lone worker protection.
Primary user group and format	It is used primarily by first responders and relief organizations; also deployed to enable citizen communications when terrestrial mobile or land line networks are damaged. It can be used to broadcast information one-to-many, or to receive information from remote sensors.

Deployment considerations	• MSS requires no reliance on terrestrial infrastructure, making it ideal in disaster recovery situations. • Handsets should be prepositioned for preparedness whenever possible. • Handsets should be equipped with solar charging ability in case of a damaged electrical grid. • Likewise, most mobile earth stations (MESs) are battery powered, and can be operated from solar chargers, and so can function for some period of time even if the local electricity supply is disabled. • ITU-R M.1854 recommends specific global and/or regional frequency bands/ranges for emergency and disaster relief corresponding with each MSS system.
Case study or deployment example	There is an enormous body of work in the ITU-D on such case studies.
Other	…

Infrastructure type	Satellite; broadcasting
Name of technology	**Iridium Burst (Iridium)**
Service applications	Ideal for M2M communications, Iridium Burst can be used to broadcast a message to unlimited devices in one transmission. The service can provide standard one-to-many data messaging regarding weather, traffic, or other information useful to a wide audience. Transmission can take as little as twenty seconds and can be delivered anywhere in the world and to any selected audience. Example uses include: • **Private Networks**: Corporations and other private entities wishing to broadcast specific information to many assets,. for example, advertisers updating electronic billboards; software updates, shipping and maritime companies dealing with logistics, fleet updates, and M2M devices. • **Command and control**: M2M data and messaging sent to assets deployed in various locations. Military organizations that need to communicate in a timely, reliable and survivable manner to manage their troops and resources, such as ground troops in combat zones or supply vehicles in remote areas. • **Maritime Safety**: Maritime agencies notifying rescue ships using Global Maritime Distress and Safety System (GMDSS) of ships in distress. Rather than having to contact each ship separately, all ships within the relevant area can be contacted simultaneously with one Iridium Burst transmission.
Disaster applications	Alerting/early warning and relief/response. Government agencies, public safety and emergency response organizations can provide timely and reliable alerts for national disaster and weather warnings, terrorism and security alerts and updates and Amber or Silver alerts.
Primary user group and format	Broadcast/one-to-many
Deployment considerations	High-powered satellite transmissions penetrate buildings, partial obstructions and weather phenomenon to reach enabled devices. It is available globally. It can be used to reach thousands of devices at one time in rural or urban areas.

7Case study or deployment example	 

Infrastructure type	Satellite; Wi-Fi
Name of technology	**Iridium Go!**
Service applications	Iridium Go! Is a portable, pocket-sized device that creates a 30.5 meter radius satellite-enabled WiFi hotspot, enabling access to the Iridium satellite network through any iOS or Android smartphone. This service is ideal for remote locations without terrestrial mobile access, or for use during network disruptions, and can be used by multiple devices within the area. Services include: • WiFi Internet for data and voice calls, converting smartphone calls to standard satellite phone calls and enabling SMS and texting. • GPS positioning and online tracking of position reporting. • Emergency SOS button. • E-mail access: Send and receive compressed email to smartphone or tablet. • Transfer compressed photos and images. • Post to social networking from integrated app. • Can be mounted in vehicles, aircraft or boats for mobile applications.

Disaster applications	Particularly in the relief and recovery phases of disaster, Iridium Go! can be used during times of network interruption following a disaster, to coordinate response efforts via voice call or sending and receiving of data. It can be procured in advance for emergency back-up communications. Importantly the device works with the user's standard smart phone.
Primary user group and format	It can be used by any individual with a smartphone, whether a first responder, a member of a relief organization, government official or a private citizen. It is best for one-to-one communication.
Deployment considerations	Multiple units can be used for scaling beyond five Wi-Fi-equipped devices or the 30 m radius of the hotspot. The device is portable and charges via microUSB.
Case study or deployment example	
Other	…

Technology type	Handheld satellite communications: SatSleeve
Name of technology	**Thuraya SatSleeve for Android and iPhone**
General application	The Thuraya SatSleeve is an adaptor for smartphones that enables satellite communications on the smartphone. This gives smartphone users fast and easy access to phone calls or data session via satellite when they are out of terrestrial coverage. Services: • Voice calls • SMS • Email • Messaging apps • Web browsing • Social media (Facebook, Twitter, Whats'App, etc.) • Emergency SOS button • Dispatch Coordination • Asset Tracking • Event Reporting • GPS waypoint navigation • Emergency tracking • Route tracking • Closed User Group • Fixed dialing
Disaster applications	Thuraya SatSleeve is used during the recovery and relief phase immediately after disasters when terrestrial networks are not functioning. It is an essential tool for first responders who are able to evaluate the magnitude of the damage and who can then direct and coordinate among the national and international relief organizations.
Primary user group and format	Government agencies and first responders, NGO's, Search & Rescue, Disaster relief and reconstitution community, connecting families through social apps to let them know they survived the disaster
Deployment considerations	Pre-disaster deployment, immediate disaster response for damage assessment and management, disaster relief and reconstruction. Solar chargers available for recharging in disasters.

Case study or deployment example	Deployed during the Philippines Typhoon Haiyan. The SatSleeve were used by the immediate local responders to evaluate the magnitude of the disasters, and raising relief appeals through social networks and sending pictures. The versatility of the satellite handsets and broadband terminals used in a disaster zone is another important factor for rapid and effective deployment of emergency communications equipment. For instance, the Thuraya SatSleeve enabled NGO workers to make the most of the satellite network coverage using the familiar interface of their smartphones.
Other	ITU, WFP, NGOs, local government and municipalities to promote disaster preparedness during natural disasters.

Infrastructure type	Satellite
Name of technology	**Mobile Satellite Services (MSS)** **Thuraya IP and Thuraya IP+** Compact, light and portable satellite broadband terminals. They can be easily deployed from backpack to broadband in a matter of seconds. **Thuraya IP Voyager**: Built for vehicular communications-on-the-move, it can be easily installed in any vehicle and data connectivity can be achieved in minutes
General service applications	• Internet access • Worker data connection to HQ • VOIP • TETRA backhauling • GSM backhauling • Push-to-Talk Radio • Video conferencing • Telemedicine • Event Reporting • Wi-Fi 200 meter radius
Disaster applications	In the relief/response and recovery phase of a disaster, MSS applications can be relied on in the absence of functional, terrestrial communications networks. In addition, MSS is useful for the coordination of global networks of volunteers or first responders. • **Emergency response coordination**: Locating, tracking the activities of, and communicating with first responders and volunteers using GPS portals. • **Environmental monitoring and alerting** via remote transmitters over widespread areas. • **Distribution of information** including warnings of impending disasters or announcements of relief provisions.
Primary user group and format	Used primarily by first responders and relief organizations; also deployed to enable citizen communications when terrestrial mobile or land line networks are damaged. Can be used to broadcast information one-to-many, or to receive information from remote sensors.
Deployment considerations	• MSS requires no reliance on terrestrial infrastructure, making it ideal in disaster recovery situations. The main advantages are portability and ease of set up without expert installation. Ideal for first responder scenarios. • Satellite terminals should be pre-positioned and pre-deployed for disaster preparedness whenever possible. • Satellite terminals should be equipped with solar charging ability in case of a damaged electrical grid. • ITU-R M.1854 recommends specific global and/or regional frequency bands/ranges for emergency and disaster relief corresponding with each MSS system.

Case study or deployment example	Typhoo Haiyan in the Philippines: Thuraya IP+ was used by the WFP FITTEST team immediate responders that flew within hours of the disasters from Dubai to coordinate all international NGOs coordination by establishing a tent on arrival to the hit area where all immediate responders connect to their various independent servers using our Thuraya IP+ terminal to send emails, upload photos of the damage, send appeals through Thuraya IP+ Wi-Fi network.
Other	ITU, WFP, NGOs, local government and municipalities to promote disaster preparedness during natural disasters.

Infrastructure type	Satellite
Name of technology	**Inmarsat Broadband Global Area Network (BGAN)** BGAN allows you to set up a broadband mobile office in minutes – wherever you are on the planet. BGAN provides affordable, mobile voice and broadband data connectivity at speeds up to half a megabit in a highly compact, easy to use form.
Applications	• Internet access • Email • Voice calling (Circuit switched + VoIP) • SMS • Large file sharing • Video conferencing • Wi-Fi • Push-to-Talk Radio • Telemedicine • Event reporting • Vehicle tracking • Environmental monitoring for advance warning, via BGAN M2M
Disaster applications	In any emergency, communication is vital. But in the event of a natural disaster, terrestrial networks are often damaged or destroyed, leaving first responders without the means to co-ordinate humanitarian relief efforts in the crucial first hours and days. This is where MSS can help save lives, through the restoration of essential communication links in any location or conditions. • First responders can arrive in a disaster zone with a BGAN terminal small enough to stow in a backpack and, with minimal technical knowledge, set up an instant field office. • Field teams and back office can then co-ordinate activity by phone and email. They have access to the internet, can record and transmit live video footage from the disaster zone, or send and receive the latest situation reports. • Vehicular BGAN allows relief workers to keep communication channels open while they are on the move. • Field team can connect BGAN to GSM Mini Instant Network and enable them using their own mobiles to SMS or call their HQ or families.
Primary user group and format	Aid workers, journalists, government personnel and other established users of mobile satellite communications welcome the superior performance and lighter load of BGAN. But other users, such as engineers, consultants and project managers – anyone, in fact, who wants dependable, secure broadband access when working in locations with unreliable or no telecoms networks –can now reap the benefits of affordable mobile satellite communications.

