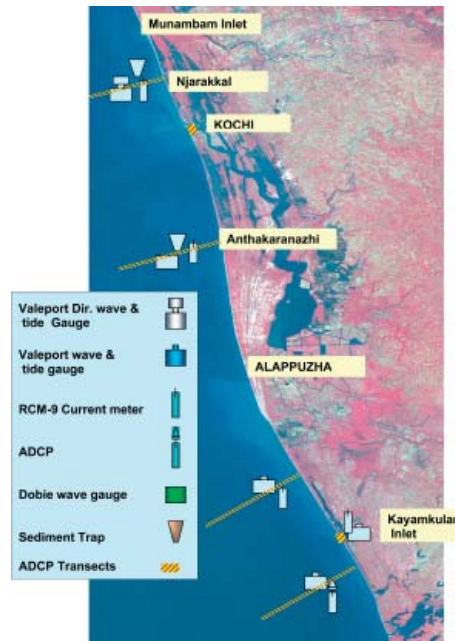




## A Shoreline Management Plan for Arattupuzha coast

The 120 km coastal stretch between Munambam and Kayamkulam in Kerala is unique in many respects. Under the research programme, 'Shoreline Management for the Munambam-Kayamkulam stretch of west coast of India', CESS has undertaken extensive studies to understand the coastal processes leading to erosion/accretion and to identify sediment cells and sub-cells and develop a shoreline management plan for critically eroding sites along this coast. Data on tides, waves, currents and sediment characteristics was collected from four offshore stations viz. Thrikunnapuzha, Mararikulam, Andhakaranazhi and Njarakkal. The wave intensity is generally found to be slightly higher at Thrikunnapuzha, which is attributed to the relatively steeper slope of innershelf at this location. The dominance of monsoon forcing, as seen in the case of waves, is not seen in the distribution of innershelf currents. Concomitant with these measurements, the textural and granulometric characteristics of the beach and innershelf sediments were determined.

Long-term shoreline change for 15-18 year period of the coast was estimated using satellite imageries referenced to SOI maps. The analysis shows that erosion was prevalent in the southern sector while accretion was dominant in the zone north of Cochin inlet. At Puthuvype, during the 15 year period, a spectacular accretion of about 1.8 km, something unique in Kerala, was observed. Another important aspect evident from the



shoreline change study was that a significant part of the coastline appeared stable, which most often was due to well-built seawalls. The southernmost sector from Kayamkulam to Arattupuzha was seen to be a critically eroding coast. Numerical models (MIKE 21 and LITPACK) were set up to simulate shelf circulation, waves, sediment transport and beach evolution. Simulations of waves, currents and sediment transport were conducted for all the three seasons and the salient hydrodynamic and sediment transport characteristics were brought out. Based on field studies and numerical experiments, sediment cells and sub-cells in the coastal sector forming part of the study were identified. A Shoreline Management Plan was proposed for the Kayamkulam-Thottappally coast which encompasses the most critically eroding sector of the coastline. This sector is divided into two, Arattupuzha and Thrikunnapuzha, for the purpose of Management Plan preparation. Based on the study, a transitional groin field with beach nourishment is proposed for the Arattupuzha sector. A large quantity of sediment with characteristics similar to the

nearshore sediments is available in the southeast corner of Arattupuzha within the Kayamkulam fishing harbour, for nourishment. In addition, sand by-passing from the sector immediately south of the inlet, which is accreting, is also proposed. For the Thrikunnapuzha sector, which already has a wide beach with accretionary tendency, no intervention is required. It is advisable to leave the coast as such and plan the landuse

*Continued in page 2*

### Sustainable Urban Development of Kerala

The city corporations in the State will soon be equipped with GIS based high resolution spatial information system for efficient property tax management, infrastructure planning and development and improved delivery of various civic services. CESS has played a pivotal role in preparing base maps for the Kerala Sustainable Urban Development Project (KSUDP), a project assisted by the Asian Development Bank. Long term goals of the project include city planning and development, efficient traffic and transportation management, settlement planning, planning and development of various civic amenities, proper management of public utilities, better tax collection and licensing systems etc. All these efforts will lead to creation of a digital urban management programme with an array of user friendly decision support tools for a host of applications.

