



# General Assembly

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## Committee on the Peaceful Uses of Outer Space

### Report on the United Nations/International Astronautical Federation Workshop on Space for Human and Environmental Security

(Cape Town, South Africa, from 30 September to 2 October 2011)

#### Contents

	<i>Paragraphs</i>	<i>Page</i>
I. Introduction .....	1-20	2
A. Background and objectives .....	1-9	2
B. Programme .....	10-16	3
C. Attendance and financial support .....	17-20	4
II. Overview of technical sessions and round-table discussion .....	21-33	5
III. Observations and conclusions of the Workshop .....	34-40	7
IV. On-site evaluation of the Workshop .....	41-48	10
V. Follow-up actions .....	49-51	11



## I. Introduction

### A. Background and objectives

1. The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), in particular through its resolution entitled “The Space Millennium: Vienna Declaration on Space and Human Development”,<sup>1</sup> recommended that activities of the United Nations Programme on Space Applications should promote collaborative participation among Member States at the regional and international levels, emphasizing the development of knowledge and skills in developing countries.<sup>2</sup>
2. At its fifty-third session, in 2010, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposiums and conferences of the United Nations Programme on Space Applications for 2011. Subsequently, the General Assembly, in its resolution 65/97, endorsed the activities to be carried out by the Office for Outer Space Affairs under the auspices of the United Nations Programme on Space Applications in 2011.
3. Pursuant to General Assembly resolution 65/97 and in accordance with the recommendations of UNISPACE III, the United Nations/International Astronautical Federation Workshop on Space for Human and Environmental Security was held in Cape Town, South Africa, from 30 September to 2 October 2011, in conjunction with the 62nd International Astronautical Congress, held in Cape Town from 3 to 7 October 2011.
4. The Workshop was jointly organized by the Office for Outer Space Affairs of the Secretariat, as part of the activities of the United Nations Programme on Space Applications for 2011, and by the International Astronautical Federation (IAF), in cooperation with the International Academy of Astronautics (IAA) and the Committee on Space Research (COSPAR). It was co-sponsored by the European Space Agency (ESA), the Secure World Foundation (SWF) and the Developing Countries Support Programme established by the International Astronautical Congress’s 2011 local organizing committee and IAF to support participation of representatives from developing countries both in the Workshop and the International Astronautical Congress.
5. The Workshop was the twenty-first jointly organized by the Office for Outer Space Affairs and IAF. It built upon the recommendations and experience gained from the previous 20 workshops, held between 1991 and 2010.
6. At the Workshop, participants discussed a wide range of space technologies, applications and services that contributed to sustainable economic and social development programmes, primarily in developing countries.
7. The event had the following primary objectives: to increase awareness among decision makers and representatives of the research and academic community of

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<sup>1</sup> *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1.

<sup>2</sup> *Ibid.*, chap. II, para. 409 (d) (i).

space technology applications for addressing human and environmental security issues, primarily in developing countries; to examine low-cost, space-related technologies and information resources available for addressing human and environmental security needs in developing countries; to promote educational and public awareness initiatives in the area of natural resources management and to contribute to the capacity-building process in that area; and to strengthen international and regional cooperation in the foregoing areas.

8. The Workshop and its concluding round-table discussion also provided an opportunity for direct dialogue between space technology experts, policymakers, decision makers and representatives of the academic community and private industry in both developing and developed countries. All participants were encouraged to share their experiences and examine opportunities for better cooperation.

9. The present report describes the background, objectives and programme of the Workshop. It has been prepared for submission to the Committee on the Peaceful Uses of Outer Space at its fifty-fifth session and to the Scientific and Technical Subcommittee at its forty-ninth session, both in 2012.

## **B. Programme**

10. The programme of the Workshop was developed jointly by the Office for Outer Space Affairs and the programme committee of the Workshop, which included representatives of national space agencies, international organizations and academic institutions. The contribution of the Workshop's honorary committee (comprising prominent representatives of the Committee on the Peaceful Uses of Outer Space, IAF and the Office for Outer Space Affairs) and that of the programme committee, in addition to the direct participation of committee members to the Workshop, ensured that the Workshop's objectives were achieved.

