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Committee on the Peaceful Uses of Outer Space

Implementation of an integrated, space-based global natural disaster management system

Note by the Secretariat

Contents

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I. Introduction

1. At its forty-third session, the Committee on the Peaceful Uses of Outer Space agreed that, in accordance with the first year of the three-year work plan entitled "Implementation of an integrated, space-based global natural disaster management system", the Scientific and Technical Subcommittee at its thirty-eighth session should review the types of natural disasters being faced and the extent of the application of space-based services being utilized for their mitigation.[1]

2. The Committee also took note of the agreement of the Working Group of the Whole of the Scientific and Technical Subcommittee that the Secretariat should invite Member States and international organizations to submit to the Subcommittee at its thirty-eighth session information on the subject to be discussed at that session (A/AC.105/736, annex II, para. 41). Pursuant to the recommendation of the Committee, in a note verbale dated 26 July 2000, the Secretary-General requested Governments and international organizations to furnish information on the subject by 31 October 2000 so that it could be submitted to the Subcommittee at its next session. The present document contains the information received from Member States and international organizations by 24 November 2000. Information received subsequent to that date will be included in an addendum to the present document.

3. A report of the Secretariat entitled "Implementation of an integrated, space-based global natural disaster management system" is being issued as a separate document (A/AC.105/758).

II. Replies received from Member States

Brazil

[Original: English]

1. The Centro de Previsão de Tempo e Estudos Climáticos (CPTEC) of the Instituto Nacional de Pesquisas Espaciais (INPE) routinely records images of the NOAA-N satellite of the National Oceanographic and Atmospheric Administration (NOAA) of the United States of America, the NOAA Geostationary Operational Environmental Satellite-E (GOES-E) and Meteosat satellites. Satellite imagery is a useful complement for weather and climate monitoring. Other variables of meteorological and environmental interest are assessed, including temperature and humidity, wind speed, sea surface temperature, solar radiation, vegetation indexes and fires. The information described is released through the CPTEC home page (www.cptec.inpe.br) for public use. Concerning disaster mitigation, two specific activities may be mentioned: monitoring of draughts; and burning mass detection.

1. Monitoring of droughts

2. The social impact of droughts affecting large areas of north-eastern Brazil can at least be mitigated if information on water stress is managed properly. The PROCLIMA Project at CPTEC performs daily assessment of soil water deficit, based on surface data and daily solar irradiation from GOES-8 visible imagery, using a model developed at INPE. This method allows monitoring of an area

extended over more than 1.5 million km^2. Geographic information systems (GIS) allow results from monitoring to be applied to management decisions by local and federal authorities. There are plans to extend this project to southern Brazil, where drought conditions in La Niña years usually have economic and social impacts.

3. The normalized difference vegetation index (NDVI) and the Global Environmental Monitoring Index (GEMI), based on the advanced very high resolution radiometer (AVHRR) sensor on the NOAA-14 satellite, are being assessed over Brazil. Previous cloud masking is performed. Comparison of index performance for identification of vegetation characteristics in selected areas is in development. These results will be valuable for the monitoring not only of soil water deficit but also of crop stress.

2. Burning mass detection

4. Forest fires may be of natural or anthropogenic origin. For more than a decade INPE has performed activities of fire monitoring using channel 3 of AVHRR/NOAA satellites. Combined with CPTEC weather forecasting and information about weather events occurring over the past week (mainly precipitation), a fire risk index has been defined. A comparison is being made between AVHRR-based hot points and GOES-8 data (channels 2 and 4) for the diurnal period. All this information is organized in GIS and is being released for management by local and federal authorities.

5. After the wildfire that affected approximately 12,000 km^2 (1,200,000 hectares) of primary forest in the state of Roraima, Brazil, in early 1998, the Government of Brazil requested that a concerted programme be initiated, based on satellite data. The decentralized dissemination of daily information about the persistence of (fire) hot spots, as detected by the AVHRR sensor on board the meteorological satellites NOAA-12 and NOAA-14, includes the type of land cover being affected by the burn, information on precipitation, accumulated over the previous 10 days, as well as the precipitation forecast, and the daily risk map (which integrates information about type of vegetation, soil retention capability, incidence of hot spots and precipitation). This dissemination of information to environmental institutions in selected Amazonian states has been responsible for monitoring the traditional burns in the region to detect any danger to nearby forested areas.

