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Economic and Social Commission for Asia and the Pacific
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Mainstreaming innovative information and communications technology in disaster risk reduction

Expanding connectivity to disaster-affected communities through the innovative use of information and communications technologies and disaster-related information

Note by the secretariat

Summary

The present document draws attention to the information and communication needs of early warning and disaster emergency response, discusses capacity gaps and reviews related experiences that have emerged from some of the recent major disasters in Asia and the Pacific. It also considers the potential role of innovative emerging technologies.

The Committee may wish to deliberate on the issues raised in the document and provide further guidance on the direction and functions of the proposed regional cooperative mechanism on disaster emergency communications, including enhanced access for countries with special needs and disaster-prone countries. The Committee may also wish to provide further guidance on outputs that could be reflected in the programme of work for the biennium 2014-2015.

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I. Introduction

1. Information and communications technologies (ICTs), including space technologies and spatial information systems, have a vital function before, during and after a disaster situation. These technologies can enable early warning of an impending disaster, improve responses during the critical hours that follow a disaster and make the management of relief and recovery efforts in the ensuing period more effective.

2. ICT tools for disaster risk management cross a wide range of technologies, including: (a) remote sensing for systematic data gathering; (b) hazard monitoring and disaster assessment; (c) spatial information systems for assessing risks and vulnerability and planning responses; (d) broadband Internet websites and portals for critical information sharing; and (e) disaster communication systems, including satellite systems, terrestrial landline and wireless communications systems, television, radio, public address systems and mobile telephony, for conveying risk information and early warning messages and for responding to disasters. The technologies used typically involve both terrestrial and satellite systems to disseminate information most effectively.

II. Information and communications needs and gaps

3. At the earliest stage of a disaster — the most critical phase for minimizing loss of life among survivors — information on the location, nature and severity of the disaster must be communicated immediately. Also of key interest in readying a disaster response is the size of the afflicted area, the estimated number and location of the people affected and the scale of the damage. The information must flow among communities, different government ministries, administrative bodies and technical supporting agencies in order to activate relevant response plans and organize and coordinate response actions. Since disasters often destroy infrastructure that is vital to fulfilling these communication needs, it is essential to have the capability to deploy rapidly alternative communication systems that are not susceptible to damage from disasters, such as satellite-based communications.

4. After this critical phase, normally 24 to 48 hours, information needs become more diverse. Local voice communications between rescue and relief teams play a significant role in the coordination and utilization of relief resources and in making land transport infrastructure usable by emergency crews. Voice and data communications are also important in connecting survivors and their families for the return to normalcy of affected communities as soon as possible.

5. Another key need, sometimes overlooked due to acute rescue needs, is the monitoring and early warning of secondary disasters. Examples of secondary disasters include dam collapses, quake-lake outbursts, glacial-lake floods, landslides, wild fires and nuclear accidents. In this regard, the information needs shift to surveying, mapping, monitoring and analysis. That information is acquired by satellite and aircraft, networking between field teams and putting in place relevant administrative and technical support systems, including highly specialized teams that are set up to deal with complex technology.

6. The media, in all its forms, are playing an increasingly important role in disaster responses, not only as a first-hand gatherer of information, but also as intermediators of information gathered by others and as disseminators.

7. Connectivity to affected communities typically suffers from a range of gaps as the result of large-scale disasters. Terrestrial infrastructure is sometimes not available in the area where a disaster has occurred or is destroyed or severely damaged during the disaster. This lack of redundancy in information and communication services applies to all forms of ICT infrastructure, namely wire line, mobile telephony systems, power grids and mass media broadcast networks. Furthermore, prohibitively high costs impede the use of non-terrestrial or satellite-based communications systems.

8. There are also a range of people-centred information and knowledge gaps. For example, national authorities or even local authorities may not be fully utilizing the potential of community structures and systems as partners in disaster risk reduction. Early warnings may thus not be understood or acted on. A lack of access to reliable data further exacerbates the problem.