11. The programme of the Workshop focused on technologies, applications and services that could help to enhance the following: the benefits of the use and application of space-related tools; support for sustainable development; medical and public health services using space technologies; the development of a comprehensive, worldwide environmental monitoring strategy; the management of the Earth's natural resources; the capacity of developing countries, by developing human and technical resources at various levels; regional and international cooperation; public awareness; and the development of appropriate infrastructures.

12. The Workshop had four technical sessions focusing on various fields in which space technology applications and monitoring provided benefits: space and climate change; space for food and water; space for health; and space for the environment. The four sessions comprised presentations on applications of space technologies, information and services, in particular presentations on international and regional initiatives and cooperation and capacity-building activities.

13. A total of 30 oral technical presentations were made during the technical sessions, and 22 papers were presented at a poster session. In addition, keynote addresses were delivered by representatives of COSPAR, IAA and the local organizing committee during the opening session of the Workshop.

14. Introductory and welcoming statements were made by representatives of the Government of South Africa, the International Astronautical Congress's local organizing committee, IAF, ESA, IAA, COSPAR and the Office for Outer Space Affairs.

15. Each technical session was followed by an open discussion on specific topics of interest, with additional opportunities for participants to voice their opinions. The discussions were continued in-depth and summarized by three working groups established by the participants in order to develop the observations and conclusions of the Workshop and to prepare for the round-table discussion addressing questions on critical issues and the main themes identified in the technical sessions.

16. The detailed programme of the Workshop is available on the website of the Office for Outer Space Affairs ([www.unoosa.org](http://www.unoosa.org)).

### **C. Attendance and financial support**

17. The United Nations, on behalf of the co-sponsors, invited developing countries to nominate candidates to participate in the Workshop. Participants were required to have a university degree or well-established professional experience in a field related to the overall theme of the Workshop. In addition, participants were selected on the basis of their work experience in programmes, projects or enterprises that used space technology applications or that could potentially benefit from using that technology. The participation of specialists at the decision-making level from both national and international entities was particularly encouraged.

18. Funds allocated by the United Nations, ESA, IAF, the Developing Countries Support Programme, SWF and the local organizing committee for the organization of the Workshop were used to provide financial support for 32 participants from developing countries to attend. Twenty-six participants received full financial support, which included international round-trip air travel, hotel accommodation and a living allowance for the duration of the Workshop and the International Astronautical Congress. A further six participants received partial funding (for air travel, and/or hotel and living allowance, and/or the registration fee for the International Astronautical Congress). Those 32 participants came from 27 developing countries. The co-sponsors also covered the cost of the Congress registration fee for 25 funded participants, thus enabling them to attend the 62nd Congress, held immediately after the Workshop.

19. The local organizing committee provided conference facilities, secretariat and technical support and transportation to and from the airport for funded participants. It also organized a number of social events for all Workshop participants.

20. The Workshop was attended by more than 110 participants from the following 39 countries: Argentina, Australia, Azerbaijan, Bhutan, Canada, China, Colombia, Czech Republic, Ecuador, France, Germany, Ghana, Guatemala, India, Iraq, Kenya, Kuwait, Madagascar, Malaysia, Morocco, Myanmar, Nepal, Nigeria, Pakistan, Republic of Korea, Romania, Russian Federation, Singapore, South Africa, Sudan, Thailand, Tunisia, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States of America, Viet Nam, Zambia and Zimbabwe. The following international intergovernmental organizations, non-governmental organizations and

other entities were also represented at the Workshop: COSPAR, ESA, IAA, IAF, International Telecommunication Union, Space Generation Advisory Council, SWF, World Meteorological Organization and the Office for Outer Space Affairs.

## **II. Overview of technical sessions and the round-table discussion**

21. The first technical session focused on applications of space technology, data and services for climate change studies. The presentations at the session demonstrated the huge potential of Earth observation data for climate change research, and emphasized the necessity of regional and international cooperation in addressing such a global problem. Participants in the Workshop were given an update on the latest developments of the ESA Climate Change Initiative, which had the objective of fully realizing the potential of both long-term global Earth observation data collected by ESA in the past and data from current and planned missions, by making a significant and timely contribution to the essential climate variables databases required under the United Nations Framework Convention on Climate Change. In that regard, ESA would take all steps necessary for the systematic generation and regular updating of 21 essential climate variables, thus ensuring that the maximum benefit was derived from ongoing and planned missions for climate purposes, in coordination with international efforts.