Deployment considerations	**Global coverage** BGAN is accessible worldwide. It delivers voice and broadband data connectivity to users wherever they are on the planet. **Easy to use** BGAN is designed for simplicity and ease of use. No specialist technical expertise is required to set up and use it. **Highly compact** BGAN terminals are compact and lightweight. They can be carried as easily as a laptop, with the smallest weighing less than one kilogram. **Simultaneous voice and broadband data** With a single BGAN device, you can access data applications at speeds up to half a megabit and make a phone call at the same time. **Completely secure** Inmarsat has vast experience in providing secure communications to military and government customers. **Reliability** Inmarsat's name is synonymous with reliable communications. Through our responsibilities in providing maritime safety services, our network operations and control infrastructure incorporates a high level of back-up and redundancy.
Case study or deployment example	**Sponsorship Télécoms Sans Frontières (TSF)** Inmarsat supplies TSF with free satellite communications equipment and financial support to enable the organization to provide telephone, fax, email, internet, data and image transmission in any location and situation. In an emergency situation, TSF's priority is to set up telecom centres to help co-ordinate first responders' relief efforts and also to enable survivors to telephone loved-ones to say they're alive. TSF has been appointed by the United Nations (UN) to act as its principal communications provider in disaster situations, and it also supports the European Commission and non-governmental relief agencies. Inmarsat was founded to save lives at sea and, even after 33 years of commercial development, humanitarian support remains at the heart of what we do. We are very proud of our close collaboration with TSF and we will continue to support TSF in every way that we can to help people whose lives have been adversely affected by any form of humanitarian disaster.
Other	National government agencies, IGOs (Inter-Governmental Organizations and NGOs (Non-Governmental Organizations) are increasingly turning to Inmarsat because we offer reliability when it is needed most.

Infrastructure type	Satellite
Name of technology	**IsatHub** Smartphone and tablet users can continue to talk, text, access the Internet and apps wherever they are in the world with this new service, which is accessed via the IsatHub control and voice app – available for iPhone, iPad and /or iPod touch and Android™ devices from the App Store of Google Play.
Applications	Field workers can use their own smart phones or tablets, access applications, share pictures and videos, and stay in touch with HQ and family. The IsatHub service provides plug-and-play access to Inmarsat's global satellite network and lets you stay connected anywhere. This high-tech device comes with special applications to make it easy to connect and use your devices in the way you are used to. Examples of applications include web browsing, e-mail, VoIP, SMS, Video conferencing, file sharing and apps such as Facebook, Twitter, LinkedIn and WhatsApp.
Disaster applications	In any emergency, communication is vital. But in the event of a natural disaster, terrestrial networks are often damaged or destroyed, leaving first responders without the means to co-ordinate humanitarian relief efforts in the crucial first hours and days. IsatHub offers a cost effective solution to have access to satellite connectivity and opens significant opportunities for those aid workers which are budget constraint and require comms to provide disaster relief.

Primary user group and format	Primary users of the IsatHub are found within NGO, media, exploration and travel sectors. NGOs have a need for a cost effective and easy controllable solution. IsatHub is particularly aimed at users without any prior satellite experience and is therefore ideal for humanitarian aid worker setting up small remote offices.
Deployment considerations	**New service in Inmarsat's portfolio between IsatPhone and BGAN services** Perfect solution for those users who need more than just voice communications from a dedicated satellite phone and wish to use their smartphones and tablets for voice, text messaging and Internet access outside of cellular and terrestrial Wi-Fi coverage. The IsatHub supports up to 5 Wi-Fi enables devices simultaneously.

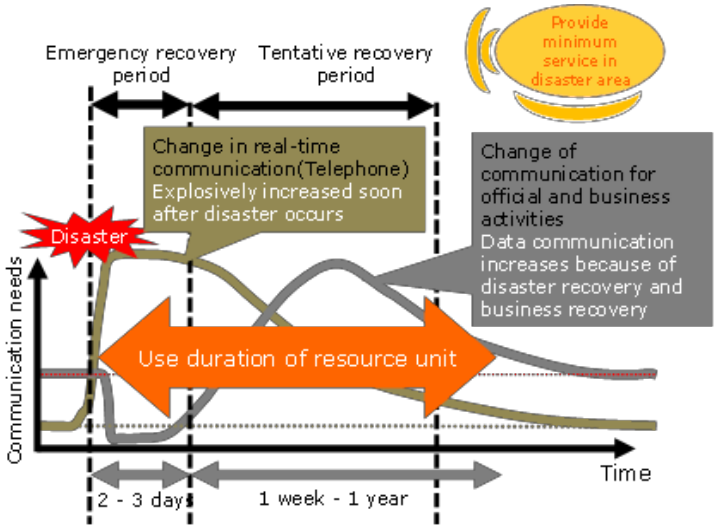
Infrastructure type	Satellite
Name of technology	**Fixed Satellite Services (FSS)**
General service applications	• Broadcast Services • Mobile backhauling • Trunking/Telephony/IDR • IP connectivity • Broadband (B2B) • Broadband (B2C) • VSAT (very small aperture terminal)
Disaster applications	• Broadband • VPN • VoIP • IP connectivity
Primary user group and format	• Satellites can be a pivotal communications element in case of natural disasters for both developing and highly developed countries • VSATs are conceived as Rx/Tx equipment, used for data, voice and video communications • Give the ability of aid workers to communicate with communities and countries for coordination • Assessment of victim needs • Management of relief material deployment between and across aid agencies
Deployment considerations	• Coverage area • Vendor management • Government liaison • Electricity power source
Case study or deployment example	• Afghanistan war 2002, Hughes VSAT installations in Kabul and Taloqan • Pakistan earthquake 2005, Skylogic VSAT deployment in 14 locations • Indonesia tsunami 2005, Skylogic VSAT deployment in 16 locations
Other	…

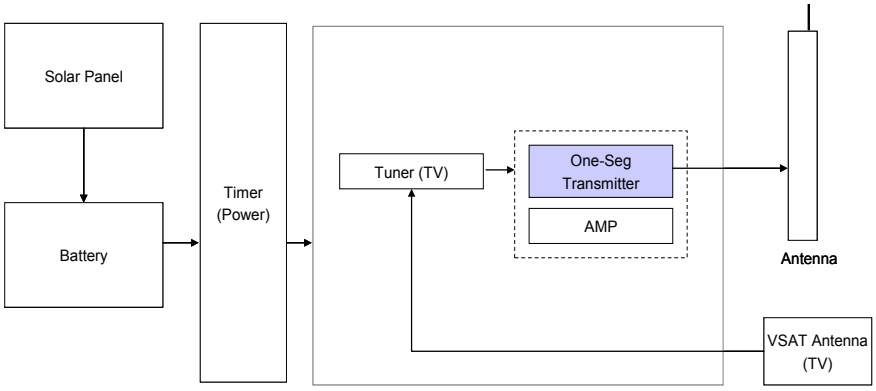
Technology type	Satellite, cloud services, mapping tools
Technology name	**Emergency.lu**
Disaster applications	The Emergency.lu service is addressing the early stages of the disaster response. Through the combination of technology (inflatable antennas, mobile Rapid Terminals, etc.), pre-allocated resources (such as satellite capacity, prepositioned equipment), value added services (VoIP, mapping, tracking and tracing, collaboration tools, etc.) and logistics elements (emergency transportation thru Luxembourg Air Rescue services) it provides an unique service allowing a quick deployment and set-up of the communication and collaboration infrastructure. Recovery: The parts of the Emergency.lu solution (Regular Terminals) can be deployed on a longer term (> 6 months) and provide services (connectivity, VoIP, etc.) used as basic infrastructure for the other applications enabling the recovery efforts. The following services are provided: Situation analysis, tracking and tracing, instant messaging, maps, Internet connectivity, voice and data sharing.
Primary user group and format	Primary user groups are first responders. The Emergency.lu is integrated in the Emergency Telecom Cluster as a resource of last resort. The deployment could take place by a number of trained relief (UN WFP, Ericsson Response,…) and civil protection organizations (including THW, MSB, Lux ProTex).
Deployment considerations	The complete system has 'star' infrastructure, the remote terminals consist of - ODU: 2.4 meter C-band antennas and - IDU: one portable rack containing, satellite router and value added services server. The solution has worldwide coverage. It uses C-band and provides a satellite based broadband connectivity from each deployed site. System is highly scalable and provides ability to deploy multiple hundreds of terminals.
Case study or deployment example	The system was successfully deployed in the Philippines as a response solution to the Haiyan disaster. It was/is deployed in Mali, South Sudan, Columbia and Nepal to address ongoing and longer-lasting disasters.
Applications	The system can provide fundamental connectivity to serve a number of applications supporting rural/ICT developments. i.e. SATMED (e-health platform) is using connectivity provided by the emergency.lu infrastructure to provide health ICT management solution for developing countries.

Technology type	Satellite, Internet and cloud services
Technology name	SATMED
Disaster applications	**Current users:** MSF, German Doctors, Friendship, etc. (medical NGOs) can quickly setup medical ICT infrastructure using the cloud-based platform through the satellite terminal and having access to a portfolio of e-health applications that cover the different requirements. **Recovery:** The platform can be quickly and easily rolled out during the response phase, but the main use case is in recovery and for mid/long term development. Users and locations are easily expandable and auto manageable so the platform can be the baseline to develop a complete health ICT infrastructure. The platform provides cloud and hosting services as well as allows the users to expand their network and exchange knowledge and information with other users worldwide.
Primary user group and format	Relief organizations (medical NGOs) Governments: to quickly and easily set up a complete, secure and reliable health ICT infrastructure. One-to-one; broadcast/one-to-many; many-to-many: many of the applications will allow exchanging knowledge and improving the education through e-consultancy, e-teaching and videoconferencing applications.

