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Technical advisory support activities carried out in 2013 in the framework of the United Nations Platform for Space-based Information for Disaster Management and Emergency Response

Report of the Secretariat

Summary

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 to all countries and all relevant international and regional organizations to all types of space-based information and services relevant to disaster risk management to support the full disaster management cycle.

The present report provides a summary of the implementation of activities carried out in 2013 by the UN-SPIDER programme, specifically in the area of technical advisory support and support for emergency response as determined in the workplan for the biennium 2012-2013.

In 2013, the UN-SPIDER programme provided technical advisory support to 24 countries. This includes technical advisory support to 4 countries (Ghana, Indonesia, Malawi and Viet Nam), follow-up activities for 10 countries supported in the previous biennium by offering technical advisory support (Bangladesh, Cameroon, Dominican Republic, Fiji, India, Mozambique, Myanmar, Philippines, Sri Lanka, Sudan) and support to 10 additional countries (Bhutan, Cambodia, China, Iran (Islamic Republic of), Kenya, Nepal, Pakistan, Peru, Thailand, Turkey). In addition, the programme provided support during 5 emergencies (typhoons in Palau and the Philippines and floods in Iraq).



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 risk management to support the full disaster management cycle and agreed that the programme should be implemented by the Office for Outer Space Affairs of the Secretariat.

2. At its fiftieth session, the Committee on the Peaceful Uses of Outer Space agreed that progress reports on UN-SPIDER and its future workplans should be considered by the Scientific and Technical Subcommittee under a regular agenda item on space-system-based disaster management support and that the agenda item should be included in the list of issues to be considered by its Working Group of the Whole.

3. The present report provides a summary of the implementation of activities carried out in 2013 by the UN-SPIDER programme, specifically in the area of technical advisory support as determined in the workplan for the biennium 2012-2013.

II. Technical advisory support activities carried out in 2013

4. Through the UN-SPIDER programme, the Office for Outer Space Affairs in 2013 worked with Member States that requested support in accessing and using space-based solutions for disaster risk management and emergency response. That support included:

(a) Assessing national capacity and evaluating disaster and risk reduction activities, policies and plans with regard to the use of space-based technologies;

(b) Assisting in the design of risk reduction and disaster risk management plans and policies with regard to the use of space-based technologies;

(c) Developing and customizing guidelines and templates for including space-based technologies in disaster risk reduction and emergency response;

(d) Facilitating access by national institutions to space-based information to support disaster risk reduction and emergency response activities;

(e) Identifying training needs and facilitating the implementation of capacity-building activities;

(f) Supporting the implementation of risk reduction and emergency response activities using space-based technologies.

5. Technical advisory support is one of the prime activities of the UN-SPIDER programme at the national level and is aimed at providing Member States with the forms of support described in paragraph 4. It can include: (a) technical advisory missions involving experts from space and disaster management agencies from other countries as well as from relevant international and regional organizations and institutions; (b) technical advice to national institutions by means of meetings,

teleconferences, videoconferences etc.; (c) facilitating direct cooperation between national institutions and providers of space-based information and solutions; and (d) facilitating access to satellite images during emergencies.

6. Since disaster risk management calls for interventions from several sectors, a mission team, when carrying out a technical advisory mission, looks into diverse areas, including data access and policy, information management, national spatial data infrastructure and institutional coordination.

7. The output of each mission is a formal report with a summary of the findings, recommendations, follow-up actions and suggestions on guidelines and policies on disaster risk management issues, always from the perspective of the use of space-based information in all stages of disaster management. Those reports are shared with the requesting Member State, as well as with the other institutions involved in the technical advisory mission. The mission report often provides valuable inputs to the United Nations country offices involved in disaster management in the country.

8. In 2013, the UN-SPIDER programme reached the established target by providing technical advisory support to 24 countries, in the form of technical advisory support/missions to 4 countries (Ghana, Indonesia, Malawi and Viet Nam), follow-up activities for 10 countries supported in the previous biennium by offering technical advisory support (Bangladesh, Cameroon, Dominican Republic, Fiji, India, Mozambique, Myanmar, Philippines, Sri Lanka and Sudan) and support to 10 additional countries (Bhutan, Cambodia, China, Iran (Islamic Republic of), Kenya, Nepal, Pakistan, Peru, Thailand and Turkey).

9. In addition, the programme provided support during five emergencies (typhoons in Palau and the Philippines and floods in Iraq).

10. Summaries of the findings and recommendations contained in the reports of the four technical advisory missions carried out in 2012 have been included in the annex to the present report.

11. The annex also includes a summary of technical advisory missions, follow-up activities and capacity-building programmes offered to various Member States.

A. Africa

12. According to the World Risk Report 2013, natural disasters in Africa have led to consequences like poverty and disease. Apart from causing humanitarian distress, such disasters also exacerbate other risks, such as disease.

13. Interventions by the UN-SPIDER programme are aimed at improving the disaster management cycle by enabling countries to use space-based information. This was achieved in 2013 through technical advisory missions to vulnerable countries and imparting capacity-building programmes focusing on flood and drought monitoring.