6. The results from this programme have enabled the environmental agency in Brazil (Instituto Brasileiro do Meio Ambiente Escritório Regional de Barreiras (IBAMA)) to request that no official authorization to burn be conceded when there is potential danger of wildfires, especially during adverse climatic conditions such as severe drought. The initiative is one component of a much larger programme (PROARCO) that includes environmental education, training to combat wildfires and wide dissemination of information. Whenever there is a danger of forest fires, local (state or municipal) control agencies are alerted by IBAMA and mobilize their staff to prevent the expansion of a possible uncontrolled burn in a forested area. All the information generated by this programme can be assessed and manipulated in a Geographic Information System called SPRING-Web, which was developed at INPE and can be used in a simple computational setting such as Windows or UNIX. All information about the programme can be accessed via the World Wide Web (www.das.inpe.br or www.cptec.inpe.br).

India

[Original: English]

1. Introduction

1. It is estimated that, by the turn of the century, 50 per cent of the world's population will be concentrated in urban agglomerations with a high population density and minimum basic facilities for disaster management and mitigation. The human suffering and economic loss in the event of a disaster will be many times that in rural areas. The Indian land mass, covering over 3 million km^2, has widely varying topography, including coastal and mountainous areas and plains, with tropical and extra-tropical climate systems. The land is affected by several natural hazards such as floods, cyclones, landslides, droughts, earthquakes and forest fires (see table 1). India has a large area susceptible to seismic activity, and several occurrences have been recorded. Tropical cyclones developing in the Bay of Bengal and the Arabian Sea affect the Indian coast with a frequency of 5-6 per year, occurring in the pre- and post-monsoon seasons.

Table 1
Summary of major disasters and their impact

Disaster	*Year*	*Region*	*Impact/lives lost*
Earthquakes	1905	Himachal Pradesh	20 000
	1934	Bihar-Nepal	14 000
	1950	Assam	1 500
	1963	Kashmir	Hundreds
	1967	Koyna	200
	1988	Bihar-Nepal	1 003
	1991	Uttarkashi, Uttar Pradesh	715
	1993	Maharashtra	7 928
	1997	Jabalpur	38
Floods	1981	All of India	1 376
	1985	All of India	1 804
	1991	All of India	1 145
	1994	All of India	1 511
	1997	All of India	929
Cyclones	1737	West Bengal	300 000
	1822	Barisal	20 000
	1864	West Bengal	50 000
	1876	Backergunj	200 000
	1942	Contai, West Bengal	15 000
	1971	Paradeep	10 000
	1977	Chirala, Arunchal Pradesh	10 000
	1999	Orissa	10 000

Sources: Government of India, Ministry of Urban Development, Report of Expert Group; and Government of India, Ministry of Water Resources, Central Water Commission.

2. Floods occur during the monsoon season because of heavy rainfall in major river systems; they affect over 65 million hectares. If the monsoon does not occur, there may be severe drought conditions and crop damage; the reduction in crops can be of the order of 10-15 million tons. Sub-Himalayan and north-west India are prone to earthquakes. The mountainous areas in the Himalayas and other parts of the country are affected by landslides, many times compounded by urbanization of these fragile areas.

3. The basic responsibility for managing disasters in India belongs to the state governments concerned. The role of national Government is supportive, in terms of supplementing physical and financial resources and complementary measures in sectors such as transportation, disaster warning and food storage. The overall policy and guidelines are provided from time to time by the national Government. The Government of India has assigned to the Department of Agriculture and Cooperation the responsibility for coordinating activities related to natural disasters. The Central Relief Commissioner at the Department is the focal point for interaction with state government and central agencies and departments. Non-governmental organizations are also involved during development of policies and plans.

2. The role of space in disaster management

4. The essential requirements of disaster management are to provide reliable and timely information during the disaster phase and analyse vulnerability to enable preventative measures. Space has a key role to play in terms of providing monitoring capability over areas affected by disasters and supporting emergency communication requirements. One of the important objectives of the Indian space programme is to provide services for disaster management. The Indian programme, encompassing the geostationary Indian National Satellite (INSAT) system and the polar-orbiting Indian Remote Sensing Satellite (IRS) system, as well as a few research satellites, provides data and observations on meteorology, land and oceans, as well as satellite-based communication services (see table 2).