*Continued in page 3*

#### In this issue.....

- \* **Shoreline Management Plan.....**
- \* **Sustainable Urban Development.....**
- \* **Storm surges.....**
- \* **New Management Committee.....**
- \* **Land disturbances.....**
- \* **CESS monitors lightning ....**
- \* **Legislative Committee visits CESS....**
- \* **Shore protection measures .....**
- \* **Boon to young researchers.....**
- \* **Plus all regular features**



*The legislative Committee on Environment visited CESS on 26 September 2007 (Report on page 4)*

## From the Director's Desk



This year, the south-west monsoon was very active in Kerala. With very intense spells of rainfall received almost throughout the season,

Kerala witnessed large incidents of landslides, particularly in the northern districts. Heavy flooding, mainly in the urban centres and coastal erosion at several stretches were also reported. CESS was summoned to look at these events, both by the local authorities and by the government. A large number of investigation reports, with recommendations, were submitted by CESS on each incident. It is hoped that our specific recommendations are attracting attention of the authorities concerned.

In Kerala, these types of natural hazards are routine in nature and its causes and solutions are generally known to all, particularly the agencies responsible for its management. There are two common factors that come to the fore in the final analysis. The extensive unscientific interventions in the landuse across the state, irrespective of the highland, midland or the coastal lowland, is the first one. The lack of preparedness and delay in implementation of mitigation measures, which forms the integral part of any pre-disaster management system, are the second. It is hoped that the new land policy, which is on the anvil, will appropriately address the first issue. Even then, the second issue of proper implementation of pre-disaster management measures only can ensure the prediction of hazards, timely implementation of the mitigative measures and general preparedness to meet any eventualities. Only with these measures, we can reassure the people and minimize losses to their property and life. A welfare society like Kerala should not be satisfied with this alone. With proper planning, our ultimate aim should be to ensure that such hazards do not turn out to be disasters and affect the day-to-day life of the people.

Dr. M. Baba

## A Shoreline Management Plan.....

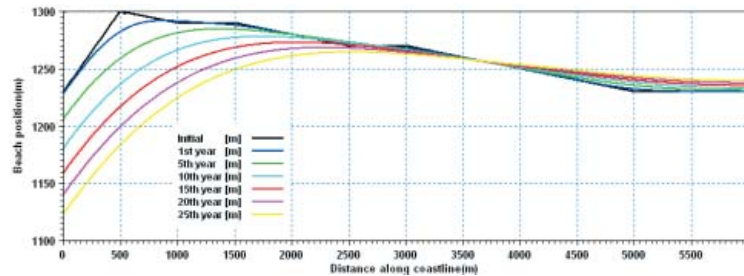


Fig 2. Shoreline evolution in the present condition

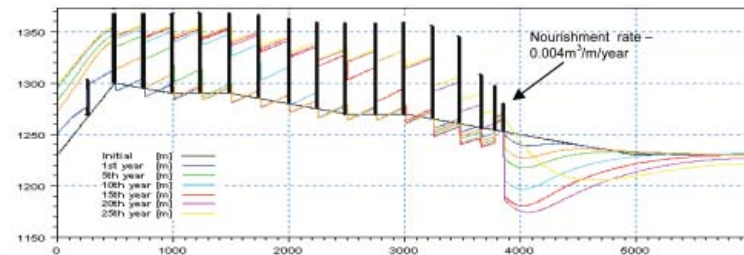
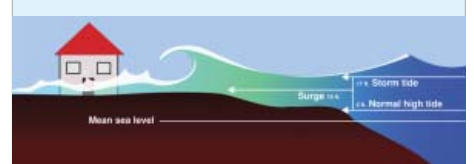


Fig 3. Shoreline evolution with groin field and point source nourishment

appropriately so that the impact of pollution from land based activities is controlled and constructions close to the beach are discouraged. Finally, the coastal hydrodynamics, sediment transport processes and shoreline evolution pattern for the Kayamkulam-Arattupuzha coastal stretch were analyzed by numerical model studies. Shoreline evolution modeling using LITPACK indicate that the sector immediately north of the breakwater is getting severely eroded due to the construction of breakwater at Kayamkulam (Fig.2). Based on the numerical model studies, a transitional groin field (Fig.3) has been proposed for this sector. Simulations show that increase in beach width over a period of 25 years is in the range of 40 to 60m. Beach nourishment is recommended at the downdrift end to prevent erosion of the adjoining area. Further improvement in performance can be attained by artificially filling sand between groins during the initial years. This prevents the downstream erosion on each of the groins (teeth like pattern) seen in the initial years till bypass commences. The extensive data generated by the project has given a fairly good understanding of the hydrodynamic regime of the coastal sector under study and the important outcome of the project is the development of a Shoreline Management Plan for the Kayamkulam-Thottapally sector, together with shore protection measures for the Kayamkulam-Arattupuzha sector. Efforts are being taken to implement the recommendations of the study. This R & D project is supported by the Ministry of Earth Sciences, Government of India