22. At the session, participants reviewed the status of international cooperation in Earth and climate observation from space, including activities carried out by, among other entities, the Group on Earth Observations and the Committee on Earth Observation Satellites. A presentation was made on a new initiative, the CarbonSat Constellation, aimed at responding to the need for an international integrated carbon observing system. Other presentations demonstrated ways that space technology and information could be used in research projects in the areas of biodiversity and ocean studies.

23. At the second technical session, participants considered the use of space technology, data and services for food security and water management. Presentations demonstrated how space technologies could contribute to programmes for sustainable economic and social development, primarily in developing countries. Presentations were made on ongoing projects such as the development of an integrated water resources management system for assessing water availability in Morocco that made use of geospatial and land surface modelling data, and the use of remote sensing and geographic information systems to estimate crop area and forecast yields in Pakistan.

24. At that session, presentations were made on the use of space technology for water harvesting and enhancing water security in urban areas, and on the use of Earth observation data for assessment of flood areas. Presentations at the session underlined the importance of capacity-building in space science and technology in developing countries, in particular in Africa, and provided case studies on how capacity in water resources management could be developed by ensuring appropriate access to Earth observation data at a low cost or free of charge.

25. At the third technical session, participants discussed the use of space technology for medical and public health services, as well as for education, in

developing countries. Presentations were made on activities carried out by ESA in the areas of e-health, telemedicine and tele-epidemiology, including projects such as the Satellites for Epidemiology, the Health Early Warning system, Disease Vector Mapping (VECMAP) and Prevent and Respond to Epidemics and Demonstrate Information and Communication Technologies (PREDICT). It was recognized that ongoing projects carried out in Africa by ESA in cooperation with various international and regional organizations contributed to achieving sustainable development goals and could serve as good models for other regions.

26. At the session, participants reviewed the status of the international project on building e-health services in sub-Saharan Africa, which was carried out with the participation of the African Union Commission, the New Partnership for Africa's Development, the African Development Bank, the World Health Organization, the European Commission and ESA. The presentation demonstrated how European organizations, African stakeholders and the World Health Organization had joined their efforts towards a programme for building a sustainable, satellite-enhanced e-health and telemedicine network for the whole of sub-Saharan Africa that embraced, as key elements, African ownership, a focus on the Millennium Development Goals and counteracting the shortage of health sector workers. Presentations were also made on the impact of climate change on public health in Africa, on training in tele-epidemiology in South America and on data handling and the creation of health data systems. Presentations were also made on case studies of the "Rally to read" tele-education project in South Africa and the use of space-derived data to detect landmine fields.

27. The fourth session addressed the application of space technology, information and services in environmental monitoring and natural resources management. Participants in the Workshop were given an update on the latest developments in the ESA Global Monitoring for Environment and Security (GMES) programme aimed at providing global, timely and easily accessible information derived from land, marine and atmospheric monitoring for the purposes of emergency responses, climate change studies and security. GMES employs space, service and in-situ components to provide the most reliable and accurate information in support of European policy priorities in the above-mentioned areas. The programme's space segment includes GMES-dedicated Sentinel missions (with the first Sentinel 1 satellite planned for launch in 2013). Data from the Sentinel satellites will be complemented by data from other European, international and national missions such as Disaster Monitoring Constellation, Radarsat, RapidEye, Satellite pour l'observation de la Terre (SPOT), CryoSat, COSMO-SkyMed and TerraSAR-X.

28. At the session, presentations were made on the operational Earth observation-based forestry monitoring and management system in South Africa, a Russian system for satellite ionospheric tomography and a proposed constellation of optical medium-Earth orbit satellites and high-resolution synthetic aperture radar low-Earth orbit satellites for environmental monitoring. An overview of the activities of the Disaster Monitoring Constellation and case studies and reports on national and regional projects in China and North and Central Africa were also presented. Papers on a strategy with respect to architecture for monitoring climate from space and on regulatory provisions and frequency bands for active and passive space sensors were brought to the attention of participants by representatives of the World Meteorological Organization and the International Telecommunication Union.

29. Documentation of the presentations made at the technical sessions of the Workshop and the poster session are available on the website of the Office for Outer Space Affairs.

30. A concluding round-table discussion was held with the participation of high-level representatives of space agencies and other relevant national or international institutions and organizations from both spacefaring and non-spacefaring nations in order to establish a direct dialogue with Workshop participants on how space technologies, applications and services could address social and economic issues and contribute to enhancing human and environmental security in developing countries.

