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Implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III)

Implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III): progress report of the Action Team on Disaster Management

Note by the Secretariat

1. At its forty-fifth session, the Committee on the Peaceful Uses of Outer Space considered the implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III).[1] The Committee recalled that, at its forty-fourth session, it had established 11 action teams to implement those recommendations which had been accorded highest priority by Member States or those for which offers to be leaders of the activities had been received.[2] As requested by the Committee, all action teams reported on their work to the Scientific and Technical Subcommittee at its thirty-ninth session and to the Committee at its forty-fifth session. The Committee recognized that ensuring the transparency of the work of the action teams was of fundamental importance to Member States and agreed that it was important that all action teams continue to report to the Committee and its Scientific and Technical Subcommittee.

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2. The annex to the present document contains a progress report submitted by the Action Team on Disaster Management concerning the implementation of recommendation 7 of UNISPACE III.

Notes

[1] See *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3).

[2] *Official Records of the General Assembly, Fifty-sixth Session, Supplement No. 20* and corrigendum (A/56/20 and Corr.1), paras. 50 and 55.

Annex

Progress report of the Action Team on Disaster Management

I. Introduction

1. The present document contains a summary account of the accomplishments after more than one year of activity of the Action Team on Disaster Management, established by the Committee on the Peaceful Uses of Outer Space at its forty-fourth session. The Committee agreed to establish action teams under the voluntary leadership of member States to implement the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III). As with the other action teams, the work of the Action Team on Disaster Management was conducted under the auspices of the Committee's Scientific and Technical Subcommittee and with the assistance of the Office for Outer Space Affairs, which provided secretariat services.

2. The mandate of the Action Team on Disaster Management relates to recommendation 7 of UNISPACE III, on implementation of an integrated, global system, especially through international cooperation, to manage natural disaster mitigation, relief and prevention efforts through Earth observation, communications and other space-related services, making maximum use of existing capabilities and filling gaps in worldwide coverage. It was felt that modern space technologies could make a difference in those efforts if proper structures and systems could be envisaged and implemented. The Action Team's task is to analyse the current situation and to express its views and present proposals on the initiatives to be taken in order to bring the benefit of space-derived information to all nations suffering from disasters. Membership is open to all Member States of the United Nations and space-related entities.

II. Background

3. The management of natural disasters is often beyond the scope of ground-based capabilities and investing in space technologies for disaster relief and mitigation is well justified. Every year, such disasters take a heavy toll in human life—an average of 100,000 lives per year in the recent past—not to mention the economic loss resulting from property damage and operation losses, which are estimated to be in the order of US$100 billion, which represents 0.3 to 0.4 per cent of the world's global product.

4. Furthermore, although the physical phenomena at the origin of disasters are more or less as they always have been in history, there seems to be an increased vulnerability of civilization to such disasters at present. Population growth and lack of adequate control of land use and urban development in areas at risk (and the fact that those areas are not adequately identified) may account for that fact.

5. During recent decades, there has been enormous progress in deepening scientific knowledge and understanding of the processes affecting the planet in areas such as solid earth, atmosphere and oceans. Space technologies and systems have

made an important contribution to that understanding. Consequently, phenomena that were perceived as totally erratic and fatal, for example volcanic eruptions, earthquakes, tsunamis and cyclones, are now seen as manifestations of physical phenomena that are understandable and, in some respects, predictable.

6. By providing a global view of the planet, space systems constitute excellent tools to observe and monitor those phenomena and to help model their evolution. They also have a unique capability to perform global and detailed observation of an area devastated by a disaster, thus providing assessment and guidance for the authorities in charge of civil protection and relief. The benefits such space systems can provide should therefore be made available as soon as possible to all nations.

7. A clear advantage was thus seen in the UNISPACE III initiative for both the advanced nations that offer space-based tools and technologies and less developed nations that are least prepared to cope with disasters on their own.

