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New and emerging technologies, applications and initiatives for space-related inter-agency cooperation*

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* The present report was reviewed and revised by the Inter-Agency Meeting on Outer Space Activities, held from 31 January to 2 February 2005, and finalized following that Meeting.



I. Introduction

1. At its fortieth session, in 2003, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space endorsed the proposal to strengthen inter-agency cooperation in the use of outer space within the United Nations system, as recommended by the Inter-Agency Meeting on Outer Space Activities at its twenty-third session. The Subcommittee invited United Nations entities to submit annual reports on specific themes (A/AC.105/804, paras. 93-95).

2. The present report has been submitted by the Inter-Agency Meeting in response to that invitation. The theme of the report was selected by the Inter-Agency Meeting at its twenty-fourth session, held in Geneva from 21 to 23 January 2004. The report contains inputs from the following United Nations entities: the Office for Outer Space Affairs, the Department of Peacekeeping Operations, the United Nations Office for Project Services (UNOPS), the secretariat of the International Strategy for Disaster Reduction (ISDR), the Economic and Social Commission for Asia and the Pacific (ESCAP), the United Nations Environment Programme (UNEP), the World Food Programme (WFP), the United Nations Institute for Training and Research (UNITAR), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Civil Aviation Organization (ICAO), the World Health Organization (WHO), the World Meteorological Organization (WMO) and the International Atomic Energy Agency (IAEA). The report was reviewed and finalized by the Inter-Agency Meeting at its twenty-fifth session, held in Vienna from 31 January to 2 February 2005.

3. The technologies, applications and initiatives identified for inclusion in the report are those with the potential to strengthen inter-agency cooperation. In most cases, the technologies, applications and initiatives outlined are implemented by individual United Nations entities, but could be further developed through inter-agency cooperation.

II. New and emerging technologies, applications and initiatives for space-related inter-agency cooperation

A. Applications and initiatives to support disaster reduction and management and humanitarian efforts

4. The Office for Outer Space Affairs is assisting the former participants of the United Nations/Sweden training courses on remote sensing education for educators in establishing an Asian Regional Task Force on Risk Assessment for Natural Resources and Environmental Protection Using Remote Sensing and GIS Technologies. The Task Force assisted during the recent Indian Ocean tsunami disaster relief and rehabilitation effort by providing imagery analyses. Such analyses have been used by WFP and other United Nations entities to plan and implement relief operations, as well as disaster reduction activities.

5. Following the tsunami that occurred in the Indian Ocean on 26 December 2004, the Executive Director of UNEP set up an Asian Tsunami Disaster Task Force. The Task Force is coordinated from the UNEP offices in Geneva and is in close

contact with the UNEP Regional Office for Asia and Pacific and other United Nations entities such as Office for the Coordination of Humanitarian Affairs (OCHA), the United Nations Development Programme, WFP, FAO, UNESCO, WHO and WMO that are involved in the humanitarian and environmental response to the crisis. The Asian Tsunami Disaster Task Force consists of 30 staff members drawn from offices in Bahrain (UNEP Regional Office for West Asia), Bangkok (UNEP Regional Office for Asia and the Pacific), Geneva (UNEP Division of Early Warning and Assessment/Global Resource Information Database (GRID) and UNEP Regional Office for Europe), Nairobi (Division of Early Warning and Assessment, Division of Environmental Policy Implementation), Paris (Division of Technology, Industry and Economics) and Cambridge, United Kingdom of Great Britain and Northern Ireland (the World Conservation Monitoring Centre). The office of the Division of Early Warning and Assessment GRID-Europe provides advice and geographical information system (GIS) and remote sensing support to the Task Force. It has already provided enhanced and analysed satellite imagery, relevant GIS layers, estimations of coastal and infrastructural damage and of the number of people affected. All of the enhanced data were provided via a website.

