❖ CSSTEAP* Newsletter ❖

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Valedictory Address : Space & Atmospheric Science

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Dr. A.E. Muthunayagam during valedictory function of Space and Atmospheric Science Course

Today is a memorable day and we see a successful completion of a milestone in the international co-operation for capacity building in this region.

Capacity building is indeed one of the major efforts by every nation all over the world towards their Socio-economic progress. We see today two distinct aspects in capacity building, the first one is the capacity building for knowledge and the second one is the capacity building to use the knowledge to meet the national needs viz. economic, industrial, strategic, geopolitical etc., the latter becoming more and more important.

As you are already aware that the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) has been running a number of courses since its inception in 1995 and has trained about 300 persons of the Asia Pacific Region in Space Science and Technology. This has been possible due to the dynamic leadership of Prof. B. L. Deekshatulu, Director CSSTEAP, active support of Director, PRL and other Centre Directors of ISRO and the National Technical leaders of our region. In view of its pioneering role in space science research in India, the Physical Research Laboratory, Ahmedabad is certainly the ideal place for conducting this space science course with international participation. I am sure that the manpower trained by CSSTEAP would serve as a nucleus for the development of Space Science and Technology in this region.

On this occasion, I request all participants and organizers of this course of "Space & Atmospheric Science" to review the events over the last 9 months and evolve strategies for the future to enhance the utility of the course. I am sure that such efforts to promote international cooperation for capacity building in Space & Atmospheric Science will bring about fruitful results in the coming years.

With increased knowledge, one recognizes, that the hydrosphere, biosphere, geo-sphere and atmosphere constitute an extraordinarily complex interconnected system which sustains life on earth. To predict the future of this complex system, we must be able to understand its behaviour. Understanding the nature of climate variability is not only one of the most challenging areas of scientific endeavour, but also of great practical importance for nations whose frontiers are tied with the vagaries of the monsoon. There is need for important science to be done to develop better models for weather prediction. In this context we recognize that Ocean is considered as

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understanding and predicting global environment and climate change. The ocean climate link is an important and strategic one.

With the advancements in Science & Technology one begins to appreciate the linkages between Ocean Science and Atmospheric Science and the vast potential to Satellites to promote Science in these areas. The role of Satellites in Space and Atmospheric Science, I am sure, is addressed well during the just completed course. I wish to briefly talk about the potential and uses of the Ocean and the application of satellites in Ocean Science.

Ocean is our last frontier. Ocean cover about 71% of the earths surface. It is estimated that about 2/3rd of the global population live within 60 km of the shore and 2/3rd of the cities with population above 2.5 million inhabitants are located along with coast.

Ocean is indeed a source of wealth. The non-living marine resources have grown in importance in the last 5 decades or so. Much of the energy requirements are met from exploiting off-shore oil and gas reserve. The methane hydrates - Gas hydrates-under seabed, estimated to be greater than all presently identified reserves of oil and gas opens up new opportunities and technological challenges for economic recoveries and efficient utilization.

Ocean is a potential source for different types of renewable energies; the promising ones are wave energy, tidal energy and ocean thermal energy. Valuable minerals exist from coast to deep water. Placier deposits zircon, rutile, illiminite, silliminite etc. are along the coast and shallow waters, phosphates and sulphides are at varying depeths from 100 to 1500 m and polymetallic nodules with Cu, Ni, Co, Mn are at around 5000 m depths. Hot submarine vents deposit large quantities of metals in and around vents along mid ocean ridges and other spreading centers.

Fisheries as we all know, a Marine living resource is a vital source of protein for many coastal and other communities. The aquaculture in the marine environment has significant growth in the last two-decade or so. Ocean is also a potential source for pharmaceutical products. A large number of marine natural products have been reported from marine organisms. Shipping is the most traditional source for deriving wealth from the ocean. Despite the developments in surface and air transport systems, the sea transport still continues to be the most economic way of moving large volume over long distances. For many coastal communities tourism is a great source of wealth. Further, Ocean provides natural service such as carbon storage, atmospheric gas regulation, and nutrient cycling and serves as an inexpensive dumping site for domestic and industrial waste from land based activities. Also Ocean plays a major role in national security. Economic development, quality of life and national security pose challenge for Scientists and Technologists working in the ocean sector.

