

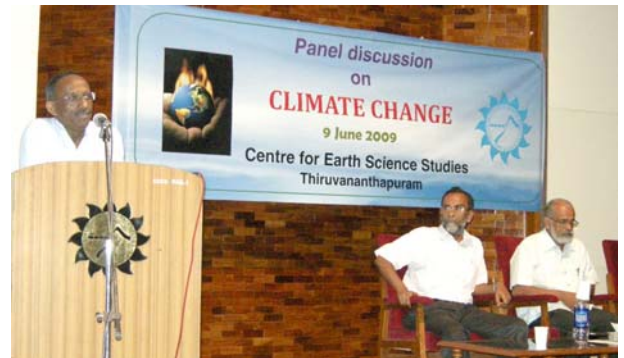


Climate Change: CESS initiates integrated multi-institutional regional study

Climate change, especially the changes since last 100 years for which recorded data are available, and its possible implications on human civilization more particularly on food security, fresh water availability, livelihood of forest dwellers, human health, sea level rise and vulnerability of coastal settlements, and biodiversity and natural ecosystem are subject matters of serious concern. Intergovernmental Panel on Climate Change (IPCC) in its fourth synthesis report observed “warming of the climate system is unequivocal as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level”. Adaptation to climate related changes, reduction in vulnerability, mitigation of underlying causes like production of green house gases and remediation are significant strategic issues.

With its sub-continental dimension, India has many climatic zones with multiple modifying factors. It is therefore necessary to embark upon regional level studies to understand the nature of climate change, its fallout and to develop area specific adaptation and mitigation strategies. Climate induced changes will affect Kerala's physical configuration, trigger rehabilitation problems in the densely populated coastal stretches, alter the nature and distribution of natural resources in all forms (rain, surface water, soil moisture and ground water), induce ecological stress, modify plant growth, affect agricultural productivity and human health.

Realising importance of the topic and at the behest of Research Council, CESS formed a core group with the Director as the coordinator and initiated the process of formulating climate change project. After several rounds of discussion it was resolved to take up the climate change project with the vision (i) to prepare a



Dr. E. P Yesodharan Executive Vice-President, KSCSTE delivering the inaugural address of the 'Panel Discussion on Climate Change'. Dr. M. Baba, Director, CESS and Dr. R. V. G. Menon, noted Scientist and social activist who presided over the function are also seen

comprehensive regional data base on climate change, (ii) to examine the global models and to apply them in regional context, (iii) to provide required technical inputs for policy formulation and (iv) to suggest necessary guidelines for mitigation.

CESS proposed a transect for the study covering central Kerala and extending over the sea up to the Lakshadweep islands.

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Evolution of Ashtamudi Estuary

Kerala coast evolved from the sea level fluctuation during the Quaternary period. The Quaternary period is the latest period of time in stratigraphic column of 0-2 million years represented by local accumulations of glacial (Pleistocene) and post-glacial (Holocene) deposits. In other words the Quaternary appears to be an artificial division of time to separate pre-human from post-human sedimentation. The Holocene represents the last 11,000 years of sedimentation in the geological time scale.

In Kerala the sea level was around 60 to 100 M below the present MSL during the last glacial maxima (~ 20,000 Years Before Present). Around 6000 YBP, the sea level rose to 4 to 6

M above the present MSL causing series of episodic transgressive/regressive event including the tectonic activity. This has also resulted in the evolution of estuaries along the coastal fringe. Radiocarbon dating indicates that the Kerala coast suffered from differential tectonic movements with younger episodes towards the south during this period. The estuaries along the Kerala coast were a direct outcome of these movements. Radiocarbon dating of limeshell and peat from inland Payyanur and Tannissery indicated that this part was uplifted not earlier than 4000-7000 YBP. This is thought to be part of the prominent

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Green Generation -Earth Day 2009

