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Information and communications technology for disaster risk reduction

Role of information and communications technology in the implementation of the Hyogo Framework for Action

Note by the secretariat

Summary

The Asia-Pacific region is affected by an increase in extreme weather events, such as tropical cyclones, intense rainfall, floods and related landslides, and prolonged drought and wildfires. Information and communications technology (ICT) plays an important role in disaster risk reduction and management.

The present document describes the fundamental role of ICT in supporting the Hyogo Framework for Action and reviews trends and emerging capabilities in ICT, including those related to space and to disaster risk reduction and management in the region. It also highlights the importance of enhancing the resilience of ICT to reduce the damage and losses that could be caused by disasters. The Committee may wish to review issues that are of common concern to members and associate members.

The Committee may also wish to provide guidance on the secretariat's future work in this particular area, including on possible outputs that could be reflected in the programme of work for the biennium 2012-2013.

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I. Introduction

1. The Asia-Pacific region has been affected by an increase in many extreme weather events, such as tropical cyclones, intense rainfall, floods and related landslides, and prolonged drought and wildfires. In 2009, Asia experienced the largest share of occurrences of reported natural disasters and accounted for 89.1 per cent of global reported natural disaster victims and 38.5 per cent of total reported economic damage from natural disasters.[1] Hydrological disasters occurred most often, followed by meteorological disasters. In the Pacific, cyclones accounted for most of the reported

[1] Femke Vos and others, *Annual Disaster Statistical Review 2009: The Numbers and Trends* (Brussels, Centre for Research on the Epidemiology of Disasters, 2010), p. 1.

disasters. During the first semester of 2010, according to statistics of the Centre for Research on the Epidemiology of Disasters, Asia and the Pacific recorded 60 occurrences of disasters, with over 4,200 people killed, more than 86 million people affected, and about $7,900 million of economic damage.[2]

2. In 2010, major floods and landslides across Asia affected millions. Pakistan experienced unprecedented floods in July and August 2010. As of 30 August, an estimated 17 million of Pakistan's 167 million people had been affected by the floods.[3] The number of people affected by catastrophic floods in Pakistan outnumbers those suffering from other recent major natural disasters, for example the 2004 Indian Ocean tsunami (5 million), the 2005 South Asia earthquake (3 million) and the 2010 Haiti earthquake (3 million).[4]

3. Landslides raised the death toll in flooded areas in Pakistan, further cutting off roads. The floods and landslides triggered by the monsoon rain have destroyed or severely damaged over 700,000 houses and caused severe damage to the infrastructure in the affected areas of Pakistan. So far, damage and losses in the communications, agricultural and other sectors are estimated in the billions of rupees.[5] The loss of lives and impacts on livelihoods may rise further, as flood warnings have been issued because of rising water levels in the southern part of the Indus River. It is estimated that it will take months before the full extent of the damage can be assessed.

4. China also experienced devastating floods. In June 2010, over 300 people had been killed and more than 29 million people had been affected by the floods in China, with the estimated economic damage amounting to $6,300 million.[6] In August, a deadly landslide caused by torrential rainfall swept through a county in Gansu province. On 18 August 2010, the death toll from that landslide rose to over 1,200, with more than 450 people missing. Deadly mudslides also occurred in Sichuan and Yunnan provinces, adding to the more than 2,000 people killed in 2010 by flooding and mudslides. As heavy rain and flooding swept these areas, other regions in China suffered from drought. According to the Office of State Flood Control and Drought Relief Headquarters, more than 3 million people and 2.46 million livestock were having difficulty accessing drinking water, while drought was severely affecting about 2.6 million hectares of crops.[7]

[2] Centre for Research on the Epidemiology of Disasters, "2010 first semester natural disaster occurrence and impacts: regional comparison", *CRED CRUNCH*, No. 21 (August 2010).

[3] United Nations Office for the Coordination of Humanitarian Affairs, "Pakistan: monsoon floods", situation report No. 19 (30 August 2010), p. 1.

[4] "Pakistan flood victims may outnumber those of tsunami, Haiti quake: UN", *People's Daily Online*, 10 August 2010. Available from http://english.people.com.cn/90001/90777/90856/7099279.html.

[5] Pakistan, "Important disasters: comparative statement". Available from www.pak.gov.pk/Flood%20Relief%20Fund/flood_comparison.pdf.

[6] Centre for Research on the Epidemiology of Disasters, "The 10 largest natural disasters over the first semester of 2010", *CRED CRUNCH*, No. 21 (August 2010).

[7] Bloomberg News, "Landslide in Southwestern China's Yunnan Province Kills Two, 90 Missing", 19 August 2010. Available from www.bloomberg.com/news/2010-08-19/landslide-in-southwestern-china-s-yunnan-province-kills-two-90-missing.html.