14. In the 2012-2013 biennium, UN-SPIDER continued its support to the African region. In 2013, support was offered to 5 countries (Ghana, Kenya, Malawi, Mozambique and Sudan), including technical advisory missions to Ghana and Malawi. In 2012, the programme offered support to 14 countries (Burkina Faso,

Burundi, Cameroon, Cabo Verde, Chad, Congo, Democratic Republic of the Congo, Gabon, Ghana, Kenya, Malawi, Mozambique, Nigeria and Sudan); full-fledged technical advisory missions were carried out in 2 countries (Cabo Verde and Mozambique).

15. From 5 to 9 May 2013, as a follow-up of the UN-SPIDER technical advisory mission in the Sudan in June 2011, a space-based technology for disaster risk management awareness and training course was conducted in that country to strengthen institutional capacities at the federal and state levels to consolidate the use of space technologies and geoinformation. The training was hosted by the Sudan Remote Sensing Authority, and experts from UN-SPIDER, the China Institute of Water Resources and Hydropower Research and the Regional Centre for Mapping of Resources for Development conducted the training sessions.

16. From 14 to 18 October 2013, upon the invitation of the Government of Malawi through its Department of Disaster Management Affairs, UN-SPIDER successfully carried out a technical advisory mission to that country. The UN-SPIDER programme invited nine experts with a broad range of expertise and diverse backgrounds. The mission evaluated the current and potential use of space-based information in all aspects of disaster management.

17. From 27 to 31 October 2013 in Beijing, UN-SPIDER organized an international training programme on space technology for flood and drought risk mapping and assessment. The training programme was organized jointly with the Asia-Pacific Space Cooperation Organization and the National Disaster Reduction Centre of China. It was hosted by Beihang University in Beijing. A total of 26 participants from Africa, Asia and Latin America participated in the training sessions, including five officials from countries in Africa (Cameroon, Ghana, Kenya, Malawi and Mozambique). Through this training programme, UN-SPIDER continued its work with countries where technical advisory support had been conducted in recent years.

18. From 4 to 8 November 2013, as a follow-up to the technical advisory mission to Mozambique in 2012, representatives from nine organizations in that country were trained on disaster mapping using space technology. The UN-SPIDER programme and the United Nations Development Programme (UNDP)-Mozambique jointly organized the training workshop, which covered various disaster-related topics in that country. Experts from the University of Cologne and the Cologne University of Applied Sciences (both in Germany), the National Disaster Reduction Centre of China and UN-SPIDER (Vienna and Beijing) trained the participants.

19. From 25 to 29 November 2013, upon the invitation of the Government of Ghana, through its National Disaster Management Organization, UN-SPIDER conducted a technical advisory mission to that country. The mission was organized to make recommendations and develop guidelines to improve the use of space-based information in disaster-risk management and emergency response.

20. The UN-SPIDER programme continued to coordinate closely with and build upon the expertise and capabilities of its regional support offices in Africa: the Algerian Space Agency, the National Space Research and Development Agency of Nigeria and the Regional Centre for Mapping of Resources for Development, based in Nairobi. These regional support offices have contributed to technical advisory missions and capacity-building programmes organized by UN-SPIDER in 2013.

B. Asia and the Pacific

21. Asia is the region that has been most affected by major disasters in 2013. Typhoon Haiyan in the Philippines and Viet Nam, flash floods in Uttarakhand State in northern India, the earthquake in south-west China, cyclone Mahasen in eastern India and the earthquake in north-east in Pakistan are some of the major catastrophes that caused tens of thousands of deaths and affected several million people.

22. The UN-SPIDER programme offered active support to the countries of the Asia and Pacific region in the 2012-2013 biennium. In 2013, UN-SPIDER provided support to 16 countries in Asia (Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Iran (Islamic Republic of), Mongolia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Turkey and Viet Nam), including technical advisory missions to Viet Nam and Indonesia. Support to other countries included offering capacity-building programmes and facilitating implementation of recommendations of the technical advisory missions.

23. From 25 to 29 March 2013, at the request of the Government of Viet Nam, through the Disaster Management Centre of the Ministry of Agriculture, UN-SPIDER carried out a technical advisory mission to that country. The mission served to evaluate the current and potential use of space-based information in all aspects of disaster management in Viet Nam and strengthen disaster risk management in the country by providing better access to space-based information for disaster risk reduction and response. The mission team included 12 experts with diverse technological expertise representing centres of excellence from different parts of the world.

24. From 12 to 16 May 2013, as a follow-up to the UN-SPIDER technical advisory mission to Bangladesh in 2011, UN-SPIDER organized capacity-building on the topic of space technology for flood hazard mapping, flood forecasting and rapid mapping in Bangladesh. The programme was jointly organized with the Comprehensive Disaster Management Programme of the Ministry of Disaster Management and Relief. The training session was hosted by the Bangladesh Space Research and Remote Sensing Organization. Experts from UN-SPIDER, the International Water Management Institute, the International Centre for Integrated Mountain Development and the National Disaster Reduction Centre of China conducted lectures and hands-on sessions. The Comprehensive Disaster Management Programme has also engaged a consultant to prepare standard operating procedures for implementing recommendations of the UN-SPIDER technical advisory mission.