6. The World Conference on Disaster Reduction, which was organized by the Government of Japan, the secretariat of ISDR and other organizations, was held in Kobe, Japan, from 18 to 22 January 2005. At that Conference, participants agreed on the Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities. That document recognized the importance of space-based Earth observations, remote sensing, GIS and telecommunications to assess, monitor, model and forecast natural hazards and risks and to enhance early warning systems. The Inter-Agency Task Force on Disaster Reduction will assist in implementing the Hyogo Framework for Action and facilitate the coordination of effective and integrated disaster reduction activities among the entities of the United Nations.

7. During the United Nations International Workshop on the Use of Space Technology for Disaster Management held in Munich, Germany, from 18 to 22 October 2004 the following three themes were discussed: helping developing countries use space technology for disaster management; coordinating the use of space technology for disaster management; and bringing space technology into Kobe (A/AC.105/837). The final recommendations of the Workshop provided a strategy on the consolidation of a coordinating entity and national focal points and other international coordinating mechanisms such as the Global Earth Observation System of Systems (GEOSS). A partnership was proposed at the World Conference on Disaster Reduction to coordinate support at the national and regional levels for the incorporation of space technology-based solutions in disaster management activities. It was also recommended that the Office for Outer Space Affairs continue to maintain and expand the existing Global Network for Space Technology and Disaster Management.

8. The Office for Outer Space Affairs has been providing training courses on satellite-aided search and rescue since 1999. The International Satellite System For Search and Rescue (COSPAS-SARSAT) has provided alerts that have assisted in the rescue of persons in distress and in rescue events since 1982. The goals of the training are to introduce the system concept and applications and to make equipment more affordable to developing countries. The training courses also introduce participants to new features of the system such as the Ship Security Alert system for

combating terrorist and pirate attacks, personal location beacons and Global Navigation Satellite System (GNSS) signal incorporation. The ultimate goal is to promote a seamless operation of the system. The Office for Outer Space Affairs invites other United Nations entities to join this effort.

9. UNOPS continues to implement the United Nations Organization Satellite (UNOSAT) service on behalf of UNITAR. The overall goal of UNOSAT is to facilitate physical planning and programme implementation by local authorities, project managers and field personnel working in emergency response, disaster management, risk prevention, peacekeeping, environmental rehabilitation, post-conflict reconstruction and social and economic development.

10. The UNOSAT service uses the Internet as its main communication tool, but also state-of-the-art technologies such as satellite imagery and GIS to manage the complex set of information required by end-users to carry out their work. The UNOSAT service is the only single point of entry within the United Nations system where professionals from the whole system involved in the implementation of humanitarian aid and development assistance projects can get assistance in managing such complex data and responding to field requirements for geographical information.

11. The UNOSAT service was recognized by OCHA as a provider of satellite data and related geographical information to the Global Disaster Alert System, which was launched by OCHA in December 2004.

12. ESCAP actively promotes various capacity-building initiatives. In cooperation with the Japan Aerospace Exploration Agency, ESCAP organized a side event on disaster prevention and regional cooperative mechanisms in space technology applications for disaster management during the World Conference on Disaster Reduction. In 2005, ESCAP will organize meetings of the Regional Working Group on Remote Sensing, Geographic Information Systems and Satellite-based Positioning and the Regional Working Group on Meteorological Satellite Applications and Natural Hazards Monitoring in the Islamic Republic of Iran. In cooperation with space agencies and national disaster management authorities, ESCAP is implementing a project, financed by the Republic of Korea, on enhancing national capacity in policy-making on natural disaster management using information, communication and space technology to promote and develop a policy framework on space information products and services. During the International Telemedicine Conference, to be held in Bangalore, India, in March 2005, ESCAP will organize, in cooperation with the Indian Space Research Organization, a regional workshop on telemedicine.

13. The status of the UNOSAT service was recently changed from a project to a fully integrated activity within the Space and Information Technologies Applications Programme at UNITAR.

14. UNITAR also hosts the recently established Earth observation user liaison office, the purpose of which is to support a dialogue with the humanitarian community at large on Earth-observation-related issues. This office is managed in partnership with the European Space Agency (ESA).

