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Report on the United Nations/Morocco/European Space Agency International Workshop on the Use of Space Technology for Sustainable Development

(Rabat, 25-27 April 2007)

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I. Introduction

A. Background and objectives

1. At the World Summit on Sustainable Development, held in Johannesburg, South Africa, from 26 August to 4 September 2002,¹ Heads of State and Government reaffirmed their strong commitment to the full implementation of Agenda 21,² which had been adopted at the United Nations Conference on Environment and Development, held in Rio de Janeiro, Brazil, from 3 to 14 June 1992. They also committed themselves to achieving the internationally agreed development goals, including those contained in the United Nations Millennium Declaration (General Assembly resolution 55/2 of 8 September 2000). The Summit adopted the Johannesburg Declaration on Sustainable Development³ and the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation).⁴

2. In its resolution 54/68 of 6 December 1999, the General Assembly endorsed the resolution entitled “The Space Millennium: Vienna Declaration on Space and Human Development”,⁵ which had been adopted by the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), held in Vienna from 19 to 30 July 1999. UNISPACE III had formulated the Vienna Declaration as a nucleus of a strategy to address future global challenges using space applications. In particular, the Vienna Declaration noted the benefits and applications of space technologies in addressing the challenges to sustainable development, as well as the effectiveness of space instruments for dealing with the challenges posed by the depletion of natural resources, loss of biodiversity and the effects of natural and anthropogenic disasters.

3. The implementation of the recommendations contained in the Vienna Declaration supports the actions called for in the Johannesburg Plan of Implementation to strengthen the capacities of Member States, in particular of developing countries, in order to improve the management of natural resources by increasing and facilitating the use of remote sensing data, and increasing access to more affordable satellite imagery.

4. At its forty-ninth session, in 2006, the Committee on the Peaceful Uses of Outer Space endorsed the schedule of workshops, training courses, symposiums and conferences of the Programme on Space Applications for 2007.⁶ Subsequently, the

¹ *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).

² *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I: *Resolutions adopted by the Conference*, resolution 1, annex II.

³ *Report of the World Summit on Sustainable Development*, chap. I, resolution 1, annex.

⁴ *Ibid.*, chap. I, resolution 2, annex.

⁵ *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.

⁶ *Official Records of the General Assembly, Sixty-first Session, Supplement No. 20 (A/61/20)*, para. 87.

General Assembly, in its resolution 61/111 of 14 December 2006, endorsed the schedule of activities of the Programme on Space Applications for 2007.

5. Pursuant to General Assembly resolution 61/111, the United Nations/Morocco/European Space Agency International Workshop on the Use of Space Technology for Sustainable Development was held in Rabat from 25 to 27 April 2007. The Royal Centre for Remote Sensing hosted the Workshop on behalf of the Government of Morocco. The Workshop was co-sponsored by the European Space Agency (ESA).

6. The Workshop built upon the work carried out by the Office for Outer Space Affairs of the Secretariat in the framework of the United Nations Programme on Space Applications.

7. The Workshop was organized to demonstrate the use of space technology for enhancing the management of coastal and marine ecosystems, water resources and land use and to bring together a panel of experts to focus on specific aspects of space technology that could be applied to those areas. The objectives of the Workshop were (a) to increase awareness among managers and policymakers and decision makers about the potential benefits of applying space technology to environmental monitoring and management; (b) to strengthen information and data-exchange networks on the use of Earth Observation data; and (c) to develop national, regional or international pilot projects using space technology to support sustainable development in Africa.

8. The present report describes the background and objectives of the Workshop and provides a summary of the presentations and observations made by the participants. It was prepared for submission to the Committee on the Peaceful Uses of Outer Space at its fifty-first session and to its Scientific and Technical Subcommittee at its forty-fifth session, both to be held in 2008.

B. Programme

9. At the opening of the Workshop, introductory and welcoming statements were made by the Director of the Royal Centre for Remote Sensing on behalf of the Government of Morocco and by representatives of ESA and the Office for Outer Space Affairs.

10. The programme of the Workshop included six sessions, at which presentations were given on the following: (a) the status of ongoing international initiatives involving the use of space technology for sustainable development in Africa; (b) the use of space technology applications in the management of coastal and marine ecosystems; (c) the use of space technologies in water resources management; (d) the use of space technologies in land-use management for agricultural development and forests and the prediction of natural disasters and the impacts of climate change; (e) case studies on the successful application of space technologies to enhance the management of water resources and rational land use; and (f) capacity-building in space technologies. A further two sessions provided opportunities for participants to discuss issues concerning regional and international cooperative mechanisms and resources for implementing projects.

11. During the three days of the Workshop invited speakers from both developing and industrialized countries delivered a total of 38 presentations, which focused on national, regional and international projects and initiatives involving the use of space technology applications for improved management of water resources and land use and the contribution of space technology to sustainable development programmes in African countries.

