

Kerala Climate

Monthly Newsletter of Institute for Climate Change Studies (ICCS), Kottayam, Kerala-686 004
(Research Organisation under Environment Department, Government of Kerala)

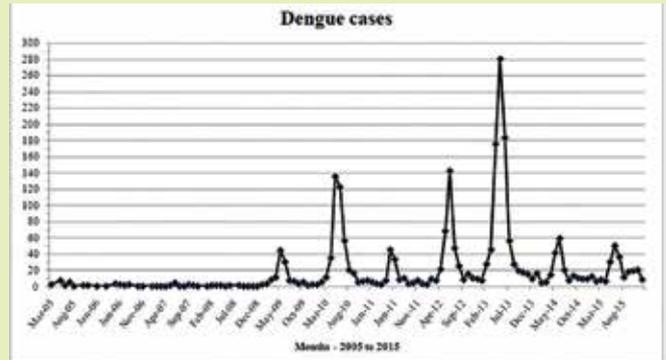
Research Highlights

Climate Change Impacts and Vector Borne Diseases

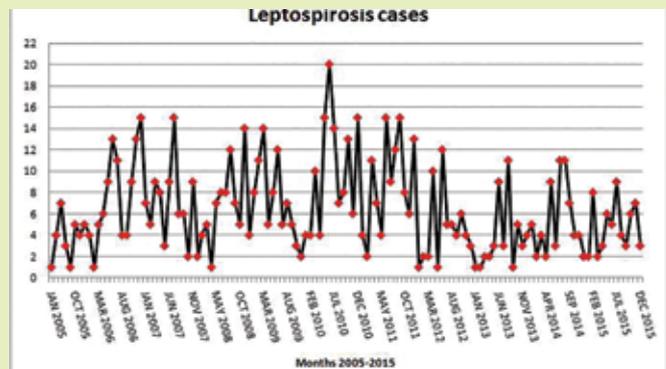
Main objectives of the two-year project entitled “Climate Change Impacts and Prevalence of Vector Borne Diseases in Kerala”, funded by the Environment Department, Government of Kerala, are: (i) to study the prevalence of vector-borne diseases and its linkages to climatic parameters; (ii) to develop a database on vector borne diseases as part of health information system; and (iii) to create awareness creation at people at large on climate change related health impacts and its mitigation strategies. The study is focused on Kottayam, Alappuzha and Pathanamthitta districts of Kerala.

The study explores the linkage between vector borne disease incidences and cases and the local weather parameters like temperature, relative humidity and rainfall for the past 10 years of the selected three districts. The information related to weather parameters and disease outbreaks and localized incidences will help the decision makers to device, mitigation strategies in the future at the local level.

Necessary data from the health institutions (primary health centres, community health centres, Taluk hospitals, General Hospitals) in Kottayam and Pathanamthitta districts have been collected, and the data collection from Alappuzha District will be over by the end of August 2017. A total of 208 health institutions were visited for the purpose (79 institutions in Kottayam, 61 in Pathanamthitta, and 68 in Alappuzha) till date. Analysis of the data collected from Kottayam and Pathanamthitta districts have been analysed. It was identified that increased number of dengue and leptospirosis cases were reported from different part of the districts, which are being analysed for their connection with climate change. Graphical representation of dengue and leptospirosis cases on a time scale are furnished in the figures.



Temporal analysis of dengue cases in Kottayam district from March 2005-Aug 2015



Temporal analysis of leptospirosis cases in Kottayam district from Jan 2005-Dec 2012

As part of creating awareness about climate change related health hazards and empowering the health officials and ASHA workers of primary/ community health centres, nine programmes were conducted so far. The project will be completed by the end of 2017.



Shri Pinarayi Vijayan, Hon'ble Chief Minister, inaugurates the workshop on Climate Variability in Kerala organised by ICCS, in association with SDMA and IMD. Dr Sekhar L Kuriakose, Member Secretary, SDMA, Dr George Chackacherry, Director, ICCS, Shri V S Senthil IAS, Additional Chief Secretary, Environment Department, Dr S Bahileyam Thampi, Deputy Director General, IMD, Shri M Chandradath, Science Advisor to Hon'ble Chief Minister, and Smt Padma Mahanthi IFS, Director, DoECC, are also seen.

Vulnerability of Vembanad-Kol Ramsar Wetland to Climate Change

The project entitled “Vulnerability of Vembanad-Kol Ramsar Wetland to Climate Change – A Case Study” is funded by the Kerala State Council for Science Technology and Environment. Major objectives of the project are, to identify issues related to climate change affecting the Vembanad-kol Wetland System, to delineate the human cost factors that act a risk addition in the climate change scenario of the wetland system, to identify the climate change hotspots which are vulnerable in the Vembanad-kol region, to measure the adaptive capacity of the people of the region, and to develop short-term and long-term climate change adaptation strategies, and to develop a common framework for vulnerability assessment of coastal wetlands of Kerala by integrating socio-economic and ecological factors.

The project has two phases - first phase for IEC activities on impact of climate on Vembanad-kol wetland, and second phase for the study. The initial phase has been completed. The programmes conducted under the project were preparation of IEC materials like leaflets and posters, awareness programmes participating various stakeholders, and a workshop experts and stakeholders. IEC materials prepared were focusing on the issues that are caused/to be caused due to climate change, and the steps that are to be taken to adapt to such situations. Awareness programmes conducted among various stakeholders were also about climate change, its local impacts, and adaptation measures.



Shri Madhavankutty, Health Inspector, speaks in the programme at Pallippuram. Dr Shylesh Chandran, Scientist, ICCS, is seen.



A view of the audience at Veliyanad



Dr Biju Mohan, Medical Officer, inaugurates the programme at Muhamma Health Centre. Shri Pratheesh C Mammen, Scientist, ICCS is also seen.

