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Committee on the Peaceful
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Contribution of the Committee on the Peaceful Uses of Outer Space to the work of the Commission on Sustainable Development for the thematic cluster 2010-2011

Note by the Secretariat

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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, held in New York from 6 to 8 September 2000, and the World Summit on Sustainable Development, held in Johannesburg, South Africa, from 26 August to 4 September 2002.

3. 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 was described in document A/AC.105/872 of 9 March 2006, and its contribution to the thematic cluster 2008-2009 was described in document A/AC.105/892 of 13 July 2007. Those documents contained information about and highlighted the benefits of space science and technology and their applications with regard to the thematic clusters being addressed by the Commission in those periods.

4. At its sixteenth session, held in New York from 5 to 16 May 2008, the Commission on Sustainable Development reviewed and assessed progress made on achieving internationally agreed sustainable development goals relating to the following issues: agriculture, rural development, land, drought and desertification, and Africa. At that session, it was noted that access to space technologies and their applications, including systems of Earth observation, meteorological satellites and communications, and access to satellite navigation systems for the monitoring and evaluation of the environment allowed for better monitoring and mapping of desertification processes and drought events. It was also noted that capacity-building in the utilization of space technologies and their application improved the knowledge base as regards drought management, climate change adaptation and crop forecasting, including the prediction of harvest periods. The Commission further noted that science and technology, including the application of space

technologies, could play an important role, for example, in monitoring changes in land use, and the international community was encouraged to provide support in that regard.

5. In its resolution 63/90 of 5 December 2008, 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 by contributing to the thematic areas addressed by the Commission.

II. Contribution of the Committee on the Peaceful Uses of Outer Space to the thematic cluster 2010-2011

6. The thematic cluster of the Commission on Sustainable Development for the period 2010-2011 addresses several topics related to overall sustainable resource management, consumption and production. Transport, chemicals, waste management, and mining are specific themes under consideration. Space-based technologies are effective tools for monitoring and assessing the environment and for managing the use of natural resources. Such technologies are multifaceted and often offer, through a single instrument or application, the means for States to make decisions concerning various cross-cutting development-related issues. Space technologies and their applications, such as Earth observation systems, meteorological satellites, communication satellites 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 2010-2011. The present report addresses areas where space technology applications could play a particularly strong role.

7. Regional and interregional cooperation and coordination provide essential mechanisms for advancing such international efforts. In addition to efforts made by entities of the United Nations system and other international organizations, major regional initiatives directly related to space-related cooperation mechanisms include: the Asia-Pacific Space Cooperation Organization, which has its headquarters in Beijing and formally started operating in December 2008; the Asia-Pacific Regional Space Agency Forum, which held its fifteenth session in Hanoi and Ha Long Bay, Viet Nam, in December 2008; the African Leadership Conference on Space Science and Technology for Sustainable Development, whose third conference will be hosted by the Government of Algeria and be held in November 2009; and the Space Conference of the Americas, whose fifth conference was hosted by the Government of Ecuador in 2006, and for which preparations are ongoing for its sixth conference.

A. The role of space technology in transport

8. Transportation is one of the basic elements needed for sustainable development. Space technologies such as remote sensing, satellite communications, satellite navigations and positioning technology, and space-derived information, coupled with advances in mobile communication and the Internet, play an important role in the planning and management of transport-related issues, including the

planning of roads, routing, transportation safety and accident avoidance, traffic management, emergency assistance, vehicle location and monitoring, cargo tracking and recovery, revenue collection and the development of intelligent transport systems.

9. Earth observation data and geographical information systems provide essential information for the development and maintenance of transportation networks, the creation of digital maps required for the operation of navigation devices and the development of early warning and disaster mitigation systems.

10. Transport is the area to which satellite navigation-based technologies are most commonly applied. Each mode of transportation needs specific data on position, velocity and time. Global navigation satellite systems (GNSS) not only provide in-vehicle navigation but are also being used to reduce traffic congestion and to track and manage fleets of vehicles. On the railway network, GNSS offer improved cargo management, real-time track surveying and enhanced passenger information services. At sea and in the air, accurate and reliable information on the position and routes of aircraft and marine vessels enables safe and efficient management of traffic, thus helping to reduce fuel consumption. Fishermen use GNSS to find fish stocks and many sailors now carry GNSS-enabled emergency beacons capable of transmitting information on the location of the sailors to rescue services, anywhere on the globe. Mariners and oceanographers are increasingly using GNSS for underwater surveying, buoy placement and navigational hazard location and mapping.

11. GNSS technologies also play an important role in helping to understand, manage and protect the environment. Knowing the precise position and time of landslips, sea-level changes and water heights in rivers and lakes makes it possible to monitor changes. Combining GNSS tools with Earth observation data and information on the passage of GNSS signals through the atmosphere provides new methods for forecasting the weather and studying the climate.

