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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.

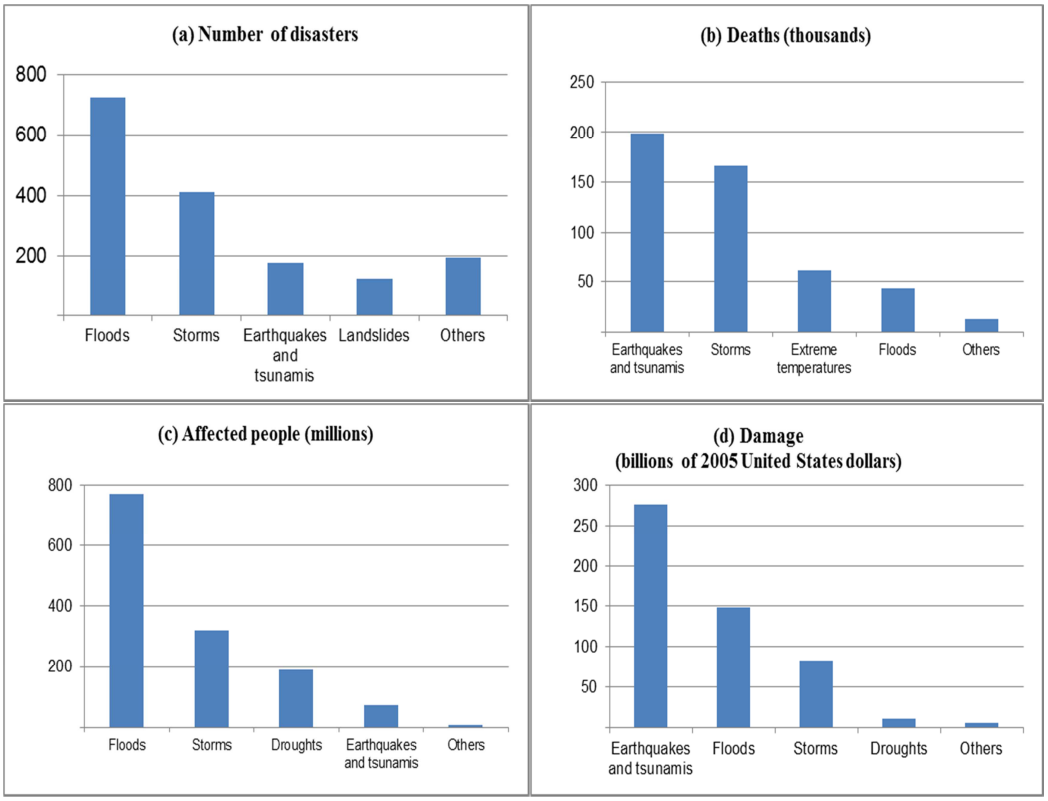
The purpose of this note is to present an overview of the role of ICT, including space applications, at all phases of disaster management. In particular, the note reviews national and regional initiatives and good practices aimed at strengthening e-resilience, such as specific strategies to incorporate 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.

* E/ESCAP/CICTSTI(1)/L.1.

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.

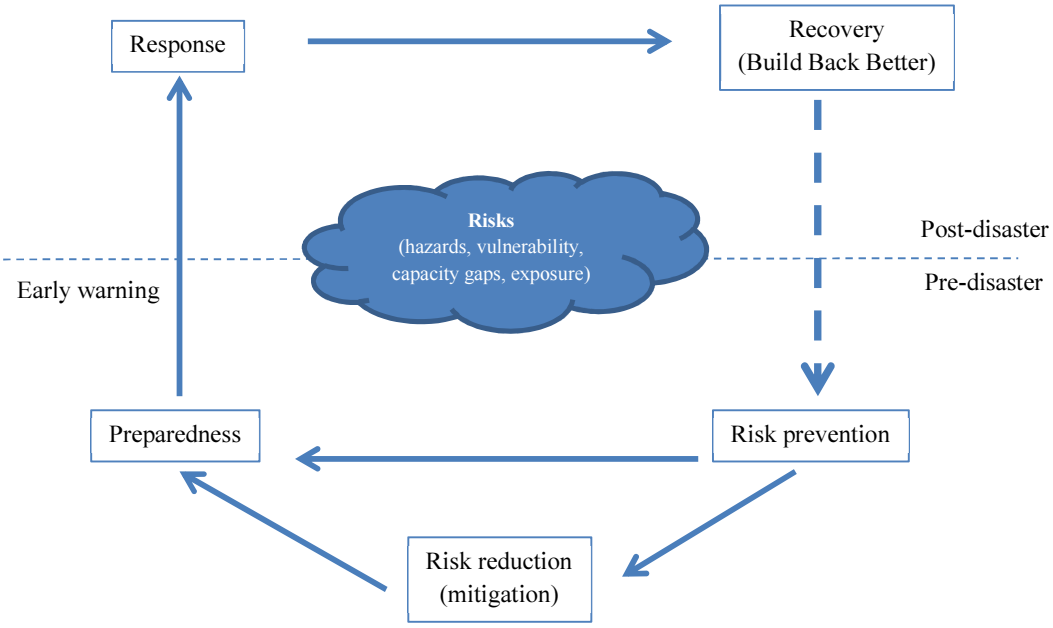
[5] General Assembly resolution 70/1.