-(N. P.Kurian, K. V. Thomas, T. S. Shahul Hameed, Sheela Nair and Ramachandran K. K)

## Brain storming on 'Storm Surges'



Storm surges are changes in water level caused due to the passing of storms over the sea that are triggered by cyclones and other atmospheric disturbances. To understand the dynamics underlying the surges and to discuss methods to predict them, a brain storming session titled 'Storm Surges (synoptic scale forcing), Mesoscale Surges and Tidal Interaction' was organized by CESS on 29 July 2007. Dr. Tad Murty, University of Ottawa, Canada, Prof. A. D. Rao, Indian Institute of Technology, Delhi, Mr. Ramana Murthy, Ministry of Earth Sciences, Dr.M.Baba, CESS and Dr.N.P.Kurian, CESS made presentations prelude to the discussions.

## New Management Committee

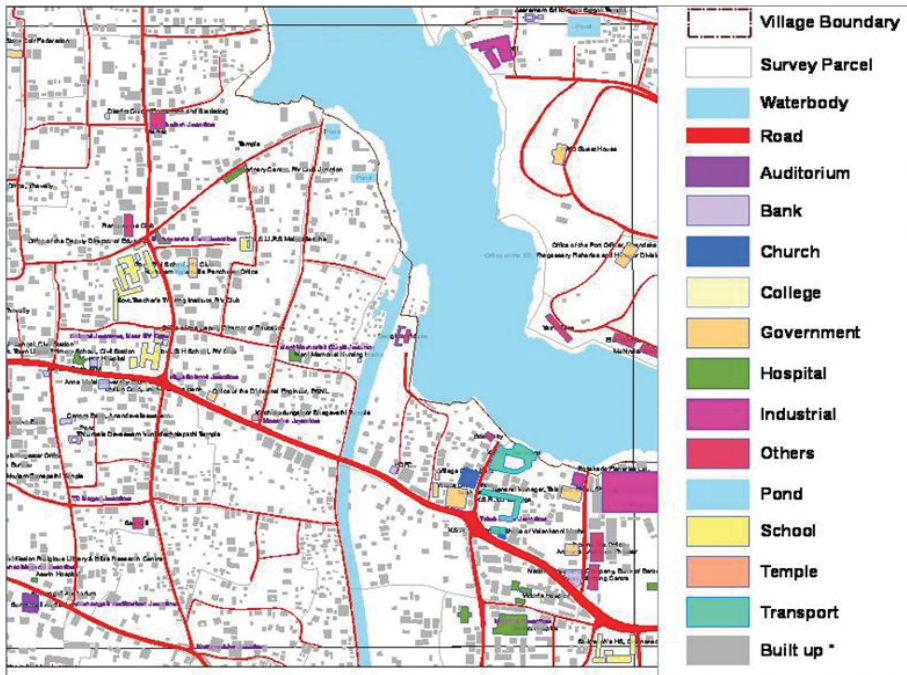
The Management Committee of CESS is re-constituted with the Director, CESS (Chairman), the Director, CWRDM, Shri G.P. Ramachandran, Additional Secretary, General Administration Department, Government of Kerala, Dr. T. Radhakrishna, Head, GSD, CESS, the Controller of Administration, KSCSTE and the Registrar, CESS (Member Convener) for a three-year term beginning 4th September 2007.

## Exhibition

CESS participated in the exhibition, named 'Suvarnavarsham', organised by the city police, Kochi at the Cochin Marine Drive during 20-25, August 2007.

## Sustainable Urban Development .....

### Kollam Municipal Corporation - Assets



CESS has prepared base maps that can accommodate survey plot level information for 5 Municipal Corporations of Kerala, viz., Thiruvananthapuram (142 km<sup>2</sup>), Kollam (58 km<sup>2</sup>), Kochi (88 km<sup>2</sup>), Thrissur (101 km<sup>2</sup>), and Kozhikode (84 km<sup>2</sup>), covering an area of 400 km<sup>2</sup>, approximately. This work had different components such as GPS, remote sensing, GIS and ground truthing. QuickBird satellite data of 0.6 metre resolution was used for database generation. Digital and visual interpretation of high-resolution remote sensing data was employed for preparing various thematic layers.

