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Committee on the Peaceful Uses of Outer Space

Contribution of the Committee on the Peaceful Uses of Outer Space to the work of the Commission on Sustainable Development for the thematic cluster 2008-2009

Space for sustainable development

Contents

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I. Introduction

1. On 20 October 2004, the General Assembly conducted a five-year review of the progress made in the implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III). The Assembly had before it the report of the Committee on the Peaceful Uses of Outer Space on the implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (A/59/174), in which the Committee reviewed the mechanisms for and progress made in implementing the recommendations of UNISPACE III, identified synergies between the implementation of those recommendations and the results of global conferences held within the United Nations system and other global initiatives and proposed a plan of action for further implementing the recommendations of UNISPACE III. In its resolution 59/2 of 20 October 2004, the Assembly endorsed the Plan of Action, proposed by the Committee in its report, and requested the Committee to examine the contribution that could be made by space science and technology and their applications to one or more of the issues selected by the Commission on Sustainable Development as a thematic cluster and to provide substantive inputs for consideration by the Commission.

2. Paramount to the strategy for implementing the recommendations of UNISPACE III was the need to take into account the results of the global conferences held within the United Nations system in the 1990s that had identified priorities for promoting human development, as well as the goals and objectives of the conferences held since UNISPACE III, in particular the Millennium Summit and the World Summit on Sustainable Development.

3. The contribution of the Committee on the Peaceful Uses of Outer Space to the work of the Commission on Sustainable Development was described in document A/AC.105/872 of 9 March 2006. The document informed about and highlighted the benefits of space science and technology and their applications with regard to the thematic cluster being addressed by the Commission in the period 2006-2007. In preparing its contribution, the Committee took into account the note by the Secretariat containing a discussion paper submitted by the scientific and technological community entitled “Overview of recent scientific and technological developments in the fields of energy for sustainable development, air pollution/atmosphere and climate change” (E/CN.17/2006/5/Add.8).

4. In its resolution 61/111 of 14 December 2006, the General Assembly noted with satisfaction that the Committee had established a closer link between its work to implement the recommendations of UNISPACE III and the work of the Commission on Sustainable Development by contributing to the thematic areas addressed by the Commission.

5. In the same resolution, the General Assembly agreed that the Director of the Division for Sustainable Development of the Department of Economic and Social Affairs of the Secretariat should be invited to participate in the sessions of the Committee to inform it how it could best contribute to the work of the Commission on Sustainable Development and that the Director of the Office for Outer Space Affairs of the Secretariat should participate in the sessions of the Commission on

Sustainable Development to raise awareness and promote the benefits of space science and technology for sustainable development.

II. Space contributions to the thematic cluster 2008-2009

6. Space technology and its applications, such as Earth observation systems, meteorological satellites, satellite communications and satellite navigation and positioning systems, strongly support the implementation of actions called for at the World Summit on Sustainable Development and can make a significant contribution to the thematic cluster and cross-cutting issues being addressed by the Commission in the period 2008-2009. Regional and interregional cooperation and coordination provide essential mechanisms for advancing such international efforts.

7. Space applications are effective tools for monitoring and conducting assessments of the environment, managing the use of natural resources, providing early warnings of and managing natural disasters, providing education and health services in rural and remote areas and connecting people around the world. They are multifaceted and often offer, through a single instrument or application, the means for States to make development decisions concerning various cross-cutting issues, as is illustrated with the information provided below on each of the themes of the thematic cluster for the period 2008-2009.

8. As a result of the implementation of the recommendations of UNISPACE III, the General Assembly, in its resolution 61/110 of 14 December 2006, decided to establish the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (SPIDER), implemented as a programme of the Office for Outer Space Affairs under the Director of the Office, as an open network of providers of disaster management support.

