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Committee on the Peaceful Uses of Outer Space

Report on the United Nations/International Astronautical Federation Workshop on Space: an Integral Part of Sustainable Development

(Enschede, the Netherlands, 30 September–3 October 1999)

Contents

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I. Introduction

A. Background and objectives

1. The General Assembly, in its resolution 37/90 of 10 December 1982, decided that, in accordance with the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space,[1] the United Nations Programme on Space Applications should assist the developing countries in establishing an autonomous technological base for the development and use of space technology by promoting the growth of indigenous capabilities. The Committee on the Peaceful Uses of Outer Space, at its forty-first session, held in June 1998, endorsed the programme of workshops, training courses and seminars proposed for 1999 by the Expert on Space Applications.[2] The General Assembly, in its resolution 53/45 of 3 December 1998, endorsed the United Nations Programme on Space Applications for 1999.

2. The present report contains a summary of the presentations and discussions of the United Nations/International Astronautical Federation Workshop on Space: An Integral Part of Sustainable Development. The Workshop was organized as part of the 1999 activities of the Office for Outer Space Affairs of the Secretariat under the United Nations Programme on Space Applications. The Workshop was co-sponsored by the European Space Agency (ESA), the Centre national d'études spatiales (CNES) of France, Station 12® (the Netherlands) and the International Astronautical Federation (IAF). It was the ninth workshop in this series, and was held in Enschede, the Netherlands, in conjunction with the fiftieth Congress of IAF held in Amsterdam. Organizational and programme support was provided locally by the International Institute for Aerospace Survey and Earth Sciences (ITC).

3. Presentations at the eight previous United Nations/IAF workshops held from 1991 to 1998 in Australia, Austria, Canada, China, Israel, Italy, Norway and the United States of America have demonstrated that space technology can provide essential information and decision-making criteria in support of sustainable development. Data acquired by Earth observation satellites can be used for a broad range of applications, including natural resources management, environmental monitoring, and disaster warning and mitigation. Telecommunication satellites link rural and remote areas to the global telecommunications infrastructure, a pre-condition for sound economic, social and cultural development in the information age. They contribute to enable developing countries to quickly catch up with the industrialized nations and to become equal partners in economic and social development activities.

4. Over the past few years certain issues have been identified that require special attention in order to ensure the successful implementation of space technology, especially in countries with little prior experience in space technology applications. One major issue is the funding of pilot projects and the operational projects resulting from such pilot projects. The high degree of specialization and discipline-specific isolation of experts on space technology applications within their own fields in some countries may prevent them from cooperating in interdisciplinary projects and therefore may also be a barrier for the implementation of space technology applications to support and enhance existing development projects. One result is the lack of convincing cost-benefit studies that would encourage potential investor organizations to support the operational use of space technology applications by providing funds.

5. It has been recognized that implementing institutions should make efforts to convince decision makers of the benefits of space technology in order to gain the political and financial support needed for establishing an infrastructure and for educating and training a skilled user-base to secure the continuity and maintenance of operational systems. Many implementing institutions, however, are headed by scientists and technology specialists who excel in developing new methods for extracting information from remote sensing imagery but who often lack the experience to approach and lobby with decision makers.

6. National policy plans supported by policy makers and decision makers and the efficient coordination between space technology and user organizations are necessary to overcome existing political, institutional and operational constraints. Operational constraints relating to, for example, availability, accessibility, affordability, autonomy and timeliness issues have been repeatedly reported as being factors that inhibit operational use.

7. The Workshop addressed those issues and discussed how the use of space technologies could become part of an agenda for sustainable development. Special sessions and working group meetings focused on the funding of space-assisted development projects and on space technology applications for water resources management and forestry. The Workshop also allowed experts in space technology applications, policy makers, decision makers and representatives of space industries from developing and

industrialized countries to exchange experience in using space techniques for development purposes. The Workshop therefore provided a forum to discuss opportunities for increased regional or international cooperation among developing countries or between developing and industrialized countries.

8. The participants were fully briefed about the objectives and outcome of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), which was held in Vienna from 19 to 30 July 1999. Possible follow-up activities in line with the recommendations of UNISPACE III, as summarized in The Space Millennium: Vienna Declaration on Space and Human Development,[3] were discussed.

9. The present report covers the background and the objectives of the Workshop as well as the presentations made, the discussions held and the observations made and conclusions reached by the participants. It has been prepared for consideration by the Committee on the Peaceful Uses of Outer Space at its forty-third session and by its Scientific and Technical Subcommittee at its thirty-seventh session in 2000. The participants will report to the appropriate authorities in their own countries. The proceedings of the workshop, including a detailed address list of all participants, will be made available through the Office in due course.