5. In the Russian Federation, wildfires that started in mid-July 2010 in the Central and Volga federal districts broke out into a series of wildfires, mostly across the western part of the country, producing a dense plume of smoke over hundreds of kilometres. Satellites registered hundreds of wildfire hot spots. According to the Government of the Russian Federation, as of 20 August, more than 28,500 islands of wildfire had broken out since the beginning of the 2010 fire risk season, covering a total area of more than 886,000 hectares, including 1,146 peat fires covering a total area of about 2,100 hectares.[8] In addition, the heat wave in the Russian Federation destroyed 10 million hectares of arable land.[9]

II. Information and communications technology in support of the Hyogo Framework for Action 2005-2015

A. Role of information and communications technology

6. The World Summit on the Information Society was centred around the commitment to build an information society in which, among other things, the majority of the world's inhabitants have access to information and communications technology (ICT). Action line C7 of the Summit's Geneva Plan of Action (A/C.2/59/3, annex) mentions using ICT applications to: (a) support sustainable development within the framework of national e-strategies (para. 14); and (b) establish disaster monitoring systems (para. 20).

7. ICT plays a fundamental role in supporting the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters (A/CONF.206/6 and Corr.1, chap. I, resolution 2), which is the main outcome of the World Conference on Disaster Reduction, held in Kobe, Japan, in January 2005. The Framework is a recognized global guide for facilitating the effective implementation of disaster risk reduction at the international, regional, national and local levels to substantially reduce losses of life and of the social, economic and environmental assets of communities and countries. Governments committed to implementing the Framework allocate necessary resources and set up the appropriate institutional and legislative frameworks to facilitate its implementation.

8. Strategically, the expected outcomes of the Hyogo Framework for Action include a more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with an emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction; the development and strengthening of institutions, mechanisms and capacities at all levels to build resilience to hazards; and the systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes.

[8] Russian Federation, "Situation with forest fires on the territory of the Russian Federation according to the information received at 06:00 Moscow time 20 August 2010", 20 August 2010. Available from www.reliefweb.int/rw/rwb.nsf/db900sid/EKIM-88L3PE?OpenDocument&rc=4&emid=WF-2010-000147-RUS.

[9] Agence France-Presse, "Russia struggles against spreading wildfires", 5 August 2010. Available from http://reliefweb.int/rw/rwb.nsf/db900sid/ASAZ-882H5Y?OpenDocument.

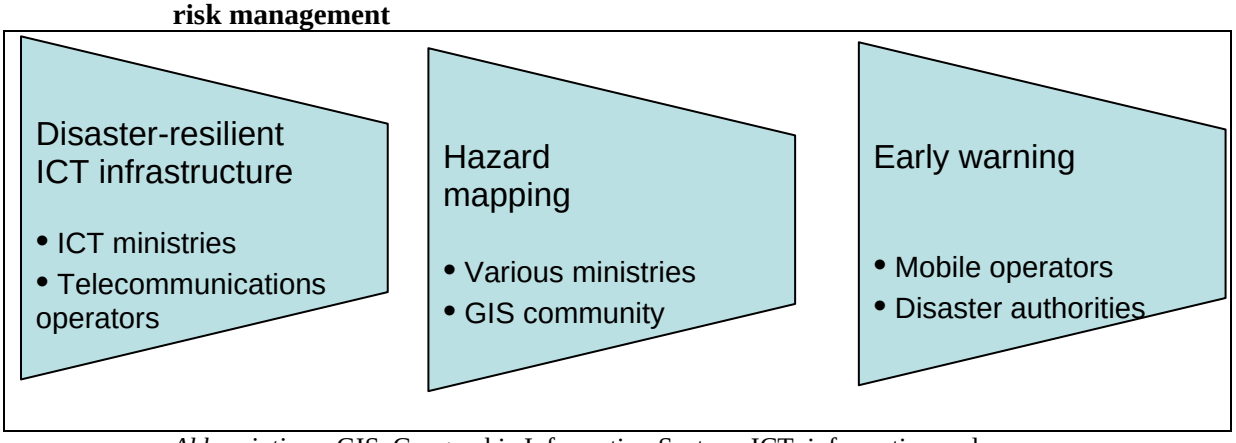
9. The Hyogo Framework proposes five priorities for action: (1) ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation; (2) identify, assess and monitor disaster risks and enhance early warning; (3) use knowledge, innovation and education to build a culture of safety and resilience at all levels; (4) reduce the underlying risk factors; and (5) strengthen disaster preparedness for effective response at all levels.

