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Committee on the Peaceful Uses of Outer Space
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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

1. The Committee on the Peaceful Uses of Outer Space, at its fifty-first session in 2008, agreed upon a plan for its contribution to the work of the Commission on Sustainable Development for the thematic cluster 2010-2011 (A/63/20, para. 58-59).

2. The Secretariat, in a Note Verbale of 5 September 2008, invited member States of the Committee to submit contributions in accordance with the plan agreed by the Committee.

3. A draft outline was presented for consideration by the Working Group of the Whole of the Scientific and Technical Subcommittee, at its forty-sixth session in February 2009 (A/AC.105/C.1/2009/CRP.6). The Subcommittee agreed, upon a recommendation by the Working Group, that any contribution that member States of the Committee might wish to have included in the report of the Committee should be submitted to the Secretariat by 30 April 2009 at the latest.

4. The Secretariat has received contribution from Japan, which is incorporated into the draft text attached to this document.

5. The annex to this document contains the draft text prepared by the Secretariat of the contribution of the Committee on the Peaceful Uses of Outer Space to the Commission on Sustainable Development for the thematic cluster 2010-2011, to be finalized by the Committee at its fifty-second session in 2009.

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Annex

Draft text to be finalized by the Committee on the Peaceful Uses of Outer Space at its fifty-second session in 2009 on its contribution to the Commission on Sustainable Development for the thematic cluster 2010-2011

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 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. These documents informed 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, in May 2008, the Commission on Sustainable Development carried out a review and assessment of progress made on achieving internationally agreed sustainable development goals relating to agriculture, rural development, land resources, drought, desertification and the region of Africa. It was recognized 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 provided a way to better monitor and map desertification processes and drought events. The Commission noted the need to build capacities for the utilization of space technologies and applications in order to improve the knowledge

base for drought management, climate change adaptation and crop forecasting, including the prediction of harvest periods. The Commission recognized the importance of investment in the application of space technologies for monitoring changes in land use, and support by the international community in that regard was encouraged.

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 on Sustainable Development by contributing to the thematic areas addressed by the Commission.

II. Space contributions to the thematic cluster 2010-2011

6. The thematic cluster for the period 2010-2011 addresses several topics related to overall sustainable recourse management, consumption and production. Transport, chemicals, waste management and mining, are specific thematic areas under consideration in this period. Space applications are effective tools for monitoring and conducting assessments of the environment and managing the use of natural resources. 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. Space technology and its applications, such as Earth observation systems, meteorological satellites, satellite communications and satellite navigation and positioning systems, therefore 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. This report addresses areas where space applications have a particularly strong role to play.

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, with headquarters in Beijing and which 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, which will hold its third Conference hosted by the Government of Algeria 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 on-going for its sixth Conference.

A. The role of space in transport

8. Transportation is one of the basic infrastructure 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 expansion of the Internet, play an important role in transport systems planning and management, including roads planning, routing, transportation safety and accident avoidance, traffic management, emergency assistance, vehicle location and

monitoring, cargo tracking and recovery, revenue collection, and development of intelligent transport systems (ITS).

9. Earth observation data and geographic information systems (GIS) provide essential input to development and maintenance of transportation networks, creation of digital maps required for operation of navigation devices, and into early warning and disaster mitigation systems concerning safe operation of transport infrastructures.

10. Transport is the most common area for application of satellite navigation-based technologies, and each mode of transportation has its own needs for position, velocity and time data. Global Navigation Satellite Systems (GNSS) not only provide in-vehicle navigation but are also being used to reduce traffic congestion and track and manage fleets of vehicles. On the railway network, GNSS is able to 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 also use GNSS to find fish stocks, and many sailors now carry GNSS-enabled emergency beacons which can transmit their location to rescue services from 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 have an important and wide ranging role in helping to understand, to manage and to protect the environment. Knowledge of precise position and time enables the monitoring of landslips, sea-level changes, and water heights in rivers and lakes. The combination of GNSS tools with Earth observation data and information on the passage of GNSS signals through the atmosphere provides new methods for weather forecasting and climate studies.

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

International Committee on Global Navigation Satellite Systems (ICG)

13. Global navigation satellite systems are becoming indispensable in providing precise vehicle location information on the ground, sea or air. GNSS, operating in different constellations, are the United States' Global Positioning System (GPS), the Russian Federation's Global Navigation Satellite System (GLONASS), Europe's European Satellite Navigation Systems (GALILEO), and China's COMPASS.