III. Establishment and responsibilities of the Action Team

8. At its thirty-eighth session, in February 2001, the Scientific and Technical Subcommittee agreed to establish an expert group to study the implementation of an integrated space-based global natural disaster management system. The group was established with core members from countries with advanced scientific and technical capability or high vulnerability to disasters. At its forty-fourth session, the Committee agreed to merge the expert group into the Action Team on Disaster Management. Canada, China and France were elected by the members of the Action Team as co-chairs and subsequently endorsed by the Committee. They have agreed to assume the chairmanship in turn for the three-year term of the Action Team, with China chairing the first year, or first phase, France the second and Canada the third. A detailed work plan was prepared by the co-chairs and submitted for approval by the Group at its first plenary meeting, held in Toulouse, France, on 5 and 6 October 2001, during the fifty-second International Astronautical Congress. Later, the work plan was revised and improved. The activities of the Action Team were reported on to the Scientific and Technical Subcommittee at its thirty-ninth session, during which the Action Team held its second plenary meeting and reviewed the follow-up to the first plenary. The third meeting was held in Houston, United States of America, in October 2002, during the World Space Congress.

9. The co-chairs conducted their work by arranging regular telephone conference calls and holding face-to-face meetings in order to make significant progress on the tasks assigned to them by the Action Team.

10. It was recognized at the outset of the work of the Action Team that in the implementation of an integrated global system three fundamental and interrelated questions needed to be considered. Those questions focused on the needs of actual users that space technologies either could satisfy or for which technologies could be adapted. User needs were different for different user groups. Some needs concerned simply the scientific and technical understanding of physical phenomena. Others related exclusively to people on the ground, such as the local authorities, those responsible for emergency response or civil protection agencies.

11. The integration of space technologies into disaster management raised a natural question regarding the ability of individual nations to make optimal use of space information, which would depend on the infrastructure available to them in terms of cartographic databases and products, equipment, training of personnel and other things.

12. The first task for the Action Team was therefore to evaluate existing space technologies specific to disaster management and to assess how easy access to those technologies was as well as to obtain information on user needs and national capabilities in terms of infrastructure.

13. Consequently, three tasks were assigned to the three co-chairs, with each co-chair being responsible for one task and with the participation of countries selected from the Action Team to complete the first phase of its work. The three tasks are summarized below.

1. Identification of user needs

14. Some needs were specific to the scientific community; they needed inputs for understanding and modelling. Others related to local authorities, who needed inputs for decision-making in land use and risk prevention. Others again were peculiar to civil protection agencies, who needed inputs in real time to support their task of relief and protection during a crisis. China undertook the compilation of information concerning and analysis of user needs.

2. Identification of national capacities

15. The capacity of a nation to make optimal use of space information depended on a number of elements, such as quality of cartography and maps, equipment and training of civil protection personnel, existing infrastructure and organization. France assumed responsibility for compiling information on and analysing national capacities.

3. Analysis of space systems

16. There were a number of important parameters that needed to be considered in order to appreciate the possible contribution of space systems to disaster mitigation, such as spatial resolution, spectral resolution, local time of coverage by satellites, capability of fast access to a given site and existence of a catalogue. What was important was to describe the set of space systems that would be in operation in two to three years in order to define the service that would be provided at that time if ever fast and coordinated action of all of them during crises could be implemented. Canada undertook the compilation of information on and analysis of space systems.

IV. Results of the work accomplished during the first phase

17. The present progress report provides a brief overview of the work completed to date, as presented and discussed during the third plenary meeting of the Action Team. The documentation of that meeting is available on the web site of the Office for Outer Space Affairs (www.oosa.unvienna.org/unisp-3/followup/action_team_07/index.html).

1. User needs

18. It is a well-known fact that natural disasters strike both developed and developing countries, causing enormous destruction and human suffering and negative effects on national economies. They represent a potentially significant obstacle to economic growth and development. With the fast development of world space technology, humankind can hope for better prevention and relief of natural disasters by using space technology, however. The purpose of the work to be completed by the Action Team consisted of improving coordination mechanisms between the world's Earth observation systems for disaster management, leading to the implementation of an integrated space-based global natural disaster management system. The goal was to foster utilization of existing and future space systems by Member States in the management of disasters around the world.