9. One of the objectives of the World Conference on Disaster Reduction, held in Kobe, Hyogo, Japan, in 2005, was “to increase the

reliability and availability of appropriate disaster-related information to the public and disaster management agencies in all regions".[1] Accordingly, one of the strategic goals listed in the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, is "the development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards".[2]

10. In its resolution 64/251 of 22 January 2010 on international cooperation on humanitarian assistance in the field of natural disasters, from relief to development, the General Assembly stressed the importance of strengthening international cooperation, particularly through the effective use of multilateral mechanisms, in the timely provision of humanitarian assistance through all phases of a disaster, from relief and recovery to development, including the provision of adequate resources. The Assembly recognized that information and telecommunication technology can play an important role in disaster response, encouraged member States to develop emergency response telecommunication capacities, and encouraged the international community to assist the efforts of developing countries in this area, where needed, including in the recovery phase.

11. In its resolution 64/2 of 30 April 2008 on regional cooperation in the implementation of the Hyogo Framework for Action 2005-2105: Building the Resilience of Nations and Communities to Disasters in Asia and the Pacific, the Commission recognized the urgent need to further develop and make effective use of scientific and technical knowledge to reduce vulnerability to natural disasters, and emphasized the need to facilitate the access of developing countries to technology in order to improve their ability to tackle natural disasters. The Commission also recognized that disaster risk reduction is a cross-cutting issue of great complexity, requiring understanding, knowledge, commitment and action, which should be addressed with the active participation of all stakeholders and that continued cooperation and coordination among Governments, the entities of the United Nations system, other regional and international organizations, non-governmental organizations and other partners were essential in order to address the impact of natural disasters effectively. The Commission also recognized the importance of linking disaster risk management with the policies, plans and programmes of regional frameworks, as appropriate, in order to address issues of poverty reduction and sustainable development.

12. In its resolution 64/1 of 30 April 2008 on the restructuring of the conference structure of the Commission, the Commission identified policy options and strategies on multi-hazard disaster risk reduction and mitigation, and regional cooperation mechanisms for disaster risk management, including space and other technical support systems, among other things, as issues to be addressed by the Committee on Disaster Risk Reduction.

13. At its first session, held in November 2008, the Committee on Information and Communications Technology recommended that the secretariat explore possibilities for developing regional and subregional disaster-communication standby systems by members and associate

[1] A/CONF.206/6 and Corr.1, chap. I, resolution 2, para. 10 (e).

[2] Ibid., para. 12 (b).

members and alternative means in synergy with the International Telecommunication Union (ITU), the Asia-Pacific Telecommunity (APT) and relevant stakeholders.[3] In this respect, the Regional Inter-agency Working Group on Information and Communications Technologies, which has more than 20 members representing United Nations entities and international organizations at its 14th meeting, held on 11 August 2010, agreed to promote an Asia-Pacific regional platform for disaster communications capacities.[4] This effort was supported by the Committee on Information and Communications Technology, which, at its second session, recognized the critical importance of communication capacity in ensuring the timeliness and efficiency of response actions to major disasters, and encouraged the secretariat to work closely with the Working Group, the Committee on Disaster Risk Reduction and the private sector to develop a more comprehensive analysis of the region's cooperative disaster communication capacities, including those for air traffic control and reporting.[5]

III. General trends

14. During the past decade, the Asia-Pacific region has experienced remarkable growth in the area of ICT. Related infrastructure and services have also improved, resulting in better reliability, higher speed and cost-effectiveness. Satellite communications, which represented a leap forward in regional connectivity about three decades ago, continues to improve: satellite broadband coupled with improved terminal performance and lower costs hold promise for the future. These improvements notwithstanding, more needs to be done to narrow the digital divide. The present section briefly highlights the key features of these trends.