B. Programme of the Workshop

10. During the course of the Workshop, successful examples of the use of space technology in applications for water resources and forestry management were presented. The Workshop was structured around seven sessions, in which 25 invited papers were presented. There was an extensive exchange of information, comments, recommendations and suggestions. In addition, 15 presentations by participants from developing countries provided an insight into the status of space technology applications in their respective countries.

11. A special panel was established, prior to the Workshop, to review the papers that would be presented and prepare draft recommendations of the Workshop for consideration by the participants. The review panel included senior space experts from the Kuala Lumpur Regional Centre for Forest Management of Malaysia, the Department of Forest Research and Survey of Nepal, the International Water Management Institute (IWMI), with headquarters in Sri Lanka, and the National Remote Sensing Center of the Sudan. The work of the panel was guided by an expert from the Food and Agricultural Organization of the United Nations (FAO). The afternoon sessions concluded with presentations by the review panel, followed by an open exchange of views.

12. National and transnational space projects and programmes were discussed, and possibilities were suggested for increased scientific and technical cooperation between developed and developing countries, as well as among the developing countries themselves.

13. Representatives of ITC and the National Aerospace Laboratory (NLR) of the Netherlands provided extensive organizational and programme support.

C. Participants

14. The United Nations, on behalf of the co-sponsors, invited developing countries to nominate candidates for participation in the Workshop. Selected participants were required to have university degrees in remote sensing, communications, engineering, physics, biological or medical sciences and preferably be involved in projects related to water and forestry resources management. In addition, participants were selected on the basis of their working experience in programmes, projects or enterprises in which space technology is or could be used. The participation of specialists at a decision-making level from both national and international entities was specifically encouraged.

15. Funds allocated by the Government of the Netherlands, the United Nations, ESA, CNES, Station 12® and IAF for the organization of the Workshop were used to cover international air travel and per diem expenses of 32 speakers and participants from developing countries. The co-sponsors also covered the cost of registration fees for participants from developing countries to participate in the fiftieth IAF Congress, which was opened immediately following the United Nations/IAF Workshop, thus enabling the participants to engage in discussions with their colleagues in one of the more important international space events.

16. The Workshop was attended by close to 100 individuals, including participants from Austria, Belgium, Brazil, China, Egypt, France, Ghana, India, Indonesia, Iran (Islamic Republic of), Italy, Japan, Kenya, Malaysia, Mongolia, Morocco, Nepal, the Netherlands,

Nigeria, Pakistan, Sri Lanka, the Sudan, the Syrian Arab Republic, Thailand, Turkey, the United Kingdom of Great Britain and Northern Ireland, the United Republic of Tanzania, the United States of America and Uzbekistan.

17. Presentations were made by representatives of the Office for Outer Space Affairs, the European Organization for Exploitation of Meteorological Satellites (EUMETSAT) on behalf of the Committee on Earth Observation Satellites (CEOS), the Arthur C. Clarke Institute of Modern Technologies of Sri Lanka, NLR, the Space and Upper Atmosphere Research Commission (SUPARCO) of Pakistan, the National Institute for Space Research (INPE) of Brazil, the Royal Centre for Remote Sensing (CRTS) of Morocco, the Indian Space Research Organization (ISRO), the National Aeronautics and Space Administration (NASA) of the United States, WMI, FAO, the African Development Bank (ADB), the World Bank, the Forest Survey of India, the General Organization of Remote Sensing (GORS) of the Syrian Arab Republic, the National Remote Sensing Agency (NRSA) of India, the Ministry of Hydrological and Electric Power of China, ITC, the Ministry of Soil Conservation of Nepal, the Tanzania Natural Resources Information Centre, and the Indonesian Space Agency (LAPAN).

18. Presentations were also made by representatives from private industry, including the following: ARGOS/CLS (France), Station 12® (the Netherlands), BRAZSAT (Brazil), Surrey Satellite Technology Ltd. (United Kingdom).

II. Observations based on the presentations and recommended actions

19. The Workshop focused on the themes "forest resources management" and "water resources management" and concentrated on defining impediments that affected the use of space technology for sustainable development and on proposing solutions. The discussions of the Workshop sessions were continuously reviewed by the review panel (see paragraph 12). Presentations by the World Bank and the African Development Bank, raised participants' awareness of possibilities for the funding of space applications projects.

20. The participants formulated the results of the Workshop, based on a questionnaire that was derived from the technical and country presentations, the sessions of the review panel and informal discussions. The observations and recommendations contained in the written responses are presented below.