15. In response to the Indian Ocean tsunami disaster of 26 December 2004, the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the

Event of Natural or Technological Disasters (International Charter “Space and Major Disasters”) was activated and, for the first time, raw satellite imagery with a multi-user licence was provided by the space agencies cooperating in the Charter. The data are hosted by the UNOSAT service and accessible to all entities (United Nations, Governments, non-governmental organizations and universities) involved in work related to the international response to the countries affected by the tsunami. Through the generous support of the European Organization for Nuclear Research, which hosts the UNOSAT office and website, 100 gigabytes of extra data storage were instantly made available. The UNOSAT web portal also acts as a map repository for a wide range of maps produced for the region affected by the tsunami, including external maps (that is, maps not produced by UNOSAT), when appropriate.

16. Another example of new space-based applications is the implementation by UNOSAT on behalf of the Office of the United Nations High Commissioner for Refugees (UNHCR) of a project in Chad to assist camp planners and managers in assessing groundwater resources and how these should be included in a water management plan. The UNOSAT service and its implementing partner used a combination of optical and ground-penetrating radar satellite imagery and field surveys. This innovative approach resulted in detailed mapping of water resources in eastern Chad, where Sudanese refugees from the Darfur region are hosted in several UNHCR camps.

17. The UNOSAT service ensures that United Nations requirements are met in the recently established Respond project, a Global Monitoring for Environment and Security (GMES) service, funded by ESA, to develop services for the use of satellite imagery and GIS in humanitarian applications. GMES Respond also comprises value-adding companies from private industry. So far, Respond services have been developed for humanitarian operations in Chad, Liberia, Myanmar/Thailand, Sudan and the tsunami-stricken countries in Asia.

18. In the aftermath of the Indian Ocean tsunami disaster, UNESCO proposed, at the World Conference on Disaster Reduction, the establishment of a global tsunami early warning system, of which an Indian Ocean system would form an integral part. UNESCO and its Intergovernmental Oceanographic Commission, in cooperation with ISDR, WMO and other partners, will organize an Indian Ocean tsunami regional conference this year, in which Member States of the United Nations located in the Indian Ocean region will discuss their roles in the regional tsunami warning system.

19. The hundred-and-fifteenth session of the Executive Board of WHO agreed on a draft resolution on e-health to be presented to the fifty-eighth session of the World Health Assembly in May 2005, in which clear mention is made of telemedicine technology. If taken forward, this initiative would not only offer a working platform for WHO to provide technical support to Member States, but would constitute also an instrument for the improvement of cooperation among United Nations and other entities working in the area of telemedicine, improving their response to needs such as those arising from the Indian Ocean tsunami disaster.

B. Capacity-building and education

20. Entities of the United Nations system play an important role in the Working Group on Education, Training and Capacity-Building of the Committee on Earth Observation Satellites (CEOS). In 2004, the Working Group completed the development of the education, training and capacity-building resources portal and demonstrated its functions to the eighteenth plenary session of CEOS. Initially, the education portal will make the Earth-observation education and training resources of CEOS members and associates more accessible, particularly to developing countries. It will provide numerous links to websites where educators, students and professionals may access educational materials, including satellite data, free of charge. The work planned for 2005 includes inviting space-related entities to submit educational materials for inclusion in the database of the education portal.

21. Under the United Nations Programme on Space Applications, the Office for Outer Space Affairs makes efforts (a) to support the development of web pages for all the regional centres for space science and technology education; (b) to disseminate information on the educational activities of the regional centres worldwide through established mail and e-mail databases; (c) to submit information on the regional centres for inclusion in international directories; (d) to develop information panels on the regional centres for incorporation in the permanent space exhibit of the Office at the United Nations Office at Vienna; (e) to arrange for presentations on the accomplishments of the regional centres to be made at the sessions of the Committee on the Peaceful Uses of Outer Space and during activities organized under the Programme; and (f) to establish a common accounting mechanism for the financial resources provided by the Programme to the regional centres.