25. From 22 to 26 July 2013, UN-SPIDER organized an international training programme on "Flood risk mapping, modelling and assessment using space technology". The training programme was jointly organized with the Centre for Space Science and Technology Education in Asia and the Pacific, the International Water Management Institute and the Economic and Social Commission for Asia and the Pacific. It was hosted by the Centre in Dehradun, India. Officials from nine Asian countries (Bhutan, Cambodia, China, India, Indonesia, Myanmar, Nepal, Philippines and Sri Lanka) and one Pacific country (Fiji) participated in the training

programme. The event was organized based on recommendations of the UN-SPIDER technical advisory missions in several countries in Asia.

26. On 3 September 2013, UN-SPIDER organized a one-day stakeholder meeting in Jakarta to discuss key issues related to the use of space-based information in disaster management that needed immediate attention. The meeting was organized jointly with the National Institute of Aeronautics and Space of Indonesia (LAPAN), which also hosts the UN-SPIDER regional support office in Indonesia. The meeting was attended by over 25 key stakeholders of the disaster management community in Indonesia. The UN-SPIDER programme invited experts from the Pacific Disaster Centre in Hawaii (United States), the National Disaster Reduction Centre of China and the German Aerospace Centre to contribute to the discussions.

27. From 21 to 22 October 2013 in Beijing, the UN-SPIDER Beijing office organized an interactive training workshop on advances in using space technology and geospatial information for disaster management. The workshop was conducted to strengthen the capabilities of staff members of the National Disaster Reduction Centre of China to effectively embed space technologies in their activities. The experts from UN-SPIDER, Delta University (United States), the Asia-Pacific regional office of the Office for the Coordination of Humanitarian Affairs, the University of Twente (Netherlands), the International Water Management Institute and the Bureau for Crisis Prevention and Recovery of UNDP shared their experience and best practices.

28. From 27 to 31 October 2013 in Beijing, UN-SPIDER organized the international training programme on space technology for flood and drought risk mapping and assessment (see para. 17 above). Officials from 10 countries in Asia (Bangladesh, Bhutan, China, Indonesia, Iran (Islamic Republic of), Mongolia, Pakistan, Thailand, Turkey and Viet Nam) participated in the training programme.

29. In carrying out its work in the Asia and Pacific Region, UN-SPIDER coordinates closely with and builds upon the expertise and capabilities of the established regional support offices in the region: the Iranian Space Agency, the Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), the International Centre for Integrated Mountain Development, the Agency for Support and Coordination of Russian Participation in International Humanitarian Operations (EMERCOM Agency) of the Russian Federation and the Asian Disaster Reduction Centre, which is based in Kobe, Japan.

30. These regional support offices participated in and contributed to several events organized by UN-SPIDER. The following publications are planned jointly with the UN-SPIDER regional support offices in the Asia and the Pacific Region: (a) SUPARCO is working on a booklet on the effective use of space-based information to monitor massive flood disasters and their impact; and (b) the Iranian Space Agency is working on a booklet on the effective use of space-based information to assess drought at the national level; and (c) the LAPAN regional support office in Indonesia is working on the booklet on the application of remote sensing for forest and land fire monitoring.

C. Latin America and the Caribbean

31. In 2012 and 2013, UN-SPIDER conducted only one training activity in the Dominican Republic and one expert mission to the Dominican Republic owing to a lack of funding support from donor countries.

32. On 13 and 17 May 2013, UN-SPIDER conducted a training course in the Dominican Republic. The course was aimed at members of the inter-institutional Geo-Spatial Information Team for Risk Management. The course focused on the use of remote sensing applications in the case of floods and benefited from the support provided by the Agustín Codazzi Geographical Institute (Colombia), the Water Centre for the Humid Tropics of Latin America and the Caribbean (Panama) and the National Commission on Space Activities (Argentina) in their role as regional support organizations.

33. In October 2013, UN-SPIDER participated in the weeklong “Semana Geomática 2013” congress organized by the Agustín Codazzi Geographical Institute of Colombia. Within that congress, a one-day workshop was conducted with representatives of Government agencies to elaborate a plan of work focusing on the use of space-based information in the case of disasters within Colombia and on a protocol to be used when considering the activation of international mechanisms such as the International Charter on Space and Major Disasters; the Mesoamerican Regional Visualization and Monitoring System; or the European Earth Observation Programme (Copernicus). That expert mission allowed UN-SPIDER to support the efforts of the Agustín Codazzi Geographical Institute and the Government of Colombia in disaster preparedness.

D. Small island developing States

34. With climate change extremes affecting small island developing States, these countries are becoming increasingly prone to major disasters and in general the regional and national capacities to use space-based solutions for disaster management require further enhancement.