12. Since 2005, the Office for Outer Space Affairs of the Secretariat has been organizing annual workshops on the use of GNSS in areas such as agriculture and environmental management, landscape epidemiology, civil aviation and inland waterway/maritime transportation, as well as to provide an overview of education and training opportunities available on GNSS and its applications.

International Committee on Global Navigation Satellite Systems

13. GNSS are becoming indispensable in providing precise information on the location of vehicles on the ground, at sea or in the air. The Global Positioning System (GPS) operated by the United States of America, the Global Navigation Satellite System (GLONASS) operated by the Russian Federation, the Galileo system operated by the European Commission and the Compass/BeiDou system operated by China are the GNSS currently operating, in different constellations of satellites.

14. Pursuant to recommendations of UNISPACE III and under the guidance of the Office for Outer Space Affairs, the International Committee on Global Navigation Satellite Systems (ICG) was established in 2005. ICG held meetings in Vienna on 1 and 2 November 2006 (A/AC.105/879), in Bangalore, India, on 6 and 7 September 2007 (A/AC.105/901) and in Pasadena, California, United States, from 8 to

12 December 2008 (A/AC.105/928) to review and discuss matters relating to GNSS and their applications. ICG will meet in the Russian Federation in 2009.

15. The objectives of ICG are to achieve the compatibility and interoperability of GNSS systems thereby saving costs through international cooperation and to make positioning, navigation and timing information available globally for the benefit of society, including through the improvement of transportation systems. ICG aims to encourage coordination among providers of GNSS core and augmentation systems in order to ensure greater compatibility and interoperability. It also aims to encourage and promote the introduction and utilization of satellite positioning, navigation and timing services, particularly in developing countries, by assisting States in integrating GNSS services into their infrastructure.

16. ICG aims to assist its members and the international user community by, inter alia, serving as the focal point for the exchange, at the international level, of information related to GNSS activities, respecting the roles and functions of GNSS service providers and intergovernmental bodies such as the International Telecommunication Union, the International Civil Aviation Organization and the International Maritime Organization. It also aims to better address the future needs of users with regard to GNSS development plans and applications.

17. ICG is working to achieve those objectives by following an indicative workplan. The current workplan of ICG focuses, inter alia, on increasing the compatibility and interoperability of GNSS systems; enhancing the performance of GNSS services; disseminating information and building capacity; and interacting with national and regional authorities and relevant international organizations. The members of ICG cooperate on matters of mutual interest related to civil satellite-based positioning, navigation, timing and value-added services. In particular, they cooperate to the maximum extent practicable to maintain radio frequency compatibility in spectrum use between different GNSS systems in accordance with the Radio Regulations of the International Telecommunication Union. Within ICG, representatives from industry, academia and government share views on GNSS compatibility and interoperability.

18. As part of ICG, a Providers' Forum was established in 2007 with the aim of promoting greater compatibility and interoperability among current and future providers of GNSS services. The current members of the Providers' Forum (China, India, Japan, the Russian Federation and the United States, as well as the European Community) address key issues such as how to ensure the protection of the GNSS spectrum and matters related to orbital debris/orbit de-confliction.

International Satellite System for Search and Rescue

19. Detection and location of an aircraft crash or maritime emergency is of paramount importance to search and rescue teams and to potential survivors. Studies have shown that while survivors have a less than 10 per cent chance of survival if rescue is delayed beyond two days, the survival rate is of over 60 per cent if the rescue can be accomplished within eight hours. Furthermore, accurately locating the site of an emergency can significantly reduce the costs incurred by search and rescue teams and the exposure of rescue teams to dangerous conditions. The International Satellite System for Search and Rescue (COSPAS-SARSAT) was created to reduce the time required to detect and locate emergencies worldwide.

20. COSPAS-SARSAT is a satellite and ground-based system designed to help search and rescue teams operating at sea, in the air or on land. The system works through the use of emergency beacons that send distress alert signals and location information via satellite to search and rescue teams. Founded in the late 1970s, the system started operating in 1982. Since then, it has assisted in saving almost 25,000 people in over 6,800 emergency situations. In 26 years, the four original member States (Canada, France, Russian Federation and United States) have been joined by 36 other States that now operate 66 ground stations and 29 mission control centres worldwide or serve as search and rescue points of contact. The system is available to any State on a non-discriminatory basis and is free of charge for the end-user in distress.

