

# News Magazine