35. In 2013, one official from the National Disaster Management Organization of Fiji was offered five days of training in the course on flood risk mapping, modelling and assessment using space technology, organized at the Centre for Space Science Technology Education in Asia and the Pacific in India.

36. As a follow-up of the technical advisory mission to the Solomon Islands in 2012, an official from the Solomon Islands attended the UN-SPIDER conference held in Beijing from 23 to 25 November 2013 and provided feedback on the impact of the technical advisory mission.

37. The UN-SPIDER programme has been providing increasing support to small island developing States since it first began targeting this group of countries in 2008 with the organization of regional workshops in both the Caribbean and the Pacific regions. This led to additional activities, including the carrying out of technical advisory missions to the Dominican Republic, Fiji, Haiti, Jamaica, the Maldives, Samoa, the Solomon Islands and Tonga, as well as supporting experts from national disaster management organizations from those countries to attend relevant meetings.

III. Support to emergency response

A. Building upon existing mechanisms and opportunities

38. The UN-SPIDER programme has in place arrangements with several leading global and regional initiatives, including the International Charter on Space and Major Disasters (the Office for Outer Space Affairs has been a cooperating body with the Charter since 2003) and Sentinel Asia (the Office for Outer Space Affairs is a member of the joint project team), Copernicus (the Office for Outer Space Affairs, through UN-SPIDER, is an international associated user). Additionally, UN-SPIDER works closely in promoting and leveraging the opportunities provided by the regional SERVIR nodes in Latin America and Africa.

39. The Office for Outer Space Affairs, through UN-SPIDER, is promoting the universal access initiative of the Charter in connecting national disaster management authorities with the secretariat of the Charter in order to increase its network of authorized users. The participation of the regional support offices of UN-SPIDER in the training programme of the Charter for project managers is also facilitated. On 27 and 28 June 2013, five regional support offices sent participants to a training programme for project managers that was held at the European Space Agency facilities in Frascati, Italy.

40. Additionally, UN-SPIDER has worked with the National Disaster Reduction Centre of China since 2011. In 2012, the two entities collaborated with several organizations in Africa to monitor drought in Africa.

41. Similarly, UN-SPIDER has been able to channel support from various other providers of satellite resources such as space agencies and the private sector. Such support has been so far offered by the Indian Space Research Organisation and by DigitalGlobe.

42. In providing support to countries, the UN-SPIDER programme ensures the involvement of the UN-SPIDER regional support offices and other centres of excellence to support the analysis of the space-based data that is made available.

B. Support provided in late 2012 and in 2013

43. The category 4 super typhoon Bopha struck the Pacific island of Palau at the end of 2012. The UN-SPIDER programme activated the International Charter on Space and Major Disasters for the typhoon on 3 December 2012 on behalf of the Office for the Coordination of Humanitarian Affairs. The UN-SPIDER programme played an important role in coordinating with the Office, providers of satellite data and end users. Although the activation was in 2012, the support continued into 2013 and is reported here, as it was not included the report to the Committee in 2012.

44. Typhoon Bopha also struck the Philippine island of Mindanao on 4 December 2012. Heavy rainfall and wind speeds of up to 210 kph forced the evacuation of thousands of people. The UN-SPIDER programme activated the International Charter on Space and Major Disasters for the storm in the Philippines on 5 December 2012 on behalf of the Office for the Coordination of Humanitarian Affairs, the Asian Disaster Reduction Center, the Manila Observatory, the

Operational Satellite Applications Programme (UNOSAT) of the United Nations Institute for Training and Research (UNITAR) and the United Nations Children's Fund. The UN-SPIDER programme played an important role in coordinating the data providers and end users, as well as data dissemination through the knowledge portal (www.un-spider.org).

45. On 7 May 2013, the Government of Iraq declared a state of maximum alert in all its service agencies to deal with the floods that were affecting several cities in the southern part of the country. After UN-SPIDER received a request from the Government of Iraq to facilitate the acquisition of satellite imagery to assess the extent of the flood and the corresponding damage, UN-SPIDER activated its network. The Indian Space Research Organisation acquired ResourceSat-2 LISS II images, which were made available on the UN-SPIDER server for dissemination. The images were processed by UNITAR/UNOSAT and by the National Disaster Reduction Centre of China to prepare rapid response maps. The maps were made available to the Government of Iraq.

46. The Office for Outer Space Affairs received a request from the Association of Southeast Asian Nations (ASEAN) Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre) for post-disaster images of Typhoon Haiyan (known locally as Yolanda), which made landfall on the central Philippine coast at 04.40 local time on 8 October 2013. In addition to thousands of people killed, more than 12 million people in 20 provinces were affected. The category five storm brought winds as strong as 314 km/h; analysts believe it may be one of the strongest storms to make landfall in recorded history. Upon request from UN-SPIDER, the Indian Space Research Organisation provided RESAT-1 microwave images for the post-damage assessment. These images were used by the AHA Centre and LAPAN for damage assessment.

