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Report on the United Nations International Conference on Space-based Technologies for Disaster Management: Multi-hazard Disaster Risk Assessment

(Beijing, 15-17 September 2014)

I. Introduction

1. In its resolution 61/110 the General Assembly decided to establish the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) as a programme within the United Nations to provide universal access for all countries and all relevant international and regional organizations to all types of space-based information and services relevant to disaster management to support the full disaster management cycle.

2. The United Nations International Conference on Space-based Technologies for Disaster Management is the annual event of the UN-SPIDER programme and has been held in Beijing since the establishment of the UN-SPIDER Beijing Office in 2011. Previous conferences covered best practices for risk reduction and rapid response mapping (2011), risk assessment in the context of global climate change (2012) and disaster risk identification, assessment and monitoring (2013). The theme in 2014 was multi-hazard disaster risk assessment.

3. The conferences bring together the national organizations responsible for disaster management, geospatial information providers, experts, academicians, scientists and emergency managers. The UN-SPIDER regional support offices and experts from centres of excellence from different parts of the world also attended the conference.

4. The conference provided a platform for the purpose of ensuring that space-based information is effectively employed in decision-making with a view to saving lives and reducing economic losses. The present report provides the

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background to and objectives of the conference, provides a summary of the discussion, presents observations and recommendations made by the participants and summarizes the outcomes.

II. Organizational framework

5. The conference was conducted as one of the outreach activities planned in the UN-SPIDER workplan for the biennium 2014-2015.

6. The conference was co-organized by the UN-SPIDER programme and the Ministry of Civil Affairs of China in collaboration with the Ministry of Foreign Affairs, the Ministry of Finance, the China National Space Administration and the Asia-Pacific Space Cooperation Organization (APSCO), and received support from DigitalGlobe, a private company. The aim of the conference was to promote the role of space-based and geospatial information in multi-hazard disaster risk assessment.

A. Background and objectives

7. Rapid development is making human settlements in developing countries prone to disasters. Extreme weather conditions related to climate change are aggravating disaster risks. Although good progress has been made in enhancing early warning and emergency response capacity in developing countries, not much has been done to identify, assess and monitor disaster risks, in spite of what has been envisaged in the Hyogo Framework for Action. To mitigate the global challenges referred in the proposed post-2015 development agenda, building-disaster resilience is a key factor in all developmental processes. Mitigating one type of risk may sometimes increase the risk of another disaster. Therefore, multi-hazard disaster risk assessment is essential to providing balanced disaster management efforts.

8. Recent disasters around the world have highlighted shortfalls in the efforts of Governments, communities and development partners in reducing disaster risks. Although in some cases early warnings of hydrological hazards (floods, storm surges, coastal erosion and droughts) and meteorological hazards (such as cyclones, tornadoes and windstorms) can help to save human lives, the economic and environmental losses are often huge and recovery usually takes years. Therefore, countries increasingly need to focus on the economic, environmental and human cost of natural disasters and develop approaches that lessen the risks and reduce the loss of life and property.

9. All the elements of disaster risk are geographical in nature and can therefore be mapped. Earth observation and geospatial data provide critical information on elements of risk. The information is delivered in the form of maps that help to predict and identify risks more accurately and plan a timely response when the situation degenerates into a disaster.

10. Multi-hazard approaches are valuable in providing an overview of risk, thus facilitating the effective planning of countermeasures. Such approaches avoid aggravating existing risks in an attempt to reduce existing ones.

11. Given the relevance of space-based and geospatial information in multi-hazard disaster risk assessment, UN-SPIDER decided to dedicate the 2014 United Nations International Conference on Space-based Technologies for Disaster Management to multi-hazard disaster risk assessment. The event was held in Beijing from 15 to 17 September 2014.

12. The objective of the conference was to promote the role of space-based and geospatial information in multi-hazard disaster risk assessment. The conference brought together experts and end-users around a single platform whose purpose was to ensure that space-based information is effectively employed in decision-making so that lives can be saved and economic losses reduced.