9. The SPIDER programme shall provide all countries and all relevant international and regional organizations with universal access to all types of space-based information and services relevant to disaster management in order to support the full disaster management cycle by serving as a gateway to space information for disaster management support, as a bridge to connect the disaster management and space communities and as a facilitator of capacity-building and institution-strengthening, in particular for developing countries. In order to avoid duplication, the programme shall work closely with international initiatives aimed at utilizing space-based disaster information, such as the Integrated Global Observing Strategy Partnership (IGOS-P), the Global Earth Observation System of Systems (GEOSS), the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters (also called the International Charter on Space and Major Disasters) and the International Strategy for Disaster Reduction.

10. In its resolution 61/111, the General Assembly noted with appreciation that the International Committee on Global Navigation Satellite Systems (ICG) had been established on a voluntary basis as an informal body to promote cooperation, as appropriate, on matters of mutual interest related to civil satellite-based positioning, navigation, timing and value-added services, as well as the compatibility and interoperability of global navigation satellite systems (GNSS), while increasing their use to support sustainable development, particularly in developing countries.

The establishment of ICG was a further result of the implementation of the recommendations of UNISPACE III. ICG held its first meeting in Vienna on 1 and 2 November 2006.[1]

11. The Office for Outer Space Affairs continuously updates a list of space-related initiatives and programmes carried out by States members of the Committee on the Peaceful Uses of Outer Space or within the United Nations system that respond to specific recommendations contained in the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation).[2] The list is posted on the website for the United Nations Coordination of Outer Space Activities (http://www.uncosa.unvienna.org/uncosa/en/wssd/index.html).

12. In its report on the contribution of the Committee on the Peaceful Uses of Outer Space to the work of the Commission on Sustainable Development for the thematic cluster 2006-2007 (A/AC.105/872), the Committee reported on capacity-building and training opportunities for developing countries in space science and technology and their applications, in particular activities carried out under the United Nations Programme on Space Applications, including the activities of the regional centres for space science and technology education, affiliated to the United Nations, which are located in Brazil and Mexico (for Latin America and the Caribbean), India (for Asia and the Pacific), Morocco (for French-speaking Africa), and Nigeria (for English-speaking Africa). Activities carried out under the Programme that relate to the thematic cluster 2008-2009 are described below.

13. In addition to regional efforts using space technology for sustainable development, major regional initiatives directly related to space-related cooperation mechanisms include the Asia-Pacific Multilateral Cooperation in Space Technology and Applications; the convention on the establishment of the Asia-Pacific Space Cooperation Organization, which will have its headquarters in Beijing; the biennial African Leadership Conference on Space Science and Technology for Sustainable Development, which was first hosted by the Government of Nigeria in 2005 and which will be hosted by the Government of South Africa in 2007 and by the Government of Algeria in 2009; and the Space Conference of the Americas, whose Fifth Conference was hosted by the Government of Ecuador in 2006 and whose Sixth Conference will be hosted by the Government of Guatemala in 2009.

A. The role of space in agriculture

14. United Nations entities and programmes, such as the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP) and the World Food Programme (WFP), collaborate with various governmental and non-governmental entities to strengthen information systems to manage food security. The Global Land Cover Network, initiated jointly by FAO and UNEP, provides an example of harmonized efforts to develop reliable and comparable baseline land-cover data (see paragraph 23 below).

15. Effective use of existing Earth observation information provides tools that enhance the collection, storage, analysis and dissemination of food security

[1] See the note by the Secretariat on the meeting (A/AC.105/879).

[2] *Report of the World Summit on Sustainable Development*, chap. I, resolution 2, annex.

information. Remote sensing data, in combination with data gathered in the field, is essential for carrying out comprehensive studies on food security and vulnerability. Satellite systems such as Landsat, the Satellite pour l'observation de la Terre (SPOT) and the Indian remote sensing satellites (IRS) and radar sensors such as those on the Environmental Satellite (Envisat) and the Synthetic Aperture Radar Satellites (RADARSAT) are used.