ICCS to associate with Carbon Neutral Wayanad Project

ICCS is associating with the Carbon Neutral Project in Meenangadi Grama Panchayat, Wayanad, in the monitoring of activities as decided in the meeting held under the chairpersonship of the Chief Secretary. The District Collector is assigned to monitor, and ICCS will help him in this endeavor.

CM Inaugurates the Workshop on Climate Variability



ICCS organized a workshop “Climate Variability in Kerala in Recent Years: Climate Change Perspectives”, in association with State Disaster Management Authority and India Meteorological Department, on 21 November 2016 at Mascot Hotel, Thiruvananthapuram.

The workshop was inaugurated by Shri Pinarayi Vijayan, Hon’ble Chief Minister of Kerala. Shri V S Senthil IAS, Additional Chief Secretary, Environment Department, presided over. Highlighting the possibility of severe drought in the State, Hon’ble Chief Minister, has called upon for people’s participation in adaptation and mitigation programmes. Pointing out that Kerala was losing the advantage of a moderate climate, he said relentless assault on nature was largely responsible for the situation. He said that Kerala was staring at the possibility of a socio-economic crisis triggered by Climate Change. Hon’ble Chief Minister stressed the need for public participation in tree planting,



A view of the participants



From the group discussion

waste management, and protection of water resources, outlined in the Harithakeralam Mission programme.

Dr S Bahileyan Thampi, Deputy Director General, IMD, delivered the key-note address. Shri M Chandradath, Science Advisor to Hon'ble Chief Minister, and Dr Padma Mahanthi IFS, Director, DoECC, offered felicitation speeches. Dr George Chackacherry, Director, ICCS, welcomed the gathering and Dr Sekhar L Kuriakose, Member Secretary, SDMA, proposed a vote of thanks.

There were three technical sessions – Session 1: Lead presentations dealing with climate scenario in the national and state perspectives; Session 2: Concept presentations dealing with impact of climate variability in Kerala; and Session 3: Group discussions dealing with the performance indicators for advancements in Kerala in the climate change sector. The valedictory session was chaired by Dr K P Joy, Chairman, State Environment Impact Assessment Authority, Kerala.

There have been 53 specific recommendations evolved in the workshop, in four different aspects (i) Increasing the Adaptation Efficiency and Resilience of Agriculture, Animal Husbandry, Fishery

and Water sectors; (ii) Climate Change and Variability Inclusive Governance System; (iii) Value Addition to Climate Systems Science by Increasing Monitoring Networks and Analytical Ability; and (iv) Increasing the Carbon Sequestration Capacity of Kerala. A few of the major recommendations are:

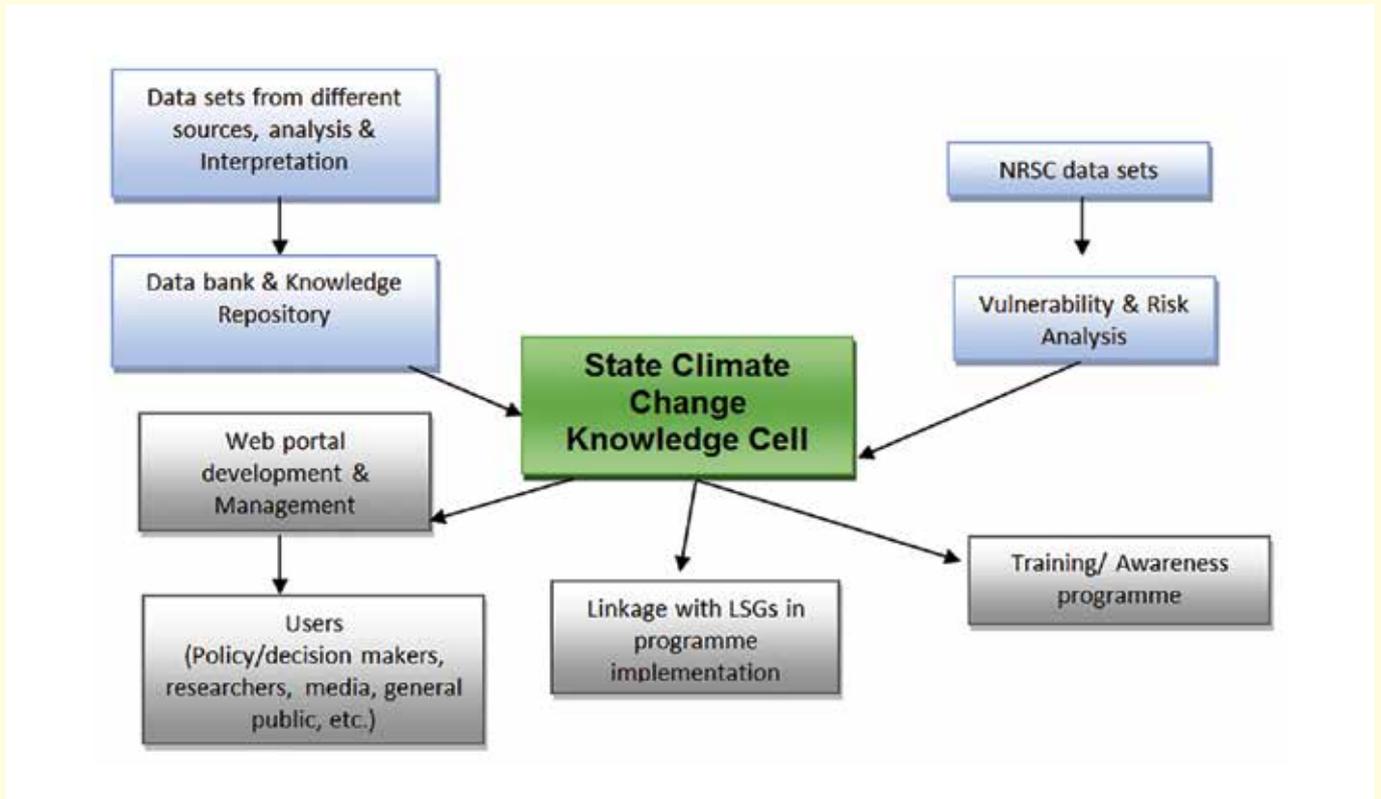
- Location specific as well as crop specific recommendations and crop calendars have to be prepared in the context of climate change.
- Scientific crop management practices and efficient irrigation practices like drip, sprinkler, poly house farming, etc. should be promoted effectively.
- Livestock advisory based on weather warning should be promoted widely.
- Provisions of Integrated Coastal Zone Management should be enforced to prevent shrinkage of coastal shore.
- Conservation of all existing wetlands should be given top priority as it is one of the major measures to combat Climate Change issues.
- Integrated Watershed Management programmes should be given top priority and proper funding should be provided for soil and water conservation. Well recharge through rooftop rainwater harvesting should be promoted on priority basis.
- Green spaces should be developed in all possible spaces in urban centres.
- Climate inclusive planning strategy should be mooted for all developmental projects by considering allocations proportionate and linked to the local climate pattern.
- Carbon footprint analysis at the local level should be encouraged for the effective functioning of developmental activities minimising adverse impacts. Identification of low carbon production projects should be encouraged and implemented at the local level.
- Efficient waste management methods should be identified and propagated/implemented at household level, community level, and regional level.
- Installation and maintenance of surface observation network at 0.250 X -250 is highly recommended. This network should represent coastal, mid land, and high regions and should be at least one observatory in every block panchayat level.
- Doppler weather radar at the northern part of Kerala (Kannur/ Kasargod/ Kozhikode) may be established.
- Trained expert manpower should be developed for dealing with climate change adaptation/mitigation and climate change induced disaster management. SDMA/ ICCS could act as the nodal agency for the purpose.
- State specific standards and protocols for the measurement, reporting and verification (MRV) of carbon (carbon accounting system applicable to various sectors) should be developed.