As we know, exploration and exploitation of the vast living and non-living marine resources for the socio-economic benefit of the society and judicious management and conservation of fragile marine environment are the two primary pursuits all over the world. Knowledge of physical, chemical, biological, geological, geophysical and other processes of the seas are essential for success in marine R & D. For this reliable oceanographic data are essential. The advent of remote sensing satellite with capability to give spatially continuous data on a repetitive basis has radically changed the nature of ocean observation and oceanogrphic studies during the recent years. The ocean satellites are ideal platforms in space to obtain global pictures of the ocean, which lead to better understanding of the ocean features and processes. Of course, these are in addition to ocean observation through moored and drifting data buoys, ocean based instruments like current meter arrays, and ships.

The main sensors that have been used for satellite observations of oceanographic parameters are multi-spectral scanners operating in the visible and infrared ranges of the electromagnetic spectrum. Imaging radar systems, which operate in the microwave region of the spectrum with capability of operation throughout day and night and through cloud cover have also come into use and are expected to provide

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more and better oceanographic data. Major instruments covering an extensive window of electromagnetic spectrums used for oceanographic application are - ocean colour monitor, Thermal infrared radiometers, Scatterometer, Synthetic Aperture radar, Altimeter, Microwave Radiometer, Imaging Spectrometer and High Resolution Imagers.

These instruments provide a wealth of information on a diverse range of geophysical parameters and phenomena such as surface or near surface colour, sea surface temperature, wave field, sea surface roughness, surface topography, wind field etc. Measurements of these features and their variations over space and time can be analysed to provide information relating a biological productivity, fish shoals, currents, sea state, surface winds, water composition and quality, sedimentation pattern, pollution and other phenomena.

Next, I wish to briefly touch upon the global scenario on ocean related satellites. The first operational oceanographic satellite was SEASAT of NASA (US) launched in 1978. During its brief period of operation of about 3 months, it provided a volume of data over the oceans. It had synthetic apearture radar, altimeter, scatterometer, scanning multi-channel microwave radiometer, and visible infrared radiometer. In the same year NIMBUS was launched by NASA, which included coastal zone colour scanner. Its main aim was to establish optimum characteristics for mapping and measuring phytoplankton pigments and other water phenomena and improving the scientific knowledge of marine ecosystem. The COSMOS of USSR, GEOSAT of US Navy, NOAA Satellite of NASA, European remote sensing satellite, SPOT of France, LANDSAT of US, JERS of Japan, and OCEANSAT of India are some of the satellites, which contributed enormously for the understanding of the ocean. Many more satellites with improved capabilities are being developed by the nations currently. Efforts are underway to improve the ocean parameter retrieval capability and mapping of coastal zone, with better scales.

I congratulate PRL, CSSTEAP and DOS for this successful course on Space and Atmospheric Science. I am sure that the participants have benefited from this programme. I wish them all success to put to use the knowledge and experience gained in their future activities. I thank Prof. Deekshatulu, Prof. Agarwal and the organizers for giving me this opportunity.