B. Attendance and financial support

13. The conference was attended by 110 participants from 32 Member States: Armenia, Australia, Austria, Bangladesh, Barbados, Bhutan, Cambodia, China, Germany, Ghana, India, Indonesia, Iran (Islamic Republic of), Kazakhstan, Kenya, Lao People's Democratic Republic, Malawi, Mongolia, Mozambique, Myanmar, Namibia, Nigeria, Nepal, Pakistan, Peru, Russian Federation, Singapore, Sudan, Thailand, Turkey, United States of America and Viet Nam. The participants represented 57 national, regional and international organizations, including organizations of the United Nations system, organizations specializing in space, disaster-risk management and emergency response, academic institutions and internationally active private companies. The following United Nations, regional and international organizations attended the conference: United Nations Development Programme, United Nations Office for the Coordination of Humanitarian Assistance to Afghanistan, Asia-Pacific Space Cooperation Organization (APSCO), Humanitarian Assistance Centre of the Association of Southeast Asian Nations, Regional Centre for Mapping of Resources for Development and Asian Disaster Preparedness Centre.

14. Funds allocated by the Government of China through the UN-SPIDER programme were used to defray the costs of air travel, daily subsistence allowance and accommodation for 21 participants from developing countries. APSCO provided funding support to four participants from its member States. In addition to UN-SPIDER funds, donations from the China National Space Administration, the Ministry of Civil Affairs and DigitalGlobe were used to defray part of the costs related to the conference venue and logistics.

C. Programme of activities

15. The programme of activities of the conference was developed by UN-SPIDER and the Ministry of Civil Affairs of China. The programme included an opening ceremony, two keynote presentations, six plenary sessions, three breakout sessions (working groups), institutional visits to two centres of excellence, a symposium on advances in using space technology and geospatial information for disaster management, and a closing ceremony. Opening and closing remarks were made by representatives of the Ministry of Civil Affairs, APSCO and UN-SPIDER. Keynote

presentations were made by experts from UN-SPIDER and the Chinese Academy of Sciences.

16. The keynote presentation by UN-SPIDER entitled “Multi-hazard identification and risk assessment: the role of Earth observation and UN-SPIDER intervention” provided an overview of the role of Earth observation in disaster risk reduction, especially in multi-hazard disaster risk assessment, the main theme of the conference. Additionally, it provided a summary of technical advisory support activities offered by the UN-SPIDER programme. The keynote presentation by the Chinese Academy of Sciences on Earth observation and disaster risk reduction provided an overview of the ways in which Earth observation for disaster management and emergency response were being used in China.

17. The six plenary sessions addressed the following topics:

(a) Disaster risk management and space-based information;

(b) Approach to and methodology for using space-based information in multi-hazard identification and risk assessment;

(c) Space-based information resources for hazard identification and risk assessment;

(d) Space-based information for damage and loss estimation;

(e) National experiences;

(f) Networking and engagement with the UN-SPIDER network.

18. The three working groups focused on the following topics:

(a) Working group 1: engaging with UN-SPIDER;

(b) Working group 2: symposium on drought monitoring;

(c) Working group 3: mapping services and products for emergency response.

19. The participants had the opportunity to visit one of the following institutions:

(a) The Earth Observation and Data Centre of the China National Space Administration;

(b) The National Disaster Reduction Centre of China (NDRCC).

20. The symposium on advances in using space technology and geospatial information for disaster management was conducted at NDRCC and consisted of three extended technical presentations by experts from the Pacific Disaster Center of the University of Maryland, United States, and the German Aerospace Centre (DLR), followed by a discussion.

21. The first session was entitled “Disaster risk management and space-based information”. It included five presentations about the experiences of Member States in using space-based information and the role of international organizations and private companies in disaster management. The topics were: (a) space-based information for disaster risk reduction in China; (b) the role of APSCO in space-based disaster management; (c) DigitalGlobe’s contributions through its project “Seeing a better world”; (d) multi-hazard mapping: global and regional

real-time systems for multi-hazard monitoring and prediction (flood, drought, landslide and storm surge); and (e) developing risk management procedures for flood mapping and monitoring practices using selected examples from Australia.

22. The second session was entitled "Approach to and methodology for using space-based information in multi-hazard identification and risk assessment". It included presentations on various uses of space-based information in multi-hazard risk monitoring and assessment: (a) the Global Flood Monitoring System, a real-time system using satellite data and numerical weather prediction to create rainfall and hydrological models; (b) application of high-resolution satellite data in the preparation of building-stock inventories for purposes of earthquake risk assessment for a megacity in a highly seismic zone in north-east India; (c) disaster risk management in Mozambique; (d) application of Fengyun meteorological satellites in disaster monitoring and reduction; (e) the Integrated Surface Drought Index and its application from the regional to the continental scale; (f) next-generation satellite-based emergency mapping; (g) flood monitoring using generic nano-satellite constellations; (h) multi-hazard risk assessment in Bangladesh and the Lao People's Democratic Republic: the experience of the Asian Disaster Preparedness Centre; and (i) a study on monitoring agricultural droughts using the synergy inversion methodology based on multi-sourced information.

