



PAST AND FUTURE CLIMATES: RESPONSES OF EARTH SYSTEMS WITH SPECIAL REFERENCE TO LARGE RIVERS AND THEIR BASINS

Understanding the Earth is riddled with complexities. According to Prof. S.K. Tandon earth records are 'snapshots' and linking them in the 'string of time' requires not only inter and multidisciplinary approaches, but transdisciplinary thinking.

CESS IN THE NATIONAL TSUNAMI WARNING PROJECT

Centre for Earth Science Studies has been awarded a new project 'Tsunami and Storm Surge Inundation Modelling and Mapping for the coasts of Lakshadweep, Kerala and Karnataka' by the ICMAM Project Directorate, Ministry of Earth Sciences, Government of India. This is part of the national project 'Establishment of National Early Warning System for Tsunami & Storm Surges in Indian Ocean'. The project aims at setting up numerical models for tsunami and storm surge inundation, its calibration, generation of scenarios of seawater inundation and preparation of inundation maps on 1:5000 scale for the Lakshadweep, Kerala and Karnataka coasts. These maps are intended for use by the National Tsunami Warning Centre at Hyderabad for alerting and evacuating coastal population in the event of a tsunami/storm surge warning. The project is sanctioned to CESS with a tentative total outlay of Rs.52 lakhs out of which a sum of Rs.28 lakh was released for 2006-07.



Prof. S.K. Tandon receiving the Prof. C. Karunakaran Endowment Shield for 2006 from Dr. P.K. Thampi, former advisor CESS.

Prof. S. K. Tandon, the renowned Geologist, presently Pro Vice Chancellor of the Delhi University was giving the seventh Prof. C. Karunakaran endowment lecture in CESS on 23 December 2006.

The evolution of both life and matter cannot be understood through knowledge sets that are limited by disciplinary boundaries. Most of us are trained in any one of the following related set of disciplines-Geophysics, Geology, Geography, Geochemistry, Oceanography, Meteorology and Atmospheric Science. Although there is growing recognition that new knowledge often lies at the intersection of disciplines, it is difficult to adopt problem solving

approaches using the knowledge skills and methods of both related disciplines and seemingly unrelated disciplines. Prof. C. Karunakaran was one of the few geologists in this country who had the courage and conviction to recast 'traditional geosciences' into a Earth Science mode - a strongly inter disciplinary mode in which the three main components of the Earth - the lithosphere, hydrosphere and atmosphere are investigated in a holistic framework. That his thinking stood shaped in this way as early as the seventies is remarkable. He was ahead of his time by two to three decades; sadly his visionary thinking has very few followers in

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From the Director's Desk



The country has just observed the second anniversary of the disastrous Indian Ocean tsunami of 26th December 2004.

Though there were many disasters in the past, this was one event which transformed our approach towards disaster management. The relief and rehabilitation measures consequent to tsunami had unprecedented impetus all over the country. As per the recent reports more than 75% of the affected families have already been rehabilitated. Restoration of livelihood activities was another major achievement.

There had been big strides in the areas of disaster mitigation and general preparedness as well. The country has adopted for the first time a national policy for disaster management. A National Disaster Management Authority had been brought in place. The Kerala Disaster Management Authority has been constituted recently as required in the National Policy.

As part of the national policy in the area of tsunami mitigation also several steps are being taken by the country. A tsunami warning system is being developed with facilities of early detection of undersea earthquakes and establishment of tide gauges, DARTs, satellite links, advanced tsunami and coastal inundation models and latest communication tools. Utilizing these facilities, the country will be able to detect the tsunami at its origin, its spread and time of arrival at the coast and to assess within a matter of minutes the extend of the coast going to be affected. CESS is part of the national team in developing the coastal inundation models and their integration with the national grid. It is a matter of pride for CESS and the Kerala to be to be a part of this National Programme.

Dr. M. BABA

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the earth sciences community in India. I feel privileged to count myself amongst those who follow the path shown by him, and be counted amongst those who firmly believe that problem - solving in the area of Environmental Sciences requires inter-multi and trans-disciplinary approaches.

We live in a world that is loaded with debatable issues; indeed in a world of loaded debate about climate change and the consequences of climate change. One of the most serious societal concerns of our times is how freshwater resources will be impacted upon by climate change. This will require a comprehensive understanding of modern surface and sub-surface water systems. We will have to move to paradigms in Earth Systems Sciences that will support 'Global sustainability'. This brings me to the subject of today's discussion - 'Large River Systems'. They have to be studied from several aspects Geology, Hydrology, Geochemistry, Hydrogeochemistry, Vegetational Systems, Anthropogenic influences and Management. These aspects of large river systems require approaches that help our understanding regarding positive and negative feedbacks between different sub systems (for example Vegetation and Hydrology; Pollution and Vegetation; Pollution and Hydrology), and the 'dynamics' of feedbacks in a scenario of climate change.

It is well known that the Earth's climate has changed with time, and will continue to change, to some extent, in a predictable way. Through geologic time, the Earth has witnessed several transitions from greenhouse state to icehouse state. The beginnings of the current icehouse earth go back to 30 million years. The icehouse earth witnesses

glacial interglacial cycles that are strongly linked to the periodicities associated with the parameters of the Earth's orbital motion. There is overwhelming evidence to support the conclusion that for 500,000 years, major climatic changes have followed variations in obliquity and precession.

Unprecedented increments in temperature over the next century are predicted from the temperature trends of the previous century. The impacts of these changes on various elements of geomorphic systems and ecosystems need to be modeled. This modeling ultimately will have to be focused on the Earth's freshwater resources. It is in this context that the world's large river systems assume a special significance. Understanding of large river systems will require new knowledge regarding their geologic and tectonic evolution, hydrological characteristics, sediment transport characteristics, morphological complexity, geochronologically constrained integrated facies models and thought experiments and simulation models of responses of large river systems to changing climatic states. These studies will have to factor in assessments of the sensitivity of river systems to century and millennial scale changes in different climatic regions of India.