Setting up of State Climate Change Knowledge Cell

The five-year project to set up the State Climate Change Knowledge Cell at ICCS started during November 2016. The project is implemented with the financial support (grant of Rs. 248 lakh) of the Department of Science and Technology, Government of India, under the National Mission on Strategic Knowledge for Climate Change.

The main aims of the project are (i) to build data-bank and knowledge repository for storing and retrieving Climate Change information at the state level to be useful to all sectoral line departments/agencies/universities, general public, etc; (ii) to establish a network with various stakeholders within the State; (iii) to assess risk and vulnerability

due to Climate Change in the State and to develop bench mark/ assessment relevant for all adaptation and mitigation sectors; (iv) to develop capacity building for all relevant departments/agencies and stakeholders to create awareness on Climate Change and develop capabilities to handle various issues; and (v) to develop a web portal for assisting decision makers in framing appropriate policy interventions in the activities of various departments/agencies. Major components of the Knowledge Cell are: (i) establishment of a data bank and knowledge repository; (ii) establishment of a web portal; (iii) vulnerability study; and (iv) stakeholder consultations and capacity building programmes.



A consultative workshop of experts on setting up of the Cell was conducted on 29 December 2016, at ICCS office, Kottayam for fine tuning the proposed activities, and for developing strategy for better implementation of the project. One of the main discussion items was, therefore, accommodating the activities within the funds sanctioned without affecting the quality of work and the targets stipulated in the objectives of the project. Suggestions of the workshop include (i) 'Bhuvan' could be integrated with knowledge cell and single window data dissemination is desirable for repository; (ii) Generic sector wise data has to be identified and collected; (iii) Journal papers should be condensed and kept in the repository; and (iv) Vulnerability index has to be developed on theme basis.



Experts in the Consultation Workshop

As a part of establishing data bank and knowledge repository under the project, research reports, journals, proceedings, publications, books, statistical data etc. pertaining to climate change and environment have been collected from various central and state governmental departments, and research institutions in Thiruvananthapuram, Ernakulam, Kottayam and Kozhikode. Data collected are simultaneously processed. Web portal to be set up as a part of the project will have relevant climate change data to assist decision makers to make policy interventions in various government departments.

As part of capacity building of stakeholders, training programmes focusing on impact of climate change, adaptation and mitigation measures were conducted in 14 districts of Kerala. Till date, 17 training programmes were conducted for selected high school teachers (9 numbers) and members of Bhoomithra Sena, consisting of college teachers (2 numbers). A total of 416 officials participated in the training programme.



Teachers training at Thrissur



Teachers training at Palakkad

Conducts Workshop on Vembanad-kol Wetland and Climate Change: Strategies for Adaptation

A workshop was organised by ICCS on 'Vembanad-kol Wetland and Climate Change: Strategies for Adaptation' at Alappuzha on 31.01.2017, under the sponsorship of KSCSTE. Dr E J James, Member, Central Wetland Regulatory Authority and Vice Chancellor, Karunya University, Coimbatore, inaugurated the programme and delivered the key-note address.

In his key-note address, Dr E J James said that sea level rise will have an adverse effect on coastal wetlands, especially Vembanad due to climate change. Storm surges may erode the sand bars which have given birth to the wetland. He warned that salinity levels will change drastically, thereby changing the ecosystem and biodiversity; Drinking water schemes at the lower end of the rivers draining to the wetland will get affected; Rice cultivation in Kuttanad in its present form will not exist. According to Dr James, the sea level may rise by 0.5 m at mid-level by 2100 and may also touch 1 m causing considerable damage. To adapt

to the situation, we have to closely watch the water quality changes; improve prediction and forecasting techniques; investigate on socio-economic impact of climate change on water resources; and formulate policies and laws that reconcile the need of the environment, people, and business that are responsive to changing climatic conditions.

