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Committee on the Peaceful
 Uses of Outer Space

United Nations Regional Workshop on the Use of Space Technology for Disaster Management for Africa

(Addis Ababa, 1-5 July 2002)

Contents

I. Introduction

A. Background and objectives

1.   The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) and the Vienna Declaration on Space and Human Development recommended that activities of the United Nations Programme on Space Applications promote collaborative participation among Member States at both the regional and international levels, emphasizing the development of knowledge and skills in developing countries.[1]

2.   Disaster management was singled out as one of the areas of focus. Earth observation satellites and other space-based technologies provide important and unique solutions in all disaster management areas: disaster mitigation, disaster preparedness, disaster relief and disaster rehabilitation. Such solutions are already an integral part of disaster management activities in many developed and even developing countries.

3.   Although national capabilities in the use of space technologies in developing countries are increasing at a significant rate, there is still a need to support in a more direct way the transfer of available solutions to be used for disaster management activities, while at the same time proposing methodological approaches that are tailored to the specific needs of a country.

4.   In order to contribute to increasing the use of space technology for disaster management in developing countries and in countries with economies in transition, the Office for Outer Space Affairs of the United Nations Secretariat, within the framework of the United Nations Programme on Space Applications, is organizing five regional workshops on the use of space technology for disaster management, bringing together practitioners and space agencies that have already developed space-based technology solutions and those responsible for dealing with disaster management and space technology in developing countries.

5.   The first of the five regional workshops was held in La Serena, Chile, from 13 to 17 November 2000, for the benefit of countries of Latin America and the Caribbean. Almost 200 participants attended, various partnerships were formed and pilot projects are at present being designed for future implementation. The second of the regional workshops was organized in cooperation with the Economic Commission for Africa (ECA) and was held in Addis Ababa from 1 to 5 July 2002.

6.   The regional workshops are the initial step towards an integrated approach, with the final objective being the incorporation of the use of space technologies in a sustainable manner into operational disaster management programmes around the world through the definition and implementation of pilot projects. In addition to the workshops and pilot projects, the approach also includes a training component and the presentation of results to high-level disaster managers and decision makers from national and international institutions, including funding institutions.

7.   ECA, within its harnessing information for development programme, implements and supports activities aimed at assisting African Member States to improve the understanding and use of space-based information technologies for decision-making in the various sectors of development. The United Nations

Regional Workshop on the Use of Space Technology for Disaster Management for Africa, held in Addis Ababa from 1 to 5 July 2002, contributed directly to the work ECA had been carrying out in Africa in that area, highlighting the importance of ECA involvement not only in co-organizing the Workshop but also in the many follow-up activities that will result from it.

8. The specific objectives of the Workshop were: (a) to increase awareness among managers and decision makers involved in disaster management of the potential benefits and the cost-effectiveness of using space-based technologies; (b) to provide a forum in which needs that were specific to the region and institutional settings could be identified together with the types of information and communications needed in managing specific disasters and the extent to which they could be met by space technologies; and (c) to develop a regional plan of action that would enable the consolidation of networking among national and regional agencies and the definition of possible partnerships that would lead in the near future to one or more pilot projects that would incorporate and refine the use of space tools in disaster management.

9. The pilot projects to be identified would be designed and carried out with international cooperation and would be aimed at producing synergy among the regional initiatives of various institutions or groups of institutions.

10. Several initiatives, many within the United Nations system, focus on making space technology solutions available to those responsible for dealing with disaster-related activities in developing countries. The workshops, together with the follow-up activities, are planned and implemented taking into consideration the relevant initiatives described below.

Committee on the Peaceful Uses of Outer Space

11. In its resolution 54/68 of 6 December 1999, the General Assembly endorsed the resolution entitled "The Space Millennium: Vienna Declaration on Space and Human Development"[2] and urged, inter alia, organizations of the United Nations system to take the necessary action for the effective implementation of the Vienna Declaration. The Declaration includes a number of recommendations, one of which called for action to be taken to implement an integrated, global system, especially through international cooperation, to manage natural disaster mitigation, relief and prevention efforts, especially of an international nature, through Earth observation, communications and other space-based services, making maximum use of existing capabilities and filling gaps in worldwide satellite coverage.[3]