[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%20Infrastructures.pdf.

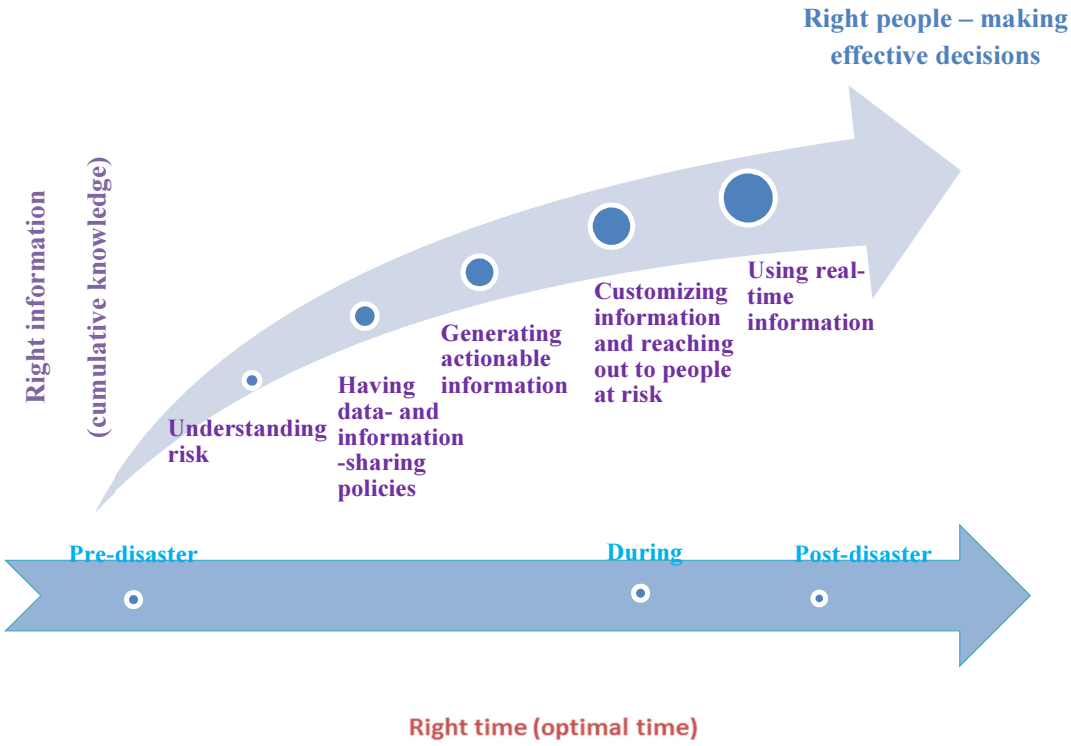
Figure II
Disaster management cycle



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%20Infrastructures.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



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).

Role of ICT in disaster risk reduction

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 decision-making (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

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.

[9] Economic and Social Commission for Asia and the Pacific, "Building e-resilience in Sri Lanka: enhancing the role of information and communications technology for disaster risk management" (Bangkok, 2016). Available from: www.unescap.org/resources/building-e-resilience-sri-lanka-enhancing-role-information-and-communications-technology.

[10] Economic and Social Commission for Asia and the Pacific, "Building e-resilience in China: enhancing the role of information and communications technology for disaster risk management" (Bangkok, 2016). Available from: www.unescap.org/resources/building-e-resilience-china-enhancing-role-information-and-communications-technology.