10. The implementation of the Hyogo Framework entails fostering political commitment to integrate disaster risk reduction into national development planning, evaluating existing legal and institutional mechanisms and policies and strengthening the clear distribution of tasks and the allocation of responsibilities, engaging in dialogue with all relevant national actors in disaster risk management to set up a multidisciplinary and multi-stakeholder national coordination mechanism for disaster risk reduction, institutionalizing disaster risk reduction and establishing mainstreaming mechanisms.

11. ICT is essential for building a knowledge base on risk and disaster risk management; establishing a hazard monitoring programme that includes effective, timely and reliable early warning and alert systems at the national and local levels; applying space technology for disaster risk management; enhancing access to information and an understanding of risk and risk management; involving the media community in risk assessment and risk communication; and organizing and coordinating emergency operations, disaster response and recovery capability.

12. The Hyogo Framework for Action also recommends that disaster risk considerations be mainstreamed into development planning for major infrastructure projects. All sectors, including ICT, should take this recommendation on board, including by establishing programmes to reduce the vulnerability of critical facilities and infrastructure.

Figure 1
Role of information and communications technology sectors in disaster risk management



Abbreviations: GIS, Geographic Information System; ICT, information and communications technology.

B. Disaster risk reduction and climate change adaptation: emerging areas of information and communications technology applications

13. There is a growing recognition that climate variability and extreme weather events are likely to increase, thereby affecting the vulnerability of

countries to both climate hazards, such as floods, tropical storms and drought, and non-climate hazards, such as groundwater salinization, which would have an impact on the growth and development of countries and the livelihoods of communities, especially in least developed countries and small island developing States.

14. The Intergovernmental Panel on Climate Change has reaffirmed in its fourth assessment report that many climate risks will be exacerbated by climate change and that many adaptation actions are embedded within local planning initiatives, including disaster risk reduction strategies.[10] The Bali Action Plan (FCCC/CP/2007/6/Add.1, decision 1/CP.13) called for the consideration of disaster reduction strategies and means to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change.

15. Disaster risk reduction is one important component of climate change adaptation. Multiple climatic and non-climatic data are required to assess the impacts of and vulnerability to climate change and to work out adaptation needs. The availability of and access to information and reliable climatic data on rainfall, tropical storms, temperature, sea surface temperature, sea level rise, and frequency and intensity of events, among other things, and non-climatic observational monitoring data on water resources, agriculture, environment and ecosystems, for example, are critical for adequate planning and decision-making for adaptation to climate change in the medium and long term.

16. ICT is essential for the collection of temporal and spatial climatic and non-climatic observational monitoring data, including those on climate variability, as well as sector- and region-specific information at different spatial scales that is needed for the development of risk information for decision-making at various levels. Access to data from operational observation and monitoring networks, for which services are provided by national meteorological and/or hydrological agencies and other subregional, regional and global networks, is crucial for the effective monitoring of local climate change and the assessment of risks.

III. Regional trends in information and communications technology for disaster risk reduction and management

A. Mobile technologies and communications applications

17. In Pakistan, ICT was put to use extensively during responses to the devastating floods in mid-2010. Mobile phones were helpful in the dissemination of early warning messages in the long stretches of the Indus flood plain basin from north to south, encompassing a geographical area of about 13 million hectares. The emergency telecommunications cluster was put in place to enhance the response capacity of the Government of Pakistan, the United Nations response team and non-governmental organizations. In order to address the most immediate humanitarian concerns, the World Food Programme (WFP) provided ICT support to United Nations agencies. The IT Emergency Preparedness and Response

[10] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: Synthesis Report*, adopted at IPCC Plenary XXVII (Valencia, Spain, 12-17 November 2007).

team of WFP helped the Government of Pakistan in evacuation and search and rescue efforts. The Fast Information Technology and Telecommunications Emergency and Support Team (FITTEST) backed up WFP operations effectively. These ICT-enabled efforts enabled the Government and the international community to rapidly scale up emergency assistance in the vast geographical area affected by the floods.

18. The increased availability and affordability of mobile infrastructures and services and the rapid growth in subscriptions to cellular mobile services open a new set of opportunities for the dissemination of alerts. Such expansion is occurring at faster pace in developing countries, including in rural areas, providing means of communication to people who were previously not connected. Mobile telephony provides remote communities with access to constantly updated weather information and is helping to create endogenous early warning systems. Some cellular handsets, in addition to telephony, may also be used to achieve two other important disaster communication functions: receiving short message service (SMS) text messages and positioning locations through embedded Global Positioning System (GPS) functions.

