

Economic and Social Council

E/escap/cictsti(1)/5

Distr.: General 15 August 2016

Original: English

Economic and Social Commission for Asia and the Pacific

Committee on Information and Communications Technology, Science, Technology and Innovation

First session

Bangkok, 5-7 October 2016 Item 2 (c) of the provisional agenda^{*} **Policy issues for information and communications technology: space applications as a critical tool for enhanced e-resilience**

Space applications as a critical tool for enhanced e-resilience

Note by the secretariat

Summary

Given the increasing damage and losses caused by natural disasters in the region, new emphasis has been placed on how to design and implement more resilient infrastructure and services related to information and communications technology (ICT), including space technology and applications, as part of overall disaster risk reduction efforts. Addressed holistically, resilient ICT infrastructure and effective use of ICT at all phases of disaster management, or e-resilience, has the potential to reduce disaster risks and improve disaster management and preparedness.

The purpose of this note is to present an overview of the role of ICT, including space applications, at all phases of disaster management. In particular, the note reviews national and regional initiatives and good practices aimed at strengthening e-resilience, such as specific strategies to incorporate ICT and space applications into disaster risk reduction and disaster management planning. The note contains a discussion of current efforts by the Economic and Social Commission for Asia and the Pacific to enhance regional cooperation on space and geographic information systems for e-resilience, followed by lessons learned, particularly pertaining to the implementation of ICT and space applications for disaster risk reduction, and issues for consideration by the Committee on Information and Communications Technology, Science, Technology and Innovation.



I. Introduction

1. Asia and the Pacific is the world's most disaster-prone region, as highlighted in the *Asia-Pacific Disaster Report 2015: Disasters without Borders – Regional Resilience for Sustainable Development.*¹ Between 2005 and 2014, there were 1,625 reported natural disaster events within the region, which affected 1.4 billion people, killing approximately half a million people and causing more than 520 billion dollars' worth of damage. This number represented over 40 per cent of all reported natural disaster events worldwide, 45 per cent of all related damage, 60 per cent of all deaths and 80 per cent of all affected people globally during the same period, as illustrated and expanded upon in figure I.

Figure I



Occurrence and impact of disasters in the Asia-Pacific region by type, 2005-2014

Source: Asia-Pacific Disaster Report 2015: Disasters without Borders – Regional Resilience for Sustainable Development (United Nations publication, Sales No. E.15.II.F.13).

2. Damage and loss to economic and social infrastructure, not to mention loss of human lives, have negated hard-won development gains and set countries back by several years. The *Asia- Pacific Disaster Report 2015* thus concludes that addressing disaster risk reduction is a development imperative in Asia and the Pacific.

¹ Asia-Pacific Disaster Report 2015: Disasters without Borders – Regional Resilience for Sustainable Development (United Nations publication, Sales No. E.15.II.F.13).

3. In response to the increasing damage and losses, the Sendai Framework for Disaster Risk Reduction 2015-2030 has shifted focus from responding to disasters to managing disaster risks, while proposing seven tangible targets to assess progress.² The Framework enunciates the following four priorities for action: understanding disaster risk; strengthening disaster risk governance to manage disaster risk; investing in disaster risk reduction for resilience; and enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

II. Information and communications technology and space technology and applications for disaster risk reduction in Asia and the Pacific

4. At times disaster, information and communications technology (ICT), including space technology and applications, has proven to be effective in delivering vital disaster response and emergency communication services, while maintaining the operations of other critical infrastructure - such as management of the power grid, medical and health services, weather forecasting, natural resource management and transport systems – which are essential for the logistics of humanitarian aid. In recognition of the critical roles that ICT plays before and after disasters, the Committee on Disaster Risk Reduction at its fourth session, in 2015, requested the secretariat of the Economic and Social Commission for Asia and the Pacific (ESCAP) to expand its support to disaster information management and e-resilience.³ In recognition of the importance of e-resilience, the Asia-Pacific information superhighway, a regional broadband connectivity initiative, specifically promotes the enhancement of ICT infrastructure resilience as one of its four pillars.⁴

5. Space technology applications and geographic information systems (GIS) support decision-making during disaster response and provide an evidence-based approach at all phases of the disaster management cycle. By providing the products and tools necessary to acquire, process, store, distribute and utilize geospatial data effectively, such innovative technologies can help quantify risks and plan actions accordingly. Many countries that are prone to disasters are increasingly taking advantage of this growing field of research and development and adapting it to address disaster management in pursuit of sustainable development.