[11] Economic and Social Commission for Asia and the Pacific, "Building e-resilience in the Philippines: enhancing the role of information and communications technology for disaster risk management" (Bangkok, 2016). Available from www.unescap.org/resources/building-e-resilience-philippines-enhancing-role-information-and-communications-technology.

16. The Information Technology, Post and Telecommunication Authority of Mongolia has been implementing major telecommunications infrastructure initiatives, including the development of a fibre-optic backbone network.[12] The majority of the fibre-optic cables are installed underground, thus providing optimal robustness against damage and requiring only a short repair time. However, there is an absence of redundancy in the central parts of Mongolia, where some of the country's worst earthquakes have occurred.

17. Important lessons can be learned from a study on the use of ICT after the great east Japan earthquake of 2011.[13] The earthquake had a devastating effect on the ICT infrastructure. Based on the lessons learned during and after this earthquake, the Government of Japan carried out a number of measures and provided specific recommendations. Furthermore, transmission cables were moved inland, those on bridges were moved under water and ring network topologies were adapted with bypass routes added for redundancy.

18. Based on the above studies, on good practices and on lessons learned, the secretariat has identified critical factors for e-resilience in the context of the Asia-Pacific information superhighway, as follows: (a) shortening the time needed for restoration after a disaster; (b) knowing disaster risks and designing for resilience; (c) ensuring last-mile connectivity; (d) promoting mobile and other communication means for redundancy and emergency communications; and (e) exploring innovative mobile, GIS and space applications and big data.[14] These critical factors are explored in more detail in the next section of the present note, while the specific initiatives of using space technology and applications follow in subsequent sections.

19. The first 72 hours after a disaster event are the most crucial time period in disaster response. Restoring affected telecommunication infrastructure as fast as possible is of particular importance in order to help authorities and people to make effective decisions using, to the extent possible, real-time information. Such information management facilitates the coordination of the delivery of food, water and other supplies by Governments and relief agencies. Understanding disaster risk characteristics is a starting point for e-resilience. ESCAP and the International Telecommunication Union have been mapping out the existing and planned ICT backbone networks under the Asia-Pacific information superhighway. The maps, studies and analysis have paved the way to identifying vulnerabilities in ICT backbone and broadband networks and to enhancing e-resilience against potential hazards in the region. In the event of a disaster, ICT infrastructure is often damaged and networks experience above-average

[12] Economic and Social Commission for Asia and the Pacific, "Building e-resilience in Mongolia: enhancing the role of information and communications technology for disaster risk management" (Bangkok, 2016). Available from: www.unescap.org/resources/building-e-resilience-mongolia-enhancing-role-information-and-communications-technology.

[13] See Economic and Social Commission for Asia and the Pacific, "Building e-resilience: enhancing the role of ICTs for disaster risk management (DRM)" (Bangkok, 2016). Available from www.unescap.org/resources/building-e-resilience-enhancing-role-icts-disaster-risk-management-drm.

[14] Economic and Social Commission for Asia and the Pacific, "Enhancing e-resilience of ICT infrastructure: gaps and opportunities in disaster management" (Bangkok, 2015). Available from www.unescap.org/resources/enhancing-e-resilience-ict-infrastructure-gaps-and-opportunities-disaster-management.

loads. As ICT infrastructure is not typically designed to handle such increased traffic, networks become congested and relief efforts are hindered. Hence, redundancy, network resilience and above-average network loads should specifically be taken into consideration in future plans to enhance ICT infrastructure, particularly backbone and access networks.

20. As to ensuring last-mile connectivity, after the earthquake in Nepal in 2015, while the telecommunications backbone in the affected areas was found to be largely intact, other components affecting last-mile connectivity, such as cell-phone towers, suffered damage, meaning that communication between the people was disabled. In other countries, mobile phones have been instrumental in distributing early warning of incoming disasters, as well as determining their impact using imagery and information submitted by the general public in the aftermath. It is important to use a systems-based approach in network planning, with focus on last-mile connectivity and e-resilience in all components.

21. Some technologies that are used to collect information after a disaster are purpose-specific and usually involve custom software, whereas others rely on social media and were developed for other purposes. The advantage of purpose-specific applications is that the information can be easily analysed and made understandable to relief works, whereas social media are generally less structured and the general public can participate. A newer generation of tools for managing disasters and crises are designed to consolidate these types of structured and unstructured data for quick decision-making.