19. During the past decade, the Asia-Pacific region has experienced tremendous growth in the area of ICT, including related infrastructure and services. Access to mobile and fixed telephone lines and the Internet has expanded rapidly. At the end of 2008, in Asia and the Pacific, there were about 676 million fixed telephone lines, as opposed to 1.3 billion worldwide, and 2.1 billion mobile cellular subscriptions, as opposed to 4.0 billion worldwide. The proportion of mobile cellular subscriptions in Asia and the Pacific increased from about 32.9 per cent of the world total in 2000 to more than 47.0 per cent in 2006 and 51.6 per cent in 2008.[11]

20. Mobile broadband infrastructures are also being increasingly rolled out in Asia and the Pacific. By the end of 2008, there were about 158 million subscriptions to third generation (3G) services in Asia and the Pacific, mostly in high-income economies. China and India, the world's two largest mobile markets, led growth in the Asia-Pacific region. 3G services are also deployed in other developing countries, although with limited coverage. Another emerging technology that may play an important role in both fixed and mobile broadband Internet access, especially in providing broadband services for underdeveloped, rural and remote regions, is Worldwide Interoperability for Microwave Access (WiMAX). The Asia-Pacific region is expected to take a leading role in its deployment. However, the technology requires considerable investment in new infrastructure.[12]

21. Despite rapid growth in mobile and broadband networks, the rural-urban digital divide in some developing countries and disparities between subregions remain a major development challenge in Asia and the Pacific. ICT penetration in the region remains relatively low, below the world average. Given the catalytic role high-speed Internet connections play in making the benefits of ICT available to people, bridging the broadband

[11] *Statistical Yearbook for Asia and the Pacific 2009* (United Nations publication, Sales No. E.10.II.F.1), p. 128.

[12] International Telecommunication Union, *Information Society Statistical Profiles 2009: Asia and the Pacific*, pp. 14 and 19. Available from www.itu.int/ITU-D/ict/material/ISSP09-AP_final.pdf.

divide in the Asian and Pacific region remains a major task for national and regional policymakers.[13]

22. Mobile telephones and smart phones are fast replacing radio and television as the best medium to communicate and coordinate with large populations. Mobile technology includes everything from smart phone applications to simple text messaging and is widely used in developing countries. This technology can be used to warn populations about risks using common alerting protocol (CAP) and to communicate using SMS, Really Simple Syndication (RSS) feeds or Twitter.[14] Cellular mobile services may provide the cheapest and broadest communication services available to field teams and affected people. To prevent the deterioration in quality that could be caused by a sudden increase in traffic, timely expansion of the handling capacity of local mobile systems should also be an important component of capacity-building efforts.

23. Terrestrial wireless services, such as cellular mobile and broadband Internet, are useful when they are connected to local and global backbone networks, mostly through terrestrial infrastructure, such as optical fibre. In many emergency situations, this infrastructure has either been destroyed by the disaster or has not been available. To address emergency situations in high risk areas, it is therefore important for wireless networks to have reliable backup and rapid deployment capacities that are not dependent on terrestrial fixed infrastructure, such as ground- or satellite-based wireless transmission.

24. Satellite communications are widely used to skip ground expansion to cover large areas, and they have been used as a major backup means for ground-based communications infrastructure. Over the Asia-Pacific region, more than 70 geostationary Earth orbit communications satellites, more than 10 of which are operated by government agencies, with the others being operated commercially, are providing various services, such as television/audio/data transmission and broadcasting, Internet backbone, backhaul and individual access, networking and regional satellite mobile services. Two medium Earth orbit constellations are used for satellite mobile services around the world. Recent development in satellite broadband has made Internet Protocol (IP)-based services more accessible and affordable to many under-serviced areas of the region. Devices for accessing satellite services have been miniaturized so that they are more convenient for rapid deployment during emergency response actions: very small aperture terminals (VSAT) are used for accessing broadband services, and satellite mobile services may provide telephony and Internet access through portable terminals or handsets.

25. Satellite mobile services are considered to be the most convenient and rapidly deployable means of telephony and Internet access in most disaster response actions, particularly in areas where terrestrial infrastructure-based services are not available. Satellite short message services provided by the Compass satellite navigation system of China demonstrated their value as the most reliable means of communication in the response to the Wenchuan earthquake in May 2008. The capacity of the Compass system to provide services to other parts of the region is under

[13] Ibid., p. 36.

[14] Abhas K. Jha and others, *Safer Homes, Stronger Communities: A Handbook for Reconstructing after Natural Disasters* (Washington, DC, World Bank, 2010), p.257.

development. Among existing satellite mobile services in the region, Inmarsat and Iridium are global satellite constellations, while Thuraya's two satellites cover most Asian and Western Pacific countries.