Georeferenced cadastral maps with individual survey field boundaries in 1:3960/5000 scale was the base map for this programme. Finally, the seamless cadastral map was reproduced in 1:3960/5000 scale with administrative boundaries up to ward level and survey fields, enabling local level applications. The large scale digital maps include themes such as landuse, landform, transport network, water bodies, utilities, important assets, monuments and land marks. The landuse categories were classified as built-up land, semi-built-up land and agriculture land. The built-up land was further classified as either residential, industrial, commercial, transportation, recreational, public/semi public, mixed built-up land and vacant land. The surface water bodies, both natural and man-made, features such as river/stream, canal, lakes, ponds, tanks, reservoir, broad settlement areas and individual buildings, important landmarks such as Government offices, other major buildings, hospitals, churches, mosques and temples, were demarcated in the asset map and updated with field observation. The thematic

layers thus derived were integrated with cadastral layer, which are provided with administrative boundaries up to ward level with survey plots in GIS domain for enabling data retrieval and query processing at a later stage.

The digital layers of the five City Corporations of Kerala was reproduced in the cadastral scale in WGS84 Datum and UTM Projection. The digital output was made in interoperable shape file and geodatabase for integration with other spatial/non-spatial data. The reports are already submitted to the KSUDP.

### Publications

T. S. Shahul Hameed, N. P. Kurian, K. V. Thomas, K. Rajith and T. N. Prakash (2007) Wave and current regime of the south west coast of India, *Jour. of Coastal Research*, Vol. 23 (5), pp 1167-1174.

Chattopadhyaya S. and Suresh Kumar S. (2007) Fractal dimensions of selected coastal water bodies in Kerala, south coast of India - A case study, *Indian Jour. of Marine Sciences*, Vol. 36 (2), pp. 162-166.

Sukumar B. and Ahalya Sukumar (2005) Palaeogeomorphic studies of Tambraparni river mouth using satellite imagery and GIS, *Quaternary Climatic Changes and Landforms*, edited by Chandrasekar, Manonmanian Sundarnar University, Tirunelveli, pp. 369-377.

Srikumar Chattopadhyaya, C. K. Sasidharan, C. Sakuntala and R. Sachin (2006), *Disaster Management: Lessons from Tsunami with a case study of Alappad-Arattupuzha segment*, National Seminar on Tsunami changes on the Marine system, Environmental and Socio-economic status of Coastal people, pp. 51-63.

### Project Reports

Shoreline Management Plan for Munambam - Kayamkulam sector, South West coast of India (Dr. N. P. Kurian *et al.*)

Land disturbances in Kunnamangalam Vayal, Meppadi, Wayanad district during SW Monsoon, 2007 (Shri. G.Sankar)

Formulation of model development master plans for selected local bodies in coastal plain area (Dr. R. Ajayakumar Varma and Dr. C. N. Mohanan)

### New Appointments

Mr. Rajesh P., Ms. Rasi P. C., Mr. Siju V., Mr. Shensha C. and Ms. Femi R. Sreenivasan joined CESS as Office Assistants, while Mr. Nishanth. N and Ms. Liji T.M joined as Technical Officers and Mr. Eldose as Technical Assistant.

### Retirements

Smt. S. Kalpana Devi (Assistant Registrar, Purchase), Shri. N. Sukumara Pillai (Engineering Supervisor), Shri. S.Devadas (Photographer) and Shri. P. Devan (Helper) retired.

### Earth Science Forum



Dr. P. V. Joseph, Visiting Professor, CUSAT and a Member of the CESS Research Council gave a talk in the Earth Science Forum on 'South-West Monsoon and its relation with the oceans' on 24 August 2007.

### Invited Talks

Dr.M.Baba delivered a special lecture on 'Coastal Zone Management' in the Centre for Management Development, Thiruvananthapuram on 28 September, 2007.

Dr. Ajayakumar Varma delivered a talk on 'Geohydrological aspects of bauxite mountains of Orissa at the Lohia Academy, Bhubaneswar on 11 July, 2007.

Dr.K.Soman delivered a talk on 'Geological Hazards' at the Institute of Land Management on 6 July, 2007.

Dr. N. P. Kurian delivered a talk on 'Water related Hazards at the Institute of Land Management on 6 July, 2007.

### Onam Celebrations



CESS celebrated *Onam* with a traditional 'Athapookkalam' (floral arrangement) competition, followed by variety entertainments staged by CESS staff and their children, under the auspicious of the Recreation Club.