22. Big data also holds promise for enhanced e-resilience. While most practical applications of big data in disaster scenarios are still experimental, useful cases have emerged in incidents such as the earthquake in Haiti in 2010. A survey conducted by the Japanese Ministry of Internal Affairs and Communications of Japan also suggests that big data is expected to make significant contributions to disaster risk reduction in Japan.[15]

V. Regional cooperation for space technology and applications towards e-resilience

23. The secretariat has continued to conduct a number of programmes to enhance access to space technology applications and GIS for disaster risk reduction and e-resilience for the member countries. The Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted during the lead-up to the United Nations development agenda beyond 2015, specifically promoting space applications for disaster management. The Commission subsequently adopted its resolution 71/12, at its seventy-first session, on strengthening regional mechanisms for the implementation of the Framework in Asia and the Pacific. In this context, the secretariat has, among other activities, been supporting the development of regional cooperation mechanisms for disaster management at the local, national and global level to ensure that disasters with transboundary origins are effectively responded to through the sharing of reliable and timely geospatial data and information.

[15] Ministry of Internal Affairs and Communications, Japan, “White paper 2015: information and communications in Japan” (Tokyo, 2015). Available from www.soumu.go.jp/main_sosiki/joho_tsusin/eng/whitepaper.html.

24. In relation to the implementation of the Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012-2017, member States adopted Commission resolutions 68/5 and 69/11.[16] These resolutions promote regional cooperation with regard to access to space technology for disaster risk reduction through the sharing of relevant space-technology-based information and GIS applications for sustainable development in the Asia-Pacific region, and call for a ministerial conference to evaluate progress and garner additional effort to proliferate the use of such technologies for disaster-related activities.

25. The impact of natural disasters very often goes beyond the boundaries of a single country, given that weather and geographical topography do not stop at the boundaries of any one country, city or administrative boundary. Managing disaster risk thus also requires cooperation between neighbouring countries. In Asia and the Pacific, ESCAP, the only regional commission with a programme on space technology applications, supports regional cooperation to ensure access to the technologies and geospatial data necessary for disaster management and sustainable development. Through its Regional Space Applications Programme for Sustainable Development, the ESCAP secretariat brings together space agencies and related stakeholders under one common purpose.[17]

26. The secretariat has also continued to coordinate with existing global and regional initiatives, programmes and resources through the following core activities.

A. Timely provision of near real-time satellite imagery to disaster-affected countries

27. The secretariat, during times of disaster and upon the request of member States, continues to provide support through the facilitation of near real-time satellite imagery and access to geospatial data. This support remains possible thanks to the strategic partnership between ESCAP and the Operational Satellite Applications Programme of the United Nations Institute for Training and Research and through the long-standing ESCAP Regional Space Applications Programme for Sustainable Development network. Disaster-affected member States can therefore receive support for effective emergency response, post-disaster damage and impact assessment and policy advice on recovery and rehabilitation. Such services are of particular benefit to countries with special needs, which normally lack the infrastructure and institutional arrangements required to access and maintain their own well-integrated monitoring, early warning and response mechanisms.

[16] Commission resolutions 68/5 on the Asia-Pacific Years of Action for Applications of Space Technology and the Geographic Information System for Disaster Risk Reduction and Sustainable Development, 2012-2017, and 69/11 on implementation of the Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012-2017.

[17] See www.unescap.org/events/18th-session-intergovernmental-consultative-committee-icc-regional-space-application.

B. Regional Cooperative Mechanism for Drought Monitoring and Early Warning

28. Many countries in the region face tremendous challenges in the area of drought monitoring, early warning and management. Given that many people are reliant on the agricultural sector for their basic livelihood needs and that the economies of many countries are at least partially dependent on the sector, agricultural drought is a serious development challenge in Asia and the Pacific. As outlined in the *Asia-Pacific Disaster Report 2015*, drought has affected more than 1.31 billion people over the past 29 years, causing damage worth more than $53 billion in the region. The challenges facing countries in the region include a relatively weak capacity to access and analyse critical information, a lack of effective methodologies to combine space-based data and products with ground-based data for appropriate decision-making, very few regional platforms for sharing such knowledge and good practices, and a lack of coordination and cooperation among agencies and institutions at the national level.

