United Nations A/AC.105/986

General Assembly

Distr.: General
24 November 2010

Original: English

**Committee on the Peaceful Uses of Outer Space**

# Report on the United Nations/Turkey/European Space Agency Workshop on Space Technology Applications for Socio-Economic Benefits

**(Istanbul 14-17 September 2010)**

## Contents



V.10-58020 (E) 131210 141210

# I. Introduction

1. At the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), States recommended that activities of the United Nations Programme on Space Applications should promote collaborative participation among Member States at the regional and international levels[1] and emphasized the development of knowledge and skills in developing countries.

2. At its fifty-second session, in 2009, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposiums and conferences of the Programme on Space Applications for 2010.[2] Subsequently, the General Assembly, in its resolution 64/86, endorsed the activities to be carried out under the auspices of the United Nations Programme on Space Applications in 2010.

3. Pursuant to General Assembly resolution 64/86 and in accordance with the recommendations of UNISPACE III, the United Nations/Turkey/European Space Agency Workshop on Space Technology Applications for Socio-Economic Benefits was held in Istanbul from 14 to 17 September 2010.

4. The Workshop was 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 2010, and hosted by the Scientific and Technological Research Council of Turkey on behalf of the Government of Turkey, in cooperation with the International Society for Photogrammetry and Remote Sensing (ISPRS) and the National Aeronautics and Space Administration (NASA) of the United States of America. The Workshop was co-sponsored by the European Space Agency (ESA).

5. The present report describes the background to and objectives of the Workshop and provides a summary of the presentations and observations made by Workshop participants. The report has been prepared pursuant to General Assembly resolution 64/86.

## A. Background and objectives

6. In its resolution 54/68, the General Assembly endorsed the resolution entitled "The Space Millennium: Vienna Declaration on Space and Human Development",[3] adopted by UNISPACE III. UNISPACE III had formulated the Vienna Declaration as the nucleus of a strategy to address future global challenges by using space applications. In particular, in the Vienna Declaration, States noted the benefits and applications of space technologies in addressing the challenges to sustainable development and noted the effectiveness of space instruments in dealing with the

---

[1] *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. II, para. 409 (d) (i).

[2] *Official Records of the General Assembly, Sixty-fourth Session, Supplement No. 20* (A/64/20), para. 82

[3] *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.

challenges posed by phenomena such as climate change and its impact on agricultural development and food security.

7. Implementation of the recommendations contained in the Vienna Declaration could support many of the actions called for in the Plan of Implementation of the World Summit on Sustainable Development.[4] In particular, existing space-based tools could contribute to and strengthen the capacities of developing countries to improve the management of natural resources and environmental monitoring by increasing and facilitating the use of data acquired through the use of space technologies.

8. The objective of the Workshop was to increase the awareness of the socio-economic benefits of space technology applications at the national, regional and international levels. The participants were provided with examples of socio-economic benefits of space science and technology applications, mainly focusing on satellite remote sensing, satellite communications, global navigation satellite systems (GNSS), capacity-building and regional and international cooperation.

9. The Workshop was aimed at contributing to international cooperation by providing an opportunity to exchange up-to-date information on space technology applications that had socio-economic benefits.

10. The Workshop had the following specific objectives:

(a) To promote ongoing relevant national, regional and global initiatives that demonstrated the capabilities and applications of space technology in the area of addressing socio-economic benefits and sustainable development;

(b) To promote international cooperation in the development of space technology and its applications between and among countries at all levels of development, with a particular focus on supporting developing countries through capacity-building activities;

(c) To explore the socio-economic benefits of using satellite remote sensing (including Interferometric Synthetic Aperture Radar (InSAR)), satellite communications and GNSS;

(d) To strengthen regional awareness and information and data exchange networks on the use of space technology;

(e) To discuss the means, media and tools to raise public awareness, reach out to the public and promote and attract public support for space programmes and activities and space technologies;

(f) To initiate pilot projects for joint work at the regional and international levels;

(g) To develop ideas on space technology and infrastructure for research applications, education, industry, space-based and ground-based space facilities and the establishment of space culture within society.