Against this background, our investigations of the responses of the Ganges dispersal system to Late Quaternary climatic shifts suggest that variations in monsoonal strength dominated Ganges river and interfluvial behavior over the past ~100 ka. Also, other workers have suggested a strong response reflected in sediment delivery to the G-B deltaic region in the Early to Mid-Holocene because of the marked strengthening of monsoonal precipitation.



View of the audience during Prof. C. Karunakaran Endowment Lecture 2006

Large river systems of the monsoon belts will require further focused efforts on the following issues:

- an improved understanding of sources and sustenance mechanisms of large rivers in a tectonics-climate coupled system;
- variations in annual sediment flux driven by climate through geological time and its implications for sequence models;
- improved understanding of the system wide response of large river systems to climate change and the links to component scale response of the system;

- propagation and transfer of the climatic response from one component to another;
- newer models of propagation of base level driven changes and an improved understanding of the interplay between the upstream propagation of basic level changes and down stream;
- propagation of the source area related changes of large river systems.

The endowment lecture series was instituted in 2000 in memory of Prof. C. Karunakaran, the founder Director of CESS. Prof. S. K.

Tandon paid rich tributes to Prof. C. Karunakaran and said that his visionary thinking had enabled the establishment of CESS by the Government of Kerala in 1978. Dr. M. Baba, Director of CESS welcomed Prof. Tandon and the gathering of scientists and professional from institutions of Trivandrum. Dr. P.K. Thampi, former Advisor CESS remembered his association with Prof C. Karunakaran and the latter's contributions to the field of Earth Sciences. Dr. C.P. Rajendran, Scientist CESS introduced Prof. S.K Tandon. Sri G.K. Suchindan, Head, TED,CESS gave the vote of thanks.

LIME SHELL RESOURCES OF VEMBANAD LAKE WITH SPECIAL REFERENCE TO THE FUTURE OF LIME SHELL BASED INDUSTRIES OF KERALA

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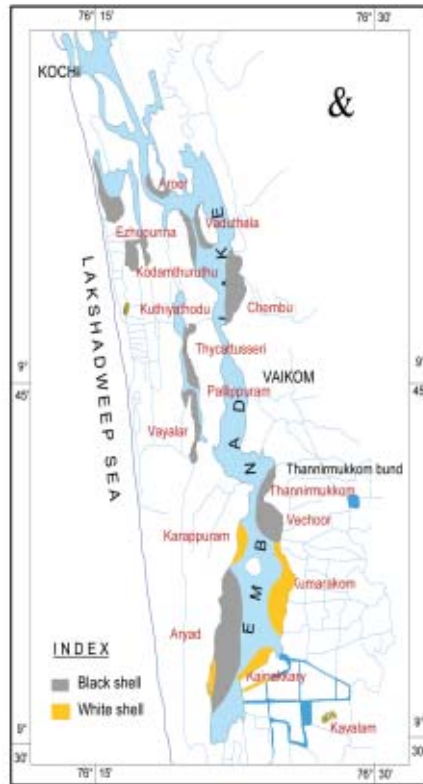
Kerala state is endowed with a variety of mineral resources. Occurrences of mineral resources are reported from all the three major geologic formations of the State such as Pre- Cambrian crystallines and Tertiary and

Quaternary sedimentaries. However, from economic point of view, the Quaternary sedimentaries are of prime importance as they host many economically viable mineral deposits like lime shells, heavy mineral placers, brick clays, river

sand etc. But, it is unfortunate that indiscriminate mining of these mineral resources, on many occasions, causes severe environmental problems in the area. These aspects have to be studied in detail for environment friendly

mining and judicious utilization of our valuable mineral resources. With this in mind, an attempt has been made in the present study to assess the environmental impact of mining of lime shell resources of the Vembanad Lake basin for laying down strategies for an environment friendly lime shell mining of the Lake basin.

Lime shell, the purest form of calcium carbonate in nature, is used for the manufacture of a variety of products like white cement, carbides, chemicals, etc. Kerala State is the top producer of lime shells in India and contributes about 50% of the total lime shell production in the country. Two types of shells are being extracted from the Vembanad Lake, white shells (fossilized deposit of *Villorita sp.*) and black shells (exoskeleton of the living clam *Villorita sp.*). White shell deposits occur abundantly in the southern arm of the Vembanad Lake, south of Thannirmukkom bund. Major lime shell occurring areas are Thannirmukkom south, Kumarakom, Kainakari, Punnamada and adjoining paddy land areas. The exoskeletons of the living clams *Villorita cyprinoides* (*karutha kakka*), that inhabit in the shallow Lake beds of Kerala coast are also used extensively for lime production. In addition to *Villorita cyprinoides*, *Meritrix casta* (yellow clam) and *Paphia malabarica* (*poovankakka*) are also collected from the Vembanad Lake for the extraction of flesh and shells. Among these clams, *Villorita cyprinoides* (*i.e.*, the black shells) constitute the predominant clam species, contributing about 80% of the clam exploited from the shallow areas of the Lake. The white shells are extracted from both the lakebed and also from the adjoining land areas.



Map showing major lime shell occurring areas in Vembanad Lake

A total of 8 co-operative societies located at Thykkattusery, Kavalam, Kuthiathode, Kattikunnu, Vaikom, Aryad, Muhamma and Vechoor are currently engaged in the collection and distribution of black shells. On an average, 30000 tonnes/year of black shells are collected through the respective societies during 1990/91 – 2004/05. A detailed analysis of the black shell collection statistics reveals that harvesting of living clams from the Vembanad Lake is almost in a steady state over the past 2-3 decades. The living clams of the Vembanad Lake are extracted by manual and semi mechanical methods.

Unlike the case of black shells, only four co-operative societies are engaged in the collection of white shells from the Vembanad Lake. They together collect an amount of 49,000 tonnes/ year of shells from

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AWARDS/HONOURS



Dr. G.R. Ravindra Kumar, Scientist, CESS was awarded the prestigious Prof. M.R. Srinivasa Rao Award for the year 2006 by the Geological Society of India, Bangalore for his outstanding contributions in the field of Petrology. The award was presented by Dr. H.K. Gupta, Vice President of the Geological Society of India during Annual Convention held at Wadia Institute of Himalayan Geology, Dehradun on 24 November 2006.

