



General Assembly

Distr.: General
23 November 2004

Original: English

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

**United Nations/Pakistan Regional Workshop on Monitoring
and Protection of the Natural Environment: Educational
Needs and Experience Gained from United Nations/Sweden
Training Courses on Remote Sensing Education for
Educators**

(Islamabad, 30 August-4 September 2004)

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I. Introduction

A. Background

1. The Swedish International Development Cooperation Agency (Sida) and the Office for Outer Space Affairs began a training programme on remote sensing education for educators in 1990, the main objective of which is to enable educators from developing countries to introduce or to enhance remote sensing courses in their respective academic institutions. The first training course, held in 1990, was open to educators from Africa. Beginning with the second course, in 1992, the programme has been open to educators from all developing countries. Courses have been provided continuously up to the present time.

2. Between 1990 and 2004, some 350 educators participated in the training programme. Participants came from 53 universities, institutions or agencies in 29 African countries, from 45 such bodies in 17 Asian countries and from 48 bodies in 22 countries of Latin America and the Caribbean.

3. The training programme has already been evaluated three times:

(a) In 1994 a survey was carried out among participants in the courses held in 1990, 1992 and 1993 on the impact of the training on their performance and productivity;

(b) In 1998 a workshop was held in Botswana to evaluate the impact of the training on African participants in the 1990-1996 courses;

(c) In 2001 a survey was made of participants in the 1990-2000 courses and their institutional administrators to evaluate the impact of the courses on their development of curricula and educational and research programmes at the local level.

All three evaluations showed that the courses had had a positive impact as regards their educational goals in the area of remote sensing and that advanced training was needed.

B. Objectives

4. The Workshop held in Pakistan was one of two activities that will constitute the fourth evaluation exercise. The other activity is a workshop to be held in Brazil from 21 to 25 February 2005 for participants from Latin America and the Caribbean.

5. The objectives for the Workshop in Islamabad were:

(a) To evaluate the impact in Asia of the series of training courses; to understand the main reasons behind the success or otherwise in implementing the knowledge imparted at the training courses;

(b) To identify the nature and scope of possible support to ensure that ongoing efforts were well rooted in the educational community in developing countries of the region;

(c) To review the current course content and format in order to determine whether any enhancement was needed;

(d) To introduce selected advanced knowledge of current remote sensing techniques and teaching methods to former participants.

C. Programme

6. The Workshop consisted of a series of technical presentations followed by discussions leading to the formulation of recommendations. The open discussions focused on evaluation of the series of courses and provided an opportunity for participants to voice their opinions.

7. In order to refresh the knowledge of former participants and keep them abreast of the latest developments in related space technology, morning sessions were devoted to presentations and discussions on advanced topics related to the applications of remote sensing to monitoring and protecting the natural environment, new techniques, instruments and platforms, and new teaching methods.

8. Afternoon sessions were devoted to presentations by former participants and to discussions of their experience in the application of their knowledge in their respective institutions, the impact on curriculum development, their needs and possible changes in the course programme, as well as to drafting recommendations. Participants were actively involved in all the deliberations of the Workshop.

D. Attendance

9. Participants in the Workshop included active educators and experts working in relevant governmental organizations, research and academic institutions or with programmes, projects and enterprises using remote sensing technology or geographical information systems (GIS). Course instructors and speakers came from Stockholm University and the European Space Agency (ESA).

10. Since the objective of the Workshop was to evaluate the effectiveness of the series of training courses, active former participants were invited to attend: 22 educators, including 9 women, from Nepal, Pakistan, Sri Lanka, Thailand and Viet Nam took part in the Workshop. The Workshop was also open to local practitioners and researchers: some 60 additional participants came from the Space and Upper Atmosphere Research Commission (SUPARCO), the Institute of Space Technology and local industry contractors.

E. Financial support

11. The Workshop was organized in cooperation with the Government of Pakistan and co-sponsored by Sida and the University of Stockholm and was hosted by SUPARCO.