26. When ground-based broadband Internet is not available, such connectivity could be achieved through satellite broadband services. Many communication satellites are providing such services with different geographical coverage and technical systems, and many kinds of terminals are suitable for rapid deployment, including those that could be air-dropped and carried to geographically difficult mountainous areas. Among these satellite broadband services, Thaicom's IPStar satellite has established the broadest service network, covering many Asia-Pacific countries.

27. Television and radio broadcasts are the most popular form of mass media for delivering early disaster warning messages to the public and for educating people on building disaster resilient communities. Television is also the most powerful means for mobilizing social resources to support disaster response and rehabilitation efforts. Although most of the population centres in the region are covered by television and radio through cable and satellite transmission systems and local broadcasting networks, many least developed and low population areas still remain out of reach of such services. The radio community provides services for disaster preparation and post-disaster communications. Citizens' band (CB) radio is used widely in many countries, particularly in island countries, such as Indonesia, and is also used by many disaster response teams for their internal voice communications.

28. Global navigation satellite systems (GNSS) are another important technical support resource for field rescue and mitigation action teams to use in determining their positions and routes in affected areas. GNSS has become very popular in recent years, even being integrated into many mobile handsets. More such systems will be made available in the Asia-Pacific region, including systems developed by countries in the region, such as China, India, Japan and the Russian Federation. China's Compass system may also provide satellite short message services.

29. Emergency communications capacity is critical in ensuring the effectiveness and efficiency of disaster response actions. Such capacity includes: the restoration or establishment of wireless telephony and Internet services; the expansion of the handling capability of local cellular mobile systems and Internet bandwidth to accommodate sudden increases in traffic; and the rapid deployment of standby communications facilities to ensure communications among field teams and relevant headquarters and to make the above-mentioned restoration and expansion possible. When necessary, such capacity may also include the restoration and expansion of the communications capacities of local airports for effective and safe flight control and air transport management.

30. Government policies on telecommunications can adversely affect crucial post-disaster telecommunications deployment if the access to telecommunications services is at odds with the national defence policy. For example, following the 2005 Pakistan earthquake, some non-governmental organizations reported that the Government restricted the use of cellphones in certain areas, hampering the coordination and exchange of information.[15] Areas with low or no communications infrastructure coverage that are at

[15] Ibid., p. 255.

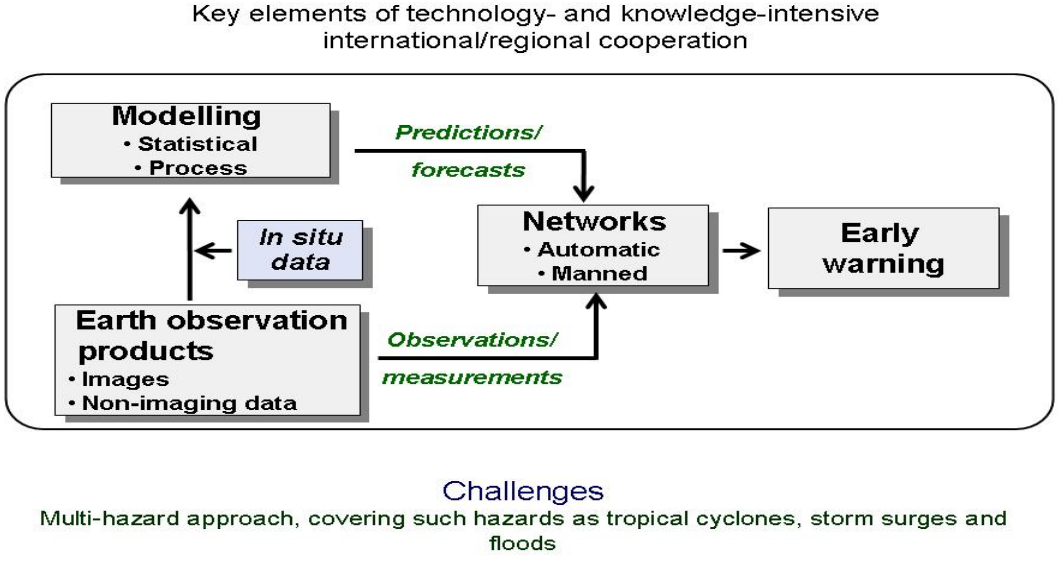
high risk and exposed to major destructive disasters should be given specific consideration in disaster communications response plans.

31. The secretariat document on collaborative efforts to improve regional disaster communications capacities (E/ESCAP/CICT2/4) provides detailed information on the importance of communicating information before, during and after disaster strikes, the ways in which different types of communications capabilities can help in the management of disasters and how regional cooperation can effectively help to establish disaster management communications capacities in the region. It also highlights issues related to the establishment of collaborative disaster communications capacity in the Asia-Pacific region.