A total of 90 persons representing, local self-government institutions, academic and scientific organisations, government department/agencies, nongovernmental organisations, cooperative societies, etc. Several panchayats were represented by presidents, vice presidents and standing committee chairpersons. Dr K G Padmakumar, Director, IRT Centre for below Sea Level Farming, Alappuzha, Dr S Leenakumari, Professor and Head, Rise Research Station-Kerala Agriculture University, Mankombu, Alappuzha, and Dr Nagendra Prabhu, Professor, S D College, Alappuzha, made lead presentations. Presentation were focused on climate change and Vembanad Ecosystem - hydrologic and



Dr E J James, Member, Central Wetland Regulatory Authority, inaugurates the workshop. Dr George Chackacherry, Director, ICCS, Dr K G Padmakumar, Director, IRTCBSF, Dr Nagendra Prabhu, Professor, S D College, Alappuzha, and Dr S Leenakumari, Professor, KAU, are also seen.



A view of the participants of the workshop



Experts clarify queries of participants during discussion. Dr George Chackacherry, Shri N K Sukumaran Nair, General Secretary, Pampa Parirakshana Samiti, Dr George Abe, Chief Scientist, CWRDM, Dr E J James, and Dr Nagendra Prabhu, Professor, S D College, Alappuzha are seen.

biodiversity aspects, Climate change impacts on Kuttanad Agriculture sector, and water quality aspects and dealing with the menace of aquatic weeds. The discussion session was moderated by Dr George Abe, Head, CWRDM Sub Centre, Kottayam. Dr George Chackacherry, Director, Institute for Climate Change Studies, welcomed the gathering and Dr Shylesh Chandran, Scientist, ICCS, proposed a vote of thanks.

Main recommendations of the workshop are:

- Introduce climate resilient reforms in all areas of water management
- Developing decision support systems for promoting better efficiency
- Baseline information for integrating climate risks to policy, planning and investment

- Promotion of climate reliance in the area of all relevant sectors to reduce risks
- Encouragement for income and job diversification to bring down climate vulnerability
- Evolve participatory efforts incorporating stakeholders, academicians, researchers, ecologists, environmentalists and social activists for the protection of Lakes
- Sustainable Soil Management through resource conservation technologies
- Zero- tillage/ Minimum tillage helps in conserving soil and water and raising crop productivity. Reduced soil disturbance and increased retention of crop residues results in lower carbon emissions
- Establishment of a climate information system
- Introducing climate resilient reforms in all areas of water management
- Developing decision support systems for promoting better efficiency.

SAPCC Revision

As decided by the State Level Steering Committee on Climate Change, the State Action Plan on Climate Change (SAPCC) is being revised under the leadership of DoECC, and with the assistance of ICCS, etc. A consultative workshop was organized. Sectoral level consultations were conducted with various departments and agencies. A template prepared by ICCS as part of the consultation was circulated to all concerned for furnishing details. Draft revised document is under preparation.

Capacity Building Programmes

Orientation Programme for District Panchayat Presidents

As a part of the training project on 'Climate Change and Disaster Risk Reduction' carried out using the Plan Fund, an Orientation Programme was conducted for District panchayat Presidents, Vice Presidents and higher officials District Panchayats on 07 January 2017 at Thiruvananthapuram.

Shri S M Vijayanand IAS, Chief Secretary, Government of Kerala, inaugurated the programme. The Chief Secretary, in his inaugural address said that in order to combat the issues of climate change, we have to go with specific programmes, or we have to act with specific targets. For adaptation and mitigation, mission mode may be adopted; departmental approach will never help. According to him, result will



Shri S M Vijayanand IAS, Chief Secretary, inaugurates the orientation programme for District Panchayats presidents at Thiruvananthapuram. Shri S Sudevan, Director, IMD, Dr George Chackacherry, Director, ICCS, Shri V S Senthil IAS, Additional Chief Secretary, Environment Department, and Smt Bindhu C Thomas, Technical Expert, ICCS, are also seen.

be much better if community approach is adopted. Shri V S Senthil, Additional Chief Secretary, Environment Department, presided over the meeting. Dr George Chackacherry, Director, ICCS, welcomed the gathering and Smt Bindhu C Thomas, Technical Expert, ICCS, proposed a vote of thanks.

Dr K K Ramachandran, Scientist, NCESS, and Dr Sekhar L Kuriakose, Member Secretary, State Disaster Management Authority, made presentations in the programme, which was followed by panel discussion led by Shri S Sudevan, Director, India Meteorological Department, Government of India, Dr A Bijukumar, Professor, Aquatic Biology and Fisheries, Kerala University, Dr P Harinarayanan, Scientist, KSCSTE, Dr Shalini Pillai, Professor, Kerala Agriculture University, and Sri K M Mohanan, Finance and Administrative Officer, ICCS.



Dr Sekhar L Kuriakose makes presentation in the workshop

Holds Meetings of GB/EC/SAC

Governing Body

The first meeting of the Governing Body of ICCS was held under the chairpersonship of the Hon'ble Chief Minister, Shri Pinarayi Vijayan, in his chamber, on 08 February 2017.

Executive Committee

The fifth Executive Committee meeting of ICCS was held under the chairpersonship of the Hon'ble Chief Minister, Shri Pinarayi Vijayan, in his chamber, on 08 February 2017.

Scientific and Academic Council

The first meeting of the Scientific and Academic Council (SAC) was held in the Conference Hall of NATPAC, Thiruvananthapuram, on 27 May 2017, under the chairmanship of the Director, ICCS.