Deployment considerations	The complete system has 'star' infrastructure, the remote terminals consist of - *ODU*: 2.4 meter C-band antennas (or 1.2 meter Ku-band antennas) and - *IDU*: one portable rack containing, satellite router, portal server and UPS (by default). The system can be connected to a WiFi and/or local network. The solution is highly and cost-effectively scalable (thousands of terminals) and the already existing infrastructure has worldwide coverage (relying on emergency.lu). The central host (Luxembourg) provides cloud services and hosting services for data Security and backup etc are available through a single portal.
Case study or deployment example	Friendship deployment (Bangladesh). 3 rolling clinics (ships), 3 in-land hospitals and HQ (Dhaka). Data backup in Luxembourg and their 'research' partners in the US can access the authorized data through a secure connection between US and Luxembourg. Archemed deployment (Eritrea). Connection between the hospital in the capital and the province hospitals. Connection with their European partners for a sustainable Residency programme, e-teaching and e-consultancy. German Doctors (Philippines and Sierra Leone) FFL (Benin).
Applications	In the medical domain, SATMED overcomes the problems that limit the current use of e/m-Health. To do this SAMTED provides an e-health platform that is open access, easy to use, readily available, and accessible everywhere. This joins a wide spectrum of e/m-Health functionalities (from e-care to e-health management) in a single platform. It reduces the need for time consuming and expensive set-up of ICT resources and their maintenance. In addition, it improves interoperability between existing e-health applications. So the SATMED technology and services can be used all the way from the response/recovery solution to the long term national health management ICT infrastructure.

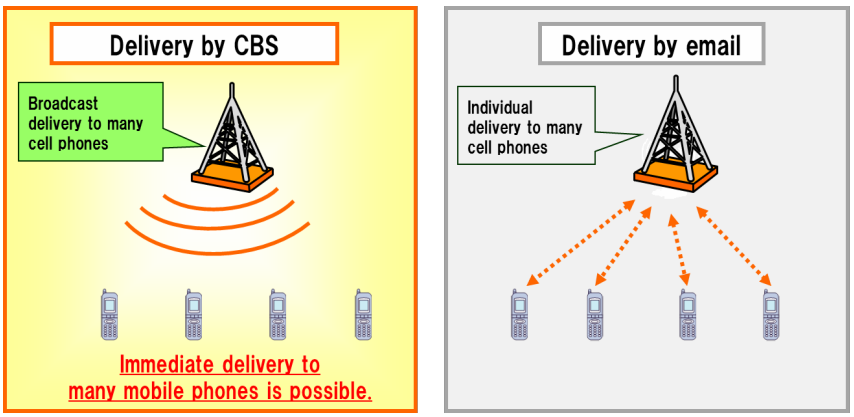
Infrastructure type	Satellite; terrestrial mobile; fibre NTT's (Nippon Telegraph and Telephone Corporation) ICT resource unit which is called MDRU (Movable and Deployable ICT Resource Unit) accommodates equipment required for both telecommunication and information services. It thus made up of various technologies such as satellite, terrestrial, mobile/fixed, and
Name of technology	**MDRU (Movable and Deployable ICT Resource Unit, NTT)**
Service applications	MDRU is usually applied to a disaster struck area for rapid recovery of ICT environment in the area. It is also applicable anywhere the ICT's demand/supply
Disaster applications	NTT's MDRU solution considers the disaster situation as making two phases of demand as shown in the graph.

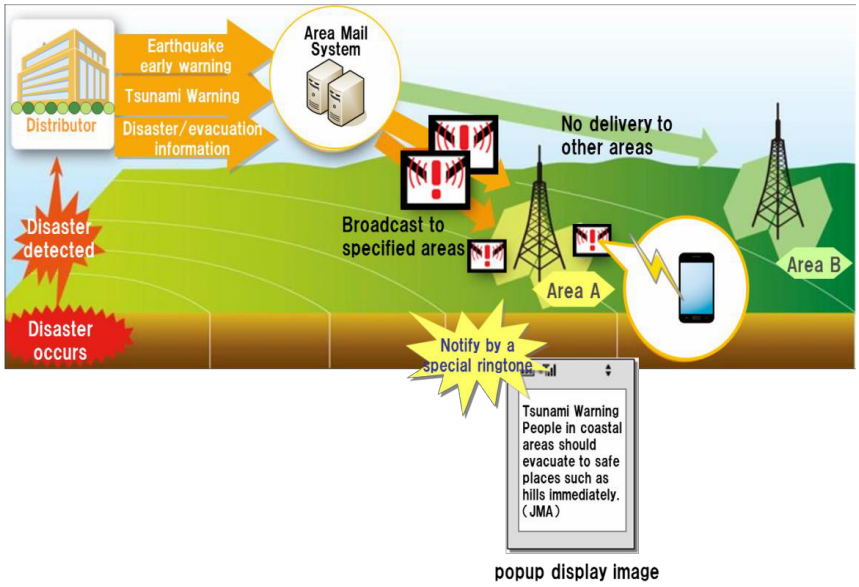
Deployment considerations	 The first phase represents the emergency recovery period, a time period of two to three days from the disaster occurrence. In this phase, real-time communications like telephone is placed under heavy demand, mainly for safe confirmation communication. The second phase represents the tentative recovery period which may range from one week to a year. In this second phase, the demand for data communication and information processing grows to support various social activities. The MDRU solution aims to fulfill the requirements in both phases by installing MDRUs in the disaster affected areas.
Primary user group and format	MDRU acts as an information hub in a disaster affected area, once deployed in the area. It thus offers services for not only evacuees but also various organizations like local government, hospitals, police, and even private companies.
Deployment considerations	 NTT succeeded in the development of vehicle-type MDRU. It accommodates network equipment for Wi-Fi-based access network, for optical/satellite links to a wide area network, servers and storage devices. The Wi-Fi_33 network enables local coverage of user terminals in a surrounding area up to a 500m radius. The performance and coverage can be extended by distributing and interconnecting several MDRUs in an area.
Case study or deployment example	The MDRU solution can be applied to any situations in which ICT demand/supply gap exists. For example, local ICT environment can be rapidly constructed by deploying an MDRU even in an area where less network
Other	The MDRU project is working to standardize the MDRU architecture in ITU-T FG

Infrastructure type	Satellite; terrestrial mobile; broadcast
Technology name	**Disaster Information Solution for rural areas using One-Seg broadcast system (Hitachi)**
Service Applications	In the normal situation, the users can receive TV programmes by the receivers. It will be useful to bridge digital divides, for example to broadcast educational programmes.
Disaster applications	Phase of disaster: all of alerting/early warning; preparedness, relief/response, recovery. The system enables information delivery for preparedness, alerting/early warning. Relief/response, and recovery using "One-Segment" broadcast.
Primary user group and format	Mainly, a government informs to its citizens. (One-to-many)
Deployment considerations	Solar (PV) panel and batteries for electric power. Transmitter of "One-Seg" radio wave. Receivers of "One-Seg" broadcast (such as mobile terminals). The cover area radius is about two or three kilometers from the transmitter antenna, (depending on landscape and surrounding buildings)  
Case study or deployment example	Feasibility studies were achieved in three areas in Indonesia. The cases provided indication that it was practicable to get enough information for disaster preparedness and damage information by receivers through the system which can be operated with low power consumption in rural areas that cannot receive normal terrestrial broadcasts due to insufficient electric power provision.
Other	…

A9.6 Terrestrial mobile / mobile broadband

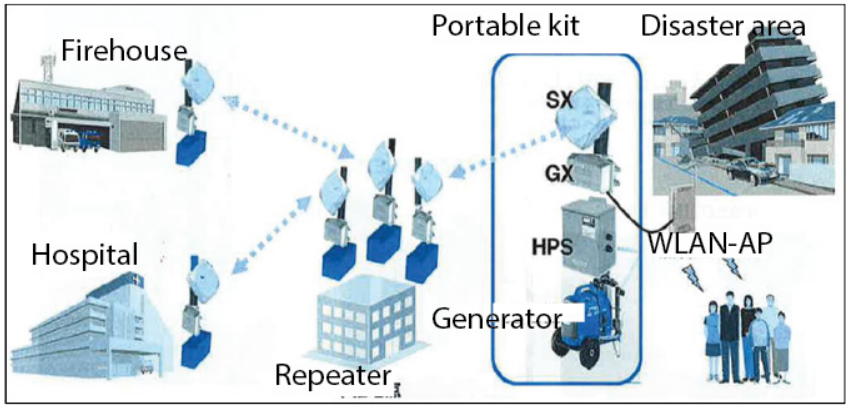
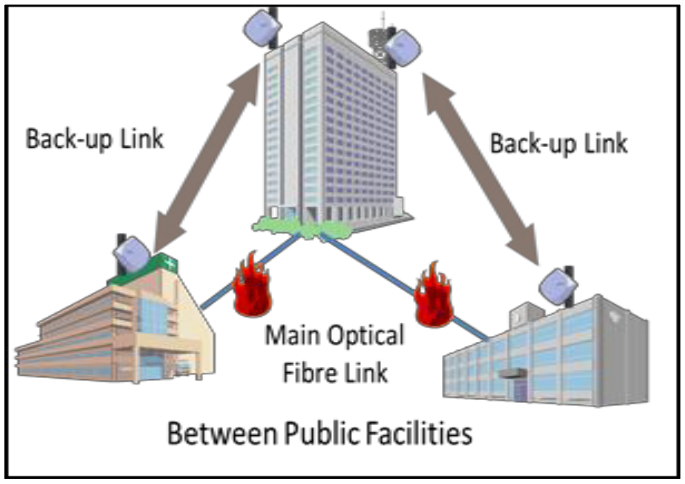
Especially in highly populated areas, consumers and many government agencies and first responders utilize terrestrial mobile or mobile broadband as an integrated, every day communication tool. The ability to reach key stakeholders no matter their location via mobile is increasing as additional applications and uses are developed. Use for both ICT4D and ICT4DR requires resilient communication networks and terrestrial mobile or mobile broadband networks often experience disruption in times of disaster. Infrastructure is not yet available in many rural areas.