12. At its forty-sixth session, the Committee on the Peaceful Uses of Outer Space decided that it would address several of the recommendations, including the one mentioned above, through action teams with the voluntary leadership of Member States. The Committee received an offer from Canada, China and France to lead the action team on the implementation of an integrated, global system to manage natural disaster mitigation, relief and prevention efforts. The first meeting of the Action Team was held in Toulouse, France, on 5 and 6 October 2001. The second meeting was held in Vienna during the thirty-ninth session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space. The third meeting was held in Houston, United States of America, on 13 October 2002. The initial three-year work plan includes the compilation of information on user needs

for disaster management, on national capacity for utilizing space-derived information on disaster management and on existing and planned operational space systems in support of disaster management.

International Strategy for Disaster Reduction

13. Recognition of the fact that disasters were an increasing problem led in part to the launch of the International Decade for Natural Disaster Reduction for the period 1990-1999, which in turn led to the establishment of the International Strategy for Disaster Reduction (ISDR). ISDR is a global strategy with two institutional components. The first is the Inter-Agency Task Force for Disaster Reduction with the following main functions: (a) to serve as the main forum within the United Nations system for devising strategies and policies for the reduction of natural hazards; (b) to identify gaps in disaster reduction policies and programmes and recommend remedial action; (c) to ensure complementarity of action by agencies involved in disaster reduction; (d) to provide policy guidance to the ISDR secretariat; and (e) to convene ad hoc meetings of experts on issues related to disaster reduction.

14. The second component of ISDR is the secretariat of the Task Force, which is based in Geneva. It serves as the focal point within the United Nations system for the coordination strategies and programmes for natural disaster reduction. The secretariat is a multidisciplinary team that supports the Task Force, in which international policy can be made and which constitutes an institutional platform from which programmes can be launched. It does not implement programmes but enables others to do so more effectively.

Office for the Coordination of Humanitarian Affairs

15. The Office for the Coordination of Humanitarian Affairs of the Secretariat was established pursuant to the reform programme of the Secretary-General (A/51/750), which was endorsed by the General Assembly. In accordance with the provisions of Assembly resolution 46/182 of 19 December 1991, the functions of the Emergency Relief Coordinator are focused in three core areas: (a) policy development and coordination functions in support of the Secretary-General, ensuring that all humanitarian issues, including those which fall in gaps between existing mandates of agencies such as protection and assistance for internally displaced persons, are addressed; (b) advocacy of humanitarian issues with political organs, notably the Security Council; and (c) coordination of humanitarian emergency response on the ground, by ensuring that an appropriate response mechanism is established, through Inter-Agency Standing Committee (IASC) consultations.

16. The Office for the Coordination of Humanitarian Affairs discharges its coordination function primarily through IASC, which is chaired by the Emergency Relief Coordinator, with the participation of all humanitarian partners, including the International Federation of Red Cross and Red Crescent Societies and non-governmental organizations. IASC ensures inter-agency decision-making in response to complex emergencies, including need assessments, consolidated appeals, field coordination arrangements and the development of humanitarian policies.

United Nations Educational, Scientific and Cultural Organization Unit for Disaster Reduction

17. Within the framework of ISDR, the United Nations Educational, Scientific and Cultural Organization (UNESCO) is focusing on building a culture of prevention to counter disasters and reduce vulnerability of populations at risk. UNESCO is engaged in the assessment and mitigation of risks arising from hazards of geological origin (earthquakes, tsunamis, volcanic eruptions and landslides) and contributes to the study of hazards of meteorological origin (storms, floods, prolonged drought and desertification).

18. UNESCO also fosters information, education, transfer of data and experience among countries and communities aiming at integrating geohazard knowledge and expertise in decision-making processes in order to encourage the adoption of policies and actions for sound planning and management of land-use and construction techniques and to promote the development of preventive and preparedness plans, including the implementation of global to local warning systems.

International Charter "Space and Major Disasters"

19. The Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters (also known as the International Charter "Space and Major Disasters") enables countries where a natural or technological disaster has occurred to receive products derived from satellite images to support disaster mitigation activities. The institutions participating in the Charter are the European Space Agency (ESA), the Centre national d'études spatiales (CNES) of France, the Canadian Space Agency, the Indian Space Research Organization and the National Oceanic and Atmospheric Administration (NOAA) of the United States. The Office for Outer Space Affairs is currently defining with the Charter the agreement that will enable the Office to become a cooperating body to the Charter, which in turn will enable the United Nations system to have access to the Charter, triggering it in the case of disasters in which the United Nations is involved.