16. Monitoring agricultural crop development from space can help predict an area's agricultural output well in advance. That information is often crucial in helping authorities to anticipate food shortage and famine, giving them enough lead time to take preventive action. The use of satellites to monitor and forecast weather is of vital importance to farmers. Satellites are an important complement to the ground-based weather stations in predicting storms, flooding and frost. Rainfall and evapotranspiration assessment by satellite helps farmers plan the timing and the amount of irrigation required for their crops. Such assessments can also contribute to improving food security.

17. By measuring environmental factors, satellites can detect areas at risk from, or already affected by, pests such as locusts, crop and livestock diseases, tsetse fly activity and animal trypanosomiasis. Available high-resolution satellite remote sensing data combined with GNSS data contribute to the development of precision farming techniques for monitoring crops on individual farms. Those techniques help to precisely identify areas under stress due to lack of water, in need of fertilizer or affected by disease. Accurate targeting of such areas contributes to an optimal distribution of water and fertilizers, which not only improves crop yields but also saves money and reduces the environmental impact of agricultural activities.

18. Radar imagery is particularly useful in regions where cloud cover may obscure the land surface. Synthetic aperture radar (SAR) data, for example, are used to measure the increase in the length of the growing season in boreal regions as an indicator of global warming; to monitor the extent and frequency of wildfires in boreal regions in order to better understand the role of the burning of biomass in the global carbon cycle; to monitor wetlands, which play a key role in greenhouse gas emissions; and to estimate the biomass of several crops. Multitemporal SAR data offer valuable information to determine, at the earliest stage of the crop season, when and where fields are prepared for sowing and, later, the phenological stages of crops, such as flowering, ripening, plant drying and harvesting.

B. The use of space in land use and for rural development

19. Land use and infrastructure are important factors for development in rural areas. Accurate land-use data at the right spatial resolution is a primary source of information for decision makers. The fact that remote-sensing products have wide coverage means that investigators and others can use that information to produce land-use and land-cover maps as the first step in various applications. Among other things, those data are used to establish rural land registers that also help to identify the capabilities and limitations of those land areas.

20. The generation of land-use products using Earth surface classification methods, which today is an automated process, reaps many benefits from the use of SAR images. For example, SAR technology is associated with algorithms for the

automatic detection of urban areas in order to study the change in urban versus rural extension and analyse urban-rural linkages (cities serve as input and output markets for the rural sector and are important conduits for the transfer of agricultural technology).

21. Low-resolution satellite data, for example, moderate resolution imaging spectrometer data, advanced very high resolution radiometer data and ancillary data (such as data on precipitation and temperature, climatic maps, land-use maps, topographic and soil maps, life zone maps, vegetation maps and the historical record of droughts) are useful to predict land surface changes and to make recommendations for appropriate and effective interventions for sustainable land management. Satellite imagery can be used to make an inventory of previous landslides and to collect data on relevant parameters concerning, among other things, soil, geology, slope, geomorphology, land use, hydrology and faults. The selection of the most adequate high-resolution satellite data (e.g. from the Landsat thematic mapper or SPOT) is essential in extracting land surface information.

22. Through the use of satellite communications, it is possible to provide high-quality and cost-efficient health services and medical care to people in areas with non-existent or underdeveloped healthcare infrastructures, such as in rural areas. Similar results and benefits are possible in the field of distance education.