---

[4] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 2, annex.

## B. Programme

11. Introductory statements were made by the Vice-President of the Scientific and Technological Research Council of Turkey, the President of ISPRS, a representative of NASA and representatives of the Office for Outer Space Affairs of the Secretariat.

12. The Workshop consisted of a keynote session, six thematic plenary sessions, including a panel discussion, and working group sessions.

13. The programme of the Workshop included a series of technical presentations on successful applications of space technology-based tools that provided cost-effective solutions or essential information for planning and implementing programmes and projects with socio-economic benefits.

14. At the six plenary sessions, presentations were given on the following topics: (a) capacity-building in space technology; (b) remote sensing applications related to urban climate, air quality and transportation; (c) regional climate, water resources and agriculture productivity; (d) data, models and the role of public-private sector partnerships in sustainable global development; (e) remote sensing applications for disaster management; (f) GNSS applications and satellite communications; (g) recent developments in space science and technology; and (h) regional and international cooperation.

15. Participants made presentations on relevant activities and contributed to discussions held to identify priority areas for possible follow-up actions and to examine partnerships that could be established or strengthened. Two working group sessions were conducted during the Workshop.

16. Workshop participants and the co-sponsors made presentations on their professional work as related to the theme of the Workshop.

17. A total of 58 presentations were made by participants from developing and developed countries, and comprehensive discussion sessions were held at the conclusion of each presentation session.

## C. Attendance

18. A total of 120 participants from the following 25 countries attended the Workshop: Argentina, Azerbaijan, Bulgaria, China, Egypt, Germany, Greece, India, Indonesia, Iran (Islamic Republic of), Kazakhstan, Kenya, Morocco, Myanmar, Nigeria, Russian Federation, Serbia, Sudan, Syrian Arab Republic, Thailand, Tunisia, Turkey, Ukraine, United States of America and Viet Nam. The Office for Outer Space Affairs was also represented.

19. Funds allocated by the United Nations and the co-sponsors were used to defray the cost of air travel, daily subsistence allowance and accommodation of 19 participants. The co-sponsors also provided funds for local organization, facilities and transportation of participants.

# II. Summary of presentations

20. The presentation sessions provided participants with an opportunity to learn how the use of space technology could be of benefit in various areas, such as aviation, maritime and land transportation, urbanization, mapping and surveying, human health, disaster management, environmental monitoring and natural resources management. In the Workshop sessions, national and regional successes were described, and potential applications were explained. The presentation sessions led to discussion on how countries could benefit from cost-effective means of achieving sustainable development goals by strengthening many sectors of space technology and its applications.

21. Further information on the Workshop programme, background materials and presentations have been made available on the website of the Workshop (www.tubitak.gov.tr/spaceworkshop).

22. The first keynote address was made by the Director of the Earth Data Analysis Center of the University of New Mexico on the topic of reflections on a career of science and technology applications from space. He stressed the need to utilize Earth observation, particularly remote sensing, to provide benefits for society. The second keynote address was made by the President of ISPRS on the topic of the value of monitoring the Earth from air and space. He focused on the role of ISPRS in aiding the development of space-based technologies around the world for socio-economic benefits. The third keynote address was made by the Director of the Innovative Partnership Programme of NASA on the topic of the socio-economic benefits of space technology applications and spin-offs, in which he highlighted the ubiquity of space technology, giving examples from everyday life, and urged participants to submit projects and innovative ideas for collaborative work with NASA.

## A. Capacity-building in space technology

23. In the first session, on capacity-building in space technology, presentations were made on several institutions conducting space-related activities and space-related projects in many countries. The importance of international cooperation and education was stressed, and many examples of educational opportunities in the area of space technology were provided. Capacity-building initiatives were described, and recommendations were made for raising public awareness of space activities. It was noted that government bodies and the private sector contributed to capacity-building in the area of space technology by promoting education activities and building technical infrastructure for space technology.