New Posts Created for ICCS

Government of Kerala have created 12 permanent posts for ICCS vide Government, vide GO (Rt) No. 6/2017/Env. dated 16.05.2017. The posts include seven scientific/technical posts (one Scientist G, one Scientist E1, two Scientist B, two Technical Officer and one Technical Assistant), and five administrative staff (Administrative and Finance Officer, Head Accountant, Office Assistant, Computer Assistant and Driver cum Attender). CSIR scales of pay are made applicable to scientific and technical staff and State scale to administrative staff.

Conducts Poster-Book Exhibitions on Environment

ICCS, in association with State Language Institute, Ashoka Trust for Research in Ecology and Environment (ATREE), and SDV School, Alappuzha, organized Poster Exhibition, Book Exhibition, Open Forum, Quiz Competition and Video Projection, on "Connecting People to Nature" as a part of observing World Environment Day 2017. The programme was conducted on 05 June 2017 at SDV Centenary Hall, Alappuzha.



Dr T M Thomas Issac, Hon'ble Minister for Finance, reaches to inaugurate the Environment Day Celebration at Alappuzha



Hon'ble Minister for Finance addresses the students

Dr T M Thomas Issac, Hon'ble Minister for Finance, inaugurated the celebration. Shri Thomas Joseph, Municipal Chairman, Alappuzha, Ms Jennifer Daubeny, Consulate General of Canada, Bangalore, Professor V Karthikeyan Nair, Director, State Institute of Languages, Smt I Latha, Municipal Councillor, Alappuzha, Dr Priyadarsanan Dharmarajan, ATREE, Dr George Chackacherry, Director, ICCS, and Shri D Ramadas, Head Master, SDV Boys School, spoke on the occasion.

Shri Thomas Issac, in his inaugural address, said that the observance of Environment Day gives opportunity for everybody to look around and watch how our environment is degrading. He cited the example of Vembanad Lake which is degrading. Hon'ble Minister reinforced the fact that every environmental issue is some way or other linked to people's wellbeing. Therefore it is inevitable to maintain people-nature linkage.



Ms Jennifer Daubeny, Consulate General of Canada, Bangalore speaks in the inaugural meeting



From the book exhibition on environment arranged by the State Institute of Languages

In the Love Bank of Wetland: Programme on Wetland Day

ICCS observed the World Wetland Day 2017 with a programme named as "Thanneerthadathinte Snehatheerathu" (In the Love Bank of Wetland), under the sponsorship of KSCSTE, on 02 February 2017 at the Regional Agricultural Research Station (RARS), Kumarakom, Kottayam.

Boating in the Vembanad Lake, elocution competition, and skit competition were other programmes held. The topic of the competitions was "Humans and Wetlands". A total 45 students and nine teachers representing nine schools of Kottayam district participated in the programme.

The programme was inaugurated by Dr Ambika Devi, Associate Director, RARS. Dr George Chackacherry, Director, ICCS, delivered a lecture on the theme of 2017 wetland day, "Wetlands for Disaster Risk Reduction". Shir Pratheesh C Mammen, Project Scientist, and Shri K M Mohanan, Administrative Officer, ICCS, spoke.



A view from skit competition

Cash prizes amounting to Rs. 1000/-, 750/-, and 500/- were awarded to the 1st, 2nd, and 3rd prize winners of Elocution Competition, respectively. 1st prize awarded to Jini Raj (S.K.M.H.S.S, Kumarakom), 2nd prize awarded to Aiswariya Saji (Govt. Devi Vilasom H.S.S, Kudavechoor), and 3rd prize awarded to Binuja Varghese (C.M.S.H.S.S, Kottayam).

Cash prizes of Rs. 3000/-, 2000/- and 1000 /- were awarded to 1st, 2nd, and 3rd prize winners, respectively. First prize was awarded to team III, which was consisted of Amal P Mathews (C.M.S.H.S.S, Kottayam), Kannan P.M (N.S.S.H.S.S, Kottayam), Arya M Madhu (Baker Memorial H.S.S, Kottayam) and Ganga T.P (S.K.M.H.S.S, Kumarakom). The second prize was won by team consisted of K H Krishnanunni (Govt. HSS, Karappuzha), Joshna Joshy (Govt. Devivilasom HSS, Kudavechoor), Haripriya Prabhash (Govt. VHSS, Nattakom) and Drishya Jayan (Baker Memorial GHSS). The third prize was won by Riya Biju (Govt. Vocational HSS, Kumarakom), P A Anjitha (Govt. Vocational HSS, Nattakom), Sneha Prasad (Govt. HSS Chengalam) and Jayalakshmi Jayakumar (Govt. Devivilasom HSS, Kudavechoor).



Boating in the Vembanad Lake



Training session in progress

Programmes were also organized by ICCS for observing Water Day and Meteorological Day. World Water Day was observed on 22 March 2017 at ICCS under the theme 'Why Waste Water'. Kumari Akhila Chandran, JRF, delivered a lecture on the 'Relevance of Water Day in connection with Climate Change', followed by lecture made by Kumari Lina Joseph, JRF, on 'Water Day and its relevance in the current situation in Kerala'. Discussion was held after the presentations.

An interaction programme was organized at ICCS in connection with the World Meteorological day on 23 March 2017. Kumari M S Asha, JRF, made a presentation on the Role of Clouds in Climate Change. Shri K M Mohanan, Finance and Administrative Officer, Smt Bindhu C. Thomas, Technical Expert, and Kumari V S Sajini, Project Assistant, spoke on the occasion, followed by video projection, and discussion.