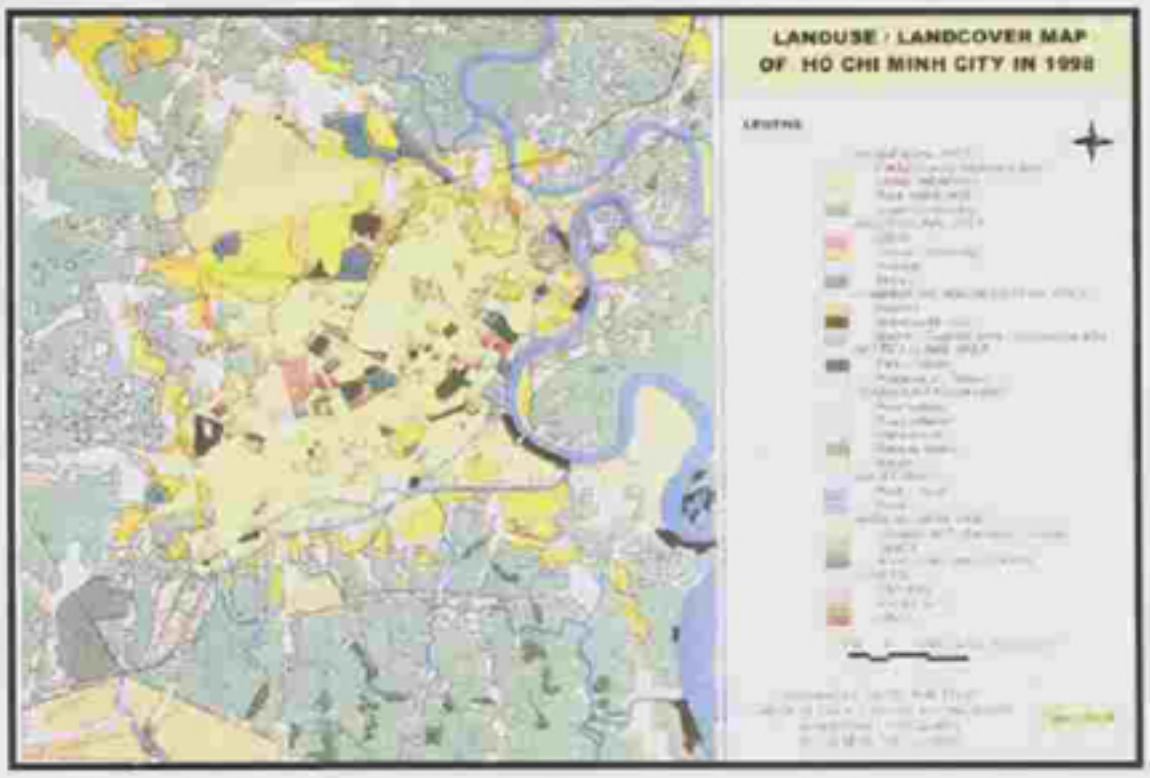
I conclude by saying that capacity building is an essential requirements for progress of any nation. International co-operation for capacity building is laudable and it needs encouragement and whole hearted support of the Leaders of the nations. Scientists and Technologists have significant role to play for the success of these programmes.

- Sponsored by UN/ESA/COSPAR Dr. Yogesh Kant, Scientist CSSTEAP, Dehradun attended the Workshop on Data Analysis & Image Processing Techniques hosted by General Organization of Remote Sensing (GORS), Damascus, Syria during 25-29 March, 2001.
- Md. Abdus Salam, Bangladesh, a CSSTEAP alumni participated in the 'SASCOM-APN Workshop 2001 on Rice Research Under Elevated CO_2 Conditions at Indian Agricultural Research Institute, New Delhi, India during March 16-18, 2001. He had undergone the PG course in RS&GIS at Dehradun during 1997-98 & has been awarded M.Tech. degree.

Urban expansion and environmental impact analysis in Ho Chi Minh city using Remote Sensing and GIS

This is Summary of M.Tech dissertation report of Ms. Thoa Thi Kim Le (Vietnam), student of RS/GIS Course 1997-1998.

Rapid urban growth and industrial development have resulted in the increase of Vietnam's urban population from 12,662,000 (19.9%) in 1988 to 15,726,000 (20.5%) in 1997. As per the statistical record, Vietnam is having more than 500 cities, out of which two cities in Class I, 5 cities in Class II belonged to management of the Central Authority; 6 cities in Class III belonged to management of the provincial authority. Ho Chi Minh City (HCMC) Province in Vietnam is also experiencing a similar phenomena as evident by proposed Saigon master plan to create a modern community that will provide the old and new city with the necessary infrastructure, services and amenities.