21. Since 1999, the Office for Outer Space Affairs has provided, through the United Nations Programme on Space Applications, the framework for holding regular training courses on COSPAS-SARSAT and capacity-building, jointly organized with Member States. The goal of the courses is to make representatives from Government institutions from a particular geographical region aware of the practical and cost-effective space-based solutions that are currently available and that will become available in the future through COSPAS-SARSAT in order to improve operations. In addition to the basic system concept and applications, the training courses have recently introduced new features of the system, such as: (a) personal location beacons; (b) GNSS signal incorporation; and (c) the Ship Security Alert System (SSAS), which provides ships with additional alarm signals that can be activated in case of an attack. The SSAS alarm is a covert signal that produces no sound and does not flash lights, making it imperceptible to intruders on board the ship. SSAS enables crew members to discreetly sound the alarm to the relevant authorities, who can in turn track the vessel in cases of compromised security.

22. In order to make COSPAS-SARSAT more efficient, distress signals emitted from analogue 121.5/243 MHz emergency beacons are no longer being processed. As at 1 February 2009, COSPAS-SARSAT users need to use digital beacons operating at 406 MHz if they want to be processed by the system. Because they are digital, each 406 MHz beacon has a unique identifier encoded in its signal. As long as the beacon is registered, the system can quickly confirm that the distress signals are real and access important information about the owner of the beacon. A major reason why it was decided to stop processing 121.5/243 MHz signals was that such a frequency band inundated search and rescue authorities with false alerts, compromising the effectiveness of lifesaving services.

B. Space technology solutions for sustainable resource management, consumption and production

23. The thematic cluster of the Commission on Sustainable Development for the period 2010-2011 addresses issues related to sustainable resource management, consumption and production in conjunction with cross-cutting matters dealing with water resource management, energy, industrial development, land use, rural development, pollution and climate.

24. A reliable supply of fresh water is essential for the sustainable management, consumption and production of resources, and has important socio-economic repercussions at local, national, regional and global levels. Food security depends on access to fresh water. Floods too, like water scarcity problems, are major disasters in terms of loss of human life and property. Understanding and observing the global water cycle contributes significantly to effective water management; space technology, primarily Earth observation satellites, plays a major role in supplying data for such studies. For example, following the World Summit on Sustainable Development, the European Space Agency launched the international TIGER initiative, focusing on the use of space technology for water resources management in Africa.

25. Land use and infrastructure are important factors for the sustainable management and development of resources 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 areas of land.

26. 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 the Satellite por l'observation de la Terre (SPOT)) is essential in extracting land surface information.

27. Space-based tools, such as remote sensing, are fast becoming vital for measuring the level of air pollution and for monitoring and observing the atmosphere and its interaction with the Earth. Research is carried out and space-based technologies are applied primarily to determine the quality of the air and any changes to that quality, and to determine changes in the ozone layer. The detection, transportation, spread and tracking of pollutants over large areas can be effectively monitored by existing space-based instruments. Furthermore, the interaction of air pollutants in the atmosphere can also be monitored and studied. Space-based instruments often are the only source of data for remote and rural regions where ground-based measurements are not available or possible.

28. Data on atmospheric temperature and water vapour are provided by polar-orbiting meteorological satellites. The temperature of the surface of the sea can be measured by such satellites, as well as by a number of remote sensing missions. Space-based radar imaging instruments provide all-weather high-resolution data on ocean wind. Precipitation, which is one of the key parameters for water cycle observation, can be measured by microwave remote sensing satellites; such measurements can be provided on a global basis with sufficient quality and

coverage to improve weather forecasting, changes in the Earth's climate and specific components of the global water cycle.

29. Radar imagery is particularly useful in regions where cloud cover frequently obscures the land surface. Synthetic aperture radar data, for example, are used to measure increases in the length of the growing season in boreal regions (an indicator of global warming); to monitor the extent and frequency of wildfires in boreal regions (to better understand the role played by burning 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.

30. The United Nations Environment Programme, the Food and Agriculture Organization, the United Nations Educational, Scientific and Cultural Organization, the World Meteorological Organization and the International Council for Science participate in the Global Terrestrial Observing System (www.fao.org/gtos). Key activities of the system include the Terrestrial Ecosystem Monitoring Sites database, the Terrestrial Carbon Observation project, the Global Terrestrial Network and the Net Primary Productivity project. The primary functions of the secretariat of the Global Terrestrial Observing System are standards-setting, communications and networking. The system is continuing with the assessment and development of international standards for the 13 terrestrial essential climate variables (including land cover and biomass) and the development of an international terrestrial framework mechanism, as specifically requested by the Conference of the Parties to the United Nations Framework Convention on Climate Change and by the Subsidiary Body for Scientific and Technological Advice of the Convention.

31. The United Nations Environment Programme also leads efforts to reduce the risk to human health and the environment caused by emissions into the atmosphere of mercury and persistent organic pollutants, including the release of mercury into the air, water and land through activities such as mining, metal scrap smelting and waste disposal. Research and modelling are based on both terrestrial and spatial data.