While presenting the award to Dr Ravindra Kumar, Geological Society noted that his studies “brought to light the great natural laboratory for lower crustal rocks available in Kerala and paved the way for more detailed studies in this region”. Further the citation stated that “his efforts and publications, from a region which presents protracted history of granulite evolution from early Proterozoic to late Proterozoic, have been of extreme importance in pinning on improving our understanding of the evolution of granulite belt and in placing constraints on the dispersal of Gondwana.

Sri. Ramkumar, N. was awarded Ph.D. degree by the University of Kerala for his thesis in “Geochemical significance and genesis of auriferous laterites in Wynad gold fields, Kerala” under the guidance of Dr. Narayanaswamy, Scientist, CESS.

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the Lake. These shells having an age range of $3,130 \pm 100$ to $6,948 \pm 130$ YBP, and are generally found as stratified deposits often attaining a thickness of 6 to 8m. In Vembanad Lake, these shell deposits are not in uniform thickness and are often found as pockets (or lenticular bodies).

Industries that utilize lime shells of Vembanad Lake can be grouped under three broad categories: (i) Extractive industries (ii) Manufacturing industries and (iii) Extractive-cum-manufacturing industries. Extractive industries are those whose activities can fulfill the human needs by utilizing materials or resources above or below the earth surface. Lime shell co-operative societies that collect the white and black shells from the Lake / back water systems are included under this category. Manufacturing industries make use the shells for various lime - products. Lime kilns are classified under this category. A total of 61 lime kilns are working in the area; out of which 49 falls within the jurisdiction of Alapuzha district, 11 in Kottayam district and one in Ernakulam district. Travancore Cements Limited (TCL), Travancore Electro Chemical Industries Limited (TECIL), Pallathara Bricks and Tiles Limited and certain limekilns are grouped under the extractive-cum-manufacturing industry. Among this the TCL is the only extractive-cum-manufacturing industry working at present. The other two industries are closed a few years back.

As per the published accounts, the Vembanad Lake had a proved lime shell reserve of 4.5 million tonnes in 1941. This survey did not cover the paddy lands and over bank areas of the Lake where there is every



Separation of black shells from living clam is on

possibility of having sporadic patches of workable lime shell resources. As per the present study, the State has already extracted about 5 million tonnes of white shells during the period 1965 -2004. From the available statistics it will be difficult to assess the future of the lime shell based major industries of the State including the Travancore Cements Limited (TCL) as we already over extracted the white shell resources. Therefore, a detailed survey has to be conducted in the entire coastal lands having fairly thick lagoonal/ brackish water deposits of Holocene age. At the same time, industries like TCL have to work out new strategies to run the industry using alternate lime sources. The lime kilns won't be affected much in the expected resource crunch as most of the kilns are using black shells for lime production. The deficiency of lime shells, if any, in the lime kiln sector can be met from pooling the black shell resources of the other backwater systems in the State and also reducing its interstate transport.

It is a fact that the shell mining activities impose irreparable damages to the Lake system. To understand the impact of lime shell mining activities on water quality, a systematic investigation is carried out in specific areas of the Lake including the lime shell mining and non-mining locations. Low to medium increase of pH is observed in water from shell mining areas compared to the samples from non-shell mining areas. Manual mining alters pH a little higher compared to that of mechanical mining. Throughout the year, DO in surface water is higher than bottom water. It is to be noted that the mechanical lime shell mining areas show low DO compared to manual mining areas. The lime shell mining activities have no remarkable impact on sulphate, salinity or hardness distribution of the overlying waters. At the same time, lime shell mining activities can increase the dissolved iron concentration in both surface and bottom waters during pre-monsoon

and post-monsoon seasons, while during monsoon such concentration variation is not observed, because of the absence or reduced level of shell mining during this period. The lime shell mining activities can increase TSS contents in the overlying waters to significant levels. The increase is markedly high (21 – 50 times) in pre-monsoon season than the other two seasons.

The process of mining is only a temporary use of land. During mining processes, several environmental problems would also be created in the affected region. Lime shell mining operations in land areas create certain negative impacts such as changes in landuse, landscape and land stability. The shell mining activities adversely affect the estuarine system in a variety of ways. The manual method of mining creates low to medium negative impacts on water quality, while the mechanized mining operation (dredging) causes high negative impact. Dredging creates both long term and short term changes in the water quality, water current, circulation, deflocculation and pollution. Mining operations can cause negative impacts on flora and fauna as well. Lime shell mining does not create any direct change in air and noise on the environment except in areas adjacent to mechanical mining. The transportation and processing of the products may cause certain low negative impacts on air and noise. The impact is medium negative on air quality due to processing operations. The lime shell mining activity provides certain positive impacts on the socio-economic conditions of the area. Mining and post mining operations attribute positive impacts in employment opportunities and income generations. There will be a marked decline in the aesthetics of the land areas subjected to shell mining activity. The ugly scars

formed due to random mining are aesthetically unacceptable and is really a negative impact.

The following are some of the major recommendations / suggestions drawn from this study.

- ❖ Estimate the white shell resource of the coastal lands of Kerala without much delay. Also work out the maximum sustainable yield of the black shells in the back water systems of the State.
- ❖ The lime based major industries of the State like TCL has to evolve strategies to use alternate sources of lime for the manufacture of their products as the shell deposits within the Vembanad Lake are declining fast due to overexploitation.
- ❖ Use the human resources of the area at the maximum level in lime shell mining and processing sectors.
- ❖ Dredging may be limited to areas, which are not accessible to manual mining.
- ❖ Use the lime shells for the indigenous lime based industries like TCL, lime kilns etc.
- ❖ Prohibit mining of juvenile clams. Fishing should be banned during spawning period (October-January) of these bivalves.
- ❖ Use the lime shell of the State only for value added products.
- ❖ All the proposals for future development projects should be evaluated in terms of the potential consequences to the

ecosystem and effects on the resource base.

RECENT TREMORS IN KERALA

There were a few tremors in the recent past. The geological and tectonic set up of Kerala region is conducive for the occurrence of mild tremors. Records of events in the recent past testify this. They are normally small events without any serious damaging impacts. Most of the events are related to the reactivation of faults and fractures. The higher incidence of minor tremors could possibly be due to an increase in stress build up in this region which varies from time to time.