Ring compost system established at the ICCS office for treating organic waste

Participates in Exhibitions

At Legislature Complex

ICCS participated in the exhibition organised as a part of Diamond Jubilee Celebration of Kerala Legislative Assembly at Legislature Complex, on 14.06.2016. The exhibition was organized with a focus on creating awareness on environment and climate related issues. The pavilion of ICCS was set up with posters depicting the theme, "Vulnerability of Vembanad-kol Wetlands to Climate Change". Shri P Sreeramakrishnan, Hon'ble Speaker of the Legislative Assembly, several MLAs, and general public visited the pavilion of ICCS.

At Karshaka Mela

ICCS participated in the exhibition organized by Pala Social Welfare Society organised as part of Karshaka Mela during 20 - 24 January 2017 at Pala. The pavilion was set up jointly with Kerala State Disaster

Management Authority. The opportunity was utilised to share ideas and information related to climate change showcasing posters.



Shri P Sreeramakrishnan, Hon'ble Speaker of Kerala Assembly, visits the ICCS stall at the exhibition organised in the Legislature complex.



A view of ICCS stall

Participates in Seminar/ Workshop/Training

George Chackacherry, Director

- State Level Steering Committee on Climate Change chaired by the Chief Secretary on 12 January 2017
- Workshop on Climate Change organized by Thanal at Thiruvananthapuram on 12 January 2017
- Inaugurated the Environment Seminar organized by Pala Social Service Society at Palai on 20 January 2017
- Delivered lecture on Wetlands for Disaster Risk Reduction at S N College, Kollam, on 03 February 2017, in their Wetland Day Celebration
- Delivered lecture on Wetlands for Disaster Risk Reduction at CMS College, Kottayam, on 10 February 2017
- National Biodiversity Meet during 23 - 24 February 2017 and chaired session on Landscape Approach and Biodiversity Conservation
- Inaugurated Science Day Celebration of Sree Narayana College of Technology on 28 February 2017
- International Seminar on Water Management - Combating Climate Uncertainties organized by DoECC during 22-23 March 2017 and performed as a panelist in the valedictory session
- Inaugurated the workshop on Ignited Minds organized by Malayala Manorama at Thiruvalla on 29 March 2017
- Panel Discussion on Water Security organized by Malayala Manorama at Kottayam on 06 May 2017

- Seminar on Pampa River organized by MG University at Kottayam and presented paper on Integrated Water Resources Management – A Case Study on Pampa on 19 May 2017
- Delivered key-note address on Connection People to Nature in the seminar organized by St Joseph's College, Alappuzha, on 05 June 2017
- Delivered lecture on Integrated River Basin Management – A Case Study on the Holy River Pampa in the National Training Programme on Audit of Water Issues organized by International Centre for Environment Audit and Sustainable Development, Jaipur, Rajasthan, on 05 July 2017

Pratheesh C Mammen, Project Scientist

- GeoVision Seminar organised by ESRI India Technologies on 09 December 2016 at Thiruvananthapuram.
- State Level Consultation Meeting of expert agencies and research organization to elicit inputs for strengthening the project design and activities of Munnar India High Range Mountain Landscape project on 20 December 2016 at Thiruvananthapuram.
- International seminar on 'Water Management – Combating Climate Uncertainties' at Thiruvananthapuram on 22-23 March 2017.
- Delivered talk on "Weather & Climate", on 23 March 2017, aired on Radio Mangalam Radio channel a part of World Meteorological day

Shylesh Chandran, Project Scientist

- Training Programme on "Wetland management" on 05-06 January 2017 at CWRDM, Kozhikode.
- Training Programme on formulation of projects under climate change for funding under National and International modes by BIRD&MSSR on 16-19 January 2017 at Wayanad.
- International seminar on 'Water Management – Combating Climate Uncertainties' at Thiruvananthapuram on 22-23 March 2017.

Bindhu C Thomas, Technical Expert

- GeoVision Seminar organised by ESRI India Technologies on 09 December 2016 at Thiruvananthapuram.

V S Sajani

- Training programme on "Introduction to Climate Change" for Focal Team Members Organised by DoECC and DFID on 19-20 January 2017 at Thiruvananthapuram

Shanu Raveendran

- National Seminar on Biodiversity Conservation and Farming Systems for Wetland Ecology organised by Kerala Agriculture university, and presented the paper "Phytoplankton distribution and nutrient dynamics in Vembanad lake" on 22-23 February 2017 at Alappuzha.

Akhila Chandran

- National Seminar on Natural Resource Management for Horticulture Crops under Changing Climatic Conditions with special reference to drought management of plantation crops and spices held on 16-17 March 2017 at CWRDM, Kozhikode.

T Aiswariya

- National Seminar on Natural Resource Management for Horticulture Crops under Changing Climatic Conditions with special reference to drought management of plantation crops and spices held on 16-17 March 2017 at CWRDM, Kozhikode.

Lina Joseph

- Conference on "Disaster, Risk and Vulnerability" held on 29- 31 March 2017 at University of Kerala, Thiruvananthapuram, and presented a paper on "Vulnerability assessment of urban slums in Kozhikode, Kerala".