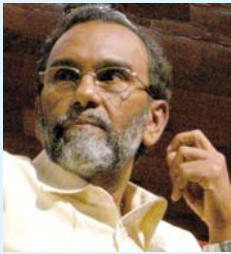
CESS observed Earth Day 2009 on 22nd April with the theme 'Green Generation' – the focal theme of the World Earth Day 2010. Students from schools in and around the Thiruvananthapuram city, numbering around 300 along with their teachers visited CESS. The laboratories were kept open for them and scientists interacted with the students. Another attraction of the day was a the painting using a single canvas on the topic 'Green Earth' ('*Haritha Bhoomi*'). About 80 painters, young and old, participated in the event. The 'Gurukulam programme in the open air was conducted by the senior scientists for more

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Earth Day observance in CESS



Director Speaks



This year's World Earth Day observed on 22 April 2009 marked the beginning of the 'Green Generation' campaign which will be the focus of

the 40th Anniversary of Earth Day in 2010. When the various Governments of the world are negotiating for a new global climate agreement coming up in December 2009, the 39th Earth Day appealed for proactive discussions and civil participation to defend the 'Green Generation' core principles viz. (i) a carbon-free future based on renewable energy that will end our common dependency on fossil fuels, including coal, (ii) an individual's commitment to responsible, sustainable consumption and (iii) creation of a new green economy that lifts people out of poverty by creating millions of quality green jobs and transforms the global education system into a green one.

In Kerala, CESS, by virtue of its uniqueness in dealing with the various facets of Earth Science studies is spearheading the observance of World Earth Day over the last two decades by arranging open house, various competitions for school children and other programmes. In addition to this CESS always reaches the people with the message of making our earth a more comfortable and safe haven to live in. A slogan 'protect our earth, our future' was inducted as CESS motto long time back. It sends messages and organizes campaigns to achieve the goals of the Earth Day. The short messages include, plant more trees, avoid forest fire to save biodiversity, encourage organic products, encourage walking/cycling for short distance travel and avoid use of fossil fuels, reduce the usage of paper, make recycling a habit, do not remove sand from beaches and invite erosion, sand in the river supports biodiversity and ground water, protect wetlands to increase biodiversity and groundwater recharge, do not fill wells and ponds, etc. This is not an exhaustive list and there are several small things each one of us can do to protect our lovely planet. This is the message on the World Earth Day.

Dr. M. Baba

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However, at present the Kerala part is being taken up for the study. It stretches from Achankovil basin in the south to the southern boundary of the Bharatapuzha basin. The rivers basins proposed to be covered are Achankovil, Pamba, Manimala, Meenachil, Muvatapuzha, Periyar, Chalakudi and east flowing Pambar. Around 15,000 sq. km area will be covered. As many as 16 projects undertaken by CESS, completed or ongoing, are related to this area and also have components of climate change. As a fresh initiative, CESS has initiated four projects viz. (i) Study on land use/ land cover change, (ii) Effect of urbanization on the buildup of urban heat island in Kochi, (iii) Solar ultraviolet-B radiation and atmospheric trace constituent in relation to climate change and (iv) Monitoring global change impacts in Sahyadri mountain ranges.

These projects are being taken up in a mission mode in consonance with the Government of India mission on "Strategic Knowledge for Climate Change" which has long range implications on nation's development. As envisaged by the IPCC our projects will strive to study (i) science of climate change- scientific investigation, understanding the processes, modeling, projections etc, (ii) impacts, vulnerability and adaptation to climate change at the area level and community level and (iii) mitigation and policies- from the State Government to local bodies.