Committee on Earth Observation Satellites, Disaster Management Support Group

20. The Committee on Earth Observation Satellites (CEOS) is an international organization charged with coordinating international civil space-borne missions designed to observe and study the Earth. Comprising 41 space agencies and other national and international organizations, CEOS is recognized as the major international forum for the coordination of Earth observation satellite programmes and for interaction of those programmes with users of satellite data worldwide.

21. The CEOS Disaster Management Support Group (DMSG) began in February 1997 as one of six initiatives undertaken by CEOS to demonstrate the concept of an Integrated Global Observing Strategy (IGOS). It was recognized that taking an integrated view of disaster management user requirements for Earth observation data, even if confined to space-based data, would be a notable challenge. After its first three years as a pilot project, the disaster management support project developed and identified specific user requirements for seven

hazards (drought, earthquake, fire, flood, landslide, oil spill and volcanic hazards) and produced recommendations for improving the ability of current and planned systems to meet those requirements. The project was given a new mandate when the CEOS plenary established the ad hoc DMSG in November 1999.

22. The objective of DMSG was to support natural and technological disaster management on a worldwide basis by fostering improved utilization of data from existing and planned Earth observation satellites. DMSG completed its work in 2002, and CEOS endorsed its recommendation that DMSG activities be integrated into the International Charter "Space and Major Disasters", the workshops organized by the Office for Outer Space Affairs and their follow-up activities and the IGOS geohazards theme.

23. Two other working groups within CEOS are involved in activities directly related to the topic of disaster management: the Working Group on Earth Observation Education and Training, which could provide valuable support to disaster management capacity-building, and the Working Group on Information Systems and Services, which aims at stimulating, coordinating and monitoring the development of the systems and services that manage and supply the data and information from participating agencies' missions.

B. Programme

24. The United Nations Regional Workshop on the Use of Space Technology for Disaster Management for Africa was organized by the Office for Outer Space Affairs and ECA and sponsored by CEOS, ESA and CNES. Funding support was also provided by Space Imaging, Inc.

25. The Workshop was hosted by ECA and held at the recently inaugurated United Nations Conference Centre in Addis Ababa.

26. At the opening session of the Workshop statements were made by representatives of the Office for Outer Space Affairs, ECA and ESA. The keynote presentation was given by Levin Lauritson of NOAA. A total of 58 presentations were delivered in 15 thematic sessions covering all aspects of the current use of space technology for disaster management. Topics ranged from Earth observation satellites, meteorological satellites, high-resolution satellites, global navigation satellite systems (GNSS) and communication satellites, and specific presentations were given on geographic information systems (GIS) and capacity-building. Seven discussion sessions enabled further discussion of the main topics that subsequently formed the framework of the proposed plan of action.

C. Attendance

27. A total of 120 participants attended the Workshop and came from the following 44 countries: Algeria, Austria, Benin, Botswana, Brazil, Burkina Faso, Cameroon, Canada, Colombia, Côte d'Ivoire, Djibouti, Egypt, Eritrea, Ethiopia, France, Germany, Ghana, Hungary, Italy, Jordan, Kenya, Malawi, Mauritania, Mexico, Mozambique, Netherlands, Niger, Nigeria, Rwanda, Senegal, Slovenia, Somalia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Turkey, Uganda, United

Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States, Zambia and Zimbabwe. The United Nations Mission in Ethiopia and Eritrea, the United Nations Organization Mission in the Democratic Republic of the Congo, the ISDR secretariat, the Office of the United Nations High Commissioner for Refugees and the World Health Organization, as well as the Office for Outer Space Affairs, were also represented.

28.   Funds allocated by the United Nations, by the co-sponsors (NOAA on behalf of CEOS, ESA and CNES) and by Space Imaging, Inc. were used to defray the costs of air travel and/or daily subsistence allowance of 30 participants and the Office for Outer Space Affairs and interpretation services in English and French.

II.   Observations and recommendations

A.   Approach to establishing a strategy

29.   The thematic and discussion sessions were structured around the three topics considered to be the cornerstones of an effective plan of action: availability of information and technology, institutional environment and capacity-building. The Workshop proposed a regional network to coordinate the plan of action and the sharing of experience and expertise.