A minor tremor occurred around Alakkode, Udayagiri and Cherupuzha in Kannur district on 27.07.06 at about 11.45 AM. This event with a local magnitude of 1.3 M was recorded at 11.45.03 IST in the Peechi station of CESS. A CESS team investigated the incidence. Felt reports collected from the area indicate that people heard rumbling sound with mild vibrations. Minor hairline cracks are observed in few houses. Based on felt reports the intensity of the tremor is III in MM scale with Alakkode as its epicenter. A detailed report on the tremor was submitted to the Government of Kerala.

An area of about 300 sq.km. around Kilimanur in Thiruvananthapuram district felt a minor tremor in the early hours on 09.08.06. CESS Scientists immediately visited the affected locality and observed that the people experienced ground shaking, vibrations from tiled roof, rattling of windows and doors and loud cracking sound. The Peechi observatory record indicates that the event with a

magnitude of 2.6 M in the Richter scale started at 04.19.36 hours and lasted for 3-4 seconds. Based on the intensity of felt reports, the epicenter is estimated to be around Koduvazhanur near Kilimannur where maximum intensity of IV in MM scale was felt. There were no casualties or damages to structures. This region has a history of minor tremors in the recent past. NW-SE trending fracture zones present in the area is the probable source for the present tremor. A detailed report on the event was submitted to the Government of Kerala.

Very mild tremor was experienced by few people around Erattupettah early in the morning on 10.08.06. The event was so minor that it was not recorded at the Peechi or Thiruvananthapuram seismic observatories. There were no reports of any damage or casualty. However, the region around Erattupettah has recorded a few mild to moderate earthquakes in the past six years. A brief report on the incidence was given to the Government.

A mild tremor had occurred during noon time on 18.08.06 in the upper catchment of Thekkady reservoir that forms part of the Thekkady wildlife sanctuary. This event was felt by the forest officials from Vellimala and Mylappara who reported mild ground vibrations and unusual noise. The earthquake was recorded by the KSEB seismic network at Ayyappancoil, Idukki and Pallom. The instrumental data reveals that the earthquake with a magnitude of 2.1M in the Richter scale occurred at 12.21 pm on 18 August 2006 and lasted for few seconds. The epicenter of the earthquake has been located near to Thannikudi. This event was not recorded at the broad band seismic observatory of CESS at Peechi. Since it was not recorded in the distant seismic observatories, it is likely to be a very shallow event. Mullaperiyar dam that supports the Thekkady reservoir falls close to the felt region

of the tremor. Inspection of the dam site did not reveal any visible damage to the structure.

The Peechi station recorded a very minor tremor near Edamalar dam on 20 October 2006 with a magnitude of 2.1M. There were no felt reports on this event probably it being in the forested areas.

Seven tremors of slight intensity were felt in parts of Thrissur and Palakkad districts from 20-27 December 2006. The seismic observatories of CESS, IMD and KSEB have recorded these events. Preliminary analysis of the instrument data located the epicenter at Latitude 10.70 N and Longitude 76.14E. The first event occurred at 07:19:40 PM (IST) on 20 December 2006 followed by five aftershocks and the main shock on 27 December 2006 at 06:44:10 AM (IST). The tremors were widely felt as a thundering loud noise accompanied by some vibrations of the ground. Based on field studies led by Dr. C.P. Rajendran, it is inferred that the tremors occurred close to Thali, a region where similar tremors have occurred in the past, notable in 1994. Vibrations and noise were also experienced at Kunnamkulam, Velur, Erumapetty and Wadakkancherry. However, there was no report of any damage or development of cracks on buildings (except some micro cracks in some houses made of mud and brick near

Thali). Instrumentally located epicenter is about 29 km NW of Peechi, about 12 km west of Wadakkancherry.

Dr. C.P. Rajendran also held a meeting with the representatives of the local administration, general public, MLAs and Honourable Speaker of the Assembly Sri. S. Radhakrishnan at 4 PM on 21 December 2006. A public awareness meeting and discussion was held on 6 January 2006 at Wadakkancherry, where a booklet on earthquakes was released by the Honourable Revenue Minister Sri. K.P. Rajendran. The meeting was also attended by the Honourable Speaker Sri. K. Radhakrishnan and MLA Sri. A.C. Moithen. Dr. C.P. Rajendran, Dr. Kusala Rajendran, Sri. S. Sidharthan and Smt. Srikumari Kesavan represented CESS in the meeting. A poster on earthquakes was exhibited for public viewing.

VISITORS TO CESS

As part of Kerala study tour 2006, a team of 8 American citizens visited CESS for a discussion on 'the state of environment in Kerala: the changing trend and Kerala's attempt to attain sustainable development' with Dr. Srikumar Chattopadhyay on 28 November 2006.



Prof. S.K. Tandon planting a tree in the CESS Campus

Dr. P.S. GOEL VISITS CESS



Dr. P.S. Goel, Secretary, Ministry of Earth Sciences, Government of India, visited CESS on 5 June 2006. He addressed the scientists and visited the laboratories of CESS and stated that “CESS is an excellent lab covering all aspects of earth sciences and a very unique laboratory. Done well and can play a very important role in national context.”

Dr. T.S. MURTY IN CESS

Dr.T.S. Murty, the internationally acclaimed tsunami and storm surge expert, was in CESS during 16 July to 6 August 2006 and 8 November to 7 December 2006 in connection with the Coastal Hazards project for which he is an Advisor.

VIETNAMESE DELEGATION

A delegation of Vietnamese technocrats and bureaucrats from mining/small scale industry visited CESS and held wide ranging discussions on the clay mining, its environmental impacts, clay based industries and utilization of laterites in the building industry.



A session with visiting Vietnamese delegation in CESS

STUDENT VISITORS

The IV year students and staff members of Government College of Engineering, Krishnagiri, Tamil Nadu visited CESS on 31 August 2006 as part of their industrial visit.

Thirty five students and five teachers visited CESS on 23 September 2006 as part of the ‘Yuvasangamam programme’ sponsored by the ‘Kerala Sasthra Sahitya Parishath’.