22. The Office will continue to organize workshops on basic space science. Future workshops will focus on preparations for the International Heliophysical Year 2007 and how they may benefit developing countries. Since 2001, in conjunction with the United Nations/European Space Agency workshops on basic space science, the Committee on Space Research and the International Astronomical Union have organized annual regional workshops for astronomers and space scientists on data processing from the Chandra and X-Ray Multi-Mirror-Newton space missions. In 2004, the Office contributed to the planning of the third workshop in the series, held at the University of Kwazulu-Natal, South Africa.

23. Within the framework of the Space Education Project of UNESCO, the first of a series of space education sessions in developing countries was organized in the Philippines in 2004. The aim of the sessions is to demonstrate best teaching practices in space science, engineering and technology at different educational levels. The next space education sessions will take place in Nigeria and Colombia.

24. In the framework of the UNESCO/ESA Earth Observation for Integrated Water Resources Management in Africa/Space Hydrology International Partnership project, capacity-building activities on the application of remote sensing to water resource studies will be initiated in 2005.

25. Within the framework of the UNESCO cross-cutting project on application of remote sensing for integrated management of ecosystems and water resources in Africa, which was developed in line with the goals identified in the Millennium

Declaration (General Assembly resolution 55/2), workshops were organized to identify and assess national projects. In 2005-2006, "training-the-trainers" courses will be organized in some of the 12 participating countries.

26. IAEA has prepared a status report on the role of nuclear power sources in the peaceful exploration of space. Apart from fostering information exchange among United Nations entities with regard to specific outer space activities, the report aimed at finding new potential sources of innovative reactor and fuel-cycle technology. In assessing the status and reviewing the role of nuclear power in the peaceful exploration of space, the report also aimed at initiating discussion on the potential benefits of space-related nuclear power technology for research and development related to innovative Earth-bound nuclear systems.

27. Discussions with IAEA are ongoing on the possible benefits of holding a joint workshop to discuss a potential safety framework for nuclear power source applications.

C. Information, communications and data-sharing

28. Satellite and aerial imagery is used by the Department of Peacekeeping Operations for the development of large-scale maps to support the movements, operations and planning of peacekeeping troops and to improve staff security and emergency-preparedness in the field. Very high resolution satellite imagery is increasingly used for preparing boundary demarcation image maps, as well as to bring older large-scale topographic maps used by the Department up to date.

29. The Department of Peacekeeping Operations is intensively testing radar imagery and works with its system contractor RADARSAT International to evaluate higher-resolution digital elevation model generation from radar imagery, as well as using radar imagery for mapping purposes. The increased capabilities of the Synthetic Aperture Radar Satellite (RADARSAT)-2, to be launched in 2006, are of special interest, as they will allow much better resolutions for digital elevation model extraction.

30. The Department uses space-based communications between its headquarters, its logistics base in Brindisi, Italy, and its 16 current peacekeeping missions. The communications teams of the Department manage large allocations of satellite bandwidth for effective communications among missions. Videoconferencing facilities are also installed and use established satellite communications channels for interconnection between missions and headquarters. The modern facilities could also be used on demand by other United Nations entities present in the respective operational areas of the Department.

31. The Department uses the Global Positioning System (GPS) in its peacekeeping missions, for their military and civilian components. The Department is also evaluating options and plans to test and install GPS differential base stations, on a pilot basis, in some of its missions. Satellite-based location units are also being installed on mission vehicles to allow easier tracking and navigation.

32. UNOPS has brokered agreements for satellite imagery, such as Satellite pour l'observation de la Terre (SPOT) and Ikonos data, to ensure that United Nations entities receive imagery at the lowest cost and with the best available licence

agreement. UNOPS is in discussions with the Department of Peacekeeping Operations and its cartographic section for the supply of SPOT data to the United Nations system contract for satellite imagery. One example of an agreement benefiting the whole United Nations family is that with INTA SpaceTurk, the data provider of Ikonos imagery. Recently, OCHA purchased archived Ikonos imagery of the Gaza Strip at a significant discount on a single user licence, but under the agreement brokered by UNOPS with INTA SpaceTurk raw data are also available to all United Nations entities and their implementing partners at no extra cost.