23. In 2004, FAO and UNEP jointly initiated the Global Land Cover Network (GLCN), a global collaborative project to develop a fully harmonized approach to making reliable and comparable baseline land-cover data accessible at the local, national and international levels, especially for the user community in developing countries. Regional collaborative networks have already been established for subregions in Africa, the Americas, the Middle East, South-East Asia and Central Asia. Through an ongoing memorandum of understanding, FAO and UNEP support a number of GLCN outreach and capacity-building activities, including a bimonthly e-newsletter, publications on GLCN and the Land Cover Classification System (LCCS), multilingual software for LCCS, documents to promote LCCS as an International Organization for Standardization (ISO) standard, support for a regional training workshop held in India in 2006 and preparations for further training workshops to be held in China, Morocco, Namibia, Oman and Uruguay in 2007. Land-cover mapping for the Libyan Arab Jamahiriya was completed in 2006. Following the success of those initiatives, GLCN is now launching a new project to carry out mapping and capacity-building activities in 13 countries in West Africa. A project involving land-cover mapping in Afghanistan will be initiated in 2007. GLCN staff are also currently involved in the update of the *Mangrove Atlas of the World*, an initiative undertaken in collaboration with the International Society for Microbial Ecology, the International Tropical Timber Organization, the Man and the Biosphere Programme of the United Nations Educational, Scientific and Cultural Organization, the UNEP World Conservation Monitoring Centre and the International Network on Water, Environment and Health of the United Nations University.

C. Using space to prevent drought and combat desertification

24. Space technology has made a substantial contribution in all three phases (preparedness, prevention and relief) of drought and flood disaster management. Remote-sensing data are an essential source of information on environmental indicators that can be used to map risk of desertification, soil erosion and soil oversalinization and acidification. Drought forecasting also relies on satellite imaging systems. With respect to the large-scale spatial data gathered from meteorological satellites, polar orbiting satellites have the advantage of providing images with much higher resolution, although at expense of temporal frequency.

25. The occurrence of drought as a consequence of climate change can be detected directly by using satellite images and other remote-sensing products and indirectly by monitoring deforestation, soil erosion, reduced precipitation and other natural and man-made processes.

26. The early detection of drought through the use of remote sensing technology enables decisions to be taken to prevent and mitigate its effects. Those activities should be complemented by the use of other technologies that are compatible with remote sensing data, such as geographic information systems.

27. In addition to optical remote sensing instruments, radar satellites are also used to forecast droughts and map desertification. SAR has potential for monitoring and mapping water resources and is a primary instrument for managing sustainable water resources and combating desertification. Other advantages of SAR are its ability to evaluate soil moisture content (even in arid regions) and to apply to the study of desertification indirect techniques such as the analysis of deforestation and soil erosion, and the cloud-penetrating capability of SAR allows the mapping of desertification in semi-arid and sub-humid regions. The data collected and the research resulting from those applications can assist policymakers and decision makers in monitoring and managing atmospheric pollution and air quality in their respective countries.

28. United Nations entities such as the Economic and Social Commission for Asia and the Pacific (ESCAP) will continue to develop regional cooperative mechanisms as part of global partnerships on space information for disaster reduction, placing the initial focus on drought and flood disasters. China, India and Thailand, as well as FAO, have expressed their commitment to partnering with ESCAP in developing a regional cooperative mechanism on drought disaster management. The Sentinel Asia project is under development, in close cooperation with the members of the Asia-Pacific Regional Space Agency Forum, with an initial focus on floods and wildfires. The project is aimed at developing a regional disaster-reduction support platform system utilizing space information, to be supported by space-faring countries in the region and other regional and international initiatives, such as GEOSS and SPIDER.

29. At the United Nations/Syrian Arab Republic/European Space Agency Regional Workshop on the Use of Space Technology for Disaster Management in Western Asia and Northern Africa, held in Damascus in April 2006 and co-organized by the Office for Outer Space Affairs as part of the United Nations Programme on Space Applications, workshop participants emphasized that further research and development of satellite data applications would provide reliable solutions for

forecasting, and combating the impact of floods, droughts and desertification in the region. In that regard, two follow-up projects were initiated at the workshop. One project focuses on the development of an early warning strategy for disaster management using space technologies, and the other concerns access to and sharing of data through the establishment of base maps of the region for specific types of natural disasters. Both projects are carried out through a network of national teams established at the workshop, and with assistance of the Office for Outer Space Affairs. Once implemented, the projects will improve national and regional coordination mechanisms for natural disaster management and strengthen the capacities of countries in the region in responding to natural disaster challenges, as well as enhance regional cooperation in that area.