B. Enhanced availability of Earth observation data

32. It is well recognized that disaster risk reduction and management over large geographic areas rely heavily on information from Earth observation satellites. Without real time or near real time satellite data, the monitoring, prediction and early warning of extreme weather-related disasters could not be realized. Earth observation satellites are important sources of information for disaster preparedness and for response and relief, recovery and reconstruction. Satellite mapping can deliver relevant geospatial information that can be used to map the disaster and support on-the-ground damage and loss assessments by providing pre- and post-disaster information. Figure 2 illustrates a scheme for a multi-hazard early warning system with integrated space technology and ICT.

Figure 2
Early warning system: space technology inputs



33. During the floods in Pakistan, multi-date satellite images and Geographic Information System (GIS) databases were used extensively for situation analysis by most of the agencies, especially by the United Nations Office for the Coordination of Humanitarian Affairs, WFP, the United Nations Human Settlements Programme, the World Health Organization, the United Nations Children's Fund and the International Federation of Red

Cross and Red Crescent Societies. The dynamics of the Pakistan flood waves were captured by a constellation of 17 orbiting satellites by more than 22 imaging sensors on board. Their products were available free of charge to end-users for almost all critical days. Those products were placed in the public domain for large-scale utilization. Existing cooperative mechanisms, such as the International Charter on Space and Major Disasters, Sentinel Asia, the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) and the United Nations Institute for Training and Research (UNITAR) Operational Satellite Applications Programme (UNOSAT), served the purpose of providing free access to these value added high resolution satellite data, available from all space agencies from both governments and the key private agencies.

34. Coarse and moderate resolution Earth observation data are free for reception around the world. Meteorological satellites (resolution over 1 km) have been used since the 1970s as the most important information source for monitoring and early warning of extreme weather events, such as tropical cyclones, windstorms and strong rainfall, and for slowly developing drought risks. Many polar orbit satellites operated by China, the United States of America and Europe are accessible to the region, as are quasi-polar satellites operated by the Russian Federation and geostationary orbit satellites operated by China, India, Japan and the Republic of Korea. Moderate Resolution Imaging Spectroradiometer (MODIS) data (around 250m) are provided by the Terra and Aqua satellites operated by the United States of America. Many countries in the region have established facilities to receive data directly from the polar orbit satellites and MODIS, or to obtain their data and value added products from relevant websites.

35. Medium resolution optical data provided by many Earth observation satellites are the most valuable information source for mapping out vulnerability and disaster risks, monitoring vegetation-related disasters, such as drought and wildfire, and estimating disaster damage in affected areas. Real time and near real time information over large geographic areas on a repeated basis can only be acquired by Earth observation satellites. Almost all public operators of Earth observation satellites, including those from countries in the region—China, India, Japan, the Republic of Korea, Thailand and Turkey—have committed to sharing their satellite information during major disasters. Some private operators of very high resolution (less than 1m) Earth observation satellites have also joined such efforts in many major disaster situations, though without full commitment.

36. While a number of technologically advanced countries in the region have established extensive capacities in operating and applying Earth observation satellites for disaster risk reduction and management, most developing countries have limited applications and operational service capacities. Regional cooperation should focus on developing and providing appropriate products and services that suit their limited capacities.

37. In Asia and the Pacific, regional cooperation efforts on capacity-building in space applications, promoted by the ESCAP Regional Space Applications Programme for Sustainable Development, have progressed beyond the primary stage, which focused on human resources development. Under some initiatives, action is being taken to assist less capable countries in establishing collaborative operational capacities. China is developing an eight-satellite constellation dedicated to disaster and environmental monitoring. It comprises four optical and four synthetic aperture radar

(SAR) satellites to ensure a maximum 12-hour revisiting interval during emergencies. Under this constellation, two optical satellites have been in operation and a SAR satellite will be launched soon.

C. Access to critical information

38. Disaster risk management is information intensive. Access to reliable, accurate and timely information is crucial immediately before, during and after a disaster. The information required for various phases of disaster risk management is diverse in its scale, content, standard, format and other aspects. The mapping scale becomes increasingly larger and, therefore, more information intensive, as we move from planning and monitoring to field implementation. Information needs to be readily collected, processed, analysed and shared in order for effective responses to be carried out. Institutional knowledge and the supporting ICT infrastructure are vital.

39. Disaster risk reduction and management require interoperable information and information management systems to facilitate short- and long-term decision-making processes. The information systems for response and mitigation decision-making and for early and longer-term recovery and reconstruction can be classified into two categories: (a) pre-disaster baseline data about the country and affected areas; and (b) post-disaster real time data on the extent of the disaster and its impacts, and the resources available to mitigate them. These systems could be organized by synthesizing spatial and attribute data sets to deliver the necessary products and services.