Infrastructure Type	Terrestrial mobile / mobile broadband; broadcast Area Mail is a service which broadcasts an emergency message to mobile phones which are in the specified area in a short time. Area Mail uses CBS (Cell Broadcast Service) which is an international specification of mobile telecommunication system made by 3GPP (3rd Generation Partnership Project). Unlike e-mail, CBS performs broadcast delivery of messages to all mobile phones in the specified area. 
Name of Technology	Area Mail (NTT DOCOMO, Japan)
Service Applications	Area Mail is a special service for delivering early warnings at the event of disaster. However CBS
Disaster Applications	Area Mail is effective to broadcast early warnings shortly just after the disaster occurs. In Japan, mobile telephone operators broadcast early warnings messages such as earthquake warnings and tsunami warnings based on early warning notification from JMA (Japan Meteorological Agency) to all mobile phones in the specified area of the warning. No messages are delivered outside this area.

	 popup display image Features: There is no need to manage destination e-mail addresses. The system enables broadcasting messages to all mobile phones in the specified area. The system enables broadcasting messages in a short time period.
Primary User Group and format	Governments, citizens, broadcast/one-to-many. Area Mail broadcasts a message from a sender (one) such as governmental organization to mobile phones (many) in the alerted area.
Deployment Considerations	To develop Area Mail system, the major requirements are as follows: • **Receiving devices (mobile phones)**: The devices need to support CBS. In the devices, an application needs to be installed to show the messages. • **Mobile networks**： The network systems need to supports CBS. • **Senders of the information**Information senders are needed for providing information such as early warnings.
Case study or deployment example	
Other	Unlike e-mail, messages of Area Mail are not stored on the Area Mail System, so it is impossible to receive the message afterward. Likewise, it is impossible to receive Area Mail messages when out of range, in poor radio conditions and so on.

Infrastructure type	Terrestrial mobile
Name of technology	**Real-time flood monitoring system with wireless ad-hoc network (Fujitsu Limited, Japan)**
Service applications	• Sensors monitor water rising leading to flood conditions. The data is transmitted in real- time through a wireless ad-hoc network by which a number of communication devices themselves are interconnected without going through base stations or access points. • An ad-hoc network device automatically detects a close accessible device and establishes an optimal communication route. The automatic route detection makes it possible to steadily transmit data even in case of partial device malfunctions.
Disaster applications	Alerting/early warning

Primary user group and format	Government agencies
Deployment considerations	Infrastructure, frequency band, civil engineering knowledge for installation
Case study or deployment example	Already adopted by several government agencies
Other	

Infrastructure type	Terrestrial mobile / mobile broadband; Wi-Fi; wireless backhaul
Technology name	**IPASOLINK (NEC)**
Service applications	The 60 GHz and 70/80 GHz radio technologies can be applied for backhaul connectivity for rapidly deploying hotspots of 3G/4G or Wi-Fi mobile communication services or restoration of damaged fibre communication links during disasters. The radios can also be used for extending mobile communication services to remote underserved areas for sustainable development.
Disaster applications	The technology can be used to establish backup connectivity for disaster preparedness and rapid deployment for connectivity restoration for disaster response/recovery relief operations.  
Primary user group and format	The primary user groups are government agencies, telecommunications/Internet service providers and relief organizations responsible for disaster preparedness and for restoration of communication/information exchange with affected citizens for providing disaster recovery/relief operations.

Deployment considerations	Compact and zero foot print, power efficient and highly reliable point-to-point radio technology for IP based information exchange operating in the microwave frequency bands of 60 GHz and 70/80 GHz. The technology uses adaptive modulation technique and provides high link capacities up to 320 Mbps in 50MHz channel spacing in 60 GHz band and 1.6/3.0 Gbps in 250 MHz/500 MHz channel spacing in 70/80 GHz band.
Case study or deployment example	Not yet as a technology for disaster communications.
Other	Please refer to URL: www.nec.com/en/global/prod/nw/pasolink/ for additional information

Infrastructure type	Wi-Fi; terrestrial, UHF; mobile broadband A Center System collects driving information (position, speed, etc.) of the vehicles mounted with the Internavi system (GPS automobile navigation system by Honda Motor Co. Ltd.) through mobile broadband. The driving information data is analyzed as big data, and the analytical results display road blockages or suspensions.
Name of technology	**Telematics service with Internavi System (Honda Motor Co., Ltd)**
Service applications	• Routinely (not during disasters) users are able to avoid traffic jams. • During a disaster, the user can evade traffic jam and problem areas. • When a road is not completely destroyed, users can acquire information in real time even if a road is temporarily blocked due to bad weather such as typhoons, snow, etc.
Disaster applications	• Relief, recovery, mitigation. • Users can understand which road is passable or not, and the road authority • can determine the problem in the road to restore it.
Primary user group and format	Governments, citizens; one-to-many The road manager understands roads with problem and publicizes the information. The user grasps traffic information and can drive down the roads which are passable.
Deployment considerations	• User terminals • The Internavi system concerned does not need any special infrastructure other than mobile broadband connections. • If the number of vehicles with an Internavi system increases, traffic information precision improves.
Case study or deployment example	The government puts an Internavi system on a public common use vehicle including in developing countries for the local government for trial purposes.. The government then recommends the deployment of the Internavi system to general vehicles after having confirmed the effectiveness.
Other	

A9.7 Wi-Fi

Wi-Fi can be used as a stand-alone local communication tool between Wi-Fi ready devices in the absence of other working networks; or, as a method for extending access to Internet as delivered by terrestrial or satellite networks. This makes the technology versatile, enabled by basic networking equipment. Moreover, dedicated spectrum is not needed in order to communicate between user terminals.

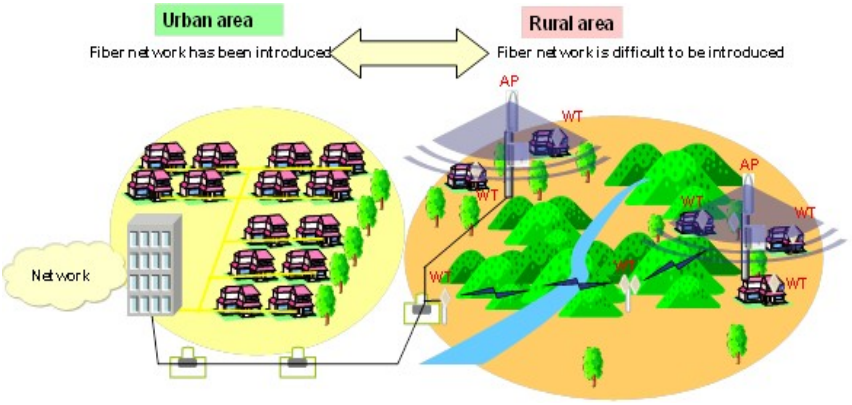
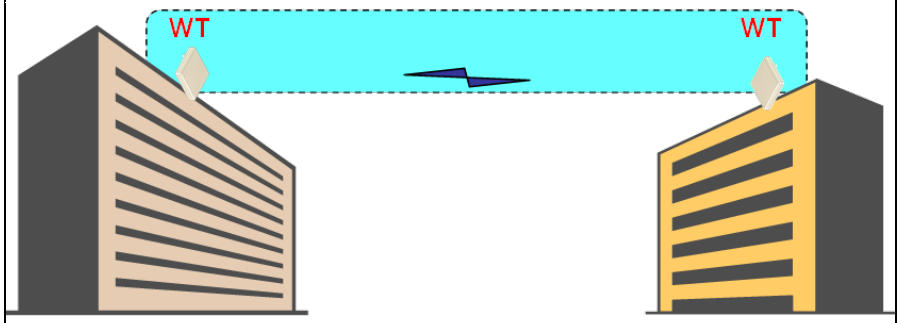
Infrastructure type	Wi-Fi; terrestrial; PPDR; mobile/fixed;