33. Even before the implementation of the United Nations system contract, the Department of Peacekeeping Operations had already closely worked with very high resolution imagery vendors to obtain previous United Nations purchase details for imagery. An inventory was prepared to allow later eventual licence upgrades by other United Nations entities, rather than repeated new purchases, as this approach could lead to significant savings. The Department continues to maintain an active relationship with vendors for the benefit of improved access to very high resolution imagery.

34. The UNOSAT service has developed and hosts a geographical metadatabase on very high resolution satellite imagery purchased by United Nations entities. This initiative was launched within the framework of the United Nations Geographic Information Working Group Task Group on Remote Sensing. The UNOSAT service works closely with the Department of Peacekeeping Operations and other United Nations entities to populate that database on metadata. The object of the exercise is to avoid multiple purchases of identical satellite imagery within the United Nations.

35. The UNEP Global Environment Outlook (GEO) data portal was initiated in 2000 to improve the empirical base of GEO and harmonize the data that are used for analysis and illustrations. The data portal has become a unique collection of data and the authoritative source of data used by UNEP and its partners in the GEO reporting process and other integrated environment assessments.

36. The secretariat of ISDR uses satellite imagery in disaster risk reduction. Supported by the UNOSAT service, several projects in Latin America receive satellite imagery for risk assessment, mapping and forecast. The secretariat of ISDR supported GRID-Europe in updating and incorporating 25 years (1979-2003) of data on cyclones, earthquakes, floods, forest fires, tsunamis and volcanoes, including data on frequency and exposure to hazards. That information is included in ISDR country profiles.

37. The data portal provides access to a broad collection of harmonized environmental and socio-economic data sets from authoritative sources at the global, regional, subregional and national levels and allows basic data analysis and the creation of maps and graphics. Its online database currently holds more than 450 variables that can be analysed and displayed as maps, graphs or tables. The data sets can also be downloaded in a variety of formats, supporting further analysis and processing by the user. The contents of the GEO data portal cover a broad range of environmental themes such as climate, disasters, forests and freshwater, as well as categories in the socio-economic domain, including education, health, the economy, population and environmental policies.

38. The online Data Portal has been designed as an easy and light system that can run on most platforms and does not need very extensive Internet bandwidth.

Although the portal is primarily aimed at the GEO user community (UNEP offices and GEO collaborating centres), other United Nations agencies, universities, schools, civil society and the general public also make extensive use of the portal.

39. Every year, WFP provides food aid to millions of vulnerable people who would risk their livelihoods and in many cases face starvation without humanitarian assistance. The challenge for WFP and its partners is to identify accurately such populations, mobilize the required resources and deliver humanitarian assistance. To achieve this in a timely and accurate manner, information from a variety of sources is required.

40. WFP has initiated a decentralized Vulnerability, Analysis and Mapping Spatial Information Environment (VAM SIE) using GeoNetwork software developed by FAO. VAM SIE will enable WFP country offices, regional bureaux and headquarters to access and exchange geo-referenced food security databases and cartographic products from a variety of sources. VAM SIE includes tools for standardization, infrastructure to support the appropriate use of spatial information and collaborative efforts are made to increase accessibility to original and derived information within WFP and with information partners. By the end of 2004, VAM SIE had been installed in all of the WFP regional bureaux (Bangkok; Cairo; Dakar; Johannesburg, South Africa; Kampala; Panama and Rome) as well as in its country offices in Addis Ababa and Khartoum.

41. The successful installation of VAM SIE in the various countries and regional bureaux has led to improved geographical information management, allowing and supporting spatial information exchange between headquarters and country offices. VAM SIE has also enabled common standards for cartographic representation, as well as standard cartographic templates for the most commonly used maps, to be adopted in all country offices and regional bureaux. Finally, it has led to ensuring hardware and software compatibility among all WFP spatial data users, who are also supported with appropriate training packages.