Fifty students and staffs of R.V.S.M. Higher Secondary School, Prayar visited CESS on 10 November 2006.

A ten member team from the Department of Agronomy, Kerala Agricultural University visited CESS on 20 December 2006.

PUBLICATIONS

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Book

Chattopadhyay, S and Franke, R.W: *Striving for sustainability: Environmental stress and democratic initiatives in Kerala*, Concept Publication Co., New Delhi. p350

LECTURES DELIVERED IN SEMINARS / WORKSHOPS

Dr. S. Chattopadhyay delivered a special lecture on 'On the way to sustainability: Kerala's initiatives' during Indian Geography Congress organised by the Department of Geography, Madgadh University, Bodh-Gaya, 10-12, November 2006.

Dr. K. Soman delivered a lecture on 'Natural Disasters' to the participants of the 'Thalir Vacation Camp' organized by State Institute of Children's literature on 3 May 2006.

Dr. R. Ajaykumar Varma delivered a talk on 'Watershed based development and its linkage with National Rural Employment Guarantee Act at Town Hall, Kalpetta, Wayanad' organized by the Local Self Government Department, Government of Kerala on 9 July, 2006.

Dr. R. Ajaykumar Varma delivered a talk on 'Environmental issues and Urban Development' in the two day conference Chamber of Municipal Chairmen at Alapuzha on 21 August, 2006.

Dr. V.N. Neelakantan delivered a lecture on 'Bioinformatics an adjunct to Taxonomy and Biodiversity Management' to the participants of the workshop in Taxonomy held at Department of Botany, University of Kerala on 24 August 2006.

Dr. N.P. Kurian delivered a talk on 'Coastal erosion problems and remedies' in the workshop on Disaster Management organized by Department of Land Revenue on 29 August 2006.

VISITS ABROAD

Dr. C.P. Rajendran visited Singapore in connection with third annual

meeting of Asia Oceania Geosciences Society (AOGS) during 10 to 14 July 2006 and chaired a session on 13 July 2006.

Dr. Suresh Babu, visited Russian Academy of Sciences (Geological Institute and the Institute of Geology of ORE Deposits, Petrography, Mineralogy and Geochemistry RAS), Moscow, Russia for 4 weeks from 15 August, 2006 for research work

Dr. C.P. Rajendran attended the Association of Asia Oceania Geosciences Conference on 'Restoration program from giant earthquakes and tsunamis' held on 10-14 July 2006 in Singapore and presented a paper on "The style of crustal deformation and seismic history associated with the 2004 Indian Ocean earth quakes: a perspective from the Andaman-Nicobar Islands" and Chaired the session on 'Recent Earth quakes and tsunamis in Asia and Oceania'.

Dr. C.P. Rajendran and Dr. Kusala Rajendran attended the Chapman conference on 'Active Tectonics and Seismic potential of Alaska' in Girdwood, Alaska, USA during 11-14 May 2006 and presented papers on: (1) "The deformational characteristics and occurrence pattern of the 26 December 2004 Indian Ocean Earth quake" (2) "Do the historic ruptures along the Andaman-Sumatra and Makran subduction\zone signal future great Earth quakes?".

Dr. K. Soman attended the meeting related to coastal marine ecosystem and their relation to management of coastal zones organised under the auspices of ACEMON network at Phuket (Thailand) during 24-28 September 2006 and made a presentation on "Drainage basins and their role in managing coastal aquatic system of Kerala".

Sri. G. Balasubramonian visited Center for Tropical Marine Ecology (ZMT), Bremen (Germany) for six weeks from 24 September 2006 for performing biogeochemical analysis.

TRAINING PROGRAMMES CONDUCTED

Training programme on GPS receivers - NET RS was conducted during July 5 to July 7 2006.

CONFERENCE/SEMINAR/WORKSHOP

Dr. M. Baba delivered the keynote address on "Agriculture and Environment" at the Valedictory function of the Golden Jubilee Year Celebrations of Mitraniketan, Vellanad, Thiruvananthapuram on 17 August 2006.

Dr. M. Baba delivered the lead paper on "Indian experiences in Coastal Zone Management" in the Seminar on 'Conservation and Management of Natural Resources for Environmental Protection of the Coastal Zone of Kerala' at KFRI, Peechi on 28 August 2006.

Dr. M. Baba presented the lead paper on "Coastal Zone Management" in the workshop on Integrated Coastal zone management held at Thiruvananthapuram on 20 May 2006.

Dr. M. Baba delivered the Engineers' Day lecture on "Role of Engineers in Natural Disaster Mitigation and Management" in the Engineers' Day Celebrations organised by the Institution of Engineers at Thiruvananthapuram on 15 September 2006

Dr. M. Baba inaugurated the session hosted by Department of Geology

in connection with 'Spectrum-2006' academic conference and delivered the Key Note Address on "Relevance of Earth Sciences" at the Sree Narayana College, Thiruvananthapuram on 31 October 2006.

Dr. M. Baba delivered the inaugural address at the ISRS Workshop on 'Geoinformatics for Local Level Planning' held in the Institute of Engineers Hall, Thiruvananthapuram on 17 November 2006.

Dr. T.N. Prakash participated in the 'National Meet on Indian Tsunami' and presented the paper "Results of Post-Tsunami field surveys along the Kerala coast", held at Anna University, Chennai on 6 June 2006.

Dr. R. Ajaykumar Varma gave a keynote address on "Environment of Kerala and Desertification" in a workshop organized by the Darsanam Samskrika Vedi and KSCSTE in connection with 'World Environment Day' at Kozhikode on 24 June 2006.

Dr. R. Ajaykumar Varma delivered a lecture on "Social Participation in Solid Management" at a training programme on 'Participatory approach for sustainable development' conducted by the Extension Training Centre, Kottarakara on 12 December 2006.

Dr. A.S.K. Nair presented a paper on "Management of Wetlands for Sustainable Development" in the symposium on 'Need for Better Natural Resources Management for Kerala' organized by Kerala State Land Use Board on 28 July 2006

Dr. V. Sasikumar participated in a National Seminar on 'Effective Utilisation of EDUSAT' organized by the Education Department of

Kerala during 3 – 4 August 2006 and presented a paper on "Free Educational Content for EDUSERVE".