47. On 29 November, the Government of Iraq requested UN-SPIDER support to monitor and manage floods in Baghdad. The UN-SPIDER programme arranged to provide high resolution satellite images from the China National Space Administration (CNSA). The regional support office in Pakistan, SUPARCO, carried out rapid mapping using SPOT images dated before the flood and high resolution images obtained from CNSA. The products were made available to the Disaster Management Information Centre and the Remote Sensing Research Centre in Iraq.

Annex

Technical advisory missions and other support activities carried out in 2013 in the framework of the United Nations Platform for Space-based Information for Disaster Management and Emergency Response

A. Ghana

1. The UN-SPIDER programme carried out a technical advisory mission upon the invitation of the Government of Ghana, through the National Disaster Management Organisation. The mission was carried out with the support of the Office for Outer Space Affairs, United Nations University, the United Nations Environmental Programme, the National Space Research and Development Agency of Nigeria, the Met Office (United Kingdom), the National Disaster Reduction Centre of China, the Secure World Foundation and the University of the Free State (South Africa).
2. The mission team visited the offices of UNDP, the Survey and Mapping Division, the Department of Geography and Resource Development of the University of Ghana, the Ministry of Food and Agriculture, the Centre for Remote Sensing and Geographic Information Services, the Town and Country Planning Department, the Forestry Commission, the Ghana Meteorological Agency, the Ghana Atomic Energy Commission (Ghana Space Science and Technology Institute), the Hydrological Services Department, the Ghana National Fire and Rescue Service, the Geological Survey Department, the Environmental Protection Agency and the Ghana Statistical Service, Ghana Ports and Harbour Authority and the Kofi Annan International Peacekeeping Training Centre.
3. In addition, a national workshop was conducted on 28 November 2013, which brought together more than 40 participants and stakeholders from academia, ministries, emergency services and international organizations. An introduction was made on the applications of remote sensing for disaster risk management and flood mapping, along with a demonstration of existing international mechanisms that make available satellite information for support emergency responses. The host organization presented its role in the coordination of disaster management in Ghana. That was followed by group discussions on the current and potential use of space-based technology and the role for disaster management in each organization. Also, capacity-building needs were identified by groups which were divided according to their role: one for emergency response teams; and one for risk prevention organizations. The exchange of views was guided by the UN-SPIDER mission team.
4. In the final session, the members of the technical advisory mission team presented their work with applications from China, risk preparedness by meteorological services, the role of regional support offices, institutional arrangements and early warning systems.
5. The team ended the mission with a debriefing to the staff of the National Disaster Management Organisation, including the national coordinator.

Observations and recommendations from the UN-SPIDER team were presented. The event was covered by several national media outlets.

B. Indonesia

6. The UN-SPIDER programme and the National Institute of Aeronautics and Space of Indonesia (LAPAN), which is a regional support office of UN-SPIDER, organized a stakeholders meeting on the utilization of space-based information for disaster risk management on 3 September 2013 in Jakarta. The aim of the meeting was to assess the current status of the use of space-based and geospatial information, understand issues and plan interventions that would lead to the effective use of space-based information in disaster management. The specific objectives were to involve LAPAN and other stakeholders to leverage the One Gate Policy of Indonesia to strengthen disaster management and discuss effective use of the InAWARE (the Indonesia All-hazards Warning and Risk Evaluation) system, the tool prepared by the Pacific Disaster Center with funding from the United States Agency for International Development (USAID).

7. Approximately 25 stakeholders from various agencies attended the meeting. Representation included the National Agency for Disaster Management; the Indonesian provincial disaster mitigation agencies; Badan Meteorologi, Klimatologi, dan Geofisika (BMKG); the national meteorological and geophysical office; the national survey and mapping agency of Indonesia; the World Food Programme (WFP); the Office for the Coordination of Humanitarian Affairs, the National Disaster Reduction Centre of China; the German Aerospace Centre; the Pacific Disaster Centre; and the Association of Southeast Asian Nations (ASEAN) Coordination Centre for Humanitarian Assistance on Disaster Management.

8. The report was prepared and circulated to all stakeholders. It provides observations on the status of use of space-based and other geospatial information for disaster management and challenges raised by stakeholder agencies. The report also provides recommendations and suggestions based on discussions between the stakeholder agencies. The discussions ended with consensus to plan further interventions based on the following three points and to plan joint activities in 2014:

(a) Improve hazard information systems and early warning by making effective use of InAWARE, including the cooperation and participation of data providing agencies in assisting the National Agency for Disaster Management and the Pacific Disaster Centre to include data resources from these agencies within InAWARE;

(b) Develop best practices of using space-based information in pre-disaster phases (such as information preparedness) to address hazard, risk and vulnerability mapping, while especially promoting role of LAPAN, the National Agency for Disaster Management and other scientific organizations;

(c) Strengthen emergency response using space-based information by addressing important concerns such as the provision of high resolution images and microwave images to monitor hydrometeorological disasters.