23. The third session was entitled "Space-based information resources for hazard identification and risk assessment". It included presentations on the following topics: (a) disaster monitoring and early warning: experiences in the Asia-Pacific Region; (b) methodology and examples of uses of space-based information for disaster monitoring and damage assessment; (c) a decision support system integrating geospatial information to facilitate hazard and disaster risk assessment; (d) integrating geospatial information to facilitate disaster assessment: a case study of the earthquake that took place in Ludian county, China, in 2014; and (e) application of satellite remote sensing in connection with agricultural and catastrophe insurance.

24. The fourth session was entitled "Space-based information for damage and loss estimation". It included technical presentations on the following topics: (a) case study of the use of space-based information for disaster damage and loss assessment in the Lao People's Democratic Republic; (b) experiences with comprehensive damage and loss assessment following major disasters in China; (c) damage and loss assessment following forest and land fires and the eruption of Mount Sinabung in Indonesia of 2014; (d) earthquake damage assessment techniques and a case study of the earthquake that took place in Lushan county, China, in 2013; and (e) building disaster monitoring and early-warning systems: a case study of forest bio-disaster monitoring.

25. The fifth session was entitled "National experiences". It included technical presentations on the following topics: (a) the power of geo-information in rapid disaster response; (b) using the Beidou satellite navigation system for disaster management; (c) using space technologies for drought monitoring in parts of River Nile state, the Sudan; (d) using geospatial technology for drought hazard mapping and vulnerability analysis: a study of the Bundelkhand region of India; and (e) introduction to the geoportal of the Iranian Space Agency and its application in disaster management.

26. The sixth session was entitled “Networking and engagement with the UN-SPIDER network”. It included presentations on the following topics: (a) the use of space-based information in disaster risk reduction and emergency response in Bangladesh; (b) how Bhutan benefits from the UN-SPIDER technical advisory mission; (c) programmes and partnerships in disaster risk reduction of the Regional Centre for Mapping of Resources for Development: achievements and opportunities for future collaboration; and (d) development of a gradual framework for the application of space technology in disaster prevention and development support objectives.

27. The first working group, on the subject “Engaging with UN-SPIDER”, was attended by 27 participants representing countries where UN-SPIDER had conducted technical advisory missions in recent years, UN-SPIDER regional support offices, partner organizations and experts who had participated in UN-SPIDER technical advisory missions in various countries. The participants from Bangladesh, Bhutan, Malawi and Mozambique shared information about their experiences with organizing UN-SPIDER technical advisory missions and gave briefings on their progress in implementing the recommendations provided by the advisory mission. Several institutions, such as the ASEAN Coordinating Centre for Humanitarian Assistance, the Centre of Excellence on Space Technology for Disaster Mitigation jointly sponsored by the Chinese Academy of Sciences and the World Academy of Sciences, and the Agency for Support and Coordination of Russian Participation in International Humanitarian Operations of the Ministry of Civil Defence and Emergencies of the Russian Federation, presented their ongoing work with UN-SPIDER. Benefits of the UN-SPIDER technical advisory missions mentioned by participants included: an increased awareness among decision makers that space technology can be leveraged in disaster management; improved coordination between providers of geospatial information and end users; the existence of national policy frameworks to facilitate the implementation of geospatial strategies and the creation of national spatial data infrastructures. Speakers also mentioned constraints and challenges in data-sharing and a lack of capacity for fully utilizing space-based information. UN-SPIDER presented a procedure for organizing advisory missions and discussed the workplan for 2015. Representatives of the Governments of Cambodia, the Lao People’s Democratic Republic and Nepal invited UN-SPIDER to conduct technical advisory missions in their countries in the coming years.