42. The successful implementation of VAM SIE enhances partnerships and knowledge-building through improved data-sharing capabilities. In 2005, it is expected that partnerships will be created with other United Nations agencies, as well as with partners such as the United States Geological Survey, the Famine Early Warning Network, Global Monitoring for Food Security, the Southern African Development Community (SADC) and the Satellite Applications Centre.

43. Although the current efforts of WHO to develop the GRID technology are directed towards obtaining access to a large amount of calculation capacities through a distributed network, it is envisaged that satellite communication networks will, in the future, contribute to the extension of this network. The need to process a large amount of sensed data in short time in complex emergency situations such as health crises may, in the future, be met by the distributed network of calculation capacities offered by the GRID technology.

D. Food security

44. Throughout much of sub-Saharan Africa the livelihoods of populations are based mainly on traditional rain-fed agriculture. In such cases, rainfall is the most

important meteorological factor in determining the food security situation locally and nationally. A prerequisite for informed decision-making and resource management is information on rainfall, crops and vegetation.

45. Such information must be timely, diverse (comprising information on rainfall, vegetation, specific crops and average scenarios) and presented in an appropriate form. Producing it in a form that can interface with databases of United Nations entities and non-governmental organizations, for example, in terms of population numbers, social structure, main crop types, market prices and infrastructural detail, ensures that it can be used to best effect. Areas of low rainfall, a delayed growing season, mid-season crop water stress or low crop production can be identified and cross-referenced with institutional databases to identify vulnerable populations and assess the degree to which people's lives and livelihoods are likely to be affected.

46. In collaboration with the University of Reading, United Kingdom, WFP has supported the development and installation of an operational system, Satellite Agrometeorological Information System (SAMIS), to provide high-quality, accurate and timely agrometeorological information to institutions involved in food-security-monitoring activities. SAMIS software has a modular design and is organized into a friendly, task-based, graphical user interface. SAMIS processes satellite and meteorological ground station data into a set of user-defined products (such as rainfall amounts, crop and vegetation indices) that can be handled in conventional GIS software for map preparation and interactive analysis. Products can also be derived in database or tabular format as statistics over user-defined areas (for example, a seasonal course of rainfall or a normalized difference vegetation index over a crop production area or administrative region) and can be linked or appended to users' databases. The system is currently installed in Sudan and Uganda. There are plans to install the system in more countries, including in the SADC countries.

47. Among other projects, FAO uses low to medium resolution satellite systems such as the Terra Moderate Resolution Imaging Spectroradiometer (MODIS) (United States of America), SPOT Vegetation (European Union), the geostationary meteorological satellite (Meteosat) (European Union) and the National Oceanic and Atmospheric Administration advanced very high resolution radiometer (AVHRR) (United States). FAO also uses high resolution satellite systems such as the Land Remote Sensing Satellite (Landsat) thematic mapper (United States), SPOT (France), Ikonos (United States) and Quickbird (United States).

48. Using those systems, FAO provides, through its Advanced Real-Time Environmental Monitoring Information System (ARTEMIS), a number of products for identifying potential locust breeding areas and for monitoring crops and rainfall. Other FAO systems include the Desert Locust Information Service, the Global Information and Early Warning System on Food and Agriculture (GIEWS), the Global Land Cover Network Land Cover Map and Geodatabase for Africa (Africover)/Land Cover Map and Geodatabase for Asia (Asiacover) and the Global Terrestrial Observing System/Terrestrial Ecosystem Monitoring Sites.

49. Real-time satellite images support the crop-monitoring activities of GIEWS through ARTEMIS, which receives, processes and stores medium and low resolution imagery. These products are provided through the Internet in near real time by METART, which provides easy access to data available in the archives of the agrometeorology and ARTEMIS groups of the FAO Environment and Natural

Resources Service. GIEWS has been providing regular bulletins on food-crop production and markets at the global level and situation reports on a regional and country-by-country basis since 1975.