21. There is, depending on the development status of a country, a real and substantial need for capacity building in the form of strengthening institutions, developing technological infrastructure and providing continuous education and training through national and international donor support. Networking among centres of excellence, universities and government institutions were considered essential for addressing this need.

22. Government, private sector and public awareness about the values of supporting economic and social developments using space technology need to be raised on a continuous basis.

23. Remote sensing, geographic information systems (GIS) and global positioning systems (GPS) applications need to be developed through a problem-oriented, multidisciplinary approach, based on the operational user requirements and actively involving the end-user throughout the development process. In the development process, emphasis should be on problem solving rather than marketing the tools available to solve these very problems.

24. Access to and exchange of remote sensing data and related information technology should be facilitated through international support and by national priority setting, through appropriate policies, possibly using technical cooperation among developing countries (TCDC) concepts.

25. An internationally coordinated information network and repository should be developed, using Internet technology. It should contain information on ongoing and planned projects, lists of experts, demonstrations of successful applications in different theme areas, contact addresses of value-adding companies, activities of organizations and specialized agencies of the United Nations and the Consultative Group on International Agricultural Research (CGIAR) centres, funding possibilities for education and training as well as relevant public domain software (e.g. GIS packages).

26. By integrating projects into a programme, their sustainability, maintainability and funding will be strengthened.

27. In addition to the technical conclusions, it was recommended that the United Nations/IAF series of workshops should be used as an important instrument in implementing the recommendations of UNISPACE III. The

planning of workshops should be a more continuous process, with the active involvement of all key players, and be undertaken on a more solid funding base.

A. Recommended actions

28. The United Nations Office for Outer Space Affairs, in the context of the follow up to UNISPACE III and in consultation with the relevant bodies and specialized agencies of the United Nations system and the CGIAR centres, should promote the further development of a comprehensive, Internet-based information repository with an open network structure to include the type of information described in paragraph 25 above. The information repository should take into account existing information systems such as the Locator Information System (CILS) of the Committee on Earth Observation Satellites (CEOS). Throughout the promotion process, the information repository should be brought to the attention of developing countries in order that they might benefit from its use and contribute to its enrichment by including their national experiences. A report on the follow-up to the present recommendation should be presented to the UnitedNations/IAF Workshop to be held in Brazil in 2000.

29. Emphasis on education and training and the raising of awareness should be placed in future workshops and other activities organized by the United Nations.

B. Recommended actions for future United Nations/IAF Workshops

30. Workshops should be planned and executed as a project, including, among other things, the establishment of timelines, key decision points and events, assignment of responsibilities and funding commitments. It was particularly important to carry out focused and coordinated actions in order to establish a more solid funding base.

31. The early and continuous involvement of organizations in the host country should be ensured.

32. The formulation and development of programmes of workshops should be coordinated among agencies involved.

III. Presentations and discussions

33. The Workshop was opened with welcoming statements by the representative of the United Nations, the President of IAF and representatives from ITC, ESA, CNES, the Committee for the Liaison of Industrialized Organizations with Developing Nations (CLIODN) and the Government of the Netherlands.

34. In the first keynote address on “Space technology applications enabling sustainable development— applications for disaster warning, food security and resources management”, a representative of the Institute of Remote Sensing Applications of the Chinese Academy of Sciences introduced the theme of the Workshop. The representative noted that sustainable development was possible only under the condition that sufficient information was available for decision-making. Space systems could form a central and integral part of an economically viable and realistic information system needed for sustainable development.

35. In the second keynote address, a representative of EUMETSAT, on behalf of CEOS described the status of the Integrated Global Observing Strategy (IGOS).

A. Need for space-acquired information in support of sustainable development

36. The representative of the United Nations Office for Outer Space Affairs introduced the United Nations Programme on Space Applications and a summary of the UNISPACE III recommendations related to the management of natural resources. The recommendations resulting from the UNISPACE III conference could enhance international cooperation in improving and coordinating the application of space-acquired information, provided that the commitments made were supported by sufficient resources.

37. The representative of IWMI stressed the important role of Earth observation satellites, indicating that the management of natural resources required specific measurements of relevant parameters in order to give a clear picture of the overall situation on the ground. Remote sensing was a powerful tool for that purpose. In order to strengthen the implementation of the use of remote sensing in development projects, however, it was necessary to convince key decision makers, link space applications with

those development projects, take into account capacity-building components and demonstrate that reliable accuracy was achievable.

38. A concept for forest management, the Forest Assessment and Monitoring Environment (FAME) initiative for the realization of a global end-to-end service to allow the monitoring of forests at national and subnational levels, was presented by a representative of NLR. The concept took into account the lessons learned from previous pre-operational remote sensing projects.