Table 2
Geostationary and polar-orbiting satellites

Satellite	*Sensors*	*Parameters*
Geostationary orbit		
INSAT-1	Visible and thermal infra-red (TIR)	Clouds, cloud motion vectors (CMBs) (2 levels), sea surface temperature (SST), quantitative precipitation estimate (QPE), Outgoing Longwave Radiation (OLR)
INSAT-2	Visible, TIR, water vapour (WV) and Charge Coupled Device (CCD)	Clouds, CMVs (3 levels), SST, WV image, QPE and OLR
INSAT-3[a]	Visible, TIR, WV, Sounder CCD	Clouds, WV image, SST and OLR
NETSAT[a]	Visible/thermal, Sounder, and WV	SST, clouds, CMVs, WV, mesoscale and temperature and humidity profiles

Satellite	Sensors	Parameters
Polar orbit		
NOAA	Advanced very high resolution radiometer (AVHRR) (5 channels), high resolution infra-red radiation sounder (HIRS), Microwave Sounding Unit (MSU) and stratospheric sounding unit (SSU)	Cloud cover, water, 15-layer mean temperature, SST and vegetation index
IRS-P3	Modular Optoelectronic Scanner (MOS) (13 chan-nels)	Ocean colour and aerosol
IRS-P4	Multifrequency Scanning Microwave Radiometer (MSMR) (4 channels) and Ocean Colour Monitor (OCM) (8 channels)	Liquid water content, ocean surface wind, SST, WV, ocean colour and aerosol
IRS-IC/ID	Linear Imaging Self Scanner (LISS) 3, Panchromatic Camera (PAN) and Wide Field Sensor (WiFS)	Land use, land cover, infrastructure, inundation and vegetation, among other things

[a]Sensors under finalization.

5. The data from INSAT and IRS satellites are being utilized by several government agencies such as the India Meteorological Department, the Forest Survey of India, the Geological Survey of India and state remote sensing centres other than the Indian Space Research Organization (ISRO). Severe weather monitoring and forecasting over the Indian land mass is dependent to a large extent on imagery and data from INSAT. The data on parameters such as land use, land cover, vegetation, soil types, water potential and drainage are useful in vulnerability analysis.

3. Operational use of space inputs

6. Over the past two decades, the operational uses of satellite data and services have emerged in certain areas of disaster management. The areas are cyclone monitoring, cyclone warning and the International Satellite System for Search and Rescue (COSPAS-SARSAT) programme. In several other areas, the experimental phase of validation of space inputs is in progress.

(a) Cyclone forecasting and monitoring

7. The India Meteorological Department has a well-established network of observatories for monitoring weather and meteorological parameters over the Indian land mass. Data from INSAT are used to detect the genesis of weather systems in the Bay of Bengal and the Arabian Sea and to monitor their development continuously. Following Dvorak’s classification of satellite imagery with respect, for instance, to central dense cloud mass and curved bands, the cyclone is assessed for its intensity. In addition to INSAT data, data from cyclone detection radars at several coastal locations on the east and west coasts are used to observe and monitor cyclones and

cyclone landfall. The India Meteorological Department issues cyclone warning messages on the location, intensity and probable track from six cyclone warning centres. The sector scan mode, which repetitively covers an area of interest, is used to acquire frequent satellite data over the cyclonic region. The Department is also pursuing research on prediction models to give storm surge assessments.

(b) Dissemination of warnings

8. A unique system developed by ISRO, the Cyclone Warning Dissemination System (CWDS), is used for providing warnings to coastal areas. CWDS has the capability to alert specific areas that are likely to be affected by a cyclone. CWDS operates through INSAT and has a receiver with specific codes. The Area Cyclone Warning Centre uplinks the warning messages (in the local language) along with the area code to alert the specific locations. The CWDS receivers are kept in the office of the district administrator for direct dissemination to the authorities. Over 250 receivers are operating in the east and west coastal areas.