Ho Chi Minh City (Formerly Saigon), the largest city of Vietnam lies between the Mekong River delta and Eastern Nam Bo (South Vietnam Proper). The city has unique geography as apparent from the hills and plains in northern part of the city, while many small rivers and canals criss-cross in the southern part of the city. The port of Saigon established in 1962 is a rare advantage for a land river port. At present this city is a centre of many activities of the country, viz. economical, financial, educational, scientific and technological. Due to diverse activities, the city has attracted many people making the city as one of the fastest growing cities in Vietnam. A high rate of urbanization has given rise to serious degradation of the environment and the city is facing various problems like inadequate water supply, sewerage system, extreme congestion in the city core, inadequate transportation system, and lastly cropping up of slum areas dispersed through out the city. Hence monitoring of urban expansion and its environmental impact analysis are, therefore, urgently needed. In this background, an attempt has been made to study urban expansion and their impact on environment using remote sensing data. The present study has used aerial photographs of 1977 and 1982, Landsat TM & SPOT merged (1992), guide map of Ho Chi Minh City (1998), Master Plan document and other secondary information. Various parameters such as location of hospitals, parks, canal and road networks are used for assessing environmental degradation. Various thematic layers are created using remote sensing data and ARC/INFO and ArcView GIS techniques. Land use/land cover maps for 1977, 1982, 1992 and 1998 are generated for further analysis. Different catchment zones are also created for each parameter and integrated with population density to assess environmental impact. After the quantification of the result, various environmentally affected zones are delineated for recommendations are proposed for the overall growth and development of the city. The following suggestions are made to solve the problems of the city.

- To prevent migrant inflowers to city as well as upgrade the infrastructure system, the Government should pay more attention to investment in rural areas in order to reduce the economic gap between urban and rural communities.
- The Government should also develop regional industrialization and urbanization planning system as a buffer accommodating a part of the migration from rural to urban areas.

The meetings of Governing Board and Advisory Committee

The third Advisory Committee (AC) and sixth Governing Board (GB) meetings were held on May 15, 2001 and May 17, 2001, respectively at Indian Institute of Remote Sensing, Dehra Dun.

3rd Meeting of advisory Committee in Progress

The AC meeting was chaired by Dr. Sergio Camacho of United Nations-OOSA, Vienna. The AC appreciated the efforts of the Centre in shaping its educational activities for the current year. The AC also noted that the committed efforts of the Centre, in particular its Director, and the host institutions - IIRS, SAC and PRL have the Centre reach high levels. The AC endorsed the courses, programmes and the future technical activities of the centre.

Members of the Governing Board & invitees at the venue of the 6th Meeting

The GB meeting was chaired by Dr. K. Kasturirangan, Chairman Governing Board CSSTEAP, Indian Space Research Oganization Memebrs/representatives from various countries viz. Mr. Kartar Singh Bhalla (Nauru); Mr. U. Soe Haing (Myanmar); H.E. Jose P. Del Rosario (Philippines); Mr. I. Ibragimov (Uzbekistan); Mr. Dhananjay Jha (Nepal); Mr. Bhairab Jha (Nepal); Mr. Tolbaev Lenar (Kyrgystan); Mr. Y. Akynzhanov (Kazakstan); Mr. Choe Song Gu (DPR Korea) and Mr. Sergio Camacho of UNOOSA, attended the meeting. Dr. Kasturirangan was unanimously elected as the Chairman of GB for another term of two years. Methods of expanding the membership of the Centre were discussed. The GB members authorized the Chairman to approach, in co-ordination with UN-OOSA, member states of the region, other donor countries, financial institutions etc., for obtaining financial support for the activities of the centre. The GB members expressed extreme satisfaction on the working of the centre, while reviewing its activities and also extended its whole hearted support to the functioning of the centre.

Fifth RS & GIS Course

The fifth (2000-2001) post graduate course on Remote Sensing and Geographic Information System (RS & GIS) which started on October 1, 2000 is in progress at Indian Institute of Remote Sensing (IIRS), Dehradun. Nineteen participants from 13 countries of the Asia-Pacific region are attending the course. The Modules-I & II of the course each with three months duration ended in December, 2000 and March, 2001, respectively. Module-III which started from April, 2001, is basically designed for carrying out pilot project work. In this module, each participant prepares and executes a pilot project under supervision of experienced IIRS faculty members. The main objective of this module is to make the course participant independent and capable to carry out research on his own towards accomplishment of natural resources inventory and survey. The broad topics of the pilot projects undertaken by the course participants during Module-III are - crop inventory; Land evaluation for landuse planning; soil and land degradation assessment & monitoring; Resource use pattern analysis; studying physiography - soil - vegetation relationships; soil erosion inventory; Forest change detection and environmental analysis; Urban facilities; Traffic routing; Tourist Information System; Seismo-technonic hazard zonation, landform change Analysis; Ground water exploration; coastal zone management and nearshore water quality assessment. This post graduate course is ending on June 30, 2001, with a valedictory function.