D. Space solutions for sustainable development in Africa

30. Several programmes and projects involving United Nations entities use space technology and its applications and address overall sustainable development for Africa. With regard to the areas under focus in thematic cluster 2008-2009, a number of examples are given below.

31. The Agricultural Meteorology Programme of the World Meteorological Organization uses remote-sensing data gathered by satellites coupled with ground weather station data in the field of agricultural meteorology. The objective of the programme is to improve the operational capability of agrometeorological services worldwide. The Programme will help promote the participation of agricultural meteorologists working for national meteorological and hydrological services in the African Monitoring of the Environment for Sustainable Development project, which is intended to develop new applications using satellite technologies and ancillary data in support of sustainable development in Africa.

32. Another project involving an entity of the United Nations system is the Land Cover Map and Geodatabase for Africa (AFRICOVER) project, whose goal is to establish a digital, geo-referenced database on land cover and a geographic referential (a type of reference map that includes place names, roads and bodies of water). The project is based on Landsat thematic mapper and ancillary data for the following 10 African countries: Burundi, Democratic Republic of the Congo, Egypt, Eritrea, Kenya, Rwanda, Somalia, Sudan, United Republic of Tanzania and Uganda.

33. The methodological results of AFRICOVER are the basis for the GLCN initiative of FAO and UNEP, described in paragraph 23 above. International standards are important because they ensure that the same data can be used by different organizations worldwide. An extension of the work completed for the AFRICOVER project is the land-cover map and geo-database for Asia (ASIACOVER) project. The aim of the ASIACOVER project is to prepare a regional, standardized land-cover database, integrated with socio-economic information, to serve as a decision-making tool for food security and sustainable development in South-East Asia.

34. The UNEP Division of Early Warning and Assessment in Africa is coordinating the technical implementation of the African Environmental Information Network (AEIN) in response to a request of the African Ministerial Conference on the Environment. AEIN focuses on developing infrastructure

mechanisms for collating and storing geo-spatial and bibliographical data, to be combined with professional expertise, in order to analyse and generate policy-oriented information to be communicated to decision makers.

35. The Economic Commission for Africa (ECA) is collaborating with the African Union to prepare a transport infrastructure master plan for Africa. The main objective of the programme of activities is to produce an optimum, integrated all-mode transport infrastructure master plan for Africa. Producing such a master plan requires access to data on all existing and planned networks and corridors of development, including railways, airports, roads, ports, harbours and waterways, and related social economic information. Those transport components need to be depicted in their correct spatial locations and cross-referenced with one another in order to perform a full analysis of all relevant factors. Since there is currently no database containing those necessary data sets, another major objective of the project is to create a database (using remote-sensing and global positioning system techniques) in a geographic information system in order to support the proper planning, design, operation and maintenance of infrastructure facilities. ECA works with WFP in sharing relevant data and satellite images.

36. The United Nations Programme on Space Applications has compiled a database with all available donated African Landsat scenes and has initiated a project entitled “Distribution and use of available global landsat data sets for sustainable development in Africa”. The project has facilitated the distribution in Africa of Landsat data sets for education, training and development projects on the national and regional levels. In 2006, Landsat data were provided to the following institutions for applications related to land use and rural development: the National Cartographic Institute of Cameroon, for mapping changes in land use and land cover; the International Commission of the Congo-Ubangi-Sangha basin of the Democratic Republic of Congo, for mapping flood plain inundation zones during both dry and wet seasons; and the International Institute for Geo-Information Science and Earth Observation of the Netherlands, for mapping vegetation in Ghana.