The study frame intends to address four issues: (i) Is climate change taking place in Kerala? What are the nature, magnitude and

manifestation? (ii) How are these changes taking place? What are the drivers of change? (iii) What are the impacts of these changes on society, economy and human well being? and (iv) How can the present practices be oriented to address the emerging issues? Preliminary analysis of rainfall data indicate decreasing trend of rainfall in some parts of the State CESS identified several gaps in the existing studies and felt that additional expertise required to address some of the components in the gap areas. Two inter-institutional meetings were held on 8th and 25th May, 2009 with experts from CWRDM, KFRI, TBGRI, Kerala Agricultural University, CUSAT, MG Univer-



A view from the Panel Discussion on Climate Change

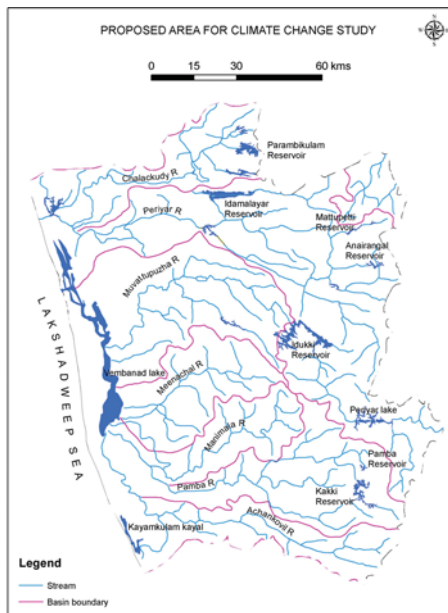
sity, and the Centre for Development Studies. A steering committee was formed to coordinate the activities. Finally a panel discussion was held on 9 June, 2009 in which the outline of the project on 'Integrated Regional Studies on Climate Change in the Western Ghat – Lakshadweep Transect' was presented. Presentations were made by other Institutes in Kerala, the National Institute of Oceanography (NIO), Goa and the Tropical Meteorological Centre, Pune. Panelists drawn from all major institutes raised various issues ranging from study components, economic implication to modalities of data dissemination etc. Drawing from the discussions and with the inputs from other institutes, CESS is now formulating a multi-institutional and multidisciplinary project on climate change.

Dr. Srikumar Chattopadhyay

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Evolution of Ashtamudi estuary....

neotectonic/eustatic event in southern peninsular India. A tree root from depth of 16.75 m near Wellington island was dated at about 8080 years. Dating of lime shell from Vembanad lake gave ages like 3130 and 3710 YBP. Further south in Ashtamudi the sample was dated to about 1330 YBP. The above data proves that the different uplift and subsidence giving rise to estuaries was sequential with younger estuaries towards the south. Escarpments seen along



The study area in Kerala

Ashtamudi, Vellayani, Sasthamkotta, Kole lands of Thrissur and areas below sea level like Kuttanad indicate their genesis through downfaulting. Horizons of carbonaceous clay occur with laterite near Thekkumbagom along the rim of Ashtamudi estuary hinting at the very recent uplift in this part.



View of Ashtamudi estuary, the second largest estuary in Kerala. Note the surface manifestation in the form of laterite escarpment and fresh water lake on the eastern bank suggestive of existence of uplifted, prograded or rising coastal margin. Maximum water depth (14 m) is seen on the eastern part of the estuary. Towards north of estuary the episodic transgressive regressive event due to sea level rise is seen.

The study of sub-surface sediments of the estuary is important since they contain the record of transgression/regression cycles, paleo-climate and tectonics of the region. It has also been reported in the literature that the best Quaternary sequence is found in and around the estuary. The coastal tract of the Ashtamudi region has thick deposits of Tertiary formations. The coast perpendicular alignment of the estuary has been ascribed to the tectonic origin. Though a number of studies are available on the Tertiary sedimentary formations including the stratigraphic sequence the evolutionary history of the estuary during the Holocene is fragmentary. A comprehensive documentation of all the critical aspects of this estuary was carried out by Black & Baba (2001). From a close look at the geomorphologic setting of the area evidences of terrain upliftment and laterite escarpment can be seen. There was also a report of shifting of river courses and closure of the existing outlets and pondering of new lagoons in the coastal belt (Valdiya and Narayana, 2007). With all these physical indicators it can be surmised that the estuary might have been evolved to its present state through a series of

transgression and regression cycles during the Quaternary.