Collecting ground truth data for pilot project work

The meeting of course curricula review

A meeting to review the course curricula of the four courses viz. RS & GIS, SATMET, SATCOM and Space Science of the centre was conducted at Space Applications Centre, Ahmedabad during May, 9-10, 2001.The meeting was done as a pro-active step by the centre to prepare for the United Nations (UN) meeting on curriculum review, planned in September, 2001. The Review Report and the Revised Course Curriculum document would be sent to UN-OOSA for consideration as background material for the September, 2001 meeting - as had been done for the Granada meeting in 1995. Dr. George Joseph, Distinguished Professor, ISRO- an eminent international scientist, was the chairman of this high-level curriculum review committee consisting of experts from Universities, Professional Institutions, and Industries besides the host institutions. The Review Committee, apart from suggesting changes in the existing topics and inclusion of newer topics had also looked into the organizational issue of the course. The committee had gone into the details of the four courses curricula and had recommended specific changes in the structure, topics, emphasis etc. - all of which would be included in the final report, under preparation. Dr. George Joseph, Chairman of the Review Committee, made a brief presentation about the summary of the curriculum review meeting to the Advisory Committee (AC) meeting of the centre held on May 15, 2001.

Course curricula Meeting in Progress

Space & Atmospheric Science Course

The Space Science Course of the CSSTEAP is a two-stage program leading to M. Tech. degree in Space Science from the Andhra University, Visakhapatnam, India, for those eligible. The first stage of the course, which is of nine months duration, was conducted at the Physical Research Laboratory (PRL), Ahmedabad from 1st August 2000 to 30th April 2001. The first phase consists of four Modules and a Pilot Project. The second phase of this course would be of one-year duration and will be conducted in the home country of the participant during 1st May 2001 to 30th April, 2002. Nine participants from 5 countries namely Kyrgyz Republic, India, Mongolia, Nepal and Uzbekistan attended this nine-month's course.

A Pilot Project of two months duration was conducted at the completion of the above mentioned Four Modules. As many of the participants did not have a clear-cut idea of what is feasible as a one year Home Project in their country, this Pilot Project at PRL attempted to initiate the foundation of one year Project at home. The Pilot Project was undertaken in consultation with the supervisors in India as well as in the home country. During this two month period, the participants worked under the guidance of one Indian supervisor and got a) the guidance on the line of action to be pursued at home, b) all the necessary experimental data, if required, c) the necessary software tools, etc.

The faculty for the Space Science Course was drawn from PRL and other first rate institutes and universities in India and abroad. It must be put on record that it would not have been possible to raise the level of this course, which it could attain, without the generous support from these institutes and universities. The students learnt through lectures, discussions and extensive experimental work in different types of laboratories within PRL.

The performance of students was judged by periodic class tests, practical tests, seminars and finally by rigorous three hour written examination in each of the topics, in accordance with the strict evaluation procedures prescribed by CSSTEAP and the Andhra University.

After the completion of phase one, a valedictory function was organized at PRL, Ahmedabad on April 29, 2001. The procession of students, dignitaries and faculty started from PRL Library Lawns and proceeded to the KR Ramanathan Auditorium of PRL. Dr. A.E. Muthunayagam, Former Secretary, Department of Ocean Development, Government of India was the Chief Guest for the Valedictory function and Prof. G.S. Agarwal, Director, PRL presided over the function. The Chief Guest awarded all the participants the Diploma Certificates and their grade cards. Prof. G.S. Agarwal released a Memoir, which was specially brought out for this occasion.

Valedictory Function of 2nd P.G. Course on Space and Atmospheric Science at PRL, Ahmedabad on April 30, 2001