19. China assumed responsibility for compiling information on user needs based on the feedback provided by Member States and reference materials made available by intergovernmental and non-governmental organizations in response to the survey form designed by the United Kingdom of Great Britain and Northern Ireland and circulated to all Member States. Responses were received from Brunei Darussalam, Canada, China, France, Italy, Mauritius, Morocco, Nigeria, Niue and the Syrian Arab Republic, the International Maritime Organization and the World Meteorological Organization. User needs in the areas of disaster management and mitigation of floods, drought, earthquakes, mud-rock flows, landslides, forest fires, volcanoes, typhoons, desertification, nuclear emergencies, ocean surges, oil spills, marine pollution, cyclones, avalanches, plant diseases and insect pests and so on were reflected in the responses received.

20. Based on the responses received and an examination of much reference material, disasters were classified on a preliminary basis into four categories in order to facilitate an analysis of user needs. The classification took into account hazard-forming environments and hazard-forming factors: (a) atmospheric and weather disasters; (b) solid earth disasters; (c) bio disasters; and (d) oceanic disasters. At the same time, in view of its growing significance and serious consequences, environmental pollution, ecological environment pollution of significant engineering projects and ecological disasters were also addressed in the report on user needs. The report also contained detailed information from the International Disaster Database of the Office of the United States Foreign Disaster Assistance and the Centre for Research on the Epidemiology of Disasters, which contains statistics on major disasters that have occurred since over one hundred years.

21. The management and mitigation of natural disasters was divided into the following four elements: a background database, which is useful during planning, warning, crisis and recovery; forecast; detection and response; and evaluation. Because environmental pollution and ecological disasters are caused mainly by human activity and mostly require routine monitoring and quick response, it would be better to analyse the following three elements: (a) routine monitoring and evaluation; (b) forecast and early warning of environmental quality; and (c) detection and response. In view of the feedback received from Member States regarding cycles of disaster and loss caused by disasters, the elements that needed to be analysed should include spatial resolution, spectral range, temporal resolution and all-weather and all-time observation. On the basis of that assumption, in

analysing user needs priority was given to reviewing related reference documents such as those prepared by the China National Committee for the International Decade for Natural Disaster Reduction and the State Environmental Protection Administration of China, as well as responses received from Member States. The report on user needs listed major disasters under each category and related needs for space information at all phases of disaster management.

2. National capacities

22. Once it is acknowledged that space systems can make a significant contribution to disaster mitigation and that space-derived information can meet many user needs, the following questions need to be addressed:

(a) What national capacities have to be built to obtain the maximum benefit from this opportunity?

(b) What is the present situation for the nations? Where are the gaps?

(c) What initiatives need to be taken today at the national or international level to fill those gaps?

23. Within the Action Team on Disaster Management, France assumed responsibility for compiling information on national capacity. Following inputs from Italy and Mexico, a survey form was prepared and sent to all Member States. As at July 2002, responses had been received from Azerbaijan, Brunei Darussalam, Canada, China, France, Greece, India, Italy, Mauritius, Nigeria, Niue, Sri Lanka and the Syrian Arab Republic.

24. The countries that provided feedback are home to half of the world's population and represent a wide variety of local situations. Their feedback was therefore considered an important contribution. Based on their responses and on what is commonly known and experienced in actual disasters, a synthesis was prepared.

25. Special emphasis was placed on the crisis phase because it was obviously the phase associated with the main immediate threat to both people and property, requiring solidarity across borders and rapid and well organized international cooperation. Priority was thus given to relief, regardless of the cost of damage.

26. It was clear that the capacity of a nation to obtain maximum benefit from space information during crises depended on the following elements:

(a) Description of the territory concerned and equipment available:

(i) Cartography;

(ii) Land use maps;

(iii) Land cover maps;

(iv) Terrain elevation models;

(v) Network of ground sensors;

(b) Facilities:

(i) Access to advanced local weather forecasting;

(ii) A robust communication network (telephone and wide-band);

(c) Preparation of civil defence personnel:

(i) Equipment;

(ii) Training;

(d) Organization:

Existence of a national "authorized user" interfacing with the community of space operators. (The responsibility of the authorized user is to pave the way so that instant action can be taken as soon as a disaster hits.)

