United Nations E/ESCAP/CICT(2)/3

Economic and Social Council

Distr.: General
3 September 2010

Original: English

Economic and Social Commission for Asia and the Pacific
Committee on Information and Communications Technology

Second session
Bangkok, 24-26 November 2010
Item 7 of the provisional agenda
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.

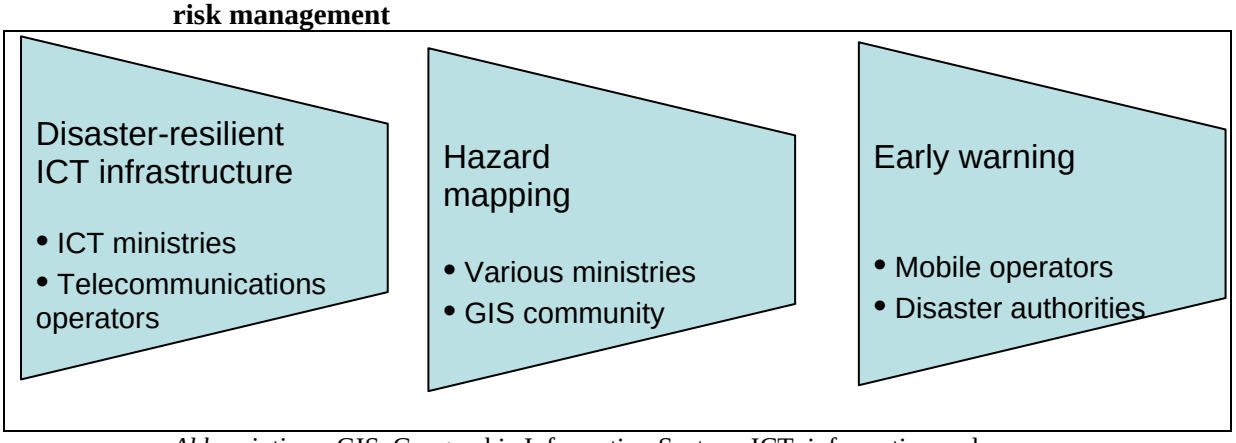
9. The Hyogo Framework proposes five priorities for action: (1) ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation; (2) identify, assess and monitor disaster risks and enhance early warning; (3) use knowledge, innovation and education 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