C. Attendance

12. A total of 91 participants from Argentina, Belgium, Benin, Burkina Faso, Côte d'Ivoire, Egypt, Ethiopia, France, Gambia, Germany, India, Italy, Jordan, Kenya, Morocco, Lebanon, Liberia, the Libyan Arab Jamahiriya, the Netherlands, Nigeria, Senegal, South Africa, Sri Lanka, Sudan, Turkey, Uganda, the United Kingdom of Great Britain and Northern Ireland, the United States of America and Zimbabwe attended the Workshop. The Office for Outer Space Affairs and ESA were also represented.

13. Funds provided by the United Nations, the Government of Morocco and ESA were used to defray the costs of air travel, daily subsistence allowance and accommodation for 16 participants from developing countries.

II. Summary of presentations

14. At the presentation sessions, participants learned how space technology could be used for sustainable development in Africa and heard about success stories and potential applications. The discussion sessions that followed focused on current trends, recent innovative developments and initiatives and institutional aspects requiring further consideration.

15. Further information on the Workshop programme, background materials and presentations is available from the website of the Office for Outer Space Affairs (<http://www.unoosa.org>).

16. The presentations on international initiatives involving the use of space technology for sustainable development in Africa highlighted the status of various programmes and projects employing geospatial data. Participants were informed of the wide availability of remotely sensed images with various spatial, spectral and temporal resolutions. The Office for Outer Space Affairs gave a presentation on the distribution and use of global satellite (Land Remote Sensing Satellite (Landsat)) datasets for sustainable development in Africa. Participants learned how to obtain free Landsat images via the Internet, particularly through the African regional centres for space science and technology education, affiliated to the United Nations, located in Morocco and Nigeria.

17. The Italian Space Agency gave a presentation on its space research programme in Kenya, which provided examples of the use of medium- and high-resolution satellite images to monitor vegetation coverage, forecast crop yields, manage water resources and sustainably exploit the marine ecosystem. Participants learned that the aim of the Terrestrial Initiative in Global Environmental Research (TIGER) an initiative of ESA, as the follow-up programme to the World Summit on Sustainable

Development of the Committee on Earth Observation Satellites (CEOS), was to develop sustainable Earth observation services for integrated water resources management in developing countries, with a particular focus on Africa. It was shown that geospatial data were being used to support decision-making for ground- and surface-water modelling and could provide early warning of floods and soil erosion. Participants were given an overview of current and future developments in applications of global navigation satellite systems for environmental sustainability, including status updates on the Global Positioning System of the United States. Participants were also shown some of the daily satellite images provided by the Disaster Monitoring Constellation, which provide a means of mapping the extent of disaster areas and monitoring fast-changing floods and fires.

18. The presentations on the use of space technology applications in the management of coastal and marine ecosystems demonstrated that remote sensing techniques were essential for assessing the intensity and magnitude of changes occurring in coastal and marine areas. The presentations highlighted current best practices in using Earth observation tools for environmental protection and the management of ecological zones. Participants were given an overview of a research project aimed at reducing the degradation of the coastal and marine environment, which was being carried out at the southern tip of Argentina on the Atlantic coast. The project was designed to study temporal changes in marine macrophytes (aquatic plants) and included the updating of marine maps using satellite imagery from Landsat and Synthetic Aperture Radar (RADARSAT) satellites. The objectives and results of that project were reviewed.

19. A project to develop tools and operational systems for the management of aquacole areas along the Moroccan coast was outlined. Participants learned that a combination of satellite data and in situ measurements integrated into a geographic information system (GIS) should enable aquaculture management and the delimitation of optimal zones for the installation of aquacole farms. The contribution of remote sensing to monitoring the upwelling along the Moroccan coast was described, as was the use of space techniques to analyse the risk to the northern Nile delta coastal zone of rises in sea level and to produce a land-use/land-cover map of the Mediterranean coastal zone.

20. The presentations on the use of space technologies in integrated water resources management demonstrated that water resources management could benefit from the use of spatial information on existing water resources and catchment hydrology. Topography, vegetation and soil moisture were identified as key parameters for water resources management. In particular, the need to integrate remote sensing data into hydrological systems was emphasized, coupled with the use of cartography, field monitoring and modelling, which was essential for the implementation of an early warning system. The use of a geo-referenced database for the Souss-Massa basin in Morocco, utilizing GIS, was demonstrated. The implementation of flood plain/wetland mapping for environmental flow assessment in Ghana was also reviewed.

21. The achievements of and plans for the Euro-Mediterranean Water Information System on Know-how in the Water Sector (EMWIS) were presented. EMWIS is an initiative of the Euro-Mediterranean Partnership that provides a strategic tool for exchanging information on institutions, training, research and documentation. The

Mediterranean Water Information Partnership, a regional water observation mechanism, would contribute to effective water resources management in the Mediterranean, would support the countries in the development of their information systems (such as a metadata catalogue of data sources and Web-mapping) and would demonstrate the potential of space technologies.