C. Malawi

9. Upon the invitation of the Government of Malawi, through its Department of Disaster Management Affairs, UN-SPIDER carried out a technical advisory mission.

10. The mission was carried out with the support of the Office for Outer Space Affairs, the Economic Commission for Africa, the Humanitarian Open Street Map, the French Research Institute for the Exploitation of the Sea, the Technical University of Vienna, the Group on Earth Observations, the Regional Centre for Mapping and Resources for Development and the National Disaster Reduction Centre of China.

11. The mission team visited the Department of Disaster Management Affairs, the Department of Surveys, the Department of Climate Change and Meteorological Services, the Department of Land, Housing and Urban Development, the Ministry of Irrigation and Water Development, the Forestry Department, the Ministry of Lands, the Ministry of Agriculture (Department of Land Resources Conservation), as well as the offices of the United Nations Development Programme (UNDP), the United Nations Children's Fund, the United Nations Resident Coordinator, WFP, the World Bank, USAID, the United Nations Human Settlements Programme and the European Union (European External Action Service).

12. A one-day national workshop conducted on 18 October 2013 brought together over 40 participants and stakeholders from academia, ministries, departments, NGOs and international organizations. The subjects addressed included remote sensing applications for disaster risk management, land use planning for disaster prevention, the added value of satellite-derived soil moisture assessments, the need to share geospatial information, regional efforts with regard to spatial data infrastructure and the need to access existing international mechanisms that make available satellite information to support emergency response. The host Government also presented the institutional and legal arrangements existing in Malawi that have a bearing on disaster risk reduction and emergency response.

13. The final session was used for a discussion. The exchange of views was guided by the UN-SPIDER mission team and set in the framework of two guiding questions, which the participants had to answer in writing through a cluster approach to the questions: "Give us one example of actual/potential use of geoinformation in Malawi."; and "Which are the factors/challenges that limit the wider use of geoinformation in Malawi?".

14. The team ended the mission with a debriefing to the Permanent Secretary/Commissioner responsible for the Department of Disaster Management Affairs and to its Director. The debriefing included points of information about the different experts and their respective organizations.

D. Viet Nam

15. At the request of the Government of Viet Nam, through the Disaster Management Centre of Ministry of Agriculture, UN-SPIDER carried out a technical advisory mission to Viet Nam from 25 to 29 March 2013. The mission served to evaluate the current and potential use of space-based information in all aspects of

disaster management in Viet Nam and strengthen disaster risk management in the country by providing better access to space-based information for disaster risk reduction as well as response.

16. The mission team included 12 experts from the following organizations: UN-SPIDER; CANEUS International (Canada-Europe-Americas-Africa-Asia-Oceania); the Centre for Large Space Structures and Systems (Canada); the National Centre for Space Studies, the National Centre for Scientific Research and Université Paul Sabatier (France), the South China Sea Institute of Oceanology, the Chinese Academy of Sciences (China), Geredis (Spain), GREEN Mindanao (the Philippines), the Pacific Disaster Center, Faculty of Geoinformation Science and Earth Observation (ITC) of the University of Twente (Netherlands). Representatives from the Department of Earth Systems Analysis (University of Twente), the Center for Interdisciplinary Geospatial Information Technologies of Delta State University (United States) and Beijing Normal University (China) were also part of the team.

17. The expert team visited key stakeholder organizations involved in providing space-based and geospatial information for disaster management: the Department of Dike Management, the Central Committee for Flood and Storm Control, the National Institute of Agricultural Planning and Projection, the Spatial Technology Institute, the National Remote Sensing Center, the Hydro-Meteorological Forecasting Centre, the United Nations disaster risk management team, the Department of Survey and Mapping and the General Department of Land Administration.

18. A one-day workshop was conducted as part of the mission, which was attended by some 60 officials from Government departments, United Nations agencies and non-governmental organizations (NGOs) supporting disaster management.

19. The final debriefing was provided to the Vice-Minister of Agriculture focusing on observations and recommendations related to capacity-building, data availability, data- and information-sharing, policy and coordination with respect to disaster risk management and emergency response. The Vice-Minister agreed that the mission had provided a wider vision to the country for the effective use of space technology for disaster management and promised to prepare a master plan and initiate projects based on the recommendations.

20. The detailed report was submitted to the Government of Viet Nam, and was translated into Vietnamese and shared with all stakeholders. The report provides observations and recommendations covering various issues related to policy and coordination, data access, data availability, data-sharing, capacity-building and institutional strengthening. In addition, specific recommendations were provided to enhance the use of space-based information in the various stages of disaster management such as risk reduction, early warning and emergency response. The expert team recommended the insertion of an article in the disaster management law on the use of satellite images and geospatial information to define a clearer and more pervasive role for geospatial data.