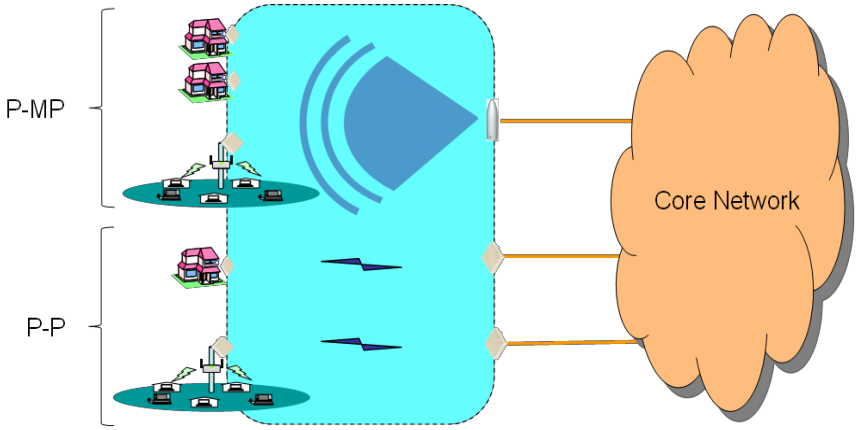
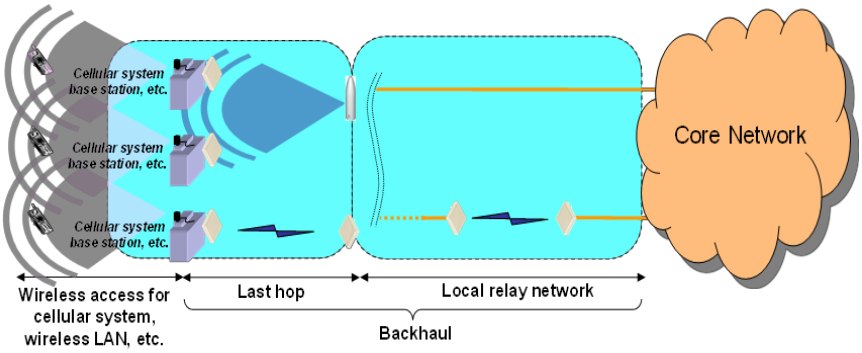
Name of technology	NerveNet (National Institute of Information and Communications Technology, NICT, Japan)
Service applications	NerveNet is a technology for configuring and operating a regional-area network platform which is composed of interconnected multiple base stations with data processing capability in a mesh topology, providing communications and data gathering/processing/sharing services with high availability even in emergency. It has two types: ad-hoc and permanently installed. Ad-hoc NerveNet is a temporary network deployed temporarily with movable base stations while the other (permanently installed) is a daily-use network with fixed base stations installed in villages and towns. Base stations accommodate end devices such as smart phones, sensors, and digital signage units through radio interfaces such as WiFi. As for interconnection between base stations, any Ethernet-ready wired or wireless transmission interfaces such as optical/metal Ethernet, 2.4 GHz/4.9 GHz/5.6 GHz WiFi, 18 GHz/25 GHz/60 GHz FWA, WiMAX, and satellite, are available, allowing fast, flexible, easy deployment by making use of existing networks. **Ad-hoc NerveNet:**, It can be used to provide ad-hoc, local communications not only post-disaster, but routinely, for outdoor events, for example. It would also be a good choice for a local network system in rural areas where telecommunication infrastructure is not sufficiently deployed or internal communication demand is heavy. **Permanently-installed NerveNet:** It permits any communications and data sharing in a local area without conventional telecommunication networks including cellular and the Internet. It enables broadcast messaging from local government, organizations, companies, and citizens to others. Routine messaging could include local event notification, sightseeing information for visitors, PTAs, schools, advertisements, security, etc. Capability of data gathering and sharing enables environmental and traffic sensing and reporting, SNS (message sharing), circulation, etc. Both of ad hoc and permanently installed NerveNet: • Provide **access** to the Internet at low cost. • Give **security against disasters** and sensing/alert services. • Allow local communications without cell-phone networks and the Internet.
Disaster applications	**"Ad-hoc NerveNet":** It enables local communications and data sharing when conventional communication networks fail and access to the Internet is denied after disasters. Exchange of data about evacuees and foods, voice/video communication, message distribution and other communications among evacuation areas are available without the connection to the Internet. **"Permanently installed NerveNet":** It enables alerting and warning by broadcasting (one-to-many) messages to all terminals and devices like digital signage through the network at the time of disasters. After disasters, it enables each user to know his/her evacuation point on a map, which comes not from a remote server on the Internet but from the nearest base station. It also enables users to input safety information and to share it with other persons such as family members (many-to- many). Voice communication is available between smart phones (one-to-one), helping first responses by first responders, local organizations, governments and citizens. A user who does not have a phone but an IC card may register and check safety information through a digital signage with IC card reader function. NerveNet also enables sensing and data gathering (many-to-one) daily and in emergency.
Primary user group and format	Many-to-many; many-to-one; first responders; government

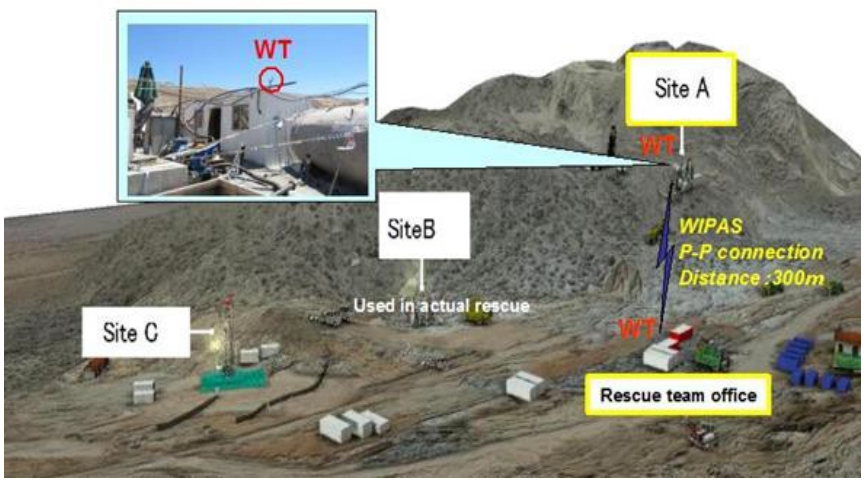
Deployment considerations	• **Infrastructure**: Base stations are located densely enough to cover the target area. They are interconnected (not necessarily fully-interconnected) with the use of Ethernet-compatible wired or wireless interfaces in a mesh topology. • **User terminals:** WiFi-ready terminals including PCs, smartphones, sensors, cameras, etc. • **Power**: Less than 50W (one base station with several WiFi transceivers for interconnecting with other base stations and for accommodating user terminals) • **Spectrum**: specific, dedicated spectrum is not needed. Typically, 2.4 GHz ISM band is a good choice for accommodating **user terminals**. WiFi in 5 GHz band is useful for the following. • **Interconnecting base stations.** (See above). • **Broadband connectivity**: Broadband communication at a net throughput of several megabit per second (or more) is provided to end terminals within the network. Connectivity to the Internet is not necessarily needed for providing local communications. • **Scalability**: One network can be composed of 100 base stations at maximum. This is large compared to commercial mesh networks that may be composed of less than 20 base stations only. • **Geographic coverage/rural/urban:** Both of rural and urban coverage is possible. Coverage size depends on the type of transmission technology used for interconnection of base stations and for accommodating user terminals.
Case study or deployment example	A pilot network has been under deployment and was scheduled to start working March 2014 in Onagawa town, Miyagi prefecture, located about 400km north of Tokyo in the region which was affected by the major tsunami in March 2011. Before this, a large-scale site composed of about 30 NerveNet base stations was developed in campuses of Tohoku University in March 2013 and has been in operation as a daily-use, resilient network. An ad-hoc network of nine movable NerveNet base stations was deployed within several hours by several persons, and safety information sharing and message distribution within the network were demonstrated at an event for public safety and preparation for disasters. Other pilot tests are under consideration in some areas in Japan and in other Asian countries.
Other	…

A9.8 Broadband

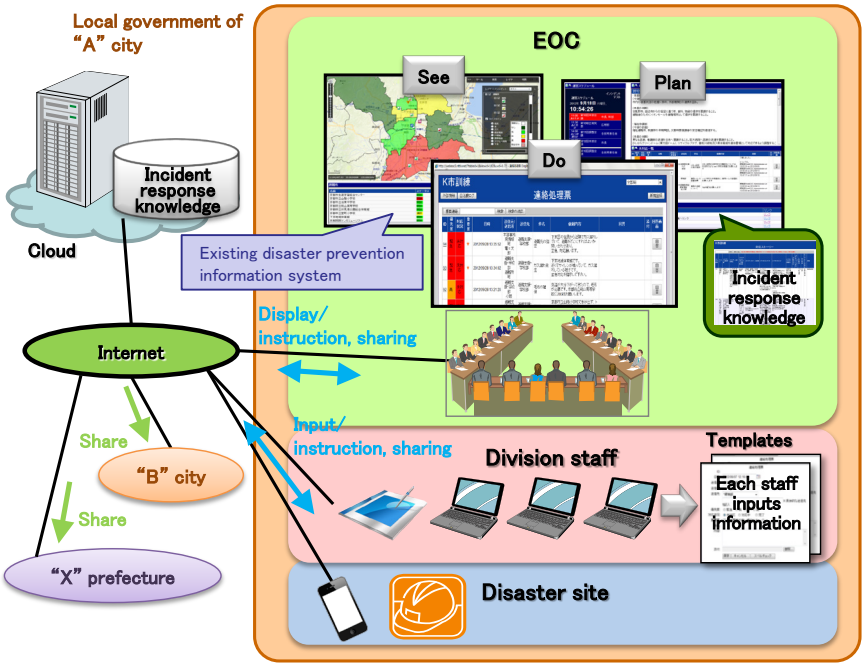
Broadband is increasingly relied upon for communication of all kinds, by governments, first responders, and citizens alike. In regions where there is broadband access and there is redundancy for network disruptions following disasters, there is an opportunity to utilize increasing numbers of cloud computing software both on a daily-use basis and for incident response coordination. Infrastructure can be a combination of fibre, terrestrial mobile, and satellite.