27. Few nations have in fact completed the steps necessary to ensure the existence of the above elements. Obstacles included technical capability and/or funding. On the other hand, no single nation could provide the whole set of space information required for disaster mitigation.

28. The objective as regards national capacity-building was not for each nation to have a full capacity to interface directly and in all respects with the community of space operators. The goal should rather be to establish what, in any given case, was appropriate for the national authority to do, what could or should be undertaken by international bodies and how they could cooperate in the management of disasters.

3. Space systems

29. The contribution space technologies can make to disaster management has been well demonstrated by various programmes and initiatives undertaken either by individual national entities (space agencies) or international organizations. The use of those space technologies is, however, less apparent among those responsible for disaster support on the ground. The information compiled in the report prepared by Canada on space systems was intended to evaluate the effectiveness of space technologies to meet user needs and the ability of their respective nations to integrate the technologies into their disaster management structures. Consequently, in addition to describing programmes and initiatives as well as space sensors and systems of choice for disaster management, the report on space systems examined the types of product offered by space data providers and the policies that governed use of and access to those products.

30. The nature of programmes and initiatives varies. Some take the form of ad hoc study groups, such as the Ad Hoc Disaster Management Support Group mandated by the Committee on Earth Observation Satellites to make recommendations on the most suitable technologies and products for disasters, or networks such as the Integrated Global Observing Strategy and the Global Disaster Information Network. Other programmes started as operational initiatives for data acquisition, such as the European Space Agency's Earth Watch and the Disaster Watch programmes of the Canadian Space Agency. The most well known operational disaster response initiative was the recently signed Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters, or International Charter "Space and Major Disasters", whose membership had already expanded to some six space agencies.

31. The sensors identified for disaster monitoring from space are both passive as well as active in nature and cover a wide segment of the electromagnetic spectrum.

They are therefore optical high-resolution imagers, multi-spectral radiometers and active microwave sensors.

32. Each sensor is adapted to cover a certain type of disaster. Data from both polar and geostationary satellites, including satellites built primarily for weather forecasting, are used to monitor drought conditions and early warning. High-resolution optical as well as radar sensors furnish data for structural mapping of seismically active regions of the world and for assessing the effects of damage caused by earthquakes. Data from satellites of the National Oceanic and Atmospheric Administration (NOAA) of the United States of America and the Vegetation sensor data of the Système pour l'observation de la Terre (SPOT) satellites have been used to track forest fires. Some recently launched sensors, such as MODIS and BIRD, are devoted to covering that type of disaster. Flood monitoring is carried out regularly by the use of both electro-optical and synthetic aperture radar (SAR) systems. The latter are becoming increasingly popular in view of their ability to see through the clouds, atmospheric disturbances and so on that occur during flood seasons. SAR satellites such as RADARSAT and the European remote sensing (ERS) satellites have provided active coverage of ice-infected waters and data from those and other satellites are now part of the operations of ice services of different countries. Landslide detection and site identification have similar data sources as for earthquake hazards. Both types of disaster rely on base mapping that can reveal features of instability, such as faults, fractures and slopes. Oil spills are caused by technological accidents or human error. Both microwave and optical data are obtained on oil spills. A volcanic eruption has multiple aspects: it causes proximal threats in the form of lava flows, explosive activity, pyroclastics and smoke or distant threats such as volcanic ash propagation, which is considered a serious hazard to civil aviation. The worldwide network of volcanic ash advisory centres established under the auspices of the International Civil Aviation Organization is supported by government agencies that operate meteorological satellites, such as the National Environmental Satellite Data and Information Service of NOAA, the European Organization for Exploitation of Meteorological Satellites and the Japan Meteorological Agency.