B. Financing for implementation of the operational use of space technologies

39. One of the main obstacles in using space technology applications was the change from proving a concept to using an application, which often required a different perspective with regard to the user group, the project size and the funding resources. While space agencies like ESA could assist with pre-operational and demonstration projects, they had no mandate to support and sustain the operational use of space applications. Funds for such initiatives could be obtained as loans from various international organizations, but the funds would eventually have to be returned.

40. One such possible organization was the African Development Bank, which was established in 1963 to promote economic development in Africa. The Bank had 77 members, 23 of them outside Africa, and administered a capital of $31.5 billion. The main task was to support projects which aim to reduce poverty. Priority was therefore given to applications in agriculture, the development of human resources and the private sector.

41. The Bank did not directly fund research projects, but would fund remote sensing applications if they were part of other projects meeting the Bank's funding criteria. Pilot projects had been funded in the past. The bank published a monthly list of projects eligible for funding. In theory, remote sensing consultants could utilize this information to offer their services to those projects. One application of remote sensing would be to support environmental impact analyses of a project. Such an impact analysis was a mandatory part of the Bank's evaluation process, and the Bank therefore had a whole branch devoted to it. It had not, however, developed any in-house remote sensing capabilities.

42. The presentation of the World Bank focused on the spending priorities of the world. The World Bank recognized the benefits of space applications to society and had funded several projects in the past. Examples included a number of case studies in India, for example, the assessment of soils for increasing agricultural productivity and various disaster management support services. Within the World Bank itself, remote sensing and GIS technologies were being used, mainly for environmental assessment studies.

C. Health, communication and navigation and location systems

43. Presentations focused on new trends and applications of space technology in the health, communication and navigation and location systems. A NASA representative discussed how remote sensing technology could be used for health applications. As with other remote sensing applications, the challenge was to transfer the tools into the hands of the users and to sustain the activities. Once it had been proved that an application could provide solutions, the user community needed to step forward to take over the day-to-day operations. It was therefore necessary to include the user community from the start of the project.

44. A representative of Station 12®, a commercial telecommunications applications provider, gave an overview of the current state of the art of personal mobile satellite communications systems. Driven by the competition in the field, prices for such applications had decreased considerably over the last few years, making them affordable for developing countries.

D. Institutional capacity building and human resources development

45. The session featured a presentation analysing the problems encountered in institutional capacity building for the use of remote sensing in India; a report on the results of the first national conference on space applications in Sri Lanka, which was aimed at preparing a national plan for applications of space technology; and a presentation on the challenges and opportunities for developing countries in using space technology for sustainable development in the post-UNISPACE III era.

E. Working group discussions on water resources management

46. Presentations at the session on water resources management were split into two parts, one covering global water issues, challenges and the role of remote sensing, and the other covering national and regional approaches to using remote sensing for water resource applications.

47. A representative of NRSA reported on the achievements in implementing the use of remote sensing in water resources management in India and on actions that were being taken to further integrate the applications with existing institutional frameworks. How remote sensing technology could be transferred from water resources research to management was also discussed by an ITC representative. Other presentations focused on operational flood monitoring in Bangladesh using low-cost radar receiving facilities; the role of remote sensing in solving hydrological problems in China; the use of Landsat and NOAA imagery to create an evapotranspiration map for semi-arid areas in Botswana; and the description of a user interface for data and image management for the use of space techniques as a tool in the integrated management of river basin water resources.

F. Working group discussions on sustainable forest management

48. Presentations and discussions in the working group on sustainable forest management focused, on the one hand, on global forestry issues and, on the other, on national and regional approaches to using remote sensing for forestry management. Applications of forestry management in Nepal, the Amazon region and Indonesia were discussed, as well as capacity-building programmes, for example, the FAME initiative of FAO and the Government of the Netherlands. The session highlighted the need to use remote sensing as a tool for forest management purposes.

G. The way forward: recommendations and follow-up

49. The recommendations of the Workshop are presented in chapter II, above. They were based on the contributions made by the participants and the input provided by the review panel. Follow-up activities would be carried out throughout the year 2000, possibly though inter-agency coordination and with the participation of interested space-related institutions.

Notes

[1] See *Report of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 9-21 August 1982* (A/CONF.101/10 and Corr.1 and 2), part one, para. 430.

[2] *Official Records of the General Assembly, Fifty-third Session, Supplement No. 20* (A/53/20), para. 51.

[3] *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (A/CONF.184/6), chap.I, resolution 1.