12. Funds for the international travel of 16 participants were provided from the fellowship budget of the United Nations Programme on Space Applications. Support for the local travel of the remaining participants, as well as the cost of room and board, course materials and inland transport for all participants, was provided by Sida and SUPARCO.

II. Summary of presentations

13. The presentations were grouped into two categories. In the morning sessions experts from Stockholm University (Bengt Lundén, Wolter Arnberg and Göran Alm) and ESA (Juerg Lichtenegger) presented advanced technologies in remote sensing and GIS. Experts of SUPARCO made a presentation on the present status of their application of the technology. The afternoon sessions were devoted to 22 presentations by former course participants, which are listed below by category.

A. Case studies and experience in the implementation in projects of the knowledge gained

14. Nine presentations came under the first category:

(a) Using remotely sensed data and GIS to estimate groundwater recharge in the Deduru Oya catchment area, Sri Lanka;

(b) Landscape management using PhotoSat imagery: the experience of Nepal;

(c) The need for remote sensing in natural resource management, with special reference to range land in Pakistan;

(d) Evaluation of rhinoceros (*Rhinoceros unicornis*) habitat in the western Terai, Nepal, using remote sensing and GIS;

(e) Classification of land ecosystems, soil fertility and salt-affected areas by means of satellite images and GIS in north-east Thailand;

(f) Westward migration of the Narayani River in central Nepal;

(g) Application of remote sensing and GIS education in ecological studies and biodiversity conservation ventures in Nepal;

(h) Experience in the application of remote sensing at the Government Girls Degree College, Haripur, North-West Frontier Province, Pakistan;

(i) Quality enhancement of the GIS and remote sensing study programme: a case study of the University of Colombo, Sri Lanka.

B. Curriculum development and evaluation of the impact of the courses

15. Thirteen presentations were given in this category:

(a) Growth and development of remote sensing and GIS in the Department of Geography, Urban and Regional Planning of the University of Peshawar, North-West Frontier Province, Pakistan;

(b) Status of remote sensing education in the university curriculum of Nepal: an evaluation of the impact of the United Nations series of courses;

(c) How to bring GIS and remote sensing to the Department of Environmental Management, Institute for Environmental Science and Technology, Hanoi University of Technology, Viet Nam;

(d) The results of the learning and experience gained from the United Nations training course: remote sensing and GIS curriculum and research development at the Hanoi University of Science and Viet Nam National University, Viet Nam;

(e) Lessons learned by Pakistan participant at the United Nations/Sweden Training Course on Remote Sensing Education for Educators in Stockholm and Kiruna, Sweden;

(f) The new remote sensing education directive to academic institutions in developing countries: an evaluation of the United Nations/Sweden training course by a participant from Nepal;

(g) United Nations/Sweden Training Course on Remote Sensing Education for Educators: progress, achievements and expectations since 1993 in Sri Lanka;

(h) Transferring remote sensing and GIS technology at Silpakorn University, Nakhon Pathom, Thailand;

(i) Proposal to establish courses in remote sensing and GIS at the Open University of Sri Lanka;

(j) United Nations/Sweden Training Course on Remote Sensing Education for Educators: education needs, experience gained (Thailand);

(k) Development of the remote sensing sector at the University of Moratuwa, Sri Lanka, and its contribution to national development;

(l) Facing challenges in teaching GIS and remote sensing courses for the postgraduate teacher educators' programme in Nepal;

(m) Impact of the United Nations/Sweden course on enhancing professional experience as a teacher/researcher and strengthening GIS and remote sensing education at Islamia University Bahawalpur, Pakistan.

III. Observations and recommendations

A. General observations

16. Participants expressed their appreciation to the United Nations, Sida, Stockholm University, ESA and SUPARCO for jointly organizing the Workshop in Islamabad.

17. Participants emphasized that more concerted efforts were needed to devise the necessary mechanisms for initiating and strengthening cooperation among Asian countries to facilitate the effective use of remote sensing data and its integration with GIS technology.

18. Given the benefits of such workshops, participants urged the organizers to hold them more frequently, preferably in Asian countries on a rotation basis, in order to afford the scientific community an opportunity to exchange ideas and

experience and information updates, which would go a long way towards establishing and strengthening meaningful cooperation among the relevant organizations and institutions.