30.   Through the presentations given during the thematic sessions participants gained an understanding of the various issues linked to each cornerstone, whereas during the discussion sessions participants focused on defining the modus operandi of the regional network.

Availability of information and technology

31.   Discussions on data were centred on the types of data needed, the present availability of data for Africa and difficulties of distributing and accessing data. The availability of data referred not only to having access to the data needed but also to receiving the data when it was needed and in a format that could be used.

32.   A number of available technologies could provide data that would be useful for disaster management: remote sensing technologies (satellite and photography), which provided data on terrain, land cover and so on; light detection and ranging (LIDAR) devices, which were being used to create elevation data for natural landscape features and buildings; ground surveying tools, which produced maps for boundaries and other landscape elements; governmental censuses and surveys, which provided socio-economic data for defined spatial units; GNSS, which offered a means of obtaining positional information for stationary or moving objects; wireless telecommunication developments, which facilitated interpersonal contacts during disasters; wireless technologies, which provided a means for data logging in the field; and Internet products and services, which provided access to and dissemination of data, information and knowledge.

Institutional environment

33.   The Workshop considered that "institutional environment" referred not only to the existence of institutions that were involved in disaster management or that

already had competence in the use of space-based solutions but also to current national and regional policies with regard to disaster management. Consideration needed to be given to existing initiatives that would support or contribute to the development of activities that used space-based technologies. Important aspects when analysing the institutional environment were the communication channels already in place and the strength of the networks and partnerships. Dealing with disasters was a multidisciplinary activity that involved all sectors of society.

Capacity-building

34. The third cornerstone of a successful strategy was increasing the current capabilities of the region through training, strengthening of institutions and funding. Human resources could be considered the single most important resource to have available during a crisis, but the training of experts took time to accomplish.

35. Resources for a regional network were limited and mechanisms would need to be put in place to build synergies among institutions, enabling the sharing of expertise and results.

36. After 58 presentations and many hours of discussion, many valuable observations were made and conclusions drawn. These are presented below.

B. Availability of information and technology

37. The availability and use of spatial data was part of and affected every aspect of society. Spatial data should be made available to the people who needed them, when they needed them and in a form that they could be used to make decisions with minimal pre-processing.

38. Data were usually considered the starting point of any strategy. There was consensus that there was an urgent need to update the base map data in many African countries, in particular in those countries which had lost relevant portions of their data infrastructure owing to recent disturbances. It was pointed out that existing options for accessing free and low-cost data should be considered first. There was also a significant amount of archived data that should be catalogued and made widely available. Whereas at the beginning of the information technology revolution data were always considered to be the bottleneck in implementing successful systems, data were currently widely available and in many cases free of charge.

39. Access to data would be greatly facilitated through the implementation and strengthening of national spatial data infrastructures, which would contribute to guaranteeing that all data be made available and easily accessible. It was recommended that all spatial data holdings be publicized through the ECA clearing house node (the standard-based geoinformation system project). In order to do that efficiently, it was also necessary to establish and use metadata standards.

40. Participants stressed the need to increase data sharing, which could be fostered by federated and distributed databases. An important recommendation was to make sure, when acquiring spatial data or compiling a spatial database, that all the needs of present and potential users were taken into account.

41.   Data access was a concern raised at the Workshop. Even when remote sensing data had been identified, access to the data might be a slow process, if not an impossible one, owing to the slow Internet connections at present available throughout the region.

42.   It was stressed in various presentations that information was useful only when it reached the end-user. The radio and Internet project was a successful example of how communication satellites could be used to inform the end-user (see www.ranetproject.net for further information on the project).

43.   Even though current data were available, the same could not always be said for benchmark or reference data, which were needed as historical data when carrying out impact and/or vulnerability studies.

44.   Participants pointed to the need to develop data requirements for each hazard scenario and to make those scenarios available to the regional network. The data requirements must take into consideration both spatial and temporal characteristics.

45.   The last recommendation on the availability of information and technology, and perhaps one of the most important ones made at the Workshop, was to take advantage of initiatives already in place that made spatial data that could be used for disaster response available free of charge, such as the initiative of the International Charter "Space and Major Disasters" (see para. 19 and www.disastercharter.org).