31. The round-table discussion was moderated by the Chairman of the Committee on the Peaceful Uses of Outer Space, Dumitru-Dorin Prunariu, with the participation of five panellists: Gérard Brachet (International Astronautical Federation), Amnon Ginati (European Space Agency), Mazlan Othman (Office for Outer Space Affairs), Peter Martinez (National Space Council, South Africa) and David Kendall (Canadian Space Agency, Canada).

32. Prior to the round table, three working groups were established in order to summarize critical issues and the main themes identified in the presentations made at the technical sessions of the Workshop, so that the panellists could address them. The first working group focused on the application of space science and technology in climate change studies. The second working group discussed the use of space-related technologies for health and education. The third working group considered the application of space technology in strengthening food, water and environmental security.

33. Panellists participating in the round table discussed the following issues brought to their attention by the moderator and the chairs of the three working groups:

- (a) Sustainability of space activities, especially in developing countries;
- (b) How space technology contributes to human and environmental security from the point of view of African countries, space agencies in developed countries and international scientific organizations;
- (c) The role of the United Nations in enhancing international and regional cooperation in the use of space technology for human and environmental security.

### **III. Observations and conclusions of the Workshop**

34. The following observations and conclusions were made by the Workshop's working groups and during the round-table discussion.

35. In the area of space and climate change, the following observations were made:

- (a) In the area of climate change measurement, techniques were well established for monitoring space, land and ocean phenomena. An integrated, global system for measuring climate change was under development. Measurements needed to be sensitive, accurate, well-calibrated and robust;

(b) Climate change modelling techniques were well understood. However, data input was insufficient to provide fully persuasive predictions and remediation actions;

(c) There was an enormous amount of international cooperation on the climate change issue. Integrating regional inputs into that cooperation, particularly from developing nations, could be enhanced;

(d) Currently, global climate change predictions were not universally persuasive.

36. In the area of space and climate change, the following conclusions were reached:

(a) Gaps in space, ground and ocean measurements should be filled so that those measurements could be used in climate change models;

(b) Data input to models, for example, the continuous and long-term global measurement of methane and carbon dioxide, should be enhanced. It should also be ensured that the outputs were not only global but regional as well;

(c) All countries, within their level of development, should be encouraged to establish measurement systems contributing to climate change assessment. It should be ensured that all countries were included in the global network of information on climate change parameters;

(d) Areas for which climate change data were lacking should be identified, according to region. Global and regional approaches should be developed to remove impediments to the acceptance of predictions of the long-lasting detrimental effects that climate change could have on societies and the need for action.

37. In the area of space for health and education, the following observations were made:

(a) Education of the population on the potential of e-health and e-learning was insufficient at the moment. The same was also true of the education of teachers in the use of technology, including space applications;

(b) There was a huge lack of awareness about the potential of space technology for the socio-economic development of society;

(c) A large number of pilot projects had not achieved sustainability (technology, especially in rural areas; maintenance of content; and skills of teachers and health-care professionals in using new services and technologies);

(d) Production of content for education and how to make it available on a global scale remained a great challenge, including content about space technologies and career opportunities;

(e) The contribution of industries to content production for continuing medical education was not yet substantial;

(f) Training of health-care professionals and teachers via e-learning for recertification and upgrading constituted an opportunity;



(g) Use of open-source free software, cloud computing and databases, as well as the crowdsourcing approach, for collecting data voluntarily from citizens, while carefully addressing privacy and security issues, had great potential.

38. In the area of space for health and education, the following conclusions were reached:

(a) All countries should support programmes that had a key element of regional ownership, addressed Millennium Development Goals, addressed education in a broad range of areas, used satellite technology to generate data for health and education, and extended the reach of services and thereby reduced the digital divide;

(b) Interested countries should offer on-site fellowship and education programmes for teachers in rural areas;

(c) International organizations and specialized agencies should provide support in setting up centres for telemedicine and e-learning by providing models that had proved to constitute best practices, and by advising the local implementers;

(d) A number of ongoing projects presented at the Workshop, such as the “Rally to read” and “E-health for Africa” projects, could serve as good models for implementation in other regions;

(e) Available open-data and open-source platforms should form the basis for a knowledge infrastructure for space education and health purposes.