Technology type	Fixed; wireless broadband
Name of technology	**WIPAS (NTT)**
Service applications	The broadband service using WIPAS is provided in areas where FTTH service is difficult to deploy. WIPAS deployment example of broadband services in Japan  Examples of applications making use of same equipment as FWA bridging two local/private area networks between separate buildings. 
Disaster applications	WIPAS can be used for quick recovery of broadband network for the damaged area. WIPAS is suitable for recovery when existing fibre networks are damaged in disasters, such as earthquakes and tsunamis, because WIPAS has the following advantages compared to wired systems. • It is independent of geographical features, such as mountains and archipelagos. • It offers a short-term system implementation period at low cost. • It offers robustness against disasters and other incidental disruption.

Primary user group and format	For disaster recovery, governments necessarily aim to recover communication between all damaged sites. The most suitable format (P-P, P-MP) depends on the physical divergence of sites, and WIPAS can support both formats.  WIPAS can be also used for quick recovery of backhaul for mobile base stations. 
Deployment considerations	For the use of WIPAS on emergency, temporary power, such as UPS or a generator supply, is required.

Case study or deployment example	An example of a wireless link using WIPAS for emergency response was used at the mine roof collapse site in Chile. A WIPAS point-to-point system connected the rescue office to one of the drilling sites, located 300 meters apart. A wired link would have taken too long time to set up and would have been prone to damage. An example of a wireless link using WIPAS for emergency use is shown below. 
Other	

Infrastructure type	Broadband; fibre; terrestrial mobile; satellite This system is based on cloud services to support strategic emergency management at an emergency operations center (EOC). In case of disaster, key personnel such as the city mayor and head of disaster management team may use it to prepare a common operational picture (COP) and carry out effective management of incident response information.
Name of technology	**Emergency Management Support System (NTT)**
Service applications	This system is used for sharing information inside a local government not only in a time of disaster but also on a routine basis. This system is coordinated with other systems such as the system of information gathering about damaged status and incident response logs, and information distribution, sharing, and disclosure system.

Disaster applications	The emergency management support system is used in incident response by an EOC and has several features below: • It can display the summarized status of an entire incident response on three screens (Plan, Do, See) which enables to prepare a COP effectively. • It can create meeting documents automatically such as incident response logs for effective meetings and reports to parent organizations. • It can provide incident response knowledge to make a strategic incident action plan. Decisions made at meetings can be disseminated in real time across the entire organization. 
Primary user group and format	Local government carries a responsibility during incidents and disasters for public safety and support, and for formal reporting to other agencies and central government. Since the framework of emergency management in local government resembles that of the private sector, the system can be applied to EOC both in a public organization and a private company.
Deployment considerations	The system is based on cloud computing-and requires Internet connection to access the server.
Case study or deployment example	
Other	This system was proposed to the ISO22320: "Societal security — Emergency management— Requirements for incident response", as a next-generation emergency management support system.

Annex 10: SSDM Advisory Board Members

Chairman of the Advisory Board

H.E. Eng. John Nasasira
Minister of Information and Communications Technology
Uganda

Hon. John M. Nasasira has held the following portfolios in the Government of the Republic of Uganda:
Minister of Information and Communications Technology (May 2013 to date)
Minister of Gender, Labour and Social Development (November 2012 – to May 2013)
Minister for General Duties in Prime Minister's Office (August - October 2012)
Government Chief Whip/Cabinet Minister (June 2011 – July 2012)
Minister of Works and Transport (June 2006 – May 2011)
Minister of Works, Transport, Housing and Communications (August 1998 – May 2006)
Minister of Works, Transport and Communications (July 1996 – July 1998)
Minister of Agriculture, Animal Industry and Fisheries (July 1995 – June 1996)
Minister of State for Agriculture, Animal Industry and Fisheries (Dec. 1994 – June 1995)
Deputy Minister of Works, Transport and Communications (April 1992 – Nov. 1994)
Presidential Advisor on Public Works (July 1991 – March 1992)
Deputy Minister of Works (April 1989 – June 1991)
Delegate to the Constituent Assembly (1994 – 1995) that debated, adopted and enacted the 1995 Uganda Constitution.

He was first elected to Parliament to represent Kazo Constituency in February 1989 and has since been re-elected in 1996, 2001, 2006 and 2011. Hon. John Nasasira graduated in 1976 with BSc (Hons) Degree in Civil Engineering from the University of Nairobi. He then qualified as a Chartered Engineer (UK) in 1986 and in the same year became a Member of Institution of Engineers, UK (MICE), a Member of the American Society of Civil Engineers, (MASCE) and a Member of Institution of Engineers of Kenya (MIEK). He is a Fellow of Uganda Institution of Professional Engineers (UIPE) and is the current Patron of this Institution.

Hon. John Nasasira worked with several International Firms of Consulting Engineers engaged in the design and supervision of buildings, water, airports, roads and bridges projects in Eastern African and Middle East (June 1976 – February 1989).

Vice Chairman of the Advisory Board

Mr José Manuel do Rosário Toscano

Director General
International Telecommunications Satellite Organization (ITSO)
ITU Broadband Commission Member

As Director General of the International Telecommunications Satellite Organization ("ITSO"), an intergovernmental organization based in Washington, DC, with 149 member nations, Mr Jose Toscano is committed to assuring the provision of affordable satellite telecommunications services to all countries of the world.

A telecommunications engineer by training, Mr Toscano has more than twenty five years' experience in the telecommunications sector, and has been actively involved in the definition, development and work of numerous regional and international regulatory initiatives in the telecommunications and satellite communications fields, including with the International Telecommunications Union, the European Commission, and the European Conference of Postal and Telecommunications Administrations.

Mr Toscano, one of the founding members of the Broadband Commission for Digital Development, also has firsthand knowledge and understanding of the critical importance of broadband to the successful promotion and development of innovative information and communication technologies on a global basis.

Mr Flavien Bachabi
Managing Director
ABS Africa (Pty) Ltd

Flavien Bachabi is currently Managing Director of Africa Broadcast Satellite (Pty) Ltd. In this capacity he is responsible for leading ABS sales and business operations for the African continent. Prior to his current position, Mr Bachabi served as Chairman and Chief Executive Officer of Intelsat (Luxembourg) S.A., as well as Vice President of Business Operations and Intergovernmental Initiatives at Intelsat S.A., and head of Intelsat's corporate headquarters in Luxembourg, between January 2011 and September 2014.

In this capacity, his responsibilities included oversight of all major business operations, joint venture agreements and regulatory filings. He was responsible for managing new business activities with intergovernmental entities and development banks. His prior positions included: Regional Vice President for Africa and Head of Intelsat Africa (Pty) Ltd., where he was responsible for building Intelsat's leading position in Africa with the Continent's premier service providers, Regional Vice President for Africa and Middle East and Group Director, Africa sales. Prior to joining Intelsat in 1996, he spent more than 15 years in senior management roles with the Benin Telecommunications administration, where he led both domestic network and international services. He also has served on the Board of Directors of the Multinational School of Telecommunications of Dakar (ESMT), the African Telecommunications Union (ATU), and the Regional African Satellite Communications Organization (RASCOM).

Mr Bachabi has over 30 years of experience with communication and technology companies, and he earned degrees in Mathematics and Physics from the University of Benin, as well as a Master of Science Degree in Telecommunications Engineering from the Technical Institute of Electronics and Telecommunications of St. Petersburg (LEIS).

Mr Khalid Ahmed Balkheyour
President and Chief Executive Officer
ARABSAT

With over 30 years of experience in the telecoms industry, Mr. Khalid Balkheyour has held the role of the President and CEO of the Arab Satellite Communications Organization (ARABSAT) since 2003.

Mr Khalid Balkheyour came to Arabsat from Lucent Technologies where he was the Executive Vice President for Marketing and Sales from 1999 to 2003. Prior to that, he was the Vice President of Operations and Maintenance in the Saudi Ministry of PTT, later known as Saudi Telecommunication Company (STC).

He holds a Masters degree in Electrical Engineering from California State Polytechnic University Pomona in 1981.

Ms Donna Bethea-Murphy
Vice President
Iridium Communications Inc.

Ms Donna Bethea-Murphy serves as Vice President, Regulatory Engineering at Iridium Communications Inc., a leading satellite communications company that offers truly global voice and data coverage. In this capacity, Ms. Murphy is responsible for the company's domestic and international technical regulatory activities, including those related to policy, standards, licensing, and spectrum management.

As a leader and advocate within the satellite community, Ms Murphy has consistently highlighted the importance of satellite services during emergencies and times of disaster. In particular, she has promoted in-country preparedness and disaster planning within the United States and at the United Nations. In part due to these efforts and Iridium's work in disaster preparedness, the ITU selected Iridium as the recipient of its 2012 ITU Humanitarian award for which Donna accepted the award.

Ms Murphy has taken on a leadership role within the industry in other areas and currently serves on the FCC's Communications Security Reliability and Interoperability Council and on the boards of the Satellite Industry Association and the Mobile Satellite Users Association. While working on behalf of satellite companies, both for Iridium and previously for PanAmSat, Ms Murphy has worked to establish regulatory policies to facilitate the successful roll-out of satellite-based Internet, broadband, Direct-to-Home broadcasting, aeronautical, maritime and telephony services.