C.   Institutional environment

46.   Many participants stressed that not all countries in the region had institutions that were competent in the use of space-based technologies and furthermore that many countries did not have centralized disaster management coordination. Thus, a first step towards strengthening institutional aspects was to help establish national disaster management centres in those countries that would promote an integrated and coordinated system of disaster management, with a special emphasis on prevention and mitigation, involving national, provincial and municipal bodies, related institutions, including universities, non-governmental organizations and other role players involved in disaster management and communities.

47.   At the same time, to promote an integrated approach to dealing with disasters, specific working groups for each type of hazard should be formed at various levels of government.

48.   When defining priority activities, it was necessary to focus on vulnerability. Specifically, the focus should be on preparedness and prevention and less on emergency response.

49.   Many examples of successful regional coordination in Africa were given at the Workshop. Such cooperation was important, in particular in Africa, because it led to improvements in access to satellite data and to reductions in the cost of data acquisition. Even so, many participants stressed that there was room for improvement, especially in the case of disasters that crossed international borders such as occasional flooding of international boundary rivers. Thus, the need for strengthening intergovernmental coordination was also stressed.

50.   Participants also noted the need to build upon existing regional networks such as the Southern African Fire Network, a part of the Global Observation for Forest and Land Cover Dynamics, and the Southern African Water Information Network, strengthening initiatives that had already determined the best modus operandi and using the existing channels of communication.

51.   Participants noted that often, when alternative approaches using unfamiliar technology-based solutions were proposed, decision makers had not understood the benefits. There was thus a need to continuously demonstrate to decision makers the cost-benefit of using remotely sensed data and other space-based technologies.

D.   Capacity-building

52.   Capacity-building should be aimed at increasing the capability of organizations and individuals to use geospatial information effectively for disaster preparedness, response and recovery. Technology in general had a role to play in expanding access to information, while GIS technology (in the form of databases and software tool boxes) could improve access to information for planning, spatial logistics (for example, evacuation routes) and other purposes, build capacity for understanding, predicting and problem solving in the geospatial domain and help the general public to contribute to disaster awareness and preparedness.

53.   Training should be channelled through the existing regional training centres affiliated with the United Nations: the African Regional Centre for Space Science and Technology—in French language, in Morocco, the African Regional Centre for Space Science and Technology Education—in English language, in Nigeria, the Regional Centre for Mapping of Resources for Development in Kenya and the Regional Centre for Training in Aerospace Surveys in Nigeria.

54.   In developing methodological approaches one should consider not only using the available satellite data but also combining such information with traditional knowledge, which could be important for understanding and predicting human behaviour. Local knowledge transmitted through beliefs, taboos and oral history had greatly helped to preserve the environment through generations and should be central to technology-based methodological solutions.

55.   Disaster prevention and mitigation required, as a first step, efficient and functional wide-area monitoring information systems that provided accurate near-real-time information, from multiple sources, that could be integrated with ease to produce appropriate products that were easily and freely accessible to all relevant role players, with the added advantage of covering large areas.

56.   Partnerships across institutions had to be created so as to maximize the benefit of implementing space-based systems. It was also necessary to increase networking with space agencies, taking advantage of the CEOS forum and in particular building upon work carried out by DMSG.

57.   Funding was a major concern and efforts should be made to involve bilateral and multilateral development agencies, such as the United States Agency for International Development and the African Development Bank. The Office for Outer Space Affairs had developed a database of funding institutions that could be contacted for financial support.

III. Plan of action for Africa

A. Implementing a regional network

58.   It was agreed at the Workshop that the course of action that would lead to consolidating the use of space technology for disaster management in Africa would be through the creation of a regional network that would provide support in coordinating the efforts of various institutions interested in forming such a network and also in developing terms of reference for pilot projects that would incorporate and test the use of space-based solutions for disaster management.

59.   In the course of carrying out their activities, the institutions taking part in the regional network would take into consideration the observations and recommendations put forward at the Workshop. The regional network would also work with the Action Team on Disaster Management established by the Committee on the Peaceful Uses of Outer Space.

60.   The regional network should recognize work in progress, especially work that already had local commitment. The network would work primarily using the Internet and facsimile, providing information to all interested institutions on activities being proposed or carried out and fostering viable partnerships among the different initiatives and interests. Once partnerships had been defined, a further step would be to identify pilot projects that the institutions could jointly become involved in. To define the responsibilities of each institution, terms of reference for each pilot project would be developed.