29. In response, ESCAP launched the Regional Cooperative Mechanism for Drought and Early Warning, which brings together regional resources in space and GIS applications and enhances the capacity for integrated analysis of space and in-season ground data and information, in order to build the resilience of agrarian communities in developing countries that are perennially affected by drought.[18] Under the Drought Mechanism, participating pilot countries in Asia and the Pacific have benefited from enhanced access to space-based data, products and services; institutional capacity-building in drought preparedness and response; strengthened institutional coordination and policies at the country level; and regional and South-South cooperation and support. Eight countries have requested to join the Drought Mechanism's pilot programme: Afghanistan, Bangladesh, Cambodia, Kyrgyzstan, Mongolia, Myanmar, Nepal and Sri Lanka. The National Remote Sensing Centre of China, the National Remote Sensing Centre of the Indian Space Research Organization and most recently the Geo-Informatics and Space Technology Development Agency of Thailand have been acting as regional service nodes to the Drought Mechanism, supporting the pilot countries by providing space-based data and products and capacity-building assistance for effective drought monitoring, early warning and management.

30. The National Remote Sensing Centre of Mongolia is now developing and utilizing the drought monitoring system and maps, and is considering ways to extend the system to crop monitoring. In Sri Lanka, a recent high-level forum developed a road map that aims to enable the country to develop and effectively utilize space-derived information to monitor drought without the support of the regional service nodes. Plans have also been developed for Cambodia and Myanmar, with preliminary training in mid-2016.

[18] See www.unescap.org/sites/default/files/Final_Drought%20brief.pdf.

31. The Drought Mechanism also complements the Global Framework for Climate Services of the World Meteorological Organization with respect to monitoring in-season crop conditions.[19] During the pilot programme in the eight pilot countries, the Drought Mechanism has been linked to slow-onset disasters through monsoon forums in Cambodia, Myanmar, Nepal and Sri Lanka. Against the backdrop of the 2015/2016 El Niño phenomenon, the initial results from the Drought Mechanism pilot countries signal a promising trend and a need to scale up the pilot programme with a twin-track strategy. First, the Drought Mechanism will offer a variety of actionable risk information products and services, such as climate outlook, seasonal forecast, in-season monitoring and scenario-based impact outlooks. Second, it will capitalize on existing platforms for risk communication such as national monsoon forums and regional climate outlook forums.[20]

C. Skills and capacity development to address existing gaps and emerging challenges

32. Although the Asia-Pacific region has a growing number of spacefaring countries, space technologies are not yet fully benefitting vulnerable people in developing countries, in particular countries with special needs, because of a lack of capacity in terms of human, scientific, technological and institutional resources. Since the third session of the Committee on Disaster Risk Reduction, the secretariat has made efforts to develop member States' capacities through a series of specialized programmes, based on the needs identified through surveys and a regional inventory on space technology and GIS applications. The focus areas include mainstreaming space applications into disaster risk management; using space applications and GIS in flood-risk mapping, drought monitoring and early warning; facilitating the establishment and use of the Geo-referenced Information System for Disaster Risk Management in countries with special needs; and providing technical advisory services on the effective use of space technology and GIS for disaster management.

33. Besides the short-term capacity-building events, the secretariat also worked with the Centre for Space Science and Technology Education in Asia and the Pacific – the node of the Regional Space Applications Programme for Sustainable Development training network – to provide a nine-month postgraduate course on remote sensing and GIS applications.[21] Since 2014, the secretariat has sponsored seven government officials from Fiji, Myanmar, Mongolia and Kyrgyzstan to attend this postgraduate course, with a scholarship provided by the Indian Government.

D. Institutional development through knowledge products, standards and procedures

34. ESCAP has supported member countries of the Association of Southeast Asian Nations (ASEAN), particularly countries with special needs in the subregion, by developing a set of procedural guidelines for national disaster management authorities and space agencies, for sharing space-based

[19] See www.wmo.int/gfcs/node/807.

[20] See http://public.wmo.int/en/our-mandate/climate/regional-climate-outlook-products.

[21] See www.cssteap.org and www.unescap.org/our-work/ict-disaster-risk-reduction/space-technologies-and-gis-applications-sustainable-development/about.

information during emergency response.[22] The guidelines were developed by ESCAP in collaboration with the United Nations Platform for Space-based Information for Disaster Management and Emergency Response, the Operational Satellite Applications Programme and the ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management, and with extensive consultation with practitioners in ASEAN countries. The recommended operating procedures within the procedural guidelines have been designed to echo working practices at the national, regional and international levels in order to support effective decision-making and provide a more evidence-based approach to integrating Earth observation and geospatial information into disaster emergency response.