28. The second working group, on the subject “Symposium on drought monitoring”, focused on drought monitoring in the Sudan, a pilot country working with UN-SPIDER and the National Disaster Reduction Centre of China (NDRCC) to develop drought monitoring methods and approaches to using space-based information. Experts from the International Centre for Drought Risk Reduction, the Sudan Remote Sensing Authority and the Regional Centre for Mapping of Resources for Development opened the discussion by sharing information about their experiences. The Sudan suffers serious droughts and floods, and the fact that those often occur in succession aggravates the problem. Although floods cause damage to agriculture and infrastructure, they also provide opportunities for irrigation if they are properly managed. Flood waters also bring fertile soil to agricultural areas. However, drought is a slow disaster and its impact in the Sudan is serious. There were few initiatives in the country to use space-based information for drought monitoring. The Sudan Remote Sensing Authority was leading the agencies

utilizing remote sensing technology. The Ministry of Agriculture of the Sudan was also using the Global Monitoring for Food Security programme to interact with partners in Europe to provide drought data and analysis. However, even with those initiatives the Sudan had a large gap in skills and expertise relating to the use of space-based technologies for drought monitoring. The country needed assistance to enhance those capacities and to operationalize a drought monitoring service. Apart from skills, other important challenges that needed to be addressed were the availability of and access to data and tools for analysing drought. NDRCC had signed a memorandum of understanding with the Sudan Remote Sensing Authority and the Regional Centre for Mapping of Resources for Development to work on developing tools and methodologies for drought monitoring with the help of space-based information. One of the points the parties had agreed on was that NDRCC would lead a pilot project on a voluntary basis to establish a drought monitoring service for the Sudan. The pilot project would aim to demonstrate the usefulness of such a service and provide recommendations for scaling it up to other countries.

29. The third working group, on the subject "Mapping services and products for emergency response", included technical presentations by experts from DigitalGlobe, NDRCC, DLR and United Nations Office for the Coordination of Humanitarian Assistance to Afghanistan. DigitalGlobe presented high-resolution satellite data products needed for emergency response and provided an overview of its services. It presented the temporary image licences it offered and explained its approach to crowdsource mapping for analysing large amounts of data. NDRCC used its recent experience with the Ludian earthquake to provide an insight into its satellite mapping services and emergency response products. Furthermore, response times, approaches to damage assessment, economic loss estimation and support for reconstruction planning were explained. The Centre for Satellite-based Crisis Information of DLR presented its emergency mapping set-up and gave an overview of its portfolio of satellite mapping products. During the discussion about mapping standards and general guidelines for map generation, reference was made to the International Working Group on the use of Satellite Data for Emergency Mapping. In a final introductory talk the United Nations Office for the Coordination of Humanitarian Assistance to Afghanistan presented its mapping needs and its approaches to visual communication of general emergency information using infographics specifically designed for its needs and purposes. A strong interest in and need for satellite mapping guidelines to allow global harmonization of satellite mapping products was expressed by various organizations. It was suggested that during major disasters UN-SPIDER could even serve as a hub through which to channel information about available satellite mapping products. It was suggested that UN-SPIDER continue to provide such information through its knowledge portal during major disasters.

30. Two institutional visits were arranged to take place in parallel on the last day of the conference.

31. One group visited the Earth Observation and Data Centre of the China National Space Administration. The centre described its mandate and presented its contributions to improving the capabilities of China's Earth observation system. It demonstrated how space-based information could be applied in various areas, including disaster risk management and emergency response.

32. Another group visited the facilities of NDRCC. The participants were introduced to its real-time operating system for disaster management. NDRCC staff demonstrated the disaster information reporting system and the quick risk assessments and comprehensive damage and loss assessments they performed using remote sensing. They also showed the images collected using unmanned aerial vehicles and their applications in connection with the Ludian earthquake.

33. The symposium on advances in using space technology and geospatial information for disaster management was held at NDRCC. It consisted of three extensive technical presentations by experts from the Pacific Disaster Center of the University of Maryland and DLR, followed by a discussion. In a presentation entitled "Disaster monitoring and early warning: challenges and good practices for operationalization and institutionalization", an expert from the Pacific Disaster Center presented the DisasterAWARE tool and shared insights gained from its deployment in the region. The DLR expert gave a presentation under the title "Towards automation and standardization in satellite-based emergency mapping". DLR operates the Centre for Satellite-based Crisis Information and was in the process of improving its emergency mapping service. Issues related to quality assurance, standardization and automation of satellite-based mapping procedures were discussed. The activities of the International Working Group on Satellite-based Emergency Mapping were also discussed and participants were invited to make contributions to it. The expert from the University of Maryland made a presentation on real-time global flood monitoring and forecasting that consisted of an online demonstration of the Global Flood Monitoring System on a regional and a global scale.