61.   Teams would work on a "best efforts" basis. Each institution would be responsible for its own expenses. If additional funding support was needed for satellite imagery and/or hardware and software, the team could contact interested space agencies and/or bilateral and multilateral development institutions to secure the additional support.

62.   In defining the role of the proposed regional network, the Workshop took a two-stage approach. During the first stage, it defined 18 hazards that should be considered separately, namely: coastal and marine systems (coastal erosion); desertification and deforestation; earthquakes/tsunamis; epidemiological and entomological risks; fires; floods; drought; food security; cyclones; land degradation; landslides; oil spills; plagues; pollution; refugee flows; transportation accidents; volcanoes; and windstorms and other extreme climate conditions.

63.   During the second stage, institutions expressed their interest in participating or even taking on a coordinating role in each hazard area. A total of 87 institutions demonstrated their interest by showing a tentative commitment to participating in one or more hazard areas, as shown in the table in the annex.

64.   The next stage for the regional network would involve the following activities: extending the network to other institutions; setting up a web-based discussion list (to support both regional and global activities); setting up a web page to disseminate information; following up on the tentative commitments, defining viable partnerships and finally developing terms of reference for pilot projects.

65.   The regional network that was established at the Workshop was aimed at governmental and academic institutions, non-governmental organizations, private

industry and United Nations bodies. Institutions could become involved at any time either by indicating that they had an interest in participating or by indicating that they wished to take on a coordinating role, that is, they would be willing to identify possible pilot projects with other institutions and take the lead in implementing them.

B. Role of the Office for Outer Space Affairs and the Economic Commission for Africa in implementing the regional network

66.   It was agreed that, as a follow-up to the tentative commitments made at the Workshop, the Office for Outer Space Affairs and ECA would send a letter to each of the 87 institutions presenting the background of the network and inviting each one to formally confirm their participation, either as participant or coordinator, in the areas in which they expressed interest. A letter would also be sent to Governments informing them of the establishment of the network and the confirmed interest. Letters would also be sent to space-related institutions in the international community. Once pilot projects had been designed, letters would also be sent to funding institutions to secure their support.

67.   The Office for Outer Space Affairs agreed to maintain the regional network table, periodically verifying the information on institutions that had demonstrated interest in participating, the names of points of contact and areas of participation and/or coordination. The Office also reported that it would focus on bringing into the network interested space agencies and development agencies and facilitate coordination with the activities of the Action Team on Disaster Management.

68.   The web site with relevant links and information on space technology and disaster management (www.oosa.unvienna.org/SAP/stdm) would be maintained for the benefit of the regional network. All institutions would be responsible for providing information to be posted on it. A discussion list created was already being used by participants in the regional network (www.ungiwg.org/cgi-bin/mailman/listinfo/unoosa-stdm).

69.   The Office for Outer Space Affairs and ECA would also focus on capacity-building through the provision of short training courses in space technology and disaster management. Training would be channelled through the existing regional training centres (see para. 53).

C. Building upon the regional network

70.   As the world witnesses an interminable succession of disasters—floods, storms, earthquakes, landslides, volcanic eruptions and wildfires—the topic is becoming a growing concern. The number of people that are at risk has been growing steadily, by 70-80 million per year.[4] Action needs to be taken immediately to alleviate the effects of such disasters in future.

71.   The Workshop demonstrated that space-based technologies had a real contribution to make in all areas of disaster management and that measures needed to be taken to ensure the use of what was currently available. It was agreed at the Workshop that the establishment of a regional network was an important step

towards the final goal, which was to see the increased use of space technology to support disaster management activities, and that it was now up to the 87 institutions that had demonstrated their interest in becoming involved, as well as all other institutions that would be given the opportunity to join, to take advantage of cutting-edge technologies and to define and implement solutions to the pressing disaster threats that were an everyday reality in Africa.

Notes

[1] *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III)*, chap. I, resolution 1, part I, para. 1 (e) (ii) and chap. II, para. 409 (d) (i).

[2] Ibid., chap. I, resolution 1.

[3] Ibid., part I, para. 1 (b) (ii).