(c) International Satellite System for Search and Rescue programme

9. Significant developments in satellite communication capabilities and the availability of low-cost terminals have led to the design of an international system for search and rescue, the COSPAS-SARSAT system. The system assists in disaster detection and position location over land or sea through the use of a beacon communication facility at the assigned frequency of 406 MHz to alert rescue coordination centres. INSAT-2A provides support to COSPAS-SARSAT and three ISRO stations operate as local terminals and service the Indian Mission Control Centre. The Centre provides services to several neighbouring countries.

4. Areas of research and development in space applications

10. Efforts are under way to assess the potential of space inputs in other areas of disaster management, with a view to eventually developing operational uses for them.

(a) Flood monitoring and damage assessment

11. With the availability of satellite data from satellites such as IRS, the European remote sensing satellite (ERS) and RADARSAT, monitoring of major floods has been taken up by the National Remote Sensing Agency in Hyderabad. Flood inundation maps are prepared using satellite data and provided to the Central Water Commission and concerned state government agencies. One of the requirements of the user is to assess the damage caused by floods to crops and infrastructure. A pilot study has been carried out for nine flood-prone districts in Assam. Information on the water level during the flood season was obtained from monitoring stations of the Central Water Commission. A digital database was created for the districts with layers on land use and land cover, administrative boundaries (in villages and districts) and socio-economic data. Damage was assessed by intersecting flood layers, obtained from near real-time satellite data, with Geographic Information System (GIS) layers on affected areas and administrative boundaries. Efforts were made to develop empirical models relating water level and rainfall to inundation of crop area.. Limited validation of the results with field-level functionaries showed conformity with ground reality. Efforts were also made to use NICNET connectivity

to disseminate information on flood levels to state centres. The study has underlined the potential of space data to provide vital information on flood damage (including spatial coverage) at the village level for use by the state government.

12. The pilot project identified the following technological problems with microwave data:

(a) Turnaround time limitations in generation and analysis of data;

(b) Lack of detailed contour information and digital elevation models (DEMs);

(c) Gaps in critical data (station network and observations);

(d) Lack of a reliable historic database for model development;

(e) Lack of an updated database on village and district boundaries.

(b) Drought monitoring

13. Owing to abnormalities in atmospheric circulation, the total monsoon precipitation over the Indian subcontinent is subject to both spatial and temporal variations that lead to drought when precipitation is low. The major drought-prone areas are in the arid and semi-arid regions of Rajasthan, Gujarat, West Bengal, Orissa and Andhra Pradesh. The 1987 drought, for example, had a lasting impact on almost a third of the population of the country and resulted in drinking water scarcity in about 93,000 villages.

14. Based on the capability of satellite data to monitor vegetation conditions, the National Agricultural Drought Assessment and Monitoring System (NADAMS) was initiated by the Department of Space with support from the Department of Agriculture and Cooperation. The project uses daily NOAA/AVHRR data to produce vegetation index maps depicting vegetation cover and conditions at the district and subdistrict levels. The drought bulletin prepared under the project provides a vegetation condition map and an assessment of agricultural drought conditions based on comparison with the previous year. Since 1998, when Wide Field Sensor (WiFS) (188 m) data from IRS-1C/1D became available, crop-specific quantitative assessment has been provided at the taluk/block/mandal level for Arunchal Pradesh, Karnataka and Orissa. Efforts are being made to integrate meteorological data with visibility information in order to assess the spatial and temporal inadequacies of rainfall at the critical crop stages and, subsequently, to assess crop status and conditions, leading to a quantitative evaluation of the impact of drought.

Drought combating and proofing

15. Poor and inefficient management of land and water resources over the years has resulted in serious concern for drought mitigation. The integrated approach of utilizing existing conventional data with satellite remote sensing data assumes great importance in enabling the development of operational methodologies in basic resource mapping and management to formulate long-term drought mitigation measures. The integration of remotely sensed data and conventional information through GIS has resulted in an integrated approach to drought mitigation aimed at evolving a set of action plans with emphasis on water resources, agriculture, land

management and fodder management. The location-specific action plans have been developed for several drought-prone districts, with emphasis on the following:

(a) Water harvesting through percolation tanks, ponds and check dams;

(b) Soil conservation through terracing and contouring;

(c) Afforestation, agroforestry and agro-horticulture;

(d) Fuel wood and fodder development;

(e) Sand-dune stabilization.