## B. Remote sensing applications

24. In the second and third sessions, on remote sensing applications, speakers addressed the impact of growing urbanization on air quality and the climate and noted that remote sensing data enhanced scientific understanding of the environment and improved the quality of life. Participants learned about the method of using satellite data to increase agricultural yields. Presentations were made on the

applications of satellite technology related to the climate, the water cycle and the environment. It was noted that space technology applications could contribute to an overall monitoring strategy, which should be a key component of regional water management and international water policies.

25. It was noted that as climate change would place an additional strain on lifestyles in developing countries, the challenge for policymakers, scientists, academics and business leaders was to stimulate economically vibrant and healthier societies in a world with limited resources. Areas such as housing, transportation, energy, water resource management and agriculture were inextricably linked to the Earth's natural system, requiring a systematic approach to development planning. In addition to exacerbating the damage caused by natural disasters, unplanned socio-economic development posed an unnecessary risk to public health and sensitive ecosystems. To be successful, sustainable development policies had to be based on a strong scientific approach and make use of proven technologies. Information was provided on the remote sensing capabilities of Turkey.

26. A panel discussion was held on the second day of the Workshop, in which it was noted that in transferring scientific knowledge to decision makers, scientists should make a serious attempt to gain a clear understanding of societal needs. It was suggested that multidisciplinary working groups be established to focus on increasing the use of satellite observations for development planning. Effective coordination between working groups was considered essential. It was also suggested that working groups should focus on how to translate scientific knowledge into applications.

27. In the third session, also on remote sensing applications, participants were informed about the importance of remote sensing (Earth observation) data in disaster management before, during and after disasters. It was emphasized that convincing decision makers was critical for making positive changes in disaster management.

28. Presentations were made on modelling systems used to make predictions before disasters took place, such as models for dust storm predictions and earthquake and tsunami early warning systems. Presentations were made on monitoring systems used during disasters, such as floods, earthquakes, drought and forest fires, as well as for the monitoring of desertification. An overview was given of the activities conducted under the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters (also called the International Charter on Space and Major Disasters) and the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER), which were global disaster management and emergency response initiatives.

29. Information was provided on complex models used to predict the effects of urbanization, climate and environmental phenomena on quality of life, and participants learned how to benefit from the use of such models. It was noted that many countries had made progress in earthquake research using remote sensing technologies.

## C. Global navigation satellite system applications and satellite communications

30. In the fourth session, on GNSS applications and satellite communications, information was provided on the various areas, such as agriculture, disaster relief and emergency services, in which GNSS technology had become a standard tool. Participants were informed that countries using their own GNSS technology might wish to actively support the deliberations of the International Committee on Global Navigation Satellite Systems (ICG) Working Group on Compatibility and Interoperability.

## D. Recent developments in space science and technology

31. In the fifth session, participants were informed about recent developments and future directions in space science and technology. It was emphasized that increasing public awareness through the education of youth and teachers was important for future development of space technology.

## E. Regional and international cooperation

32. In the last session, participants were informed about several initiatives in regional and international cooperation in the area of space technology. Several presentations provided detailed information on space activities of different countries, with an emphasis on regional and international cooperation. The capabilities of not only government agencies but also the industrial sector, as well as cooperation between those two sectors were key topics. The presentations drew attention to the variety of forms of ongoing international collaboration and to the need to further enhance such collaboration, and focused on problems shared by different countries.

# III. Conclusions

33. The Workshop provided an opportunity for scientists and engineers from various countries engaged in the use of space technology for the benefit of their communities to share their experiences and explore opportunities for collaborative research and application studies. While modelling systems played a central role in regulatory planning decisions throughout the industrialized world, their use in developing countries was limited, partly due to the unavailability of scientifically credible data and observations. Remotely sensed data from satellite and airborne platforms could provide the information required for modelling systems. Use of those remotely sensed observations and computer models could substantially enhance the ability of communities and countries to embark on a more sustainable path to economic development, substantially reducing the costs of inadequate planning.