[4] *Living with Risk: A Global Review of Disaster Reduction Initiatives* (forthcoming United Nations publication). A preliminary version is available at www.unisdr.org/unisdr/Globalreport.htm

Annex

Space technology and disaster management: regional network for Africa

Institution	Earthquakes/tsunamis	Floods	Drought	Coastal and marine systems (coastal erosion)	Epidemiological and entomological risk	Desertification and deforestation	Oil spills	Food security	Cyclones	Land degradation	Fires	Plagues	Windstorms—extreme climate conditions	Pollution	Refugees	Volcanoes	Landslides	Transportation accidents
Eastern Africa																		
Arid Lands Resource Management Project, Kenya		P	C			P		C	P									
Department of Geology, University of Nairobi, Kenya	C	P							P							C	C	
Department of Meteorology, Uganda		P	P					P	C									
Department of Meteorology, University of Nairobi, Kenya		P	P		P			P	P	P			P	C	P			
Department of Surveying, University of Nairobi, Kenya		P			P				C					C	P			
Disaster Management and Refugee Studies Institute, Sudan		P	C			P		C	P	P						C	P	
Disaster Management Center, Rwanda		P	P													P		
Disaster Management Department, United Republic of Tanzania	P	P	P									P			C	P	P	C
Ethiopian Mapping Authority		C	P		P	C		C	C	C				P	C		P	
Humanitarian Aid Commission, Sudan		P	P		P	C		P	P				P		P			
Jomo Kenyatta University of Agriculture and Technology, Kenya						C		C		P								
Kenya Meteorological Department		C	C					P	P									
National Disaster Operations Centre, Kenya	P																	
National Environment Management Council, United Republic of Tanzania		P	P	C		P	C	P		P				C				
National Meteorological Service Agency, Ethiopia		P	P		P			P	P				P	P	P			
United States International University, Nairobi			P					P	C					P	P			
University College of Lands and Architectural Studies, United Republic of Tanzania		P	P					P	C									C
Northern Africa																		
Centre national des techniques spatiales, Algeria		P	C	P				C	P									
Centre royal de télédétection spatiale, Morocco	P	P	P					P	P									

Institution	Earthquakes/tsunamis	Floods	Drought	Coastal and marine systems (coastal erosion)	Epidemiological and entomological risk	Desertification and deforestation	Oil spills	Food security	Cyclones	Land degradation	Fires	Plagues	Windstorms—extreme climate conditions	Pollution	Refugees	Volcanoes	Landslides	Transportation accidents
Civil Defence Authority, Egypt	P	P	P	P	P	P	P											
National Authority for Remote Sensing and Space Sciences, Egypt	P	P	P	C	C	P	C											
Southern Africa																		
Agricultural Research Council, Institute for Soil, Climate and Water, South Africa		P	C	P	P	P		C		C	P		P	C			C	
Catholic University of Mozambique, GIS Centre, Mozambique		P	P	P	P			P	P	P	P			P				
Department of Communications, Institute for Satellite and Software Applications, South Africa		P	P	P		P	C			P	P							
Department of Meteorology, Zambia		P	P		P	P		P	P	P	P		P	P				P
National Disaster Management Centre, South Africa		P	P	C	C	C	P	P	C	P	P		C	P				P
Satellite Applications Centre, South Africa	C	P	P		P	P	P	P	P	P	P		P	P	P	P	P	
Southern African Fire Network, Botswana											C		P	P				
Department of Surveys, Malawi		P	P	P		P		P	P	P	P			P				P
Western Africa																		
African Center for Environmental Information, Côte d'Ivoire		P	P	P	P	P				C	P			P	C			
Agence béninoise pour l'environnement, Benin		P																
Bureau national d'études techniques et de développement, Côte d'Ivoire		P	P	P	P	P				P	P		P					
Centre de suivi écologique, Senegal		P	P	P	P	P					P							
Centre for Remote Sensing and Geographic Information Services, Ghana		P	P	P		P								P				
Centre national de gestion des réserves de faune, Benin											P							
Centre national de recherche agronomique, Côte d'Ivoire		P				P				P								
Centre national de télédétection et de couverture forestière, Benin		P									P							
Comité national de télédétection et d'informaton géographique, Côte d'Ivoire		P	P	P		P					P							
Centre SIG et télédétection, Adjaratou, Burkina Faso	P	C		C	P			C		C	P							
Direction des forêts et ressources naturelles, Benin		P				P					P							
École nationale supérieure polytechnique, Cameroon	P		P											P				
Environmental Protection Agency, Ghana		P	P	P		P								C				