14. Pursuant to recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), and under the guidance of the Office for Outer Space Affairs, a new international mechanism for coordination of positioning, navigation, and timing through satellite systems, the International Committee on Global Navigation Satellite Systems (ICG), was established in 2005, and held its annual meetings at the United Nations Office at Vienna in 2006 (A/AC.105/879), India in 2007 (A/AC.105/901), and United States

in 2008 (A/AC.105/928) to review and discuss matters relating to GNSS and their applications. The 2009 meeting of ICG will be held in the Russian Federation.

15. The objectives of ICG is to achieve compatibility and interoperability of GNSS systems thereby saving costs through international cooperation and making positioning, navigation, and timing available globally for societal benefits, including transportation systems. ICG aims to encourage coordination among providers of GNSS core systems and augmentations in order to ensure greater compatibility and interoperability; and to encourage and promote the introduction and utilization of satellite positioning, navigation and timing services, particularly in developing countries, through assistance for the integration of GNSS services into their infrastructures.

16. ICG also aims to assist the members of the ICG and the international user community by, inter alia, serving as the focal point for international information exchange related to GNSS activities, respecting the roles and functions of GNSS service providers and intergovernmental bodies such as the International Telecommunication Union (ITU), the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO); and to better address future user needs in the GNSS development plans and applications.

17. These objectives are accomplished by an indicative workplan. The current workplan of ICG includes compatibility and interoperability of GNSS systems; enhancement of performance of GNSS services; information dissemination and capacity-building; and interaction with national and regional authorities and relevant international organizations. 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 International Telecommunication Union (ITU) Radio Regulations. Within ICG, representatives from industry, academia, and governments share views on GNSS compatibility and interoperability.

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

International Satellite System for Search and Rescue (COSPAS-SARSAT)

19. Detection and location of an aircraft crash or maritime distress is of paramount importance to the Search and Rescue (SAR) teams and to the potential survivors. Studies show that while the initial survivors have less than a 10% chance of survival if rescue is delayed beyond two days, the survival rate is over 60% if the rescue can be accomplished within eight hours. Furthermore, accurate location of the distress can significantly reduce both SAR costs and the exposure of rescue teams to hazardous conditions. The International Satellite System for Search and Rescue (COSPAS-SARSAT) was created to reduce the time required to detect and locate distress events worldwide.

20. COSPAS-SARSAT is a satellite and ground system designed to help SAR operations at sea, in the air or on land. The system works with emergency beacons which send distress alert signals and location information via satellites to the SAR centers providing information to 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 distress situations. In 26 years the four original member countries (Canada, France, Russian Federation, and United States of America) have been joined by 36 other countries that now operate 66 ground stations and 29 Mission Control Centers worldwide or serve as SAR points of contact. The system is available to any country 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, under the United Nations Programme on Space Applications, has regularly conducted training courses on COSPAS-SARSAT and capacity-building, jointly organized with Member States. The goal of these courses are to make representatives from government institutions from a particular geographical region aware of both practical and cost-effective space-based solutions that are currently and in future would be available through the COSPAS-SARSAT Satellite system in order to improve infrastructure of system and consequently, to improve its operation. In addition to the basic system concept and applications, the training courses have recently introduced new features of the system such as: (i) personal location beacons; (ii) GNSS signal incorporation; and (iii) the Ship Security Alert (SSAS) system, providing ships with additional alarm signal, which can be activated in case of an attack. This alarm is a covert signal, which will have no sound and no flashing lights so that it is in no way obvious to any intruders on board the ship. SSAS is capable of discreetly raising the alarm to the relevant authorities and tracking the vessel if the security of the vessel is compromised.

22. In order to make the COSPAS-SARSAT system more efficient, the satellite processing of distress signals from analogue 121.5/243 MHz emergency beacons were terminated on 1 February 2009. Users of the COSPAS-SARSAT will need to switch to digital beacons operating at 406 MHz if they want to be processed by the system. Because of the digital nature of 406 MHz beacons, every beacon in the world has a unique ID encoded in its signal. As long as the beacon is registered, the system can quickly confirm that the distress is real and have access to important information about the beacon owner. A major factor in the decision to stop satellite processing of 121.5/243 MHz signals was due to problems in this frequency band which inundate SAR authorities with false alerts, adversely impacting the effectiveness of lifesaving services.

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

23. The thematic cluster for the period 2010-2011 addresses areas related to sustainable resource management, consumption and production with strong cross-cutting inter-linkages, such as water resource management, energy, industrial development, land use, rural development, pollution, and climate related issues. The following section provides examples on the role of space-related applications in addressing thematic areas under consideration in the period 2010-2011.