34. Participants proposed the establishment of a number of inter-organizational working groups to facilitate the identification of specific application approaches and studies in all regions that demonstrate the integration of space science and

technology into support decision-making related to societal benefits. The following seven thematic areas were identified for use as working group themes: urbanization and transportation; water resources and agriculture; air pollution and energy; disaster management; natural resource management; extraterrestrial exploration; and positioning, navigation and timing. In addition, seven cross-cutting sub-themes were identified: weather and climate; health; uncertainty and risk assessment; economic valuation; education, outreach and communication; international space law; and satellite development. A number of individuals and organizations volunteered to chair or co-chair those working groups.

35. It was agreed that in the months following the Workshop, the chairs of working groups would solicit information from the space community and decision makers regarding development challenges facing communities worldwide and specific application approaches integrating the use of space science and technology to support decision-making for societal benefits. The Office for Outer Space Affairs would disseminate that information to Member States seeking to participate in further workshops, either as developers of the scientific approach, or as practitioners or potential beneficiaries of a proposed activity. Case studies highlighting the multiple scientific and engineering approaches employed in various parts of the world would be discussed in greater detail during future sessions of working groups.

36. Participants recommended that the Scientific and Technological Research Council of Turkey and the Office for Outer Space Affairs further develop the website of the Workshop, which was vital for disseminating information on the Workshop.

37. Participants also recognized the need for additional workshops and training courses to build upon the results of the Workshop.

38. The following member States expressed an interest in hosting future workshops on the socio-economic benefits of space technology: China, Egypt, Indonesia and Viet Nam.

39. Participants expressed their appreciation to the Scientific and Technological Research Council of Turkey for its hospitality and organization of the Workshop.

40. Participants also expressed their appreciation for the significant support provided by the co-sponsors Government of Turkey, Office for Outer Space Affairs and the European Space Agency; and the co-organizers ISPRS and NASA.

## A. Working group on health

41. The working group on health established at the Workshop focused on applications of remote sensing and other Earth observation technologies used to understand how natural environments contribute to or trigger the spread of human diseases. One area of interest was the identification of Earth observation data that could be used to improve models and enhance surveillance systems, tools to support decision-making and early warning systems. The working group would reach out to colleagues in the scientific and engineering communities, as well as to health-care and well-being communities of practice. The mission of the working group was to be supported by companion working groups of ISPRS, the International Council for

Science, the International Union of Geological Sciences, the Group on Earth Observations and other entities as identified.

42. The working group on health formulated the following tasks under its terms of reference:

(a) Integrate Earth observations products with enhanced predictive modelling capabilities for early warning and the surveillance of environmental factors that have an impact on human health, in cooperation with other national, regional and international organizations and activities;

(b) Build leadership or collaborative roles in appropriate global health initiatives relevant to the programmes and objectives of the Office for Outer Space Affairs;

(c) Develop a register of human health projects and products using Earth observation technologies;

(d) Link Earth observation technologies with human health communities, including health professionals, by organizing technical sessions, workshops and symposiums at appropriate venues.

## B. Working group on water resources and agriculture

43. The working group on water resources and agriculture made several recommendations, as summarized below. The working group would focus on the implementation of these recommendations and seek to enhance cooperation and the exchange of information on use of space technology applications for water resource management and agriculture.

44. The working group recommended building expertise. The number of satellite-based data sets that could be used in water resource management was rapidly increasing. The most important factor in utilization of these data sources was the building of expertise in developing countries. This can be done only through education, active involvement and collaboration. Regional centres, such as the regional centres for space science and technology education, affiliated to the United Nations, were excellent resources in that regard. Additionally, availability of graduate-degree fellowships for students in developing countries and the encouragement and funding of international collaboration efforts and workshops were highly beneficial. Through that approach, hydrologists using satellite-based products would be made aware of the advantages and limitations of those products.

45. The working group also recommended that studies should be conducted to test the utility of satellite-based water resources applications. That can be done through the regional application of those products in hydrological studies. Methods were required that optimally merged and corrected satellite-based estimates using other data sources, assimilated those data sets into models to improve simulation and prediction of performance and that focused on issues of scale (downscaling and upscaling) to match the scale of those data sets with the scales required for hydrological studies.