Prior to joining PanAmSat, Ms Murphy worked for a leading mobile terrestrial operator and advocated company regulatory policy positions before United States government agencies on issues such as Caller-ID, E-911, radio frequency radiation hazards and Communications Assistance for Law Enforcement. Ms Murphy began her career working for the United States Federal Communications Commission where she negotiated bilateral coordination agreements between the US-based satellite operators and foreign administrations, and she represented the US government before international intergovernmental bodies.

M. Bethea-Murphy holds a Bachelors of Science in electrical engineering from Clemson University.

Ms Charlotte Lindsey Curtet
Director of Communication and Information Management
International Committee of the Red Cross (ICRC)

As Director of Communication and Information Management at the International Committee of the Red Cross (ICRC) a post she has held since July 2010, Charlotte Lindsey Curtet is responsible for the ICRC's global ICT services, Archives and Information Management, Public and Corporate Communication.

Prior to this post, Charlotte was Deputy Director of Communication, ICRC, from January 2004 to July 2010. In a 21 year career with the ICRC, Charlotte has also held a number of other posts in the ICRC's Headquarters and in field delegations including deputy Head of Division for Policy and Cooperation within the Movement, Head of Women and War Project, and missions in Bosnia-Herzegovina, Kenya, Rwanda, Tajikistan and Croatia in a range of functions.

Ms. Lindsay Curtet holds a Masters degree (MSc. Hons.) in Communication Management. She has honours degree (BA Hons.) in Business Studies majoring in law and marketing. Charlotte has authored several publications including Women facing War published in 7 languages.

Mr Timothy S. Ellam Q.C.
President
International Amateur Radio Union

Timothy St. John Ellam QC is a partner in the Litigation and Intellectual Property Groups at McCarthy Tetrault LLP and a former member of the Firm's Board of Partners.

Mr Ellam advises clients over disputes relating to intellectual property, related commercial matters and with international arbitrations. He has appeared as senior litigation counsel in patent, licensing, copyright and technology related trials, arbitrations and hearings. Recent cases where he was lead counsel are recognized in Chambers Global (2011-2014) and Lexpert (2010). He frequently works with the Firm's London office on significant international arbitration matters and on litigation proceedings in the High Court of Justice (Commercial Court).

Mr Ellam is also a Solicitor Advocate (Higher Courts – Civil) in the Law Society of England and Wales and

holds Rights of Audience in the Higher Courts in that jurisdiction. He is an IBA Fellow in International Legal Practice; a distinction granted by the International Bar Association and the College of Law of England and Wales in 2005, becoming the first lawyer in Canada to be awarded this designation. He was recently elected to the American Bar Foundation. In 2014, he was appointed Queen's Counsel.

Mr Ellam is also the co-author of *Dispute Resolution in the Telecommunications Sector*, published by the International Telecommunication Union and the World Bank. He is a recognized speaker in a number of areas relating to intellectual property including privacy and data protection and been a speaker and moderator at a number of ITU Telecoms.

Mr Ellam is also President of the International Amateur Radio Union (IARU), a sector member of the ITU. Created in Paris, France, in 1925 the IARU has been the watchdog and spokesman for the world Amateur Radio community since 1925. Currently located in Newington, CT USA, the IARU is an UN recognized NGO consisting of over 160 national amateur radio societies around the world. He has represented the IARU at a number of ITU meetings since 2001.

Mr Samer Halawi
Chief Executive Officer
Thuraya Telecommunications Company

Samer Halawi has served as Thuraya's Chief Executive Officer since January 2011. Drawing upon his extensive experience in ICT and the global satellite communications industry, Samer is responsible for leading Thuraya's strategic positioning and driving its growth as a prominent global Mobile Satellite Services operator.

Throughout his career, Samer has demonstrated an unwavering commitment to connecting the disconnected via satellite. He has supported a number of non-profit organizations including the ITU, SOS Children's Villages, NetHope, the Rory Peck Trust and the International News Safety Institute with free airtime and satellite equipment enabling rural and remote communications. Samer has been responsible for leading the close collaboration between the Company's Service Partners, NGOs and government organizations to provide satellite communications during times of emergencies in China, Japan, the Philippines and Sierra Leone. Thuraya's services have resulted in countless lives being saved when terrestrial networks were damaged or destroyed.

Before joining Thuraya, Samer played a leading role in starting-up and growing a new venture involved in the digital space that focused on mobile content, IPTV, mobile advertising and web management. Prior to that, Samer was part of Inmarsat's global strategy team where he was responsible for running operations for the Middle East, Africa, and Asia Pacific. Samer's other telecommunications experience relates to his roles at Flag Telecom and ICO Global Communications. His role at ICO followed a private placement for the shares of the company that he led during a three-year period he spent in investment banking in the Middle East.

Samer started his career in the automotive industry where he was part of the Chrysler Corporation and Ford Motor Company. He holds a Bachelor of Science degree in Electrical Engineering from Lawrence Technological University and an MBA with a concentration in Finance from the University of Michigan at Ann Arbor in the U.S.

Mr Rashid Khalikov
Director
Office for the Coordination of Humanitarian Affairs (UN OCHA)

Rashid Khalikov joined the Russian Foreign Service in 1976. He worked in New Delhi, Moscow and New York handling humanitarian, political, economic and environmental issues. Mr Khalikov joined the United Nations in 1993. He has worked as a Senior Humanitarian Affairs Officer, Chief of the Office of the Under-Secretary-General for Humanitarian Affairs and Inter-Agency Standing Committee/Executive Committee on Humanitarian Affairs secretariat, and Deputy Director of OCHA Geneva.

In 2005 he became the Head of the OCHA Regional Office for Asia and the Pacific in Bangkok, and the Area Humanitarian Coordinator in the aftermath of the South Asia earthquake. From September 2006 to April 2010, as the Director of OCHA New York, Mr. Khalikov oversaw OCHA's work on policy development, information management, external relations, the Central Emergency Response Fund and other humanitarian financing issues.

In 2009 and 2010, at the request of the Emergency Relief Coordinator, Mr Khalikov led missions to Pakistan, Yemen, the Democratic People's Republic of Korea and Kyrgyzstan to evaluate in-country humanitarian conditions, and to develop recommendations on the UN's humanitarian role in these crises. In March 2010, the UN Secretary-General, Ban Ki-moon, appointed Mr Khalikov as the Director of OCHA Geneva. In March and April 2011, M. Khalikov was the Humanitarian Coordinator for Libya, as designated by the ERC. In August 2011, he led a UN humanitarian mission to Syria.

Mr Khalikov is a graduate of the Moscow State Institute of International Relations and holds a Master's degree in International Law and International Relations.

Mr Jones A. Killimbe
Director General
Regional African Satellite Communications Organizations (RASCOM)

Dr Jones A. Killimbe is an MSc and a PhD holder of Telecommunications Engineering from the University of Telecommunications Dresden/Germany. He joined the Tanzania Posts and Telecommunications Corporation (TPTC) in 1989 and later the Tanzania Telecommunications Company (TTCL) in 1994.

Between 1994 and 2003 he held a number of senior positions in the Company including Director of International Operations, Director of Network Construction, Deputy Managing Director, Acting Managing Director and Executive Director. He joined the Regional African Satellite Communications Organizations (RASCOM) in January, 2004 as the second DG/CEO since its establishment in 1993. He was also at one time a member of the Board of Governors of INTELSAT and Board Director/Chairman of RASCOM. He is Chairman of the African Regional Working Party on Private Sector Issues to the Forum on Telecom/ICT Regulation and Partnership in Africa (FTRA).

RASCOM is an African Continental Organization with the mission to launch a dedicated communication satellite for Africa and it brings together 44 African countries plus the West African Development Bank (BOAD). Its headquarters is in Abidjan, Ivory Coast.

Mr Olof Lundberg
Former Chairman and CEO of ICO Global Communication
Former Director General of INMARSAT

Mr Lundberg started his career with Swedish Telecom where he gained broad experience in telecommunications and in particular radio. During his time with Swedish Telecom he developed Maritex, an automated HF Telex System and he was involved with several generations of mobile radio.

In different assignments he managed HF Radio and Satellite Services, and also spent time in the regulatory area managing spectrum policy. During this period he participated actively in ITU and CEPT work. In 1979 he was appointed Director General of Inmarsat which he managed from creation through 1995.

At Inmarsat he led the pioneering development of mobile satellite communications in all forms, at sea, on land and in the air. He was CEO and then Chairman and CEO of ICO Global Communications 1995-2000 and Chairman and CEO of Globalstar around 2001-2002.

Mr Lundberg has received the CCIR Award d'Honneur and the ITU Gold Medal. He was awarded the Arthur C Clarke Award, has twice received the Aviation Week and Space Technology Laureate Award and has been inducted into their Hall of Fame. He has received the Tsiolkovsky Medal and is inducted to the SSPI Hall of Fame.

Mr Anudith Nakornthap
Former Minister of Information and Communication Technology
Thailand

Group Captain, Mr Anudith Nakornthap is the former Minister of Information and Communication Technology of Thailand. Prior to taking his political career, Mr Anudith Nakornthap was a distinguished pilot serving in the Royal Thai Air Force.