16. Several projects being coordinated by the Department of Space, with the collaboration of user agencies, contribute to long-term drought mitigation. They include:

(a) The Rajiv Gandhi Drinking Water Technology mission, for the preparation of maps on groundwater potential at the district level on the scale 1:250,000 for the entire country using multispectral satellite data. This has helped in the identification of better well sites for groundwater extraction;

(b) The Integrated Mission for Sustainable Development, to evolve action plans for combating droughts against the backdrop of the socio-economic conditions of the watershed: satellite-derived thematic information is integrated with socio-economic data to provide action plans for the development of food, fodder and water resources. The implementation of action plans have resulted in:

(i) Reduction of run-off loss by about 50 per cent;

(ii) A rise in the water level from 0.9 to 5 m due to check dams and percolation tanks;

(iii) An increase of between twofold and fivefold in agricultural productivity;

(c) Irrigation management using satellite data in selective basins, for the investigation of proposed irrigation development, the identification of poor performance distributories and the assessment of sediment loads in reservoirs.

(c) Landslide zonation

17. Satellite data are being used in conjunction with ground surveys to map landslide-prone areas in the Himalayan region and to assess the risk of landslides. Through an approach that involves weighting the geological, structural and geomorphological features, landslide risk is being assessed using GIS techniques.

(d) Database creation

18. To support disaster management, the design and development of digital databases for priority districts have been started by ISRO. Specifications, including modelling and a query-based interface, sources of information, standards to be followed with respect to the framework, structure and quality control and a plan for creation of the database, have been drawn up. The districts to be covered in the first phase have been identified as the cyclone-prone districts of Andhra Pradesh, Orissa and West Bengal and the flood-prone areas of Assam and Bihar. The GIS layers for the database have been identified as land use/land cover, administrative boundaries,

infrastructure, socio-economic data and locations of warning and relief centres. Subsequently, drainage, topography, geomorphology and soil layers will be added.

5. Constraints in using space data for disaster management

19. Some of the constraints that affect the operational use of space data for disaster management are:

(a) Limitations due to cloud cover and repetitivity;

(b) Considerable turnaround time for data analysis and the dissemination of information to end-users;

(c) Understanding and appreciation of the information communicated by the affected population, decision makers and planners;

(d) Inadequate supporting data such as databases, digital terrain models (DTMs), fine contour information and other models.

6. Conclusions

20. While extensive work has been carried out in India to utilize the potential of satellite data and services for disaster management, there is a long way to go before those services can be put into operation. Major constraints need to be overcome, for instance, ensuring satellite data availability, developing supporting infrastructure such as digital databases, DTMs and fine contour information and creating appropriate modelling support and communication links for the timely dissemination of information. Ultimately, the user acceptance and adoption of the technology need to be ensured.

Peru

[Original: Spanish]

1. El Niño phenomenon

1. Activities relating to the monitoring of flood impact zones and damage assessment are carried out using satellite images.

2. Automatic meteorological stations use satellites as retransmitters in order to obtain information and send it to processing centres.

2. Other flood risks

3. In the Peruvian jungle areas, satellite images are used for monitoring the major rivers. Use is also made of meteorological satellites.

3. Earthquakes

4. A seismological network uses satellites to obtain information and transmit it to the processing centres.

4. Frost/cold

5. Nationwide meteorological stations automatically send meteorological information to the processing centre by satellite. This is the most suitable method owing to communication difficulties caused by the terrain.

Philippines

[Original: English]

1. Introduction

1. The Philippines is a country frequently visited by natural disasters, including tropical cyclones, storm surges, typhoon floods, droughts, lahars, mudflows, earthquakes, El Niño and La Niña. For such disasters, space technology services and products are utilized, depending on the availability of data and the magnitude of the disaster.

(a) Typhoon and storm prediction

2. Weather conditions in the Philippines are monitored in real time by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). The geostationary meteorological satellite of Japan and the polar-orbiting satellite of the United States of America are routinely utilized for monitoring storm surges, floods, droughts and thunderstorms and in tracking tropical cyclones. The data and information obtained from those satellites are used in the preparation and provision of early warnings, advisories and bulletins, which initiate the national disaster preparedness programme when warranted. In addition to manned and automatic weather stations, the agency utilizes advanced very high resolution radiometer (AVHRR) images received through its ground receiving station to monitor the location of typhoons. Storm signal warnings are announced twice a day immediately after receiving the AVHRR satellite images, once in the morning and once in the afternoon.