To understand all these aspects a project titled ‘*Spatio temporal shore changes during Holocene and tracing the evolutionary history of the Ashtamudi estuary, southern Kerala*’ was taken up as a collaborative project between CESS and Department of Geology, Anna University in February 2009. This is a three year project sponsored by the Department of Science & Technology, Government of India with Drs. T.N. Prakash and M. Samsuddin from CESS and Prof. R. Nagendra from Anna University as Investigators. This project addresses the sequence of events during Holocene (represent 11,000 YBP in geological time scale) to generate high-resolution database on sediment records, which help in understanding the evolutionary history of the estuary. The proposed research work involves the application of different methodologies to evaluate rates of sedimentation, identification of signatures of neotectonic activity and study of proxy environment indicators for palaeo-depositional condition of the estuary.

The study programme involves a systematic geological approach involving sediment core collection, sub-bottom profiling and analyses for the palaeoclimatic studies that have not been carried out so far, to understand the evolutionary history of the Ashtamudi estuary. The study will also bring focus on the spatio-temporal changes resulting from the change in land use/land cover of the study area. The data on sedimentation, which is an important aspect of the study, will be very useful for the overall assessment and management of the estuary. The results of the study are expected to be valuable addition to the scientific literature

Dr. T. N. Prakash.

Publications

Maya K., Padmalal. D. and Narendra Babu. K., (2009) Lime shell mining from Vembanad Lake basin, Kerala State, SW Coast of India: Problems and Prospects. ICFAI Journal of EARTH SCIENCES, Vol.3, No.2, pp. 41-54

Narendra Babu K., Omana P. K. and Mahesh Mohan (2009) ‘Water and sediment quality of Ashtamudi Estuary, a Ramsar site, South West Coast of India- a statistical appraisal’. Environmental Monitoring and Assessment (Springer), DOI 10.1007/s10661-009-0947-0 (online)

New Plan Projects

The work on the following projects have been initiated under the Plan Scheme:

Study of land use/land cover change linked to climatic change in Kerala- Dr. Srikumar Chattopadhyay

Effect of urbanization on the buildup of urban heat island in Kochi – Dr. E. J. Zachariah

Solar Ultraviolet-B radiation and atmospheric trace constituents in relation to climate change – Dr. G. Mohankumar

Monitoring Climate Change impact in Sahyadri – Dr. C. N. Mohanan

Data Centre (Establishing Kerala Resources Information System & Service (KRIS) Sri V. N. Neelakandan

Numerical Model Studies and shore protection for Alappad coast – Smt. Sheela Nair

Tectonothermal History of Kerala Khondalite Belt- Dr. V. Nandakumar

Invited Talks

Dr. M Baba, Director delivered an invited talk on ‘New trends in coastal engineering’ in the National Workshop on ‘Recent Trends in River and Coastal Protection Works’ organized by Indian Society for Hydraulics on 11 June 2009 at CWRPS, Pune.

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Earth Day 2009.....



than an hour was a great opportunity for the students to interact with them. An Earth science centric quiz competition was also conducted for students and the winners were given trophies and certificates of merit. The quiz competition was followed by a lecture on ‘Remote sensing and GIS application’. Dr. M. Baba, Director, CESS, gave away the prizes to winners of competition.