19. The increase in atmospheric pollution in the developing countries was of particular concern to participants and they therefore urged all countries, especially in the Asian region, to take the necessary measures to control the sources of pollution effectively so as to provide a safe and clean atmosphere for the better health of their citizens.

B. Recommendations

20. During the Workshop, a committee was set up, consisting of Suman Suvedi (Nepal), Kim Chi Vu (Viet Nam), K. Watchraraporn (Thailand), Ranjith Premalal De Silva (Sri Lanka) and Amir Khan and Khalida Khan (Pakistan). Its members will serve as lead persons for their respective countries in making recommendations concerning future United Nations/Sweden training courses on remote sensing education for educators.

21. The Workshop provided an opportunity for former participants to share their experience, knowledge and expectations while acquiring information on recent advances in the technology related to remote sensing and GIS. The committee collected input from all participants during the presentations and discussions and formulated the following recommendations:

(a) The United Nations/Sweden courses should be continued, for the following reasons:

(i) The courses had acted as a catalyst for remote sensing and GIS education in the participating countries. Further, they had contributed to the dissemination and expansion of remote sensing and GIS activities in several institutions;

(ii) All the countries involved had initiated fully fledged graduate and postgraduate study programmes in remote sensing and GIS and had provided the necessary platforms for high-quality academic and applied research;

(iii) In addition to the direct impact on the universities, remote sensing and GIS knowledge and information had been transferred to policy planners and decision makers, enabling them to make informed and evidence-based decisions and plans. Basic remote sensing and GIS education had also found its way into secondary school curricula;

(iv) Administrations of the participants' universities had expressed their appreciation for and commended the support extended through the courses. University authorities had pledged their support for the strengthening of academic programmes in remote sensing and GIS in their universities;

(b) A refresher and advanced training programme for former participants and educators in remote sensing and GIS in general should be set up at least at the regional level:

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- (i) Former course participants had limited opportunities to update their knowledge through participation in workshops, symposiums and conferences;
 - (ii) The rapid development of the technological knowledge base in the developed world needed to be transferred to the developing countries by educators;
 - (iii) A specially tailored training programme for a selected group of educators at a university would be another way to encourage the expansion of education in remote sensing and GIS. A critical mass of expertise needed to be developed at each participating university. A long- or medium-term fellowship programme for educators would be another means of strengthening the knowledge base at each university;
- (c) An alumni association and a computer-based communication network of former United Nations/Sweden course participants should be established with the support and guidance of Sweden and the United Nations:
- (i) The workshop had shown the usefulness of interaction among former participants in developing strong links among individuals and institutions engaged in remote sensing and GIS education in the region;
 - (ii) The network could be of benefit to each country by developing strong remote sensing and GIS educator groups that could be a means of sharing the limited resources available for remote sensing and GIS education, including data, teaching materials and publications. It would also provide a valuable opportunity to understand how resource constraints could be overcome in each country of the region;
 - (iii) This would also enable former participants to get mutual support through the exchange of resources, both human and physical;
 - (iv) A web site could be maintained providing details about the participants and their activities and details about forthcoming workshops and symposiums and relevant publications;
 - (v) The alumni group could be further expanded to create a regional forum of remote sensing and GIS educators and practitioners in the region;
- (d) Regular regional meetings should be organized in collaboration with national institutions such as SUPARCO of Pakistan and the International Centre for Integrated Mountain Development of Nepal:
- (i) Such regional meetings could be held in other countries of the Asian region on a regular basis;
 - (ii) Financial support from the United Nations for former participants and those engaged in teaching and research in the fields of remote sensing and GIS to attend regional workshops, symposiums and conferences would encourage former participants to expand their activities beyond national boundaries;
- (e) The organizers of the United Nations/Sweden training courses should be enabled to visit educational institutions of former participants to ensure continued support to participants. That would help strengthen remote sensing and GIS activities in universities and would also encourage university administrations and higher authorities to support the course participants in their future activities;

(f) There should be close collaboration between former participants in the United Nations/Sweden training courses and the disaster management task force established at the Workshop (see para. 24 below). Participants would assist their countries in the event of a natural hazard or disaster and provide technical expertise in designing early warning systems;

(g) Papers prepared by former participants should be published in order to give educators in the region an opportunity to exchange and share knowledge and research methodologies.