Dr. A.S.K. Nair attended the seminar on 'Fire Protection Force and Society' held during the Silver Jubilee Celebration of the Kerala Fire Service Association and delivered a talk on "Science and Technology inputs to Fire and Rescue Services Department of the Government of Kerala" on 26 October 2006.

Dr. G.R. Ravindra Kumar gave an invited talk on "Overview on Kerala charnockites" in the annual convention of the Geological Society of India held at the Wadia Institute of Himalayan Geology, Dehradun during 22-24 November 2006.

Dr. R. Ajaykumar Varma attended a one day workshop organized by Kerala Union of Working Journalists at KILA, Thrissur and delivered a talk on "Water policy of Kerala" on 3 December 2006.

Dr. K. Soman attended a seminar on 'R&D needs for Regional Development' and made a presentation on "R&D needs in natural resources & environmental management" organized by Indian Institute of Chemical Engineers, Trivandrum Regional Centre and Regional Research Laboratory on 8 December 2006

Dr. A.S.K. Nair attended a seminar organized by Kerala State Land Use Commissioner, Government of Kerala and presented a paper on "Resource Mapping for Development at Panchayat Level" on 26 December 2006.

Workshop on Pathiramanal Biodiversity Conservation and Biopark Project.

The Pathiramanal Biodiversity Conservation and Biopark Project, sponsored by the KSCSTE, was initiated in the month of April 2006. A brain storming workshop was held to discuss various issues related to this project on 17 August 2006 at CESS. Professionals having expertise in the fields of Biodiversity, Fishery, Environment, Geology, Tourism, Economics and Rural Management, from various organisations in the State were invited. Representatives from Kanjikuzhy Block Panchayat and Muhamma Gram Panchayats also participated in the workshop. The discussion began with a brief presentation made by the CESS project team highlighting objectives of this project and presenting results of the preliminary survey. During deliberations it was stressed that conservation and enhancement of biodiversity will be the focus of this project. Development of ecotourism and all other ancillary activities will be around this main theme. As a part of diagnostic survey it was proposed to conduct bathymetric survey, land use mapping, plant biodiversity survey, identification of core forest area, computation of tourist visitation, soil analysis and preparation of a plant biodiversity information system. Planting of trees enhancement of vegetation cover in the island and also in the shoals around the island have been envisaged as a first step of intervention. It was suggested that outcome of this project will be a detailed action plan for biodiversity conservation and ecotourism development. This project is identified as one year programme of CESS.

User Interaction Workshop: Integration of Natural Resource Potential (NRP) and Socio-Economic Development (SED) for Micro Level Planning in Kottayam District.



Sri. Thomas Kunnappally, President Kottayam District Panchayat inaugurating the workshop



Group discussion of participants during the workshop

This three years project, sponsored by the DST, Government of India was undertaken to generate panchayat level information on natural resources and levels of socio-economic development and to understand interrelationships between NRP and SED. It is expected that results emerged from this study will help preparation of micro level planning of Kottayam district. The user interaction workshop held on 18 February 2006 at Kottayam was intended to receive feed back from the panchayats and to use that information for finalising the report. The second objective was to initiate a discussion for evolving a broad guideline for district plan through detailed interaction among the participants. A brief write up was circulated before hand among the potential participants from Gram Panchayats, Block Panchayats, District Panchayat and different Government, Semi-Government and Non Government organisations. The programme of the workshop was accomplished through one inaugural session and three technical sessions. There were 145 participants from all levels of the district. Director, CESS welcomed the gathering and Sri. Thomas Kunnappally, the President, Kottayam District Panchayat

inaugurated this one day workshop. Technical session began with presentation of the study report. Group discussion followed general identification of core forest area, computation of tourist visitation, soil analysis and preparation of a plant biodiversity information system. Planting of trees enhancement of vegetation cover in the island and also in the shoals around the island have been envisaged as a first step of intervention. It was suggested that presentation. Each group coordinated by a resource person and discussed all the issues relevant to their panchayat / block. The study findings were scrutinised by the group members with the help of a check list of problems emerged from data analysis related to the project. There were presentations from the groups during feed back session. Participants opined that 80% to 90% of the problems identified through the study were valid. They also got an understanding about the relationship between NRP and SED and expressed their desire to use the report for preparation of development plans of their panchayat / block with Dr. Srikumar Chattopadhyay as Principal Investigator.

NOMINATIONS

Dr. M. Baba and Sri. John Mathai were nominated as members of the 'Committee of Experts to assist the Cabinet Sub-Committee constituted for preliminary discussion with the Government of Tamil Nadu on the Mullaperiyar issue', constituted by the Government of Kerala.

Dr. M. Baba was nominated as a member of the 'University Level Advisory Board of the Rajiv Gandhi Chair for Contemporary studies' constituted by the Cochin University of Science & Technology.

Dr. Srikumar Chattopadhyay was nominated by the Govt. of Kerala as a member of the 'Advisory Committee to finalise the methodology and design of Urban Atlas' prepared by the Information Kerala Mission

Dr. R. Ajaykumar Varma was nominated as a member of the 'Plan Committee on Irrigation, Water and Waste Water' constituted by the Planning Board, Trivandrum.

Dr. R. Ajaykumar Varma was nominated as a Co-chairman of the 'Working Group for irrigation sector' constituted by the State Planning Board, Trivandrum.

Dr. R. Ajaykumar Varma was nominated as the Convener of the 'Core Committee formed for organizing a workshop on Draft State Water Policy'.

Dr. T. Radhakrishna served as a member of Expert Committee, for IRPHA project entitled 'Setting up of palaeomagnetic Laboratory in Mizoram University, Aizawl, Mizoram', of the DST.

Dr. R. Ajaykumar Varma was

selected as a member of the 'Technical Committee of the Solid Waste Management projects' under ADB assisted KSUDP.

Dr. Srikumar Chattopadhyay has been nominated as the member of the 'Working Group on Urban Infrastructure, Plan Committee on Transport Infrastructure' constituted by the State Planning Board, Government of Kerala.