35. Furthermore, the secretariat is currently developing a geospatial decision support handbook for specific hazards, in response to requests by member States during the 4th ASEAN workshop held in Bogor, Indonesia, in April 2016. The secretariat is also converting its recently published manual on rapid assessment for resilient recovery using innovative tools, techniques and space applications for the South Asian Association for Regional Cooperation to focus on the ASEAN region. The manual is designed to provide guidelines to enhance the capacity of government agencies to conduct rapid post-disaster needs assessments.

36. The secretariat has been promoting the use of geo-referenced information systems for disaster risk management portals and providing technical assistance for their establishment in Bangladesh, the Cook Islands, Fiji, Kyrgyzstan, Mongolia and Nepal. These portals (available through local intranets only) have been positioned within the appropriate in-country national authorities in order to be used for collecting, analysing and disseminating disaster-related data in a centralized, credible and inclusive manner, together with satellite imagery and socioeconomic information to support decision-making, and are therefore considered essential by the national authorities and agencies concerned.

37. To further support the capacity-building activities of the secretariat at the regional level, particularly in the development of Geo-referenced Information System for Disaster Risk Management portals, an online e-learning platform was developed in 2015. The platform provides innovative courses that help practitioners to further develop their core skills of analysis and problem-solving using space technology and GIS applications for disaster risk management. This platform will enhance and facilitate information exchange relating to the application and operation of space technology and GIS applications for disaster risk management and to the development of relevant policies.

VI. Lessons learned

38. The Asia-Pacific region has achieved remarkable progress in space technology and GIS applications for disaster management and there is the momentum and strategic scope to further improve their use. Countries with

[22] Economic and Social Commission for Asia and the Pacific, “Procedural guidelines for NDMAs and space agencies in ASEAN countries: for sharing space-based information during emergency response – 7-step quick guide” (Bangkok, 2016). Available from www.unescap.org/sites/default/files/7%20Step%20-%20Quick%20Guide.pdf.

special needs, which are at high risk of disasters and yet have low capacity to respond to them, are facing special challenges such as limited access to ICT and space infrastructure, a shortage of human capital and a lack of technical capacity. These challenges can impede their access to such innovative technologies, which are therefore rendered impractical and underutilized. As stipulated in various United Nations frameworks, it is important that the United Nations system, including regional commissions and their partners, make continuous and concerted efforts to improve the accessibility, availability and affordability of ICT and space applications to those countries by reducing institutional and technical barriers surrounding such innovations while enhancing e-resilience.

VII. Issues for consideration by the Committee

39. The secretariat, in collaboration with all partners and stakeholders, will continue to focus on providing assistance to the member States in reducing disaster risks at all levels. In particular, the secretariat will continue efforts to enhance e-resilience in the framework of the Asia-Pacific information superhighway; strengthen regional cooperation and integration through the Regional Space Applications Programme for Sustainable Development and through implementation of the Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012-2017; promote the operationalization of the Regional Cooperative Mechanism for Drought Monitoring and Early Warning; enhance capacity-building of member States with a focus on countries with special needs; and undertake analytical research to identify emerging challenges and needs.

40. The Committee may wish to:

(a) Guide the secretariat's work priorities in the area of e-resilience, in particular with respect to space applications and technology;

(b) Support the work of the secretariat on enhanced e-resilience within the framework of the Asia-Pacific information superhighway and on the Regional Cooperative Mechanism for Drought Monitoring and Early Warning;

(c) Support and contribute to efforts by the secretariat to assist developing countries to gain from advances in applications of space technology and GIS by increasing access to and use of geospatial information, particularly the regional land cover data set and change monitoring, and strengthening disaster risk modelling on floods, monitoring and impact assessment through the development of a series of customized standard operating procedures;

(d) Encourage member States to carry out activities in support of Commission resolutions 69/11 on implementation of the Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012-2017, and 71/12 on harnessing science, technology and innovation for inclusive and sustainable development in Asia and the Pacific, and update the secretariat on steps taken;

(e) Support and contribute to efforts by the secretariat to survey the capacity of developing countries with regard to geospatial information management, with a view to providing guidance on a regional plan for capacity-building for 2016-2020, focusing on countries with special needs;

(f) Invite member States to host a ministerial conference on space applications for disaster risk reduction and management and sustainable development in Asia and the Pacific, in accordance with Commission resolution 69/11, in 2016 or 2017;

(g) Encourage the sharing of information, experience and technological know-how through ESCAP e-learning platforms and training facilities on space technology and GIS applications for the benefit of countries that are at high risk of disasters but have low capacity to cope with their mitigation.