39. In the area of space for food, water and the environment, the following major challenges for developing countries were noted:

(a) There was insufficient access to high-resolution spatial, temporal and spectral data;

(b) Space-derived data should be complemented by other data needed for addressing environmental issues;

(c) Relationships between Government institutions, the private sector and non-governmental organizations were still underdeveloped and could not support the most efficient use of space technology for food, water and environmental security;

(d) Sustainable capacity-building was of great importance to developing countries;

(e) There was limited sharing of space data and information on transboundary resources and issues.

40. In the area of space for food, water and the environment, the following conclusions were reached:

(a) Broader use of space information to avoid boundary conflicts over common natural resources should be encouraged;

(b) A clear vision and short- and long-term space programmes at the national level should be developed;

(c) Sustainable capacity-building for the use of space information should be encouraged and strengthened;

(d) Data-sharing policies at the national level should be created and harmonized;

(e) A central access point to metadata, maps, policies, services, products and custodians should be established in each country;

(f) Space-based integrated natural resources development and management systems at the national level should be built.

#### **IV. On-site evaluation of the Workshop**

41. In order to assess the Workshop, participants were given a questionnaire on the last day of the event. A total of 23 completed questionnaires were returned to the organizers, of which 17 (74 per cent) were from participants who had received financial support from the co-sponsors and 6 (26 per cent) were from self-funded participants.

42. All respondents except one felt that the theme of the Workshop was relevant to their current position. All respondents felt that the programme of the Workshop met their professional needs and expectations. All respondents said that they would recommend participation in future United Nations/International Astronautical Federation workshops to their colleagues.

43. Fifty-five per cent of respondents considered the overall level and quality of presentations at the Workshop to be very good, and 45 per cent considered it to be good. Seventy-five per cent of respondents considered the overall organization of the Workshop to be very good, and 25 per cent considered it good.

44. Participants indicated that participation in the Workshop helped them:

(a) To gain and enhance knowledge of space technology and applications (17 replies);

(b) To generate new ideas for projects (16 replies);

(c) To enable potential cooperation with other groups (16 replies);

(d) To confirm ideas and concepts in space technology and applications (15 replies);

(e) To enable possible partnerships (13 replies).

45. With respect to the actions or projects that they would initiate as follow-up to the Workshop, respondents indicated that they would:

(a) Contact experts and/or a network (16 replies);

(b) Undertake additional education or training (14 replies);

(c) Seek funding support for projects (14 replies);

(d) Define new projects (13 replies);

(e) Procure equipment or technologies (6 replies).

46. In assessing the Workshop's round-table discussion, 55 per cent of respondents considered it to be very interesting, 40 per cent estimated it to be interesting and

5 per cent to be not so interesting. All respondents considered that round-table panellists had addressed issues of particular interest to them and their agencies. Seventy-five per cent also felt that they had had a chance to bring their questions to the attention of the panellists.

47. Sixty per cent of respondents considered the level of interaction between panellists and the audience to be very interactive, 35 per cent considered it to be interactive, and 5 per cent considered that the discussion was not so interactive.

48. The survey also showed that no one among the funded respondents would have been able to attend the Workshop and the International Astronautical Congress without the financial support provided by the organizers.

## **V. Follow-up actions**

49. At the meeting of the IAF Committee for Liaison with International Organizations and Developing Nations, held during the International Astronautical Congress, which was attended by representatives of the Office for Outer Space Affairs, it was decided that the 22nd United Nations/International Astronautical Federation Workshop should be held in Naples, Italy, from 28 to 30 September 2012, as an associated event of and in conjunction with the 63rd International Astronautical Congress, to take place in Naples from 1 to 5 October 2012.

50. The theme of the 22nd United Nations/International Astronautical Federation Workshop should be finalized by the end of 2011 by the Office for Outer Space Affairs in cooperation with the local organizing committee, the IAF secretariat and other co-organizers of the event. Discussions on the objectives and the programme of the 22nd Workshop would be continued at a meeting to be held on the margins of the forty-ninth session of the Scientific and Technical Subcommittee in 2012.

51. It was also reconfirmed at the meeting of the Committee for Liaison with International Organizations and Developing Nations that further round-table discussions between participants and heads or senior managers of space agencies and other relevant institutions or organizations should be held during future United Nations/International Astronautical Federation workshops.

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