37. Satellite-based technologies play a vital role in disseminating distress alert and location information in maritime and aviation distress situations and in providing critical assistance in terms of near real-time search and rescue operations. The Office for Outer Space Affairs, through the United Nations Programme on Space Applications, held the United Nations/South Africa Training Course on Satellite-Aided Search and Rescue in Cape Town, South Africa, in November 2006, with the cooperation and participation of 13 countries in southern Africa. The training course was aimed at promoting awareness of the International Satellite System for Search and Rescue (COSPAS-SARSAT) and establishing a formal, reliable protocol with the countries in the region for the better understanding and coordination of COSPAS-SARSAT activities and operations, thus enabling the system to play an important role in saving lives.

III. Capacity-building and training opportunities for developing countries in space science and technology and their applications

38. Capacity-building and training opportunities for developing countries in space science and technology and their applications directly relate to the implementation of the thematic clusters and the cross-cutting issues.

39. In relation to the specific issues addressed in the thematic cluster and cross-cutting issues of the Commission on Sustainable Development for the period 2008-2009, the Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, organized in 2006 several workshops, training courses, expert meetings and projects. Some examples are given in paragraphs 29, 36 and 37 above. The objectives and accomplishments of those initiatives are described in the report of the Expert on Space Applications (A/AC.105/874).

40. The priority thematic areas of the Programme continue to be the use of space technology for disaster management, satellite communications for tele-education and telemedicine applications, monitoring and protection of the environment, management of natural resources and education and capacity-building, including research areas in basic space sciences and space law.

41. In 2007, among the 10 activities that the Programme has scheduled in coordination with co-organizers, the following activities directly address the thematic cluster 2008-2009 and cross-cutting issues:

(a) United Nations/Morocco/European Space Agency International Workshop on the Use of Space Technology for Sustainable Development, held in Rabat from 25 to 27 April 2007;

(b) United Nations/Mexico/Pan-American Health Organization Training Course on Satellite Technology for Tele-health, held in Mexico City from 25 to 29 June 2007;

(c) United Nations/International Astronautical Federation Workshop on the Use of Space Technology for Sustainable Development Towards Food Security, to be held in Hyderabad, India on 21 and 22 September 2007;

(d) United Nations/Russian Federation/European Space Agency Workshop on the Use of Microsatellite Technologies for Monitoring the Environment and Its Impact on Human Health, to be held in Moscow from 3 to 7 September 2007;

(e) United Nations/Viet Nam/European Space Agency Workshop on Forest Management and Environmental Protection, to be held in Hanoi from 5 to 9 November 2007;

(f) United Nations/Argentina/European Space Agency Workshop on Sustainable Development in Mountain Areas of Andean Countries, to be held in Mendoza, Argentina, from 26 to 30 November 2007.

42. A directory of the activities of the United Nations Programme on Space Applications in the areas of education, training, research and fellowship

opportunities in space science and technology is available on the website of the Programme (www.unoosa.org/oosa/SAP/eddir/index.html).

IV. Conclusion

43. Space science and technology and their applications, coupled with advances made in other fields of science and technology, offer a wide range of specific tools and solutions and can enable and support States in overcoming obstacles to sustainable development.

44. By establishing a closer link between the Committee on the Peaceful Uses of Outer Space and the Commission on Sustainable Development, the synergies created between the implementation of the recommendations of UNISPACE III and the overarching development agenda set at the World Summit on Sustainable Development would be strengthened.

45. In accordance with the request of the General Assembly, the Committee will continue to examine the contribution that could be made by space science and technology and their applications to the issues selected by the Commission on Sustainable Development as a thematic cluster and will provide inputs for consideration by the Commission.

46. To strengthen its contribution to the work of the Commission and encourage interaction between the two bodies, the Committee invites the Director of the Division for Sustainable Development of the Department of Economic and Social Affairs of the Secretariat to participate in the sessions of the Committee to inform it on how it could best contribute to the multi-year programme of work of the Commission. The next session of the Committee will be held in Vienna from 11 to 20 June 2008.