C. Follow-up action

22. Participants agreed to publish papers and other materials documenting successful application of the knowledge gained at the United Nations/Sweden training courses on remote sensing education for educators. Participants formulated a list of requirements as regards the format of such papers. Ranjith Premalal De Silva (Sri Lanka) was named chief editor and Juerg Lichtenegger (ESA) would serve as chief reviewer. The Office for Outer Space Affairs would monitor progress in the project, ensure the quality of the papers and seek funding to cover printing costs. A target publication date was set for early 2005.

23. During the Workshop, participants designed a pilot project to create a central data repository containing baseline data of regional geographical characteristics. As follow-up action, each participant would define her or his disaster-prone geographical area for individual study using her or his own particular expertise, acquire free data from ESA and the National Aeronautics and Space Administration of the United States of America, process the data and generate images of the area under study. The data would be deposited in the central database and made generally available. Riffat N. Malik (Pakistan) volunteered to serve as coordinator of the project. The United Nations, ESA and Stockholm University would provide technical assistance and monitor the project. The baseline data would be shared among users and would be used for modelling and analysis as needed. The target date for setting up the structure of the database was the first quarter of 2005.

24. Participants established an Asian Regional Task Force on Risk Assessment for Natural Resources and Environmental Protection Using Remote Sensing and GIS Technologies. Members in the Task Force would have an active role and undertake the following activities:

(a) Use of the baseline data supplied by the participants (see para. 23 above) in order:

(i) To perform modelling, analysis and prediction of potential disasters in the disaster-prone areas and to make the results available to relevant local officials for preventive action;

(ii) To establish communications with local disaster rescue organizations such as the International Federation of Red Cross and Red Crescent Societies, law enforcement officials and government authorities to develop a relationship for disaster management support;

(b) In the event of a natural disaster:

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- (i) Establishment of contact with team advisors, team partners and the Office for Outer Space Affairs;
 - (ii) Use of the baseline data (see para. 23 above) along with data on the emergency scene to perform modelling and analysis of damage caused and to make suggestions as to how to mitigate the damage;
 - (iii) Provision of the study results and recommendations to local authorities and rescue teams in order to assist in the emergency rescue efforts; and maintenance of contacts with local authorities for risk mitigation, when applicable;
 - (iv) Addition of the newly produced emergency scene assessment data and descriptions to the central data repository; and dissemination of information to the members of the Task Force.

25. Following the Workshop the Office for Outer Space Affairs would:

(a) Play an active role in the development of the Task Force by maintaining frequent contact with the local sub-team leaders on the progress of their sub-team; be aware of practical issues and provide assistance in resolving them; maintain monthly telecommunication with all team members on the status of work and related issues;

(b) Provide information on 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”), of which the Office is an active member; and assist the members of the Task Force to understand the process of acquiring emergency scene data through the mechanism of the Charter;

(c) In the event of a disaster, the Office for Outer Space Affairs would provide assistance in acquiring data, arrange for technical support for modelling and analysis work and assist in the submission of the results of the analysis and recommendations to the rescue authority.

26. The participants elected the following four coordinators for their respective areas: Ashar Lodi, coordinator for SUPARCO; Amir Khan, coordinator for universities; Nasim Uddin, military coordinator; and Alice Lee and Sergei Chernikov, United Nations coordinators. The technical advisers would be Goran Alm, Wolter Arnberg and Bengt Lundén (Stockholm University) and Juerg Lichtenegger (ESA).

27. Commitments were made by 51 participants to support the work of the Task Force, a list of whom, together with their related contact information, was distributed during the Workshop. The coordinators will make frequent use of electronic mail and telephone calls concerning the status of work and issues of development in order to ensure the success of the Task Force.