E. Other new and emerging applications and initiatives for space-related inter-agency cooperation

50. The UNEP Regional Office for Europe, together with the Division for Early Warning and Assessment, continued to develop the GMES initiative, in collaboration with the United Nations Development Programme and the Organization for Security and Cooperation in Europe. The North Atlantic Treaty Organization "Partnership for Peace" programme also joined GMES in 2004. GMES and its activities currently cover the Caucasus, Central Asia and South-Eastern Europe and it is planned to extend the work to Belarus, Moldova and Ukraine in 2005.

51. The WMO Space Programme completed its first year as a major new cross-cutting programme. A review by the fifth session of the WMO Consultative Meeting on High-level Policy on Satellite Matters identified three activities that related to new and emerging initiatives relevant to inter-agency cooperation: the establishment of an international geostationary laboratory; an integrated global data dissemination service and its associated concept of alternative dissemination methods; and further development of the Coordination Group for Meteorological Satellites/WMO Virtual Laboratory for Satellite Training and Data Utilization. With regard to WMO members' satellite systems, the Governments of India and the Republic of Korea made formal commitments to participate in the space-based component of the World Weather Watch/Global Observing System. India communicated its plans to meet the WMO requirements for half-hourly imagery in a phased manner, with the ultimate goal to be achieved within three to four years. The Republic of Korea intended to participate in the space-based Global Observing System with its new geostationary communications, ocean and meteorological satellites, due to be launched in 2008. The Korea Meteorological Administration planned to make meteorological observations for research, operations and applications available without restrictions.

52. The international geostationary laboratory initiative is based on partnership and sharing of the benefit of a geostationary demonstration mission among several space development agencies, operators of operational meteorological satellites and satellite data users. At a meeting held at the headquarters of WMO in Geneva in December 2004, participants had strongly felt that technical work on the laboratory should not be embarked upon until space agencies had committed themselves to collaborating on its development. All the space agencies present at the meeting supported the laboratory initiative and noted that it could assist in the implementation of the space component for GEOSS. The participants considered two test proposals (the Geostationary Imaging Fourier Transform Spectrometer (GIFTS) and the Geostationary Observatory for Microwave Atmospheric Sounding (GOMAS)) and concluded that they represented important opportunities for collaboration on enhancing the Global Observing System, with capabilities identified as crucial in the evolution of the World Weather Watch/Global Observing System. The WMO Consultative Meeting on High-Level Policy on Satellite Matters, at its fifth session, held the opinion that the laboratory initiative was of the utmost

importance to the space agencies participating in the sessions of the Consultative Meeting, as well as to WMO members. There was strong support for continuing the discussions on the laboratory initiative and in particular for continuing, at an early date, the discussions on the two test proposals.

53. With regard to the integrated global data dissemination service and the alternative dissemination methods, the Consultative Meeting was of the opinion that the approach would constitute a revolution in the history of satellites in that there was a strong emphasis on one of the critical issues of satellite technology, namely, increasing the availability and use of the data. The approach was entirely consistent with the new WMO model for satellite data dissemination in which there was a balance between a limited number of coordinated ground receiving stations, coupled with a wide dissemination of data and products through communication satellites using inexpensive digital video broadcasting technologies. The WMO Space Programme would continue to play an active role in establishing regional integrated global data dissemination services and alternative dissemination methods. Participation by WMO in the phases of development of the various regional implementations was recommended in order to ensure consistency and compatibility when interregional data exchanges were established and coherence with the integrated global data dissemination service. A number of currently unfulfilled user requirements for satellite data had been identified around the world. In order to meet some of those unfulfilled user requirements, two alternative dissemination methods had been proposed: one Regional Advanced Television Infrared Observation Satellites (TIROS) Operational Vertical Sounder Retransmission Service (RARS) for South America and one RARS for Asia and the Pacific.