(b) El Niño and La Niña

3. Using processed AVHRR satellite data, PAGASA is able to determine sea surface temperature. AVHRR images taken at different times and on different dates make it possible to monitor the movement of warm water on the ocean surface. Consequently, PAGASA is able to forecast when El Niño and La Niña will hit the Philippines and what parts of the country will be severely affected. This has resulted in the preparedness of the Government and the people for those two extreme climatic phenomena.

(c) Lahar and mudflow hazards from Mount Pinatubo

4. After the 1990 eruption of Mount Pinatubo, various optical images from Landsat Thematic Mapper (TM) and SPOT XS, taken on different dates, were utilized to determine the extent of damage caused by the eruption. Areas of pyroclastic material deposits were mapped using the images. Built-up areas that were under the threat of extreme lahars, mudflows and consequential flooding were identified using satellite imagery.

2. Volcanic eruptions and impacts of primary and secondary eruptive products

(a) Volcano eruption prediction and monitoring

5. Global Positioning System (GPS) technology is used for the monitoring of precursory ground deformation of active volcanoes (such as the Mayon and Taal volcanoes).

6. Satellite images, for instance, from weather satellites, are used to monitor volcanic activities such as the spatial and temporal dispersal of the eruption cloud.

(b) Volcanic hazards mapping

7. Space-based services are used to identify and map various volcanic deposits to produce deposit maps, volcano-geologic maps and assess potential hazards in the event of future eruptions. Satellite and radar images are used in mapping volcanic products and volcanic structures. The data gathered serve as input for the preparation of geologic maps and hazard maps for various eruptive products. Space-based images are especially useful in mapping in remote, inaccessible and socio-politically non-viable areas for ground-based surveys. Volcano hazard maps have been generated for several active volcanoes and are being utilized by government and non-government agencies in the preparation of volcano eruption disaster mitigation contingencies. Preliminary and rapid mapping of newly erupted volcanic products can be carried out using space-based data, if these are available. The delineated extent is then validated in the field. Application of GPS technology is very important in mapping out newly erupted volcanic deposits especially when the morphology of the volcano has been drastically changed (which was the case with the Mayon and Pinatubo volcanoes). Satellite technology provides digital data that can be easily integrated into the Geographic Information System (GIS), which can be manipulated to generate a variety of information on volcanic deposits, structures and processes for volcano hazard assessment. Elevation data from radar images have been used to generate preliminary digital elevation models (DEMs) for the Mayon volcano and the crater area of Pinatubo, which have been used for mapping and hazard assessment. The currently available topographic map for the Mayon volcano was prepared before 1984, and several eruptions have already occurred since then that have changed the topography of the volcano. The DEM for the Mayon volcano, based on radar images from 1996, served as a guide during field mapping of the 2000 eruption deposits. DEMs generated for the crater area of Pinatubo served as the basis for estimating the volume of water in the crater lake, which is important in assessing the flood or lahar hazard that could occur if the crater lake breached.

(c) Lahar mapping

8. Space-based services are used to map the distribution of potential lahar source materials and old lahar deposits and to delineate the possible extent of future lahars in active and potentially active volcanoes. Satellite and radar imageries are utilized to delineate the extent of pyroclastic flow deposits (potential source materials) and lahar deposits from past explosive eruptions of active and potentially active volcanoes in the Philippines in order to identify areas threatened by future occurrences of lahars. Satellite and radar images are used to identify geomorphic changes in watershed areas and river channels draining a newly erupted active volcano (such as the Mayon and Pinatubo volcanoes).

3. Earthquake hazards and active faults

(a) Active fault mapping

9. Space-based services are used to identify and characterize regional and local active faults in order to better assess earthquake-related hazards and risks. Space-based information, such as synthetic aperture radar (SAR) and Land Remote Sensing Satellite (Landsat) data, is utilized to a significant extent in the mapping of faults, since satellite scenes usually cover an area of several hundred square kilometres and therefore are very useful and effective in mapping large linear structures. Aerial photo interpretation, topographic analysis, drainage analysis and field investigation would later validate structures defined using satellite-based data. Considering the presence of numerous islands and mountain ranges in the Philippines, access to and utilization of satellite-based data can minimize fieldwork in far-flung and inaccessible areas. Active faults and potentially active structures can be mapped using space-based images (though with lower certainty) in areas in which the situation concerning peace and order is critical.