34. Additional information about the conference can be found at www.un-spider.org/BeijingConference2014.

III. Outcomes and recommendations

35. At the United Nations International Conference on Space-based Technologies for Disaster Management: Multi-hazard Disaster Risk Assessment, UN-SPIDER and its partners achieved the outcomes and made the recommendations presented below.

A. Outcomes

36. In the spirit of the mandate of UN-SPIDER, which is to ensure that all countries have access to space-based information for use in disaster management, NDRCC signed a memorandum of understanding with the Sudan Remote Sensing Authority and the Regional Centre for Mapping of Resources for Development to carry out a pilot project in which NDRCC would establish a drought monitoring service for the Sudan that would use space-based information.

37. With 50 technical presentations in six plenary sessions, three working groups and institutional visits to two centres of excellence, the conference allowed participants:

(a) To renew their focus on the uses of space-based information in multi-hazard risk assessment and become aware of some of the tools and best practices;

(b) To get an in-depth understanding of the role of space-based information in risk assessment;

(c) To establish links between disaster managers and geospatial experts;

(d) To learn about opportunities to build capacity and collaborate to improve disaster management using geospatial information;

(e) To see state-of-the-art facilities for disaster management information during the institutional visits;

(f) To develop plans to engage with UN-SPIDER and benefit from the services offered by UN-SPIDER through its network of regional support offices.

38. The conference helped UN-SPIDER:

(a) To develop components of the workplan for 2015 by obtaining specific commitments from member countries;

(b) To engage regional support offices in ongoing activities and in carrying out its workplan;

(c) To generate interest among member countries in working with it and benefiting from its services;

(d) To network with experts from centres of excellence and engage with them in connection with the events planned by it.

39. During all annual conferences organized by UN-SPIDER in Beijing, institutional visits were conducted to expose participants to state-of-the-art facilities in China related to satellite data collection, archiving and dissemination. One of the outcomes of those institutional visits was the request from the delegation of Mozambique for more information about building an operations centre. UN-SPIDER provided the delegation of Mozambique an opportunity to visit to the facilities of Space Star Technology Company of the China Academy of Space Technology, the company instrumental in building such facilities. During the meeting, the delegation of Mozambique expressed an interest in receiving support for building a similar facility in Mozambique.

B. Main recommendations

40. The key recommendations proposed during the working group sessions carried out during the conference are presented below.

41. Countries should make efforts to use a combination of space-based information, geospatial information and ground data in multi-hazard risk assessments and vulnerability assessments.

42. UN-SPIDER and international organizations should continue their efforts to create a standard procedure for sharing satellite data worldwide. There is a need to engage with data providers and facilitate access to data for use in disaster risk management.

43. UN-SPIDER should continue to provide a platform through its outreach events, including international conferences, workshops and expert meetings, to facilitate cooperation among government agencies at the national level.

44. UN-SPIDER should continue to provide technical advisory support by organizing joint technical advisory missions and capacity-building programmes with partner organizations.

C. The way forward

45. UN-SPIDER will continue to follow up the recommendations of the conference and include them in its 2015 and 2016 workplans.

46. UN-SPIDER will plan a fifth conference, to be held in 2015.

47. UN-SPIDER will inform the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space of the need for collaboration and financial support to develop a pilot project on drought monitoring in the Sudan at its fifty-second session, in 2015.

48. In the same vein, UN-SPIDER will continue to play an important role as a platform for all Member States for building collaboration to improve their capacity in using space technology for disaster management.

49. UN-SPIDER will continue to enhance cooperation with international, regional and national organizations and use its network to address the issues raised by participants in the area of institutional strengthening.

IV. Conclusions

50. The conference acknowledged with appreciation the support of the Ministry of Civil Affairs of China, the Ministry of Foreign Affairs, the Ministry of Finance, the China National Space Administration, the Asia-Pacific Space Cooperation Organization and DigitalGlobe.

51. The United Nations International Conference on Space-based Technologies for Disaster Management: Multi-hazard Disaster Risk Assessment built on the conclusions of the previous conferences, in 2011, 2012 and 2013. UN-SPIDER had facilitated the participation of officials from national disaster management offices from developing countries, regional support offices and officials and experts from the space community in all those conferences. Priority had been given to officials from the countries engaged with UN-SPIDER or willing to engage with it in the near future. Thus, the conference had greatly contributed to strengthening the use of space technology in disaster management in developing countries.