24. Reliable supply of fresh water is an essential element of sustainable resource management, consumption and production, and has important socio-economic impact at local, national, regional and global scales. Food security depends on ability to provide access to fresh water. In addition to water scarcity problems, floods are major disasters in terms of loss of human life and property. Understanding and observing the global water cycle contribute significantly in effective water management, and space technology, primarily Earth observation satellites, plays a major role in supplying data for water studies. As an example, the European Space Agency, following the 2002 World Summit on Sustainable Development, 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 sustainable resource management and 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.

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 SPOT) is essential in extracting land surface information.

27. Space tools, such as remote sensing, are fast becoming vital tools in measuring the level of air pollution and monitoring and observing the atmosphere and its interaction with the Earth. Among the primary areas of space research and applications is the determination of the quality of air and any changes in it and changes in the ozone layer. The detection, transportation, spread and tracking of pollutants over large regions 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. Atmospheric temperature and water vapour data are provided operationally by polar orbiting meteorological satellites. Sea surface temperature measurements are also provided by these 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 is one of the key parameters for water cycle observation, and microwave remote sensing satellites provide precipitation measurements on a global basis with sufficient quality and coverage to improve prediction of weather, the Earth’s climate and specific components of the global water cycle.

29. 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.

30. UNEP, FAO, UNESCO, WMO 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. UNEP also leads efforts to reduce the risk to human health and the environment by atmospheric emissions of mercury and persistent organic pollutants, including from releases of mercury to 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 to detect areas of illegal dumping of industrial waste and chemicals, is becoming an important tool for the management of hazardous waste. For example, images from the advanced land observing satellite “Daichi” of JAXA, are used to detect suspected points of illegal dumping in a geographically wide area, by comparing changes in the ground between satellites 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 the threats associated with the sustained use of non-renewable, and especially carbon-based, fuels. Images from remote sensing satellites are being used to aid the search for oil reserves and to monitor oil spills. Satellite navigation systems are used to plan and to 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 in the management of electricity networks. Results of the spin-offs of space exploration can lead to the improvement of solar cell efficiency.

34. Space spin-off technologies can also help to strengthen industrial processes and development, for example with regard to instrumentation, design practices, operational use and safety procedures for the storage of hydrogen as a fuel, thus opening an arena for fuel cell research and development.

35. Several space-based technologies are identified for use in the mining industry, such as space robotics developed by the space industry for planetary surface

exploration, life support systems, and navigation and localization services. They can assist, for example, in inspecting cracks in the rock walls of mines using sophisticated ground penetration radar techniques thus improving mining 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 which, inter alia, addresses baseline potential of the mining resources in the Andean subregion using space data and to design a way for those resources to be used sustainably. Specific objectives of this project are to create an inventory of all industries and strategic mining resources in the Andes, using optical and radar data, and to determine the impact of mining activities using satellite data. The project envisages to establish a geosemantics database as a tool for producing and exchanging information; to define a methodology and standards for processing space information so as to identify mining resources and outline an environmental baseline; and to elaborate a mining resource management model.

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

37. 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.

38. 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 and 2008-2009, 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 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 on Sustainable Development for the period 2010-2011, the Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, organized in 2008 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. In 2009, among the activities that the Programme has scheduled in coordination with co-organizers, the following activities directly address the thematic cluster 2010-2011 and cross-cutting issues:

(a) United Nations/United States of America Training Course on Satellite-Aided Search and Rescue, held in Miami, Florida, USA, from 19 to 23 January 2009;

(b) United Nations/Azerbaijan/ESA/USA Workshop on Integrated Applications of Global Navigation Satellite Systems, held in Baku, Azerbaijan, from 11 to 15 May 2009;

(c) Workshop on Applications of Tele-health to Service Delivery in Public Health and Environment, to be held in Thimphu, Bhutan, from 27 to 30 July 2009;

(d) 19th United Nations/International Astronautical Federation Workshop on Integrated Space Technologies and Space-based information for Analysis and Prediction of Climate Change, to be held in Daejeon, Republic of Korea, from 9 to 11 September 2009;

(e) United Nations/Peru/ESA Workshop on Integrated Space Technologies Applications for Sustainable Development in the Mountain Regions of Andean Countries, to be held in Lima, Peru, from 14 to 19 September 2009;

(f) United Nations/ESA/USA Training Course on Satellite Navigation and Location Based Services at the African Centre for Space Science and Technology - in French language (CRASTE-LF), to be held in Rabat, Morocco, from 29 September to 24 October 2009.

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 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.

43. 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.

44. 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.

45. To strengthen its contribution to the work of the Commission and encourage interaction between the two bodies, the Committee, pursuant to the recommendation by the General Assembly in its resolution 63/90, 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 on the Peaceful Uses of Outer Space will be held in Vienna from 9 to 18 June 2010.