E. Support for member States as a follow-up to technical advisory support

Sudan: workshop and training course on space-based technologies for disaster risk management

21. As one of the follow-up actions of the UN-SPIDER technical advisory mission carried out from 22 to 26 May 2011, a workshop and training course on space-based technologies for disaster risk management was conducted from 5 to 9 May 2013 in Khartoum. It included a one-day awareness-raising workshop on 5 May and a four-day training course for selected Government officials and United Nations staff members. The activity was jointly organized by UN-SPIDER and the Remote Sensing Authority, the National Center for Research of the Sudan and the Regional Centre for Mapping of Resources for Development, in collaboration with the Sudan Civil Defense General Administration, the Directorate of Public Health and Emergency of the Ministry of Health, the Ministry of Agriculture and Irrigation and the Sudan Meteorological Authority.

22. The activity raised the awareness of decision makers and local staff through the workshop and built local capacity through training for more efficiently using space-based technology for disaster management at the national level in the Sudan.

23. Over 120 participants from Government, NGOs, academia, United Nations organizations and private companies in the Sudan participated in the workshop. The Minister of Science and Communications gave a welcome and opening statement during the opening ceremony, which was also attended by the State Minister of the same ministry, the undersecretary of the Ministry of Health and other high-level officials. The Director of Civil Defense of the Ministry of Interior also met with the UN-SPIDER expert team after the workshop. About 20 participants from the Remote Sensing Authority, the Meteorological Service, the Ministry of Defense, the Ministry of Interior, the Ministry of Health and the Ministry of Agriculture and Irrigation and local United Nations Offices (such as WFP and UNDP) attended the training course. Five experts from UN-SPIDER, the China Institute of Water Resources and Hydropower Research and the Regional Centre for Mapping of Resources for Development were fully engaged in the activity, which was coordinated by UN-SPIDER.

Bangladesh: space technology for flood hazard mapping, flood forecasting and rapid mapping

24. The UN-SPIDER programme organized a capacity-building programme in Bangladesh from 12 to 16 May 2013 on the topic of space technology for flood hazard mapping, flood forecasting and rapid mapping in Bangladesh. The programme was jointly organized by the Comprehensive Disaster Management Programme of the Ministry of Disaster Management and Relief, and the Space Research and Remote Sensing Organisation of Bangladesh. The training programme was a follow-up to the UN-SPIDER technical advisory mission to Bangladesh from 19 to 23 June 2011. Its objective was to implement the recommendations made by that mission in order to strengthen the capacity of national agencies to use geospatial technologies for flood hazard mapping, flood forecasting and rapid mapping.

25. The training programme was inaugurated by the secretary of the Ministry of Disaster Management and Relief. It covered a wide range of topics, such as the role of Earth observation in disaster management, a regional plan of action on promoting space and geographical information system (GIS) applications for disaster risk management and sustainable development, global and regional flood hotspot assessment, flood hazard/risk mapping, multi-hazard risk and vulnerability assessment, flood inundation mapping using multi-resolution satellite data, and flood response rapid mapping. Participants were provided with hands-on sessions to develop skills in mapping and modelling floods.

26. Experts from the following organizations conducted the training sessions: the Beijing office of UN-SPIDER; the International Water Management Institute; the National Disaster Reduction Centre of China; the International Centre for Integrated Mountain Development; the Economic and Social Commission for Asia and the Pacific (ESCAP); the Pacific Disaster Centre; the Asian Disaster Preparedness Centre; and the Space Research and Remote Sensing Organisation. There were 20 officers from 17 organizations in Bangladesh who participated to the training programme.

India: international training programme on flood risk mapping, modelling and assessment using space technology

27. From 22 to 26 July 2013, UN-SPIDER, jointly with the Centre for Space Science Technology Education in Asia and the Pacific, the International Water Management Institute and ESCAP, organized an international training programme on flood risk mapping, modelling and assessment using space technology. The training took place on the premises of the Centre for Space Science Technology Education in Asia and the Pacific in Dehradun, India.

28. The training programme was conceived based on the observations and recommendations of several technical advisory missions organized under the framework of UN-SPIDER in several countries. A total of 19 participants from 11 countries in the Asia and Pacific region attended the training programme. The programme included theory lectures and experience sharing by the experts from the UN-SPIDER Beijing office, the International Water Management Institute, the UN-SPIDER programme, the Indian Institute of Remote Sensing, the Indian Space Research Organisation, the Geo-Informatics and Space Technology Development Agency and the National Disaster Reduction Centre of China. The lectures covered climate change and disaster risk reduction, adaptation to enhanced floods, concepts of flood inundation mapping, the operational flood alert system of the Indian Space Research Organisation, monitoring and damage assessment using space technologies, a global flood detection system and flood inundation modelling using HEC-RAS tools.

29. Hands-on sessions were offered by the International Water Management Institute and the Indian Institute of Remote Sensing on flood inundation mapping using multi-resolution satellite data and flood inundation modelling using HEC-RAS tools.

30. Participants also visited the area downstream of the recent floods in Northern India (Kedarnath) that caused heavy loss of life and damage to property a month prior to the training activity. The Central Water Commission of India demonstrated

the acoustic doppler current profiler that collects data on the flood level and discharge of the river and transmits that data through a telemetry system to servers for flood analysis and decision-making.