32. The development of industrial graveyard monitoring systems based on remote sensing technologies is becoming important for the management of hazardous waste and for detecting areas where industrial waste and chemicals are dumped. For example, images from the Advanced Land Observing Satellite ("Daichi") of the Japan Aerospace Exploration Agency are used to detect, over a wide geographical area, suspected points of illegal dumping by comparing changes in the ground between satellite images collected at different times.

33. Space-based technologies play an important role in the identification of sources of new and renewable energy and in facilitating the assessment of threats associated with the sustained use of non-renewable and, especially, carbon-based fuels. Images from remote sensing satellites are being used to aid in the search for oil reserves and to monitor oil spills. Satellite navigation systems are used to plan and manage energy networks. Space technology is also being used to improve the generation, transmission and use of energy on Earth. For example, the monitoring of space weather and solar storms can help to manage electricity networks. One spin-off of space exploration could be the improvement of solar cell efficiency.

34. Other spin-offs of space technologies can help to strengthen industrial processes and development, for example with regard to instrumentation, design

practices and safety procedures for the storage of hydrogen as a fuel, thus opening up possibilities for fuel cell research and development.

35. Several space-based technologies have been identified for use in the mining industry and space robotics have been developed by the space industry for planetary surface exploration, life support systems, and navigation and localization services. Such technologies can be used, for example, to inspect cracks in the rock walls of mines using sophisticated ground penetration radar techniques, thus improving safety. Another example is mineralogy and chemical analysis by remote spectrometry for mapping materials.

36. The Office for Outer Space Affairs is developing a project proposal that addresses, inter alia, the baseline potential of the mining resources in the Andean subregion by using space data. The aim is to design, through the proposed project, a way to use those resources sustainably. Specific objectives of the project are to create, using optical and radar data, an inventory of all industries and strategic mining resources in the Andes and to determine, using satellite data, the impact of mining activities. Through the project, it is envisaged that a geosemantics database will be established as a tool for producing and exchanging information; that a methodology and standards for processing space information so as to identify mining resources and outline an environmental baseline will be defined; and that a mining resource management model will be elaborated.

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

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

38. In the reports 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) and for the thematic cluster 2008-2009 (A/AC.105/892), the Committee reported on capacity-building and training opportunities for developing countries in space science and technology and their applications. In particular, it reported on activities carried out in the framework of 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).

39. In relation to the specific issues addressed in the thematic cluster and cross-cutting issues of the Commission for the period 2010-2011, in 2008 the Office for Outer Space Affairs organized, within the framework of the United Nations Programme on Space Applications, several workshops, training courses, expert meetings and projects. The objectives and accomplishments of those initiatives are described in the report of the Expert on Space Applications (A/AC.105/925).

40. The following activities were scheduled to be carried out in 2009 in the framework of the United Nations Programme on Space Applications with the aim of directly addressing the issues contained in the thematic cluster 2010-2011, as well as cross-cutting issues:

(a) United Nations/United States of America Training Course on Satellite-Aided Search and Rescue, Miami, United States of America, 19-23 January;

(b) United Nations/Azerbaijan/European Space Agency/United States of America Workshop on Integrated Applications of Global Navigation Satellite Systems, Baku, 11-15 May;

(c) Workshop on applications of tele-health to service delivery in public health and environment, Thimphu, 27-30 July;

(d) Nineteenth United Nations/International Astronautical Federation Workshop on Integrated Space Technologies and Space-based Information for Analysis and Prediction of Climate Change, Daejeon, Republic of Korea, 9-11 September 2009;

(e) United Nations/Peru/European Space Agency Workshop on Integrated Space Technologies Applications for Sustainable Development in the Mountain Regions of Andean Countries, Lima, 14-19 September;

(f) United Nations/European Space Agency/United States of America Training Course on Satellite Navigation and Location-Based Services at the African Centre for Space Science and Technology – in French language (CRASTE-LF), Rabat, 29 September–24 October.

41. Information on activities of the United Nations Programme on Space Applications in the areas of education, training and fellowship opportunities in space science and technology is available on the website of the Programme (http://www.oosa.unvienna.org/oosa/en/sapidx.html).

IV. Conclusion

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

43. The synergies arising from the recommendations of UNISPACE III and the overarching development agenda set at the World Summit on Sustainable Development would be strengthened by the establishment of a closer link between the Committee on the Peaceful Uses of Outer Space and the Commission on Sustainable Development.

44. Pursuant to General Assembly resolution 63/90, the Committee will continue to examine how space science and technology and their applications could contribute to implementing the United Nations Millennium Declaration and will provide input for consideration by the Commission.

45. Also pursuant to General Assembly resolution 63/90, and in order to strengthen its contribution to the work of the Commission and encourage interaction

between it and the Commission, the Committee on the Peaceful Uses of Outer Space 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 work of the Commission. The next session of the Committee will be held in Vienna from 9 to 18 June 2010.