## Legislative Committee on Environment visits CESS

The Legislative Committee on Environment, Government of Kerala, under the chairmanship of Shri. Rajaji Mathew Thomas MLA, visited the Centre to discuss and evaluate the R&D activities related to environmental issues faced by the State. Shri. M. Hamsa, Shri. V. D. Satheesan, Shri. V. Surendran Pillai and Shri. A. M. Yousuf are the other MLA members of the Committee who interacted with the scientists of CESS. Discussions were mostly related to the impact of sand mining and rock quarrying in Kerala. The Committee was very keen to understand the issues associated with the availability of river sand and its alternative sources, like mining of palaeo river channels, rock sand, sand from the off shore regions, etc. The members expressed concern over the eroding banks of rivers and the increasing river pollution. The Committee appreciated the efforts of CESS in preparing the sand mining status reports for 10 districts in the State. The Committee was informed that CESS will continue with the river sand auditing studies only after obtaining government approval to the methodology it had submitted, as stipulated in the River Protection Act, 2003. Detailed discussions were also held on the environmental and other hazards posed by hundreds of rock quarries in the State, especially on the possible threat of earth tremors and landslides. CESS briefed the Committee about the findings of the studies carried out in this area and suggested speedy action for bringing in improved regulations. The Committee appreciated CESS for undertaking such important work.

## New Project - Shore protection measures for Lakshadweep

CESS has initiated a feasibility study for implementation of a suitable shore protection structure in one of the islands through numerical modeling. The project will document historical and long-term shoreline changes, set-up hydrodynamic and wave model for the island coast, collect hydrodynamic data in the lagoon and adjoining sea for input to the model, calibrate the numerical model and carry out impact analysis for different shore protection measures and recommend suitable shore protection measures to combat sea erosion in the island. The work will be initially taken up in one of the islands of Lakshadweep where there is severe erosion. The project is sponsored by the Department of Science and Technology, UT of Lakshadweep.

## Boon to young researchers

The Department of Science & Technology (DST) and Council for Scientific and Industrial Research (CSIR), Government of India has decided to increase fellowship grants to researchers in various categories to attract more and more youngsters to pursue active research in the field of Science and Technology in India. This hike in fellowship is one among the several measures being introduced to retain the young talents available in the country. The Junior Research Fellowship is hiked from Rs.8,000/- to Rs. 12,000/- and the Senior Research Fellowship is increased from Rs.9,500 to Rs. 14,000. The maximum remuneration a Research Associate can now receive is Rs. 18,000 as compared to Rs. 12,000 previously. The fellows are also eligible for other perks like house rent allowance, medical allowance etc.

## Land disturbances in the Western Ghats

Heavy rainfall during the South West Monsoon in 2007 triggered widespread land disturbances in many parts of the Western Ghats of Kerala causing severe damages to life and property. In addition to swift debris flows (*Urul Pottal*), land creeps, wide and lengthy land cracks and land subsidence due to piping phenomena were reported this year. In Idukki district, CESS submitted detailed reports on the ground cracks developed at the KAP 5<sup>th</sup> Battalion firing range, Peermade, debris flows at Indian Chola (Thenga Kallu) and Puthuval (Thengakkal 110 acre) and rock falls near Aladi (Upputhura) to the Government



A view of the Valamthode urul pottal in Wayanad district

of Kerala. Wayanad and Palakkad districts also experienced widespread land movements this year. Debris flows at Valamthode, Thachankolli Colony of Kuruma tribe, Venmony, Narikolli, Naripara Himagiri estate, Kunnamangalam Vayal, Slide Movements at Karimani and North Ommala Area in Agali and land subsidence due to piping at Padinjarethara are some of the incidences investigated by CESS.

## CESS monitors lightning in Braemore

In Kerala, lightning activity kills many people every year. Usually, lightning related deaths are ignored as isolated incidents. But, in a recent study by CESS it was estimated that more than 70 people, on an average, lose their life due to lightning, every year. Proper data on loss of property, both direct and indirect, are still unavailable. Even statistics at the state level were not collected by any agency as to the number of deaths and other losses due to this natural hazard, except for some interventions by CESS in the recent past.



Instruments installed at the field station in Braemore

Convective cumulonimbus clouds (Cbs) cause most of the lightning discharges in Kerala. CESS established a field station in the Western Ghats at Braemore, Nedumangad, 800m above sea level in Thiruvananthapuram district, to detect the formation of Cb clouds and to understand the conditions under which it forms. The field station is equipped with an automatic weather station, a lightning location detector and field mill. Analysis of the data collected during September 2004 to March 2007 revealed that Cb clouds form at the foot hills of the Western Ghats. The analysis also detected conditions conducive to the formation of cumulus clouds which can grow into Cb. On many such days lightning was found to occur in Braemore and at a later time in Thiruvananthapuram also. The lightning detector data has indicated the spread of lightning activity along the mountains to the southern direction. This is attributed to the simultaneous formation of Cb along the length of the mountain foot hills.