40. Accurate and timely information on the extent and impact of damage in areas affected by disasters plays a critical role in planning response and mitigation, in particular in the most affected areas, where immediate mitigation measures are necessary, as well as in recovery and reconstruction. For emergency response, data from a variety of sources are needed. Remote sensing and supporting GIS databases are key tools for providing a quick assessment of the situation when it is needed for response and urgent mitigation efforts.

41. In the wake of the flood in Pakistan, end-users such as the Government of Pakistan, the United Nations country team, international non-governmental organizations and other aid agencies in the field used products derived from Earth observation satellites extensively, not only for rapid humanitarian response and early recovery but also for flash appeals. The Pakistan Initial Floods Emergency Response Plan (PIFERP), which is seeking a total of almost $460 million in contributions, was launched by the United Nations on 11 August 2010.[16] It was based on GIS and remote sensing data on the affected areas, which were used to help mobilize international aid and support. Further, based on these data, United Nations assessments were launched in the three most affected provinces to identify severely affected communities that required life-saving humanitarian assistance.

[16] Food and Agriculture Organization of the United Nations, “Pakistan Initial Floods Emergency Response Plan 2010”, 11 August 2010. Available from: http://www.fao.org/emergencies/tce-appfund/tce-appeals/appeals/emergency-detail0/fr/item/44701/icode/?uidf=19653.

IV. Ensuring information and communications technology connectivity for disaster risk reduction and management

A. Resilience of critical information and communications technology infrastructure

42. Improved access to ICT is one positive development in the developing and least developed countries. Improvements have been particularly significant in the case of mobile telephony. However, the least developed countries still lag far behind other developing countries in other areas, such as fixed telephony, Internet access and broadband connectivity (see E/2010/12).

43. In the Asia-Pacific region, many developing countries and least developed countries are prone to disasters, including typhoons, floods, earthquakes, tsunamis, landslides and drought. There are low penetration levels of ICT in these countries, in general, as indicated by the number of telephone lines, television sets, radios and personal computers, which suggests that few are able to avail themselves of information dissemination through these media. At the national level, a low level of economic development, poor infrastructure, illiteracy and poor telecommunications infrastructure result in low levels of connectivity and access. Given the low penetration levels, it is extremely difficult to establish an effective ICT-based disaster warning system.

44. The use of mobile phones in these countries shows an exponential growth. An important impact of access to telephones is that it creates a sense of security because it enables people to receive alert messages and act in an emergency. Benefits can also be seen in disaster management through all of its stages, from warning to response to recovery. The use of mobile phones has rich potential for disaster risk management frameworks. In the event of major disasters, however, communications infrastructure often suffers damage, affecting response and rehabilitation adversely. Disasters have led to the destruction of physical communications infrastructure. Severe damage to communications infrastructure has been seen during all recent disasters in the region, such as the unprecedented floods triggered by heavy rains in Pakistan. There is a need for resilient telecommunications infrastructure and effective arrangements for standby capacities. There is also a need to advocate policy measures that treat communications as critical infrastructure for disaster management through the joint efforts of telecommunications and disaster management agencies.

45. Preparedness for disaster communications requires anticipating scenarios in which information and communications technologies, including broadcast radio, television, mobile telephony, information databases, Internet communications and electricity, are affected. Reliance on a single communications system, such as mobile phones, which may become overloaded or inoperable after a disaster, and low levels of ICT interoperability due to a lack of standards in system design and data collection are issues that ICT authorities need to address.

46. The resilience of existing terrestrial communications infrastructure could be improved through higher construction standards for mobile base stations and wireless transmission towers in high disaster risk areas; higher power backup capacities; well established response plans to motivate

human and technical resources for the rapid restoration of possible damage; and guaranteed scalability to handle the sudden increase in traffic that could occur during emergency disaster responses. Network resilience could be enhanced through increased network redundancy. Satellite communications have been used widely by many countries in the region as a major means of backup to enhance the resilience of communication infrastructure.

47. Enhancing the resilience of existing communications infrastructure has been a major disaster preparedness measure undertaken in many countries in the Asia-Pacific region, where telecommunications authorities have established policies and response arrangements as part of national disaster reduction strategies and response plans, and service providers have taken action to better prepare their communications infrastructure for possible major disasters. For example, in Samoa, the process of developing a national emergency telecommunications plan addresses both risk reduction measures to ensure that ICT infrastructure is protected from harm, and service continuity issues, such as arrangements for backup and recovery, and responsibilities before, during and after the crisis.