He was repeatedly awarded for his outstanding performance and academic achievements while in the Air Force. Although Mr Nakornthap became well known as a politician in Thailand when he was elected as Member of the House of Representatives from 2007-2011, his role in the Parliament, in fact, began as early as in 2005 when he dually served as a political secretary for Minister of Defense and advisor to Minister of Agriculture and Cooperatives from 2005-2006.

He was also actively involved in the energy sector while he was a member of the Committee on Energy of the House of Representatives in 2007-2011, during which he was appointed as Chairman of the Sub-Committee on Renewable Energy Promotion of the House of Representatives.

H.E. Mr Phillip Paulwell, M.P.
Minister of Science, Technology, Energy and Mining
Jamaica

The Hon. Phillip Paulwell M.P. is Minister of Science, Technology, Energy and Mining, leader of Government Business in the House of Representatives and Member of Parliament for the constituency of East Kingston and Port Royal. Minister Paulwell is also the current President of the Caribbean Telecommunications Union, and is one of six Regional Chairmen of Jamaica's governing People's National Party.

An attorney-at-law by profession, he first entered Gordon House as a Senator in 1995. In the General Election of 1997, he contested and won the East Kingston and Port Royal seat, and took his place in the Lower House. He has never lost an election since, and is currently in his fourth consecutive term of political representation. Minister Paulwell served as a Cabinet Minister from January 1998 to September 2007, and his portfolio responsibilities over the years have included Commerce, Industry, Telecommunications, and Energy, and, since his appointment as Minister in January 2012, Science, Technology, Energy and Mining. In this term of office, Minister Paulwell has announced bold plans to introduce tablet computers to schools, to revitalise the bauxite alumina sector and to reduce the high cost of energy.

These goals may seem ambitious, but his record of performance indicates his commitment to successfully executing visionary projects. Among his many achievements, Minister Paulwell is credited with the leading liberalization of the telecommunications sector, and in 2000 received the Gleaner Honour Award for implementing historic measures to introduce competition, breaking the 25-year Cable and Wireless monopoly. More recently, Minister Paulwell piloted the 2012 Telecoms Amendment Act through Parliament, resulting in a historic reduction of mobile call rates from as high as $18.99 per minute to as low as $2.49 in less than 12 months. Also in 2012, Minister Paulwell successfully negotiated to prevent the closure of WINDALCO's Ewarton alumina refinery, preserving over 600 direct jobs, and hundreds more indirect jobs.

Minister Paulwell is a graduate of the University of the West Indies, the Norman Manley Law School, and Excelsior High School.

Mr Christian Roisse
Executive Secretary
European Telecommunications Satellite Organization
(EUTELSAT IGO)
ITU Broadband Commission Member

Since July 2005, Christian Roisse has been the Executive Secretary of the European Telecommunication Satellite Organisation (EUTELSAT IGO). He was reappointed for a third mandate in May 2013. EUTELSAT IGO, which has 49 European Member States, has a twofold role. It maintains the rights to use radiofrequencies and orbital locations which were assigned collectively to the Member States by the International Telecommunication Union before the 2001 restructuring and monitors the operations of the Company, in particular to ensure that the Basic Principles are observed.

Prior to this, Christian Roisse was General Counsel of Eutelsat S.A., the world's third largest satellite operator, overseeing the legal activities of the company through the first 4 years of its operations as a French national law company. As Legal Adviser of EUTELSAT from 1988 to 2001, he played a key role in the restructuring of the organization and the transfer of its commercial and operational activities to the French national law company, Eutelsat S.A. which was established for this purpose.

From 1977 to 1988, he was Legal Adviser to France Telecom and Counsellor to the Head of the General Directorate for Industry in the French Industry Department. Christian Roisse holds a Master's degree in Law and a postgraduate Diploma in Public Law. He is a founding Commissioner in the Broadband Commission for Digital Development, established in May 2010 by the International Telecommunication Union and UNESCO and a Member of the Working Group on Long-term Sustainability of Outer Space Activities established by the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS).

He is a member of the International Institute of Space Law, the European Centre for Space Law and a Board Member of the Association pour le Développement du Droit de l'Espace en France (ADDEF). He sits on the Boards of Directors of Eutelsat S.A. and Eutelsat Communications S.A. as Censeur.

Mr Jean-Louis Schiltz
Former Minister of ICT and Development cooperation
Schiltz & Schiltz, avocats, Luxembourg
Guest Professor (Telecommunications law), Luxembourg University

Jean-Louis Schiltz practices law in Luxembourg with focus on technology and finance. He is a Guest Professor at Luxembourg University, where he teaches Internet- and telecommunication law.

From 2004 to 2009, Jean-Louis Schiltz was a Cabinet minister in Luxembourg. He was in charge of media and telecommunications, including Internet. He was also the minister for international development cooperation during that period. In 2006, he was entrusted a third ministerial portfolio, that of Defense.

As the former Minister of Communications, Jean-Louis Schiltz actively promoted Luxembourg in the fields of telecommunications and ICT. He was also in charge of the development of the information and communication networks in Luxembourg. Thus he is the initiator of the LuxConnect project, a high bandwidth network between Luxembourg and primary foreign Internet access centers. LuxConnect is today one of the major actors in the sector and greatly contributes to strengthen the international Internet connectivity of Luxembourg.

Jean-Louis Schiltz is a member of the Broadband Commission for Digital Development.

H.E. Mr Tifatul Sembiring
Minister of Communication and Informatics
Republic of Indonesia

H.E. Mr Tifatul Sembiring is an Indonesian politician and minister of Communication and Information Technology of Indonesia. He is chairman of the moderate and Islamic Prosperous Justice Party and Minister of Communication and Information in the Second United Indonesia Cabinet.

He has a degree in computer engineering from the Information and Computing Management School, Jakarta, and was active in a number of Indonesian Islamic organizations from his student days, such as PII, the Indonesian Student's Association.

Mr Gerson Souto
Chief Development Officer and Member of the Executive Committee
SES

Gerson leads the Development Office of SES and is responsible for Corporate Development (Strategy, M&A), Business Development and investigating new ventures outside the core FSS business, as well as Spectrum Management & Development and providing a single view on a global satellite fleet via an integrated Fleet Development & Yield Management function. Gerson is also on the Board of O3b Networks.

He joined SES in 1998 and amongst other functions, in 2007, was on the Management Committee of SES NEW SKIES, and as of 2009 was on the Management Team integrating SES Americom and SES NEW SKIES into a combined entity, SES WORLD SKIES, before becoming the Chief Development Officer of SES in 2011. Previously Gerson worked at Intelsat and prior to that, he worked as an engineer at Embratel, a Brazilian telecommunications long distance carrier.

Gerson holds an MBA from George Washington University in Washington, D.C., an MA in Telecommunication Systems from the Pontifical Catholic University in Brazil, and a bachelor's degree in Telecommunication Engineering from the Federal Fluminense University in Brazil.

Mr. Andrew Sukawaty
Chairman
Inmarsat Plc.
United Kingdom

Andy Sukawaty is the Chairman of Inmarsat PLC (LSE), having previously been both Chairman and CEO between 2003 and 2012. He led the company through its privatization and subsequent listing on the London Stock Exchange. During this period, Inmarsat launched new services on the back of the launch of a new global constellation of satellites and grew its revenues and profits dramatically. He has over thirty years' experience in the communications services arena including telephone, wireless, cable TV and satellite.

He is a pioneer in mobile communications; involved in launching some of the first cellular mobile phone systems in the early 80s in the US. He then crossed the Atlantic to start a UK mobile operator (which became T-Mobile UK). He went on to run NTL Ltd in the UK and in 1996 returned to the US to start up the US national mobile phone operator, Sprint PCS. After four years in which the company established the leading growth position in the US wireless industry he left to enter the Cable TV industry in Europe.

In addition, he is currently an Executive in Residence for the global private equity firm, Warburg Pincus. He has held various non-executive director roles including the Deputy Chairman of O2, Powerwave Technologies and others. He is the former Chairman of Xyratex (NASDAQ) and Ziggo (Euronext). In June 2013 he became an Independent Non-Executive Director of BSkyB (LSE).

A graduate of the University of Minnesota (MBA) and the University of Wisconsin (BBA), he is on the Board of Advisers of the University of Wisconsin Department of International Studies.

Mr Masahiro Yoshizaki
Former Vice-Minister for Policy Coordination
Ministry of Internal Affairs and Communications
Japan

Mr Masahiro Yoshizaki is the former Vice-Minister for Policy Coordination of the Ministry of Internal Affairs and Communications of Japan.

1979 Entered the Ministry of Posts and Telecommunications (MPT).
2001 Director of ICT Accessibility and Human Resources Development Division, Information and Communications Policy Bureau, MIC, Director of Information Policy Division, Information and Communications Policy Bureau, MIC.
2002 Director of Municipal Tax Planning Division, Local Tax Bureau, MIC.
2004 Director of General Policy Division, Information and Communications Policy Bureau, MIC.
2005 Director of the General Affairs Department, National Institute of Information and Communications Technology (NICT).
2006 Director of Policy Planning Division, Minister's Secretariat, MIC.
2007 Deputy Director-General for IT Strategy Commerce and Information, Policy Bureau, Ministry of Economy, Trade and Industry (METI).
2009 Vice-President, National Institute of Information and Communications Technology.
2010 Director-General of the Kanto Bureau of Telecommunications, MIC.
2011 Director-General for Policy Coordination, Minister's Secretariat, MIC.
2012 Director-General of the Information and Communications bureau.
2013 Vice-Minister for Policy Coordination （International Affairs）.

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