Decision Making Bodies of ICCS

ICCS was established under the Department of Environment, Government of Kerala, as an autonomous research organisation during the year 2014. The Institute, which was registered under the Travancore Cochin Literary, Scientific and Charitable Societies Registration Act 1955, started functioning at Kottayam during August 2014. The objectives of ICCS are focussed research on state specific impacts of climate change on various sectors; and propose appropriate actions for climate change management and adaptation. ICCS is expected to act as the knowledge centre on climate change; to facilitate the Government in the implementation of State Action Plan on Climate Change (SAPCC); and to conduct capacity building programmes on Climate Change Adaptation and Mitigation for various stakeholders. The details of decision making bodies of ICCS and their members are furnished below:

Governing Body

- Hon'ble Chief Minister of Kerala (Chairperson)
- Minister for Environment, Government of Kerala (Vice-Chairperson)
- Secretary to Government, Department of Environment
- Secretary to Government, Department of Finance
- Secretary to Government, Department of Disaster Management
- Director, National Centre for Earth Sciences Studies
- Director, School of Environmental Sciences, MG University
- Two nominees of the Government of Kerala
- Director, ICCS (Member Secretary)

Executive Committee

- Hon'ble Minister for Environment, Government of Kerala (Chairperson)
- Secretary to Government, Department of Environment
- Secretary to Government, Department of Finance
- Director, Department of Environment and Climate Change
- Director, School of Environmental Sciences, MG University
- One nominee of the Government – Dr Sekhar L Kuriakose, Member Secretary, State Disaster Management Authority
- Director, ICCS (Member Secretary)

Scientific and Academic Council

- Director, ICCS (Chairperson)
- Director, National Centre for Earth Science Studies
- Director, India Meteorological Department, Kerala
- Director, School of Environmental Sciences, MG University
- Two scientists/academicians/technocrats nominated by the Governing Body of ICCS - Dr K Rajendran, Group Head and Coordinator, Multiscale Modelling Programme, CSIR; and Dr E Vivekanandan, Former Scientist, Central Marine Fisheries Research Institute
- Nominee of the Executive Committee from amongst Group Heads of ICCS

Extreme and unusual weather trends to continue in 2017

World Meteorological Organisation (WMO) issued its annual statement on the State of the Global Climate ahead of World Meteorological Day on 23 March, 2017. According to this report, the year 2016 made history, with a record global temperature, exceptionally low sea ice and unabated sea level rise and ocean heat. Extreme weather and climate conditions have continued in 2017.

Highlights of this report are

(i) Temperature: A new warming record was set with temperature remaining 1.1°C above the pre-industrial period, and 0.06 °C above the previous highest value set in 2015. According to the report, global temperatures in 2016 were influenced by the strong El Niño event of 2015-2016 and increased forest fire events. The year 2016 features in the “five warmest years for every inhabited continent”.

(ii) Globally averaged sea surface temperatures in 2016 were the warmest on record. The anomalies were strongest in the early months of 2016. Global ocean heat content was the second-highest on record after 2015. Increased Ocean Heat Content is responsible for about 40 per cent of observed global sea level rise over the past 60 years, according to the report. Globally, sea level has risen by 20 cm since the start of the twentieth century, mostly due to thermal expansion of the oceans and melting of glaciers and ice caps.

(iii) Arctic sea ice: Throughout 2016, the Arctic sea-ice extent was well below average. It was at record low levels for large parts of the year. The maximum extent of 14.52 million sq km, recorded on March 24, was in fact, the lowest seasonal maximum ever since satellite data was first recorded in.

(iv) Heatwaves: The year 2016 started with an extreme heatwave in southern Africa in the first week of January. Extreme heat also affected South and South-East Asia in April and May, prior to the start of the summer monsoon. A national record of 51.0 °C was observed on 19

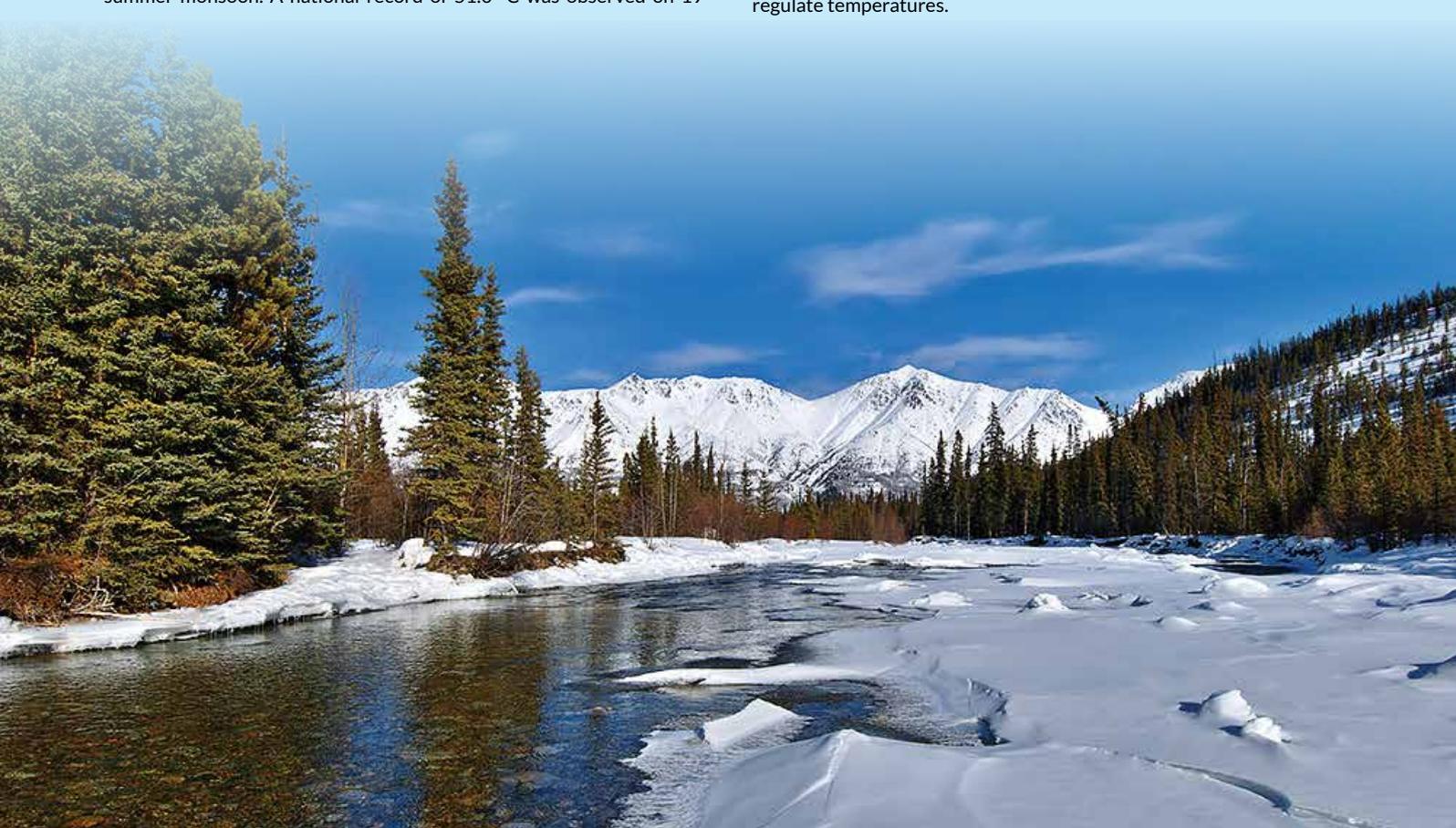
May at Phalodi, India. Record or near-record temperatures occurred in parts of the Middle East and North Africa. The highest temperature observed was 54.0 °C at Mitribah (Kuwait) on 21 July will be the highest temperature on record for Asia.