54. The Virtual Laboratory for Satellite Training and Data Utilization was established in May 2001 jointly by WMO and the Coordination Group for Meteorological Satellites as a means of promoting the utilization of satellite data and products by WMO members. Virtual Laboratory activities are overseen by a focus group that reports to the Coordination Group and WMO. At a training event held in 2003, the language barrier common to such events was overcome by a seminar simultaneously conducted for participants in Barbados and at the WMO Regional Meteorological Training Centre in Costa Rica through the use of a high technology teaching methodology called Virtual Institute for Satellite Integration Training (VISITview). All the Barbados participants were trained in how to obtain the free VISITview software, as well as how to establish similar dual location lectures. Participants in the twenty-fifth session of the Inter-Agency Meeting were informed of how to access the Virtual Laboratory and its associated online Virtual Laboratory resource library through the WMO Space Programme website.

55. The Office for Outer Space Affairs has co-organized a series of meetings that have contributed significantly to the work of the Action Team on Global Navigation Satellite Systems (GNSS) in improving universal access to and the compatibility and interoperability of space-based navigation and positioning systems. Further steps were taken in the preparation of the terms of reference for the establishment of an international committee on GNSS for the purpose of promoting and coordinating their use and applications.

56. The reduction in the cost of GPS devices, as well as access to more precise reading, is resulting in the growing use of GNSS technologies, allowing the integration of geography as one of the variables during the data analysis process.

The use of GPS devices to reduce morbidity and mortality linked to road accidents is one example of the new type of application which is starting to emerge in the field of public health. This growing interest is reinforced by initiatives such as the creation of a task group on GNSS within the framework of the United Nations Geographic Information Working Group, the generation in countries of inventories of devices that could be used for different data collection exercises or to answer specific needs linked to complex emergencies.

57. ICAO applies space-based navigation systems in its communications, navigation and surveillance/air traffic management that support the required air navigation performance and contribute to increased aviation safety. In cooperation with the International Satellite System for Search and Rescue (COSPAS-SARSAT), ICAO is working on matters relating to the carriage by aircraft of GPS-based emergency locator transmitters.

58. In July 2004, the Office for Outer Space Affairs, together with the European Association for the International Space Year and other co-sponsors, organized a Conference on Tele-health and Satellites in Morocco. The main purpose of the Conference was to compare the various approaches adopted by the different space agencies and national, international and non-governmental organizations and to enhance international cooperation in the field of tele-health. The Office is planning activities in the field of space-based tele-health and aims to launch a pilot project in that area. In October 2004, the Office accepted an invitation from the International Society for Telemedicine to enter into partnership.

59. The open initiative of UNESCO, conducted jointly with space agencies, on the use of space technology for monitoring World Heritage and natural sites is developing well. The monitoring of gorilla habitats in the Democratic Republic of the Congo is being carried out in cooperation with ESA, while awareness-raising workshops for site managers are being organized in Latin America in cooperation with the National Commission on Space Activities of Argentina.

60. A study was carried out by the International Academy of Astronautics, at the request of UNESCO, on the reconstruction of Afghanistan, emphasizing the role of space technology to promote peace by demonstrating how space-based applications can accelerate the process of rebuilding infrastructure, the economy, education and health support. The report, entitled "Space to promote peace", proposes the implementation of four pilot projects that underline inter-agency cooperation on the following themes: telemedicine, tele-education, disaster management and geospatial infrastructure. The telemedicine project is being developed in cooperation with the Office for Outer Space Affairs, WHO, the Indian Space Research Organization and other partners. Other United Nations specialized agencies are invited to cooperate in the pilot projects.

61. The growing access to data sensed by satellites and the development of GEOSS are offering new perspectives to public health specialists in areas such as preventing the exposure of populations to natural hazards, preventing the extensive use of DDT for malaria control and measuring physical accessibility to health care. In order to be effective, the material used and produced through those exercises would have to be based on well-established standards (ground reference, metadata) in order to ensure a sustainable and interoperable source of knowledge for the future.