22. The presentations on the use of space technologies in land-use management for agricultural development and forests and the prediction of natural disasters and the impacts of climate change highlighted the need for continued environmental monitoring, forest species studies, and regional and national biodiversity modelling and analysis. The presentations demonstrated the successful use of remote sensing data in assessing desertification and deforestation through the development of land-use/land-cover maps, developing forest-fire-vulnerability indicators, generating information for forest-fire management and rehabilitation, and mapping disasters. It was shown that space technology had been used effectively in the region, although improved access to Earth observation data was needed. The presentations highlighted the potential of geo-information and space-based technologies for contributing to humanitarian assistance and to land-use management.

23. The presentations on case studies gave participants an additional opportunity to share their experiences in the use of existing space technology for various applications. Presentations were made on the use of remote sensing and GIS for hazard mitigation in Lebanon, satellite information applications in agriculture in Senegal and Uganda, the use of satellite data for the sustainable management of tea plantations in Sri Lanka, and the use of Landsat satellite imagery for an urban growth model in Turkey. Of particular interest was a presentation on projects in Africa using data from different sensors to manage flood plains and reduce erosion risk, to study the implementation of dams, and to route high-speed railway lines. It was stressed that such data were particularly useful when combined with ground-based data and information, and when integrated into GIS so that complex scenarios could be modelled and analysed.

24. The final session on capacity-building in space technologies highlighted the importance of organizing appropriate education, training and public awareness activities to address the benefits and limitations of space technologies and to develop the necessary knowledge to handle and use satellite imagery and geo-positioning for environmental monitoring and management. The African Regional Centre for Space Science and Technology—in French Language contributed a presentation on educational opportunities in space applications. Participants learned that the Centre offered in-depth training in remote sensing and GIS, meteorological satellites and global climate, satellite communications, and space and atmospheric sciences. Participants learned about a training programme on the production and utilization of satellite imagery, offered by the GeoEye company, and the Egyptian space programme. The ESA project in Africa to extend the Data Dissemination System services of near-real time Environmental Satellite (Envisat) sensor products through the integration of Earth observation and telecommunication technologies was also presented. Participants were also given a multidisciplinary review of questions related to the use of space technologies in various fields of sustainable development and training, research and application programmes offered by the Royal Centre for Remote Sensing of Morocco.

III. Conclusions

25. Two discussion sessions were organized as part of the Workshop for the purpose of identifying follow-up projects aimed at enhancing regional cooperation for activities of common interest and exchanging information and experiences. The sessions were designed to give participants an opportunity to share and understand issues and concerns relating to the effective utilization of space-based technologies for sustainable development in Africa, and to work together to define a framework for a mechanism for regional or international cooperation, or both.

26. Participants noted that a significant quantity of low-cost spatial data was widely available from various space-based sensors, although information concerning what spatial data were available was limited. Archived data were also considered a solution, as the cost of such data would be low. Participants also noted that the distribution and use of available Global Landsat datasets for sustainable development in Africa were part of the priority thematic areas of monitoring and protection of the environment and management of natural resources of the Office for Outer Space Affairs. It was also noted that the global orthorectified Landsat datasets were available free from the Global Land Cover Facility via File Transfer Protocol (www.landsat.org).

27. As an outcome of deliberations at the Workshop discussion sessions, three follow-up projects were initiated by the Workshop participants. The projects were intended to systematize best practices (knowledge- and information-sharing), enabling space-based technologies to be transferred between countries throughout the region. Projects were to be carried out through a network of national teams established at the Workshop and with the assistance of the Office for Outer Space Affairs. Contact information for the project leaders and co-leaders and principal investigators is provided in annex I. Participants agreed that the projects were to be carried out at minimum cost by utilizing the existing facilities and resources of participating institutions.

28. The first project, entitled “The approach to establish national data-sharing policy”, was to focus on national spatial databases, more specifically, the thematic databases that were needed to support natural resources management activities, taking into consideration existing data standards in order to facilitate the sharing of data. The second project, entitled “Data access, data-sharing and -mapping”, concerned data-sharing in relation to the establishment of base maps for various fields, such as forest-area estimation, forest-fire monitoring and assessment, flood and damage assessment, land-use/land-cover classification, soil and hydrology layers, meteorology and landscape epidemiology studies in the region. The objective of the third project, entitled “Capacity-building”, was to raise awareness among managers and policymakers and decision makers of the potential benefits of space-based technologies for sustainable development and to provide continuous training for experts, educators and end-users. That could be achieved through the provision of long- and short-term training and education at the regional centres for space science and technology education, affiliated to the United Nations, located in Morocco and Nigeria, and through other academic centres of excellence within the region.

29. The Workshop provided a unique opportunity to channel support for the increased use of space technologies for sustainable development in Africa. The projects identified would provide guidance on how institutions could work together through regional partnerships. It was recommended that the Office for Outer Space Affairs should provide support in the consolidation of the partnerships that were formed in Rabat, which would result in the sharing and transfer of knowledge and the development of joint activities, in particular through pilot projects.

30. Participants expressed their appreciation to the Government of Morocco, the Royal Centre for Remote Sensing, the United Nations and ESA for the Workshop and the significant support provided.

Annex

Contact information for project leaders, co-leaders and principal investigators of projects proposed at the Workshop

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