Dr. Srikumar Chattopadhyay has been nominated as a member of the 'Plan Committee on Fisheries, Environment & Eco-system' constituted by the State Planning Board, Government of Kerala.

Dr. Srikumar Chattopadhyay has been nominated as Special Invitee, 'Mission Group of Flag Ship Programme on Rural Energy' constituted by the State Planning Board, Government of Kerala.

Dr. K. Soman was nominated as a member of the 'Plan Committee on Fisheries, Environment and Eco-system' constituted by the State Planning Board, Government of Kerala

Dr. R. Ajaykumar Varma was nominated as a technical member of the 'Kerala sustainable urban development project' by the Local Self Government Department

Dr. N. Subhash was selected as a member of the 'Technical Advisory Board of Aries Institute of Marine Technology, Cochin', which gives training to engineers for various branches in the marine field.

Dr. M. Samsuddin, was nominated as a member of the expert 'Committee for evaluation of the proposals on the development of GIS database of vested forests in Palakkad District'.

EXHIBITION

The Seventh All India Photographic Competition and Exhibition in connection with the World Environment Day celebration 2006 was jointly organised by the KSCSTE, CWRDM, Kozhikode and CESS, Thiruvananthapuram.



Photograph on the theme 'Nature & Wild Life' which bagged the first prize

An exhibition was conducted at Erattupetta in connection with the Awareness programme on Disaster Management.

An exhibition was held at Kochi in connection with the 'Swasraya Bharat 2006'.

CESS participated in the exhibition conducted as part of the Golden Jubilee Celebration of Mitraniketan during 14 -17 August 2006.

DIRECTORS' MEETING IN CESS

**CESS hosted meeting of EVP
with Directors of all R&D
Centres on 18 December 2006.**

NEW SPONSORED PROJECTS

Pathiramanal (Munro Island) Biodiversity Conservation and Biopark Project: An action Research Programme. Funded by KSCSTE.

Conservation and nourishment of beaches of selected tourism locations of Kerala. Funded by Department of Tourism, Government of Kerala.

Cadastral scale CRZ maps for Urban Areas in Kerala: Phase 1 – Kozhikode, Kollam & Trivandrum Corporations and Varkala Municipality. Funded by KSCSTE.

Upgradation and Operation of Broadband/Seismological Observatories in the Peninsular Shield of India. Funded by DST.

Metasedimentary rocks of the Kerala Khondalite belt; southern India: Petrology and Geodynamics of their formation. Funded by DST.

Tectonic and hydrologic control on late Pleistocene–Holocene landforms, Paleoforest and non-forest vegetation: Southern Kerala. Funded by KSCSTE

CESS INTRODUCED ASSISTANTSHIP TO PG STUDENTS

The Centre for Earth Science Studies, as part of its efforts to improve research aptitude among students in different areas of earth sciences, proposes to support post graduate students by extending assistantships. The programme was introduced during the academic year 2005-06 onwards. The assistantship was extended to selected students nominated by the Departments of Universities and Government / aided colleges in the disciplines of Geology / Geography / Chemistry / Physics / Environmental Sciences / Computer Applications / Geophysics / Oceanography / Atmospheric Sciences / Mathematics for supporting M.Sc/M.Tech students for their dissertation / internship programme in CESS. Applications were invited from the University Departments / Colleges for consideration of the internship with a monthly assistantship of Rs.2000/- for a period of 3 to 6 months. The Head of the Department of Universities and Principals of Colleges nominated their meritorious students who were interested in carrying out the dissertation / internship programme in CESS. The following students received the assistantship during 2006:

Ms. Anju V.R., from the Department of Geology, University of Kerala submitted her dissertation entitled 'Petrological studies of gneiss – charnockite – khondalite association in and around Thiruvananthapuram, Kerala' under the guidance of Dr. G.R. Ravindra Kumar. Ms. Leelitty Thomas, School of Planning, CEPT, Ahmedabad submitted her dissertation "Environmental impact assessment of inland placer mineral mining, Manavalakurichi" under the guidance of Dr. R. Ajaykumar Varma. Ms. S. Sasikala, Environmental Sciences of Bharathiar University, Coimbatore submitted her dissertation " State of the Environment of Manavalakurichi, a placer mineral mining area with emphasis on air quality and socio-economic status" under the guidance of Dr. C.N. Mohanan. Ms.Safarunisa, from the Postgraduate Department of Applied Geology, MES Ponnani College submitted her dissertation entitled 'Long term and short term stability of Ponnani coast, Kerala' under the guidance of Dr. K.K. Ramachandran.

PROJECTS COMPLETED AND REPORTS SUBMITTED

Landslides occurred during May-June 2006 in Kuppukada near Passukkadavu in Marudhonkara Panchayat, Vadakara Taluk, Kozhikode District submitted to the District Collector (Sri. G. Sankar).

Investigation on the causes behind conductivity variations (Dr. S. Murali Das) submitted to the DST, GOI.

Biodiversity Register of selected Rural and Urban Local Bodies (Dr. C.N.Mohanan et. al.) submitted to DSP Mission, Government of Kerala.

Results of Hotspot monitoring 7th, 8th, 9th, 10th, 11th, 12th, 14th, 19th and 20th Cruise Programme from Veli to Karwar submitted to Ministry of

Earth Sciences, GOI. (Dr. P.P. Ouseph)

Compiled Status Report on Marine Pollution along Kerala, Karnataka and Lakshadweep islands from 1991 to 2005 submitted to Ministry of Earth Sciences, GOI (Dr. P.P. Ouseph)

Integration of Natural Resource Potential (NRP) and Socio-Economic Development (SED) for Micro level planning in Kottayam district submitted to the DST, GOI.(Dr. Srikumar Chattopadhyay)

Developing spatial and temporal constraints on earthquakes in Gujarat using paleoseismological techniques (Dr. C.P. Rajendran and Dr. Kusala Rajendran) submitted to DST, GOI.

A study on the role of active tectonics in the development of ancient indigenous culture around

Gulf of Cambay, northwest India (Dr. C.P. Rajendran and Dr. Kusala Rajendran) submitted to DST, GOI.