China: interactive training workshop on advances in using space technology and geospatial information for disaster management

31. From 21 to 22 October 2013, the UN-SPIDER office in Beijing organized an interactive training session in that city to strengthen the capacity of the National Disaster Reduction Centre of China to effectively embed space technologies in its activities. The Centre was established to serve China's needs in the field of disaster prevention and reduction. A comprehensive operational system is now working efficiently at the national level through the reasonable deployment of resources, space-ground integration and coordination between departments.

32. The experts gave presentations, followed by in-depth discussions, on the following topics: integrating climate change adaptation, sustainable development and ecosystems in disaster risk reduction: space technology perspective; integrating geospatial technologies for crisis management; using secondary data in humanitarian needs assessments; disaster risk modelling, mapping and profiling for public decision-making: review of the concepts of risk, risk modelling, risk mapping and risk profiling; object-oriented image analysis methods in disaster risk management; and use of remote sensing data in flood mapping and modelling: case studies from Asia and Africa.

33. Experts from the UN-SPIDER Beijing office, Delta University (United States), the Asia-Pacific regional office of the Office for the Coordination of Humanitarian Affairs, the University of Twente, the International Water Management Institute and the Bureau for Crisis Prevention and Recovery of UNDP shared their experience and best practices in using space technologies and geospatial information in disaster management. The training course was organized back-to-back with the United Nations International Conference on Disaster Risk Identification, Assessment and Monitoring, which took place from 23 to 25 October 2013 in Beijing.

Dominican Republic: capacity-building and follow-up activities

34. Following the recommendations of the technical advisory mission conducted in January 2010, as well as the resulting institutional strengthening mission in November 2011, an inter-institutional geo-spatial information team for risk management has been established in the Dominican Republic. The team comprises more than 15 Government ministries, agencies and university centres and is headed by the National Emergency Commission.

35. Upon request and as a follow-up to the two preceding missions to the Dominican Republic, UN-SPIDER organized a one-week training as a first step to strengthen the remote sensing capacities of the geospatial information team to derive flood-related information from satellite imagery. The training was organized in close cooperation with the National Emergency Commission and with three regional support offices: the Agustín Codazzi Geographical Institute, the Water Centre for the Humid Tropics of Latin America and the Caribbean (CATHALAC) and the National Commission on Space Activities of Argentina.

36. The training took place on the premises of the National Emergency Commission in Santo Domingo from 13 to 17 May 2013. Lectures and hands-on sessions were provided by experts from the Water Centre for the Humid Tropics of Latin America and the Caribbean, the Agustín Codazzi Geographical Institute and UN-SPIDER. Topics included the following: introduction to remote sensing for disaster risk management and emergency response; acquisition of satellite data and useful data products for flooding; pre-processing, supervised and unsupervised classification of multispectral images; calculation of indices and change detection with multispectral images; introduction to radar data; use of digital elevation models for hydrologic modelling; use of thermal data for change detection; and introduction to the web portal SMIT. At the end of the training session, the participants were able to process satellite and ancillary data to derive a flood susceptibility map, to update land cover maps and to assess damages caused by flooding.

37. The training session constituted the first effort on behalf of UN-SPIDER to strengthen the capacities of the members of the team in the Dominican Republic. A similar inter-institutional team has been set up in Guatemala at the recommendation of UN-SPIDER. The team from Guatemala is composed of representatives of five Government agencies.

Mozambique: national training programme on disaster mapping using space technology

38. In October 2012, a mission team of the UN-SPIDER technical advisory mission had evaluated the current and potential use of space-based information for disaster management in Mozambique and recommended the organization of training workshops on the use of geospatial technology for the key stakeholders for disaster management. As a follow-up to those recommendations, UN-SPIDER and UNDP-Mozambique jointly organized a national training course on disaster mapping using space technology in Maputo from 4 to 8 November 2013. The training course took place at the Eduardo Mondlane University.

39. The training course was attended by more than 20 participants from various line ministries and departments that are involved in supporting disaster risk management and emergency response, as well as from two universities in Mozambique. In total, representatives of nine institutions attended the training course: National Disasters Management Institute, Mozambique Institute of Agricultural Research, National Cartography and Remote Sensing Centre, Regional Administration of Waters in the South, National Meteorology Institute, National Directorate of Land Planning and Management, Municipality of Maputo, Mozambique Technical University and Eduardo Mondlane University.

40. Experts from the following organizations delivered hands-on training sessions: Cologne University of Applied Sciences, the National Disaster Reduction Centre of China and UN-SPIDER. The participants were given an introduction to the concepts of hazard, vulnerability and risks, the basics regarding earth observation satellites, geo-data for disaster management, including access to freely available data, rapid mapping, the functioning of the International Charter on Space and Major Disasters and other topics. Hands-on exercises were provided on flood forecasting, flood detection, drought monitoring and rapid mapping of disasters, which were conducted with ArcGIS and ENVI software. The participants processed digital

elevation models, rainfall data, satellite imagery and geographic data on infrastructure, utilities and population.