(b) Seismic hazard identification and mapping

10. Space-based services are used to map and identify areas affected and susceptible to earthquake-related hazards. Space-based information provides time-series images that allow identification and delineation of temporal variations of ground surface conditions used in the generation of geologic and seismic (landslide, liquefaction) hazard maps. Generated liquefaction susceptibility maps are being utilized by government and non-government agencies in preparation of disaster contingencies in the event of a major earthquake. Space-based images provide rapid documentation of the damage and impacts of major earthquakes, such as the landslides caused by the earthquake on Luzon on 16 July 1990.

Replies received from international organizations

Economic and Social Commission for Asia and the Pacific

[Original: English]

The Economic and Social Commission for Asia and the Pacific (ESCAP) has a Regional Working Group on Meteorological Satellite Applications and Natural Hazards Monitoring. The members of the Working Group are working together to develop a self-sustaining mechanism for promoting regional cooperation on meteorological satellite applications and natural hazard monitoring and to formulate and implement collaborative meteorological satellite application projects relevant to natural disasters in the region. The major activities of the Working Group in the past were in human resource development and information exchange.

Food and Agriculture Organization of the United Nations

[Original: English]

1. In 1993, the Food and Agriculture Organization of the United Nations (FAO) established an in-house task force on the coordination of emergency activities of the Organization. The Emergency Coordination Group was established: (a) to ensure that coordinated action is taken by technical divisions concerned in responding to critical emergency situations identified by the Global Information and Early Warning System (GIEWS); (b) to provide the mechanism for disaster preparedness and close monitoring of situations; (c) to ensure appropriate links and coordination between emergency and post-emergency action, including reconstruction, rehabilitation and longer-term development; and (d) to monitor the flow of financial resources for emergency activities. With the restructuring of the Organization that led to the reallocation of functions related to emergency assistance, the composition of the Emergency Coordination Group and its terms of reference were in August 1999 amended as follows.

2. In full consultation and with the support, as necessary, of the units concerned in the Organization, the Emergency Coordination Group will:

(a) Ensure coherent preventative action and systematic response from all the units concerned within FAO, through enhanced collaboration at all stages in the emergency, entailing both normative elements (establishing clear and practical guidelines and procedures) and operational elements (ensuring high levels of synergy between field operations at each stage);

(b) Ensure that FAO maintains a high profile and strong voice in the various inter-agency emergency-related consultative forums, that food and agriculture sector issues receive due attention and coverage and that action in the food and agriculture sector are given due priority in the formulation of emergency prevention, mitigation and rehabilitation policies and operations;

(c) Convene in the event of large-scale natural disasters and man-made emergencies, or economic crises, on the basis of early warning and other information, and ensure that coordinated action is taken;

(d) Arrange for action plans to be prepared for each stage of FAO interventions and monitor the progress of the Organization’s response vis-à-vis the targets in the action plan, review in-house evaluations and draw lessons from past experience;

(e) Ensure that FAO liason offices in Geneva and New York, representatives and regional and subregional representatives are kept adequately informed and involved in action taken at headquarters and apprise them of the Organization’s position in inter-agency forums;

(f) Identify the appropriate measures to strengthen the capacity of FAO for resource mobilization to ensure that its interventions are adequate and timely by defining a comprehensive strategy, monitoring actual resource commitments against appeals and increasing advocacy at the field level.

3. Specific FAO disaster-related activities, including the use of remote sensing, Geographic Information System (GIS) and related decision support tools, are described below.

1. Participation in the Inter-Agency Task Force for Disaster Reduction

4. To strengthen cooperation within the United Nations system, international organizations and non-governmental organizations concerned, FAO has actively participated in the work of the International Strategy for Disaster Reduction since its inception as a follow-up arrangement of the International Decade for Natural Disaster Reduction. FAO designated an organizational focal point for the Strategy and is among the eight United Nations agencies identified as the members of the Inter-Agency Task Force for Disaster Reduction. The organizational focal point participated in the meetings of the Task Force. FAO also provided both policy and technical contributions to the formulation of the framework for action for the implementation of the Strategy. In addition, FAO has also designated three senior technical officers as contact persons and provided substantive technical contributions to three working groups established by the Task Force on the following subjects: El Niño and La Niña, climate change and variability; early warning; and risk, vulnerability and disaster impact assessment.