A. Mobile telephone networks and broadband technology

15. In Asia and the Pacific, access to mobile telephony has expanded very rapidly and at a faster pace than in the rest of the world. The average annual mobile cellular subscriber growth rate for the region from 2005 to 2009 was 25.8 per cent, the second highest rate globally by region after Africa, while the average growth rate for the world during that period stood at 20.5 per cent.[6] Figure 1 shows that the average number of subscribers in Asian and Pacific countries has risen to 61.2 per 100 inhabitants. This rise is driven by China and India, for which the combined total of subscriptions added in 2010 is expected to have reached 300 million.[7]

16. The increased availability and affordability of mobile infrastructure and services and the resulting rapid growth in subscriptions to cellular mobile services have opened up new opportunities for the dissemination of disaster alerts. Consequently, mobile telephones and smart phones are quickly replacing radio and television as the best means of reaching communities in disaster areas. Entire communities can be warned about

[3] See E/ESCAP/65/7, para. 11.

[4] See www.itu.int/ITU-D/asp/CMS/Events/2010/14th-IWG/index.asp.

[5] See E/ESCAP/67/9, para 47.

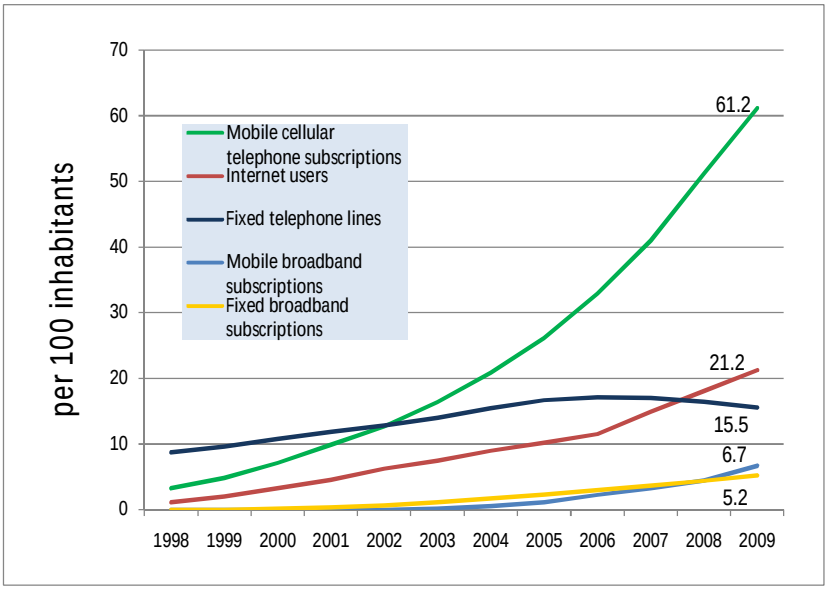
[6] International Telecommunication Union, ICT Statistics Database. Available from www.itu.int/ITU-D/ict/statistics/index.html.

[7] Ibid., *The World in 2010: ICT Facts and Figures*. Available from www.itu.int/ITU-D/ict/material/FactsFigures2010.pdf.

risks using common alerting protocol, short message service (SMS), Really Simple Syndication (RSS) feeds or Twitter,[8] among other means.[9] It also remains the most inexpensive form of communications. Additionally, in normal times, mobile telephony provides remote communities with access to constantly updated weather information.

17. In contrast to the above, growth in Internet usage in the Asia-Pacific region has been slower during the period from 2005 to 2009, with 19.7 users per 100 inhabitants.[10] Similarly, broadband penetration has lagged, with 4.8 users per 100 inhabitants on average,[11] creating a digital divide between the most advanced broadband countries (notably Japan and the Republic of Korea) and low-income developing countries of the region. This trend is worrisome because it limits the extent to which technological advances can be utilized fully for disaster risk management.

Figure 1
ICT growth in Asia and the Pacific



Source: ESCAP, using data from the ITU World Telecommunication/ICT Indicators Database 2010.

[8] Mention of firm names and commercial products does not imply the endorsement of the United Nations.

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

[10] International Telecommunication Union (ITU), ICT Statistics Database. Available from http://www.itu.int/ITU-D/ict/statistics/index.html.