(v) Greenhouse emission: According to the WMO report, increased growth rate of greenhouse gases, both through increased emissions from terrestrial sources (forest fires) and decreased uptake of CO₂ by vegetation in drought-hit areas boosted warming in 2016. The CO₂ levels rose to 405.1ppm in 2016, putting CO₂ at its highest levels in over 10,000 years.

Extreme events continue in 2017: Newly released studies, indicate that ocean heat content may have increased even more than previously reported. Provisional data also indicates that there has been no easing in the rate of increase in atmospheric carbon dioxide concentrations. Even without a strong El Niño in 2017, we are seeing other remarkable changes across the planet that are challenging the limits of our understanding of the climate system.

The Antarctic Peninsula has been one of the fastest warming places on the planet throughout the latter half of the 20th century. This warming has driven profound environmental changes, including the collapse of ice shelves, namely Larsen A and B. Larsen C, a floating platform of glacial ice on the east side of the Antarctic Peninsula, is the fourth largest ice shelf in the Earth's southernmost continent. Recently, between July 10 & 12, a massive iceberg having area close to 5800 square kilometers, split off from Antarctica's Larsen C ice shelf, reducing the area by approximately 10%.

Scientific research indicates that changes in the Arctic and melting sea ice is leading to a shift in wider oceanic and atmospheric circulation patterns. This is affecting weather in other parts of the world because of waves in the jet stream – the fast moving band of air which helps regulate temperatures.



Fishes and Climate Change

Eating fish becomes a costly affair due to climate change. According to a first of its kind assessment by the Central Marine Fisheries Research Institute (CMFRI), more fish species on the east coast, especially in the waters off Odisha and West Bengal, are highly vulnerable to climate change. Vulnerability hinges on the ability of a species to adapt to climatic change, their spawning patterns, geographic location and the availability of prey would eventually determine their numbers. This vulnerability stems not only from changes in climate but also from fishing pressure and lower productivity. Overall, 69% of the 68 fish species studied were found to be vulnerable to climate change. They include Bombay duck, tuna, sharks, various shrimp, pomfret, and catfish, among others. Fish inhabiting surface or near surface waters like tuna, mackerel and sardine are most affected by temperature change; they also account for a sizeable chunk of the catch. Overfishing plays a major role in the vulnerability of 16 species.

In a comprehensive assessment, the CMFRI studied important fish species in four geographic zones: northwest (comprising Gujarat and Maharashtra), southeast (Goa, Karnataka, and Kerala), southeast (Tamil Nadu and a part of Andhra Pradesh), and southwest (Northern Andhra Pradesh, Odisha and West Bengal), species most under pressure include Bombay duck on the western coast, hilsa in the east and the oil



sardines found off Tamil Nadu. Scientists looked at how exposed each zone was to changes in sea surface temperature, ocean current speed and rainfall. Sea surface temperature rose by between 0.5-0.8C along the Indian coast since 1975, with the highest increases on the west coast. Fish that inhabit surface or near surface waters are most affected by temperature change. These pelagic fish, as they are called, comprised more than 50% of fish landings in India last year, and include Bombay duck, ribbon fishes, mackerel (bangda), tuna, and sardines (taarli)

Human activities triggered recent warming in India



The rapid warming observed in India in the recent decades is primarily due to human activities. A team of scientists from the National Atmospheric Research Laboratory (NARL), Tirupati, published this result in the June issue of Scientific Reports, a Nature

research journal. According to them changes in land use and land cover and substantial increase in GHG emissions are the major factors for warming over India.

Compiling India's temperature data for the past 145 years, the researchers have found that the period of 1969 to 2005 showed a higher warming rate of 0.2°C per decade, compared to the lower rate of warming of 0.055°C for the period of 1860-1905.

The Land use- Land cover (LULC) change was the reason for the warming for the period from 1980 and Green House Gas (GHG) emissions played major role in warming for the period from 1960-1980. The spatial variation of trends from different reasons for warming over India indicates that the impact of GHGs is more severe over the Northern and Western parts of India.

The observed warming is more pronounced during the summer followed by winter, monsoon season, and post-monsoon. Future warming is larger during the winter season followed by summer, monsoon and post-monsoon seasons over India. By the end of the 21st century, both rare cold and heat events are expected to increase over India.