46. The working group emphasized that near-real-time availability of satellite-based products was critical for timely warning and mitigation of natural and

man-made hazards, such as floods and landslides. Therefore, algorithms and web interfaces should be developed to minimize the latency of these products.

47. The working group stressed that quantification of the uncertainty in satellite-based products would be beneficial for end-users.

## C. Working group on education, outreach and communications

48. The working group on education, outreach and communications underlined the importance of education and recommended that educational programmes should be organized to foment curiosity about space, develop knowledge about space, encourage students to do research and make them aware of the important contribution that space technologies make to daily life. Such programmes should be adapted for different age groups, especially for primary school students. Young students would develop a positive attitude towards space if they were introduced to the subject at an early age.

## D. Working group on extraterrestrial exploration

49. The working group on extraterrestrial exploration considered research on settlements on the Moon, Mars and other celestial bodies. Research on design, construction, management and maintenance of those settlements was an open-ended area with infinite possibilities and with potential products of significant importance that would be helpful to humankind. For example, an automated construction technique to be developed for lunar applications would also be useful on Earth and could completely change conventional construction methods. The working group stressed that research done in those areas would significantly improve the quality of life on Earth and lead to the creation of many new products and processes. The working group noted that such research should be supported by international organizations aimed at promoting the peaceful use of outer space and a more developed world that had smaller discrepancies between countries and peoples.

## E. Working group on urbanization and transportation

50. The working group on urbanization and transportation discussed the main topics and objectives of the integration of space technology into urbanization processes, as space technology had direct applications vis-à-vis urbanization issues. Those issues can be grouped under the categories of demographic, social, economic, environmental, political, administrative, physical and technical-technological issues. For a more practical approach, the above-mentioned issues relating to urbanization could also be categorized as belonging to three levels: the macro-, meso- and microlevels. The urbanization issues at the macrolevel include overall urban policies, strategies for urban development, the main decisions on urban management, administration and economic aspects and legislation and regulatory decisions relative to the above-mentioned issues. Issues at the meso-level were the main urban functions, such as housing, transportation, commerce, health, education, tourism, industry, history and archaeology, social and technical infrastructure, green and recreational facilities; urban problems related to risks, safety, the side effects

(unexpected or negative) of development strategies; spatial plans, urban management and development plans and programmes as well as administrative organizations and working programmes. Issues at the microlevel were citizen-level dynamics and decisions; urban assets such as buildings, urban furniture, services and utilities; neighbourhood living standards and styles; citizen interest in urban solidarity, safety, community culture, the aesthetic development of the physical environment and property rights.

51. Remote sensing tools and methods could be used in monitoring, data collection, the analysis of existing conditions, modelling and future appraisals for urbanization and transportation. The following actors and entities at the three levels described above could make use of relevant space technologies:

(a) At the macrolevel: urban policymakers and administrative officers of the central Government or decision makers in the upper level of the local government;

(b) At the meso-level: mayors, district mayors, decision makers of local authorities, chambers of related business groups, trade associations, academics and scientific researchers and non-governmental organizations whose work related to urban settlements;

(c) At the microlevel: citizens, relevant technical professionals such as architects, landscape architects, engineers, public and private construction institutions, insurance companies, quality control bodies and community-level non-governmental organizations.

## F. Working group on international space law

52. The main aim of the working group on international space law was to increase awareness of space law within the space community and address legal issues that might hinder the integration of advanced space technologies into the current international legal framework. The working group believed that efficient legal solutions should be sought through a multidisciplinary approach and thus gave particular importance to communication and cooperation with other working groups. Legal issues concerning space community might relate to a wide range of space technologies, from satellite-based applications to extraterrestrial exploration and human space flight. In that regard, the working group would gather information from the space community to identify and focus on the legal issues that required immediate attention. In order to find solutions, the working group would analyse related legal instruments and consult legal experts in the field of space law. Working in that way, the working group aspired to contribute to the development of an adequate international legal framework for space applications.