[11] Ibid.

18. Bandwidth is vital for facilitating global web-based access to geospatial information across technology infrastructures.[12] It facilitates the processing of data by significantly enhancing the speed of data downloading. Through higher bandwidths, countries can capture large amounts of pre-disaster information at the time it is needed. Furthermore, the web, as a universal platform that integrates and distributes diverse information systems, can overcome the decades-old technical challenges of interoperability. Given the catalytic role that high-speed Internet connections play in making the benefits of ICT available to people, particularly during disasters, bridging the broadband divide in the Asian and Pacific region remains a major task for national and regional policymakers.[13]

19. Consequently, a number of developing countries have redoubled efforts to roll out mobile broadband infrastructure. Long Term Evolution (LTE) and Worldwide Interoperability for Microwave Access (WiMAX) are among the emerging technologies that will play important roles in both fixed and mobile broadband Internet access, especially in providing broadband services for underdeveloped, rural and remote regions. The Asia-Pacific region is expected to take a leading role in the deployment of WiMAX, with considerable investment in new infrastructure planned in 2011.[14]

20. For terrestrial wireless services to function effectively, they need to be connected to local and global backbone networks, which are provided mostly through optical fibre infrastructure. In disaster situations, this infrastructure, if it existed, is destroyed by the disaster. To address emergency situations in high-risk areas, large and complex infrastructures, such as electricity and mobile phone networks, should be able to cope with massive service failures following disasters. While much depends on the scale and spread of the disaster, there are ways in which preparedness for disaster communications could be improved. One way is to avoid reliance on a single communications system, such as mobile phones, which may become overloaded or inoperable after a disaster. In this regard, satellite communications represent a major backup means for ground-based communications. Another effective measure could be to decentralize emergency management and control systems of a network to the local level, which would result in the network remaining operable in areas that have not been damaged. Finally, the resilience of existing terrestrial communications infrastructure could be improved by adhering to higher construction standards for mobile base stations and wireless transmission towers in high disaster-risk areas; providing higher power backup capacities and guaranteed scalability to handle the sudden increase in traffic that could occur during emergency disaster responses and increased network redundancy are also important.

[12] For a comprehensive discussion of the use of ICT as a tool to support the different phases of disaster management, see Chanuka Wattegama, "ICT for disaster management" (UNDP-Asia-Pacific Development Information Programme and the Asian and Pacific Training Centre for Information and Communication Technology for Development, 2007), available from: www.unapcict.org/ecohub/resources/ict-for-disaster-management.

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

[14] Ibid.

B. Integrated space technology and spatial information systems

21. Throughout the Asia-Pacific region, more than 70 geostationary Earth communications satellites are providing various services, such as television/audio/data transmission and broadcasting, Internet backbone, backhaul and individual access, networking and regional satellite mobile services. Ten of these satellites are operated by government agencies, while the others are commercially operated. Devices for accessing satellite services have been miniaturized to make them 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.

22. Satellite short message services provided by the Compass navigation satellite system of China demonstrated their value as the most reliable means of communication during the response to the Wenchuan earthquake in May 2008. The capacity of this system to provide services for other parts of the region is under development.

23. When ground-based broadband Internet is not available, connectivity can be established 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 can be air-dropped and carried to geographically problematic areas. Among the satellites providing broadband services, the IPStar satellite, launched by Thaicom, has established the widest service network, covering many Asia-Pacific countries.

24. Space-based technology is particularly effective in providing continuous information acquisition over broad geographic areas, as well as in distributing information to remote and less-serviced areas. The rapid development of space-based ICT and the integration of remote sensing, geographic information systems (GIS) and satellite positioning systems, have created a solid foundation for effective disaster monitoring and information and knowledge management. In short, advances in spatial information systems are revolutionizing the way risks and vulnerability to hazards are analysed, consequently improving disaster preparedness.

25. For example, GIS technology, using spatial data, enables different kinds of information to be combined as map overlays and analysed. This