6. While developed countries that have existing satellite technology infrastructure experience the benefits of such innovations, many other countries are potentially left behind, adding another dimension to the already widening digital divide in Asia and the Pacific. Disaster-prone countries – in particular countries with special needs, including least developed countries, landlocked developing countries and small island developing States – can benefit from the use of space technology applications and GIS for disaster risk reduction, disaster risk management and, ultimately, sustainable development.

² General Assembly resolution 69/283, annex II.

³ See E/ESCAP/CDR(4)/6.

⁴ For more details on the Asia-Pacific information superhighway initiative, see documents E/ESCAP/CICTSTI(1)/1 and E/ESCAP/72/17.

III. E-resilience

7. Given the increased recognition of its importance, new emphasis has been placed on the conceptualization and operationalization of e-resilience and, more specifically, how to design and implement more resilient ICT infrastructure and services, including space technology and applications, as part of overall disaster risk reduction efforts in the region. Addressed holistically, e-resilience has the potential to reduce disaster risks and improve disaster management and preparedness.

8. ICT is considered crucial to the broader context of achievement of the Sustainable Development Goals. The 2030 Agenda for Sustainable Development recognizes that the spread of ICT and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies.⁵ The most closely related Sustainable Development Goal explicitly specifying ICT in this context is Goal 9 which aims to build resilient infrastructure, and within it means of implementation target 9.c, which seeks to significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020.⁶ However, as a development enabler, ICT supports all the other Sustainable Development Goals by integrating e-resilience as a basis for sustainable development, and hence should be considered as a priority on the development agenda in Asia and the Pacific.

9. Resilience can be defined as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.⁷ When applied specifically to ICT (e-resilience), the concept implies two dimensions: (a) ICT for disaster response and recovery, including the rapid restoration of ICT infrastructure and services; and (b) ICT for disaster risk prevention, risk reduction and preparedness. The two dimensions of e-resilience were described in an ESCAP study on the resilience of ICT infrastructure,⁸ and are illustrated in figure II, which has been modified from an analysis of how ICT systems had been effectively used in disaster responses to the 2004 tsunami in the Maldives and Sri Lanka and the 2011 earthquake in Japan.

⁵ General Assembly resolution 70/1.

⁶ Other targets and means of implementation targets that explicitly mention ICT include 4.b on education and lifelong learning, 5.b on gender equality and empowerment of all women and girls and 17.8 on means of implementation and the global partnership.

⁷ See www.unisdr.org/we/inform/terminology.

⁸ Economic and Social Commission for Asia and the Pacific, "The resilience of ICT infrastructure and its role during disaster" (Bangkok, 2015). Available from www.unescap.org/sites/default/files/The%20resilience%20of%20ICT%20Infrastruct ures.pdf.

Figure II Disaster management cycle



Source: Adapted from ESCAP, "The resilience of ICT infrastructure and its role during disasters" (Bangkok, 2015). Available from www.unescap.org/sites/default/files/The%20resilience%20of%20ICT%20Infrastruct ures.pdf.

10. In the management of a disaster, providing the right information to the right people at the right time is critical to prompt timely actions and ensure coordination among different government and humanitarian organizations. The *Asia-Pacific Disaster Report 2015* identifies five essential steps (figure III): (a) understanding risk; (b) having data- and information-sharing policies; (c) generating actionable information; (d) customizing information and reaching out to people at risk; and (e) using real-time information.



Figure III E-resilience essential steps

Right time (optimal time)

Source: Asia-Pacific Disaster Report 2015: Disasters without Borders – Regional Resilience for Sustainable Development (United Nations publication, Sales No. E.15.II.F.13).