B. Economic costs of disaster impacts

48. The damage and loss assessment methodology developed by the United Nations Economic Commission for Latin America and the Caribbean provides a basis for quantifying the socio-economic impacts of disasters, breaking them down into direct damages and indirect losses, and their consequences for the living conditions in and the economic performance of the affected country. It also provides a basis for defining recovery and reconstruction needs.[17] Measures for disaster risk reduction and management are taken into consideration while carrying out the needs assessment.

49. The impact of recent major disasters on the economy, including the communications sector, is summarized in the table below.

50. Countries with small and vulnerable economies have the highest ratio of economic loss to capital stock and often have very low national savings, which constrains their capacity to absorb impacts and recover.

51. Disaster risk management is a key cross-cutting issue. The recovery and reconstruction needs of each sector, including ICT, must take into account the extra cost of increasing resilience to future hazards. Disaster risk reduction measures, including the strengthening of national policies and institutional arrangements in disaster risk management and measures for building back better, must be an integral part of the process of identifying recovery and reconstruction needs. Their inclusion in the assessment should lead to reduced vulnerability and enhanced resilience.

[17] Economic Commission for Latin America and the Caribbean, *Handbook for Estimating the Socio-economic and Environmental Effects of Disasters* (2003).

Table

Damage and loss assessment of the impact of natural disasters on the information and communications technology sector in selected developing countries

(Millions of United States dollars)

Disaster	Sectors	Subsector	Disaster effects				Recovery needs	
			Damage	*Losses*	*Total*	*Effects by sector (%)*	*Total*	*Needs by sector (%)*
Cyclone Nargis, Myanmar, 2008	Social sectors				967.70	24.1	859.00	85.7
	Productive sectors				2,806.80	69.8	51.00	5.1
	Infrastructure				189.90	4.7	88.00	8.8
		Transport and communications			167.90	4.2	59.00	5.9
	Cross-sectoral				57.20	1.4	4.00	0.4
	Total		**1,754.00**	**2,268.00**	**4,021.60**		**1,002.00**	
Tsunami, Samoa, 2009	Social sectors		15.78	10.51	26.29	11.2	70.16	19.3
	Productive sectors		39.45	76.33	115.78	49.5	192.11	52.8
	Infrastructure		81.68	9.78	91.46	39.1	101.24	27.8
		Communications	2.96	1.10	4.06	1.7	10.71	2.9
	Cross-sectoral		-	0.32	0.32	0.1	0.64	0.2
	Total		**136.91**	**96.94**	**233.85**		**364.15**	
Typhoon Ketsana, Lao People's Democratic Republic, 2009 (millions of kip)	Social sectors					18.9		20.6
	Productive sectors					38.3		36.9
	Infrastructure					42.8		42.5
		Communications				5.3		4.5
	Cross-sectoral					0.0		0.0
	Total		**51.00**	**7.00**	**58.00**		**51.90**	
Typhoon Ondoy and Pepeng, Philippines, 2009	Social		706.60	212.50	919.10	21.0	1,606.2	46.2
	Productive		557.80	2,661.70	3,219.50	73.4	1,422.4	40.9
	Infrastructure		181.20	56.30	237.50	5.4	397.3	11.4
		Telecommunications	4.10	-	4.10	0.1		n/a
	Cross-sectoral		6.30	0.90	7.20	0.2	54.1	1.6
	Total		**1,451.90**	**2,931.40**	**4,383.30**		**3,480.0**	

V. Issues for consideration

52. The Committee may wish to review the issues covered in the present document and advise the secretariat on priority areas of work to support regional cooperation in the following areas:

(a) Ensuring that disaster risk reduction strategies are incorporated into national and regional ICT development programmes and promoting disaster-sensitive legal and regulatory frameworks at the national level;

(b) Sharing ICT resources, good practices and knowledge for disaster risk reduction and management at the subregional and regional levels, in particular to support the least developed countries, Pacific small island developing countries and countries with economies in transition;

(c) Increasing ICT connectivity among member countries to improve the sharing of critical information for disaster preparedness as well as for response and recovery;

(d) Promoting ICT connections for critical local and community-based early warning networks;

(e) Promoting cooperation aimed at creating regional mechanisms for space-based disaster early warning systems and to increase access to satellite-based observation platforms in all disaster-affected countries;

(f) Promoting regional cooperation, with the appropriate involvement of the private sector, to help developing countries with emergency telecommunications as part of the response effort following disasters and to develop ICT systems that will bring the benefits of the information society to all.

53. The Committee may wish to provide the secretariat with guidance regarding activities aimed at addressing issues of common concern to members and associate members. It may also wish to provide guidance on the secretariat's future strategic direction in ICT for disaster risk reduction, including possible outputs that could be reflected in the programme of work for the biennium 2012-2013.