Institution	Earthquakes/tsunamis	Floods	Drought	Coastal and marine systems (coastal erosion)	Epidemiological and entomological risk	Desertification and deforestation	Oil spills	Food security	Cyclones	Land degradation	Fires	Plagues	Windstorms—extreme climate conditions	Pollution	Refugees	Volcanoes	Landslides	Transportation accidents
Geography Department, Burkina Faso			P			P				P								
Institut de recherche agricole pour le développement, Cameroon								P									P	
Institut de recherches géologiques et minières, Centre de recherches hydrologiques, Cameroon	C	P	C		P	P				P				P		C	C	
Institut médical et des plantes médicinales, Cameroon					P													
Institut national de cartographie, Cameroon																	P	
Institut national de recherches agricoles du Bénin, Benin			P						C									
Institut universitaire de technologie, Cameroon	P		P															
Laboratoire de télédétection appliqué, Institut des sciences de la terre, Université Cheikh Anta Diop, Senegal	C	P	P	P		P										P		
Ministry of Rural Development, Mauritania			P					P		P								
Ministry of the Environment, Nigeria	P	P	P	P	P	P										P		
Ministry of Water Resources, Nigeria	P		P													P		
National Emergency Management Agency, Nigeria	C	P	C		P	C							P					
National Space Research and Development Agency, Nigeria	P	P	P	P	P	P							P			P		
Nigeria National Petroleum Corporation and Department of Petroleum Resources, Nigeria							C											
Organisation de coordination pour la lutte contre les endémies en Afrique centrale					P													
Protection Civile, Ministère de l'intérieur, Mauritania	P	P	P	P					P	P	C							
Société de développement des forêts de Côte d'Ivoire			P			C												
University of Ibadan GIS Laboratory, Nigeria	P	P	P	P	P	P							P					
University of Yaoundé, Cameroon																	P	
Regional institutions																		
Drought Monitoring Centre, Nairobi	C	C	P	P	P	P		C		P	C	C					P	P
Niger Basin Authority	P	P																
Oakar Services Ltd., Kenya																		
Regional Centre for Mapping of Resources for Development	P	P			P	C		C		C	P			P	P		P	

Institution	Earthquakes/tsunamis	Floods	Drought	Coastal and marine systems (coastal erosion)	Epidemiological and entomological risk	Desertification and deforestation	Oil spills	Food security	Cyclones	Land degradation	Fires	Plagues	Windstorms—extreme climate conditions	Pollution	Refugees	Volcanoes	Landslides	Transportation accidents
Regional Centre for Training in Aerospace Surveys						P				P								
Regional Training Centre for Agrometeorology and Operational Hydrology and their Applications		C	C	P		C		C		C	C		C	P				
Southern African Development Community		C	C	P	C	C	P	C	C	C	C							
Other institutions																		
Aerospace Geomatics Ltd., Germany/Nigeria		P	P		P	P				P								
Avanti Communications, United Kingdom of Great Britain and Northern Ireland	P	P		P				P	P		P			P				
Centre national d'études spatiales, France	P	P	P													P		
Cranfield University, United Kingdom		P	P			P		P		P	P							
German Aerospace Center, Germany		P	P							P								
Global Fire Monitoring Centre											C							
International Water Management Institute, Sri Lanka		P	P			P		P		P								
Open University, Department of Earth Sciences, United Kingdom		P	P							P								
San Marco Project Research Centre, University of Rome, Italy	P	C	C	C		C	P		P	P	C		P	P			P	P
Services et conception de systèmes en observation de la Terre, France		P	P			P		P		P								
Surrey Space Centre, United Kingdom		P	P			P												
Synthetic Aperture Radar Satellite, Canada		P																
University of Jena, Germany		P	P							P								
Vienna University of Technology, Austria		P	P															
United Nations																		
Department of Peacekeeping Operations																		
Office of the United Nations High Commissioner for Refugees								P	P						C			

<div align="center">

Institution offering to Participate = P

Institution offering to take on a Coordinating Role = C

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