Initial EIA of the proposed hardrock quarry and crushers unit at Valarthukad estates, Desamangalam, Thrissur Dt. (Dr. R. Ajaykumar Varma, Sri. John Mathai & Dr.C.N. Mohanan) submitted to KSCSTE.

Resource evaluation and inventory of manufactured sand from Trivandrum district (Dr. Suresh Babu and Dr. Kunjaria Isaac) submitted to the DST, EOI. Department of Revenue, GOK.

River Sand Mining and Management (Dr. D. Padmalal) submitted to the Department of Revenue, GOK.

Marine pollution monitoring along Kavaratti island, Lakshadweep sea (2005) (Dr. P.P. Ouseph) submitted to MOES, GOI.

Graphite Mineralization in the

Karimukul area, Ernakulam district, Kerala with special emphasis on graphitization process and Genesis (Dr. Ansom Sebastian) submitted to Director, CESS.

The gold purity testing laboratory (Dr. M.N.M Nair) submitted to Department of Metrology, GOK.

Integrated coastal zone management plan for Lakshadweep islands. (Dr. T.N. Prakash) submitted to the MOEF, GOI

Environmental implications of decentralized governance-review of statutes, enactments and rules on environmental conservation and management (Dr. R. Ajaykumar Varma) submitted to the Department of Local Self Government, GOK.

An approach paper on Biodiversity Register (Dr. C.N. Mohanan and Dr. A.T. Aji) submitted to Decentralisation Support Programme Mission, GOK.

Monitoring of water and sediment quality in the Kochi Harbour region (Dr. P.P. Ouseph) submitted to the Cochin Port Trust.

Biodiversity Register of selected Grama Panchayaths and Municipalities (Dr. R. Ajaykumar Varma) submitted to Decentralisation Support Programme Mission, GOK

Monitoring the performance of Wells and aquifer in the coastal Grama Panchayat's of Vettom and Mangalam (Sri.John Mathai) submitted to Jananidhi.

Malignancy detection using laser-induced fluorescence emission (Dr. N. Subhash) submitted to the DST, GOI.

State of Environment report and action plan (Dr. R. Ajaykumar Varma) submitted to KSCSTE, GOK.

CONSULANCY PROJECTS COMPLETED

Delineation of HTL, LTL and CRZ boundaries for a Development site at Nariman point, Mumbai, Maharashtra for Acer Links Ltd, Mumbai.

Delineation of HTL, LTL and CRZ boundaries for the telecommunication cable entry point at Valiathura, Trivandrum, Kerala for Reliance Communications, Mumbai

Demarcation of HTL and Coastal Regulation Zone for proposed development site at Asramam, Kollam for Hotel & Allied Trades Ltd, Kochi

HTL and Coastal Regulation Zone for resort at Chittari (Ajanoor), Kasaragod for Air Travels Ltd., Thiruvananthapuram

Delineation of HTL and LTL for development of storage facilities in Jawaharlal Nehru Port Trust area, Navi Mumbai, Maharashtra for IMC Ltd., Mumbai

HTL, LTL and Coastal Regulation Zone for resort at Kikan (Ajanoor), Kasaragod, Kerala for Hotel & Allied Trades Pvt. Ltd., Kochi

Demarcation of HTL and Coastal Regulation Zone for the proposed resort at Uduma in Kasaragod, Kerala for Bharath Hotels, Bangalore.

High Tide Line and Coastal Regulation Zone for the proposed fishery harbour at Chettuwa for Harbour Engineering Department, Thiruvananthapuram

Demarcation of HTL, LTL and CRZ in Rajapur Muncipal Council,

Ratnagiri District, Maharashtra State, Government of Maharashtra.

Demarcation of HTL and coastal regulation zone for river / creek crossing along the pipeline route in Maharashtra for Konkan area spur pipeline: Phase I for Reliance Gas Transportation Infrastructure Ltd., Mumbai

Demarcation of HTL and Coastal Regulation Zone for 'Vallarpadam – Edappally Rail Connectivity' for Kitco, Kochi

Demarcation of HTL, LTL and CRZ in Mahad Muncipal Council Raigad District, Maharashtra, for Government of Maharashtra

HTL, LTL and CRZ for factory land at Abrama, Valsad, Gujarat for Asha Dispersions Ltd., Mumbai.

ONAM CELEBRATIONS

In connection with the Onam festival celebrations of 2006, a pookalam competition was organized by the CESS Recreation Club. Variety entertainments by the staff members were an added attraction.

OTHERS

Dr. R. Ajaykumar Varma gave a talk on 'Stockholm Convention on Persistent Organic Pollution' in AIR, Trivandrum on 3 May, 2006.

Dr. A.S.K. Nair delivered a talk in Malayalam on 'Land resources conservation and soil conservations' in AIR, Thiruvananthapuram on 6 November 2006.

EARTH DAY 2006 AND TECHNOLOGY DAY - 2006

CESS observed the Earth day and Technology day on 11 May 2006 with various awareness programmes. About two hundred students from nearby higher secondary schools and the public visited the Centre and participated in the programmes arranged in the campus. Laboratories were open to the students and public. Mr. Satish Babu, President INAAP technologies, Technopark, while delivering lecture on “Information technology - for young practitioners” said that “ITC have revolutionalised the way we think, work, educate and



Winners of quiz competition receiving prizes from Dr. M. Baba, Director, CESS



Students attending the Earth Day and Technology Day 2006

do business”. He also said that “the pervasive computing is accessible, affordable and present everywhere”.

Another lecture by Dr. Nandakumar, Scientist, GSD, stressed that “Soil is the life and it is our responsibility to

conserve it, protect it and nurture it”.

A quiz competition was held for high school students from Thiruvananthapuram city and neighboring regions on the theme “Earth Environment and Technology”. Kumari Neeraja Ramakrishnan from VSSC Centre School won the first prize, Master Shyam Venkat from Sainik School Thiruvananthapuram and Master Sunil Thomas from St. Thomas School Thiruvananthapuram, won the second and third prizes respectively. The winners of the quiz competition were given trophies and cash awards.