2. Support to emergency planning: development of a disaster preparedness database under the United Nations Interim Mission in Kosovo administration

5. FAO, through its Emergency Coordination Unit in Pristina, is fully committed to adjust its agricultural assistance programmes in Kosovo to support the transition period from emergency to development. For this purpose, the Unit is involved in inter-agency dialogue and cooperation with local institutional counterparts in Kosovo, particularly the Department of Agriculture, Forestry and Rural Development under the United Nations Interim Mission in Kosovo (UNMIK). As part of that process, FAO has established a food security surveillance unit under a project funded by the United States of America that should ultimately fall under the responsibility of UNMIK. It is hoped that the project can be extended for a second year, with a broadening of its focus to include food security surveillance in neighbouring areas such as Serbia and Montenegro and countries such as Albania. In addition, FAO undertook a mission to review mechanisms to assist the Office for the Coordination of Humanitarian Affairs of the Secretariat with its Humanitarian Community Information Centre in Pristina and is developing a proposal for the Office for the Coordination of Humanitarian Affairs on the creation of a disaster preparedness database to be used as part of an inter-agency response mechanism. At a more global level, such a database would be aimed at supporting the response of the international community to human and natural disasters in affected and at-risk regions worldwide.

6. FAO is also participating in a new initiative launched by the Secretariat and members of the Geographic Information Support Team (GIST) to increase data sharing among United Nations missions by generating agreed standards for geo-referenced data. The areas of cooperation are being developed in various places, from Kosovo to the Horn of Africa. The database developed by FAO under its Land Cover Map and Geodatabase for Africa (Africover) project has already proved useful for emergency planning and disaster preparedness. FAO is ready to share its

expertise and information on the Programme Management Information System (ProMIS) in Afghanistan, an integrated system for emergency and rehabilitation planning.

3. Development of databases and handbooks for food security and sustainable agriculture

7. In cooperation with stakeholders concerned, FAO is providing operational service on environmental information through an Advanced Real Time Environmental Information Monitoring System using satellite remote sensing data. A database on agricultural disasters, including systematic and quantitative descriptions of causal factors, is being developed in FAO. FAO has also developed guidelines for rapid estimation of the impact of geophysical disasters on agriculture, using new and emerging Earth observation technology in combination with standard methodology. Through its normative programmes, FAO has also been developing baseline information for disaster prevention and monitoring, including the integrated use of GIS, remote sensing and decision support tools for vulnerability mapping to identify areas vulnerable to natural hazards and to provide assistance to its efforts to prevent natural disasters relating to food security and sustainable agricultural development. FAO has also recently initiated a technical handbook series on its emergency activities, commencing with six pamphlets on its contributions at each phase of the emergency sequence.

World Meteorological Organization

[Original: English]

The World Meteorological Organization (WMO) is very active in the detection and mitigation of natural disasters. Indeed, most WMO members have national mandates in that area. The WMO secretariat has focused its efforts on providing support for the detection and mitigation of natural disasters through its active participation in the International Strategy for Disaster Reduction. One small but shining example of the contribution made by WMO members to natural disaster reduction is the space-based Global Observing System of WMO that has been an integral part of its World Weather Watch from the very inception of the satellite.

International Astronomical Union

[Original: English]

The International Astronomical Union (IAU) welcomes the initiative by the Committee on the Peaceful Uses of Outer Space on space-based global natural disaster management systems. While most natural disasters studied by such systems are not of an astronomical nature, IAU wishes to point out the relevance of such systems for the timely detection of near Earth objects (minor planets and comets presenting a non-zero probability of an impact on Earth at some future time). Such objects, residing wholly or mostly inside the orbit of the Earth, are basically seen only in daytime and therefore invisible from the ground; space observations are required to detect them. IAU members study those issues as part of their regular duties in a variety of research organizations, and IAU therefore primarily intends to work with interested delegations and agencies rather than present independent programmes on those issues.

Notes

[1] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* (A/55/20), para. 119.