A prize winner in the quiz competition receives trophy from Dr. M. Baba, Director

Visit abroad

Dr. T. Radhakrishna Head, Geosciences Division and Sri. Balasubramanian Scientist in Charge, Training and Extension Division visited University of Montpellier, France under the Indo-French Centre for the Promotion of Advanced Research (IFCPAR) project during 14 May - 12 June 2009

CESS Participates in the oil spill modelling of MoES

Ministry of Earth Sciences (MoES), Government of India has sanctioned a project entitled 'Oil Spill Modelling for selected locations of Kerala and Lakshadweep'. An amount of Rs 49.91 lakh has been released by the MoES for the current year (2009-10). Detection of oil spills and predicting its movement towards Indian coast and timely assessment of extent of damage is a pre-requisite for efficient management of oil spills and also to combat or to reduce its ill effects. Ministry of Earth Sciences has entrusted ICMAM –PD Chennai the task of developing oil spill models for the Indian coast with the involvement of various research institutes. CESS has been identified as one of the participating institutes for this mega project. The major objectives of the project are setting

up of habitat specific oil spill trajectory models along the Kerala and Lakshadweep coasts. The developed model will be operated for prediction of the movement of oil from offshore to the coast in the event of any oil spill incident. Information containing biological, infrastructural, social, environmental aspects of the area also will be compiled as apart of developing the oil spill model to identify high risk areas which are both ecologically and environmentally sensitive like mangroves, coral reef, lagoons, and turtle nesting grounds. Demarcation of economically sensitive areas like tourist beaches and archeologically sensitive areas like forts, ancient monuments etc will also be carried out as part of this work as they face threat from varying degree of oil spill.

New arrivals in CESS library

Premachandran, P.N. (Ed.). Bench mark soils of Kerala. Soil Survey Organisation, Kerala, 2009.

Rani Mary George and Sandhya Sukumaran. A systematic appraisal of hard corals (family acroporidae) from the Gulf of Mannar biosphere reserve south-east India. CMFRI Bulletin No. 50. CMFRI, Cochin, 2007.

Liu, Philip L.F. , Harry Yeh and Costas, Synolakis (Ed.). Advanced numerical models for simulating Tsunami waves and runup. World Scientific Publishing Co., Singapore, 2008.

Tomoyo, Shibiya. Coastal processes: concepts in coastal engineering and their applications to multifarious environments. World Scientific Publishing Co., Singapore, 2009.

Kowalik, Z. and Murty, T.S. Numerical modeling of ocean dynamics. World Scientific Publishing Co., Singapore, 1993.

Mudroch, Alena and Azcue, Jose M. Manual of aquatic sediment sampling. CRC Press Inc., Florida, 1995.

Mudroch, Alena, Azcue, Jose M. and Mudroch, Paul (Ed.). Manual of physico-chemical analysis of aquatic sediments. CRC Press Inc., Florida, 1997.

Membership in Committees

Dr. M. Baba, Director has been nominated by the ministry of Earth Sciences, Government of India, as a member of the Review Committee on the Shoreline Management Programme for various sites of Kerala Karnataka and Gopalpur

Dr. M Baba, Director has been re-nominated as a member of the 'National Coastal Zone Management Authority' constituted by the Ministry of Environment and Forests, Government of India.

Seminar / Meeting / Workshop

Dr. M Baba and Dr. K.V. Thomas attended and the latter presented a paper on 'Coastal Regulation Zone' in the Workshop organised by Ministry of Environment and Forest, ENVIS and the Kerala State Council for Science Technology and Environment at Munnar during 2-3 April 2009.

P.G. Studentship Programme

Under the Poat Graduate Studentship programm 2008-09, thirteen students belonging to different science diciplines, selected from all over Kerala on merit basis, completed their project report. Each studentship awardee was given Rs.2000/- per month during the period the project work in CESS. The students were spervised by senior scientists and were allowed to utilise the laboratories and other facilities in CESS. The notification for studentship 2009-10 will be issued in September 2009.

Retirement



Dr. M. N Muraleedharan Nair, Scientist-in-Charge, Chemical Sciences Division, CESS retired on 30 June 2009



Mr. V. Krishnan, Typist, Grade 2 in Director's office retired on 30 April 2009

Action during the CESS sports day organized by the CESS Recreation Club on 24 May 2009



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