11. ICT plays a key role in accelerating and facilitating disaster risk reduction efforts as an enabler, while at the same time being a sector to be protected. This distinction helps prioritize initiatives and efforts at all phases of disaster management (see table).

Phase ICT roles	Risk prevention	Risk reduction	Preparedness and response	Recovery
Key tasks	Improving risk information as the basis for investments and business strategies and operations	Reducing the chance of disasters and mitigating the level of disruption, damage and losses	Getting ready to respond to a disaster eventuality adequately, appropriately and in timely manner	Being able to restore functions, recover assets and operations and build back better
ICT for its own resilience	 Not creating or increasing risks Not exacerbating existing risks Avoiding and transferring risks 	 Addressing the underlying factors of risks Reducing vulnerability Increasing capacity and protection Retrofitting Reducing exposure Investing in early warning 	 Planning for system and network continuity Ensuring system redundancy and back-up Ensuring response readiness Training and conducting drills Planning for contingency Ensuring emergency response mechanisms Ensuring early recovery 	 Performing a rapid assessment of damage and losses Assessing needs for recovery Factoring in additional investment to reduce future risks
ICT for society's resilience	 Making ICT available to improve risk assessments Acting as a crucial analysis tool Enhancing development and business investment planning 	 Keeping risk databases Using GIS for decision-making, planning and mitigation Using ICT as a tool for knowledge, innovation and education Enhancing coordination via ICT Enhancing risk observation, assessment and early warning by ICT 	 Using ICT as society's asset to enhance preparedness Using ICT as a tool for rapid assessment and emergency decisionmaking (assessment, mapping, databases and planning) Enhancing emergency and humanitarian communication and coordination 	 Enhancing rapid assessments and detailed post-disaster needs assessments Informing more robust future investment within the recovery framework

Role of ICT in disaster risk reduction

Source: Economic and Social Commission for Asia and the Pacific, "Unleashing the ICT contributions in DRR and CCA under the sustainable development" (Bangkok, 2016). Available from www.unescap.org/sites/default/files/For%20show%20Prospect%20of%20Gateway%

20as%20a%20nexus%20of%20DRR%20and%20ICT.pdf.

IV. Highlights of national and regional studies on e-resilience

12. ESCAP has actively pursued a research agenda to identify ways in which telecommunication networks can be strengthened to enhance e-resilience. A series of country-level case studies (Sri Lanka, China, the Philippines and Mongolia) with a consolidated regional review and a data-gathering exercise including examples at the national, subregional and regional levels were conducted. These analytical exercises provided evidence of the significant role that ICT can play in promoting inclusive and disaster-resilient development and assisting disaster management agencies before and after the event.

13. In Sri Lanka, since the tsunami in 2004, the focus of the disaster risk reduction policy has shifted from reactive to proactive.⁹ Examples of current uses of ICT in disaster risk reduction include the installation of 77 multi-hazard warning towers along the coastal belt. To ensure redundancy, the national emergency operations centre is connected to numerous communications systems.

14. In the case of China, most natural disasters affect densely populated areas where the telecommunications infrastructure is relatively well developed.¹⁰ However, there is significant regional disparity across China in terms of deployment of the ICT infrastructure and the availability and affordability of ICT services to the local population. This divide may have an impact on the effectiveness of ICT systems for disaster risk management and the resilience of the ICT infrastructure.

15. The Philippines has shifted its focus from disaster response to a holistic and proactive approach to disaster risk reduction, with the intention of increasing the resilience of the ICT infrastructure.¹¹ The Philippine Disaster Risk Reduction and Management Act (2010) serves as the country's overall policy and framework and guides the work of the National Disaster Risk Reduction and Management Council. The Act stipulates that various stakeholders participate in the development, updating and sharing of information on disaster risk reduction, in which ICT plays a critical role, especially in assisting coordination efforts among different stakeholders involved in disaster risk reduction and management.

Economic and Social Commission for Asia and the Pacific, "Building e-resilience in

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