33. The distribution rights of satellite data and associated products and services have generally been assigned by space agencies to separate entities, mostly in the private sector. For example, Eurimage is an international data distribution centre providing products from satellites of Japan, the Russian Federation and the United States and offering different data catalogue and browsing services. Euromap is a private sector entity that distributes data from Indian remote sensing satellites. Orbimage is currently operating OrbView satellites, with near real-time delivery to its customers. Radarsat International (RSI) is the worldwide commercial distributor of Canadian RADARSAT-1 data, offering satellite-programming and data-processing services designed to accommodate a broad range of applications and customer requirements. RSI also has the distribution rights for other satellite data. Space Imaging, a commercial company, owns the high-resolution optical imagery from the IKONOS spacecraft. SPOT Image was set up in 1982 by the Centre national d'etudes spatiales of France to distribute worldwide imagery from SPOT satellites.

34. The data use and access policies for various satellite programmes are designed by the space agencies or operators that own and/or operate the satellites in question.

The principles of the data policies of ESA, Canada, India, Japan and the Russian Federation and the United States agencies are described in the report prepared by Canada.

V. Ongoing activities of the Action Team and work plan

35. The work conducted during the first phase has provided the Action Team with a significant review of user needs, standards of national capacity and space systems available in the coming years. Those are the fundamental components that have to be matched to make optimal use of space data. Obviously, the match between the three components is not straightforward and depends on local as well as global factors.

36. In order to make sure that its analysis was based on realistic "facts of life", the Action Team established six new working groups during the its third plenary meeting. With a focus on specific disasters, that is, earthquakes, drought, floods, forest fires, oil spills and ice hazards and under the voluntary leadership of members of the Action Team, the working groups will identify and describe the actual gaps and shortages in different countries in the utilization of space data for disaster mitigation. The nature of those gaps and shortages may be technical, operational, organizational, financial or educational.

37. It is expected that that analysis will lead to a precise description of the cross-cutting issues common to many disaster situations. It will be followed by discussions on scenarios, proposals and initiatives to fill the gaps. Those discussions will be held within the Action Team and during an open forum to be held in June 2003 with non-governmental organizations, various institutions and entities of the private sector.

38. The work plan is as follows:

October 2002-January 2003

- Each of the six working groups will conduct gap analysis.
- By 31 January 2003, each working group will submit its findings and suggestions to the co-chairs.

Fortieth session of the Scientific and Technical Subcommittee, Vienna, February 2003

Fourth plenary meeting of the Action Team

- Each working group will present its findings and suggestions.
- Members will be regrouped into task forces to address cross-cutting issues, based on the findings and suggestions of the working groups.
- Suggestions will be solicited for an open session in June 2003.

February-May 2003

- Each task force will analyse gap-filling philosophies and produce a number of scenarios.

- By 31 May 2003, each task force will transmit scenarios and recommendations to the co-chairs.

Forty-sixth session of the Committee on the Peaceful Uses of Outer Space, Vienna, June 2003

Open session of the Action Team

- Non-governmental entities will be invited, including non-governmental organizations and industry.
- Each task force will present its recommendations.
- Invited speakers will provide their own views on the way forward.

Following the open session, the third phase of the work of the Action Team will be devoted to selection and packaging of the proposals and recommendations to be formulated by the Action Team at the end of its mandate, in 2004.

VI. Final remarks

39. The co-chairs wish to acknowledge the remarkable interest demonstrated by many countries in contributing to the work of the Action Team. So far, 30 nations and 7 international institutions have either participated in the meetings or provided significant contributions to the work of the Action Team. The co-chairs are, however, eager to increase those numbers and will use any occasion to stimulate discussion with and solicit views on the needs and demands from as many countries as possible. Increasing awareness and enhancing organization of necessary actions are key factors in the use of space data for disaster mitigation.

40. Many thanks go to the members of the Action Team; their active involvement is a guarantee of progress and pertinence. The Office for Outer Space Affairs has been a very efficient partner in the organization of the work of the Action Team.

41. The Action Team enjoys an intense spirit of cooperation among various nations representing more than half of the Earth's population. In common with the co-chairs, they feel that the problem the Action Team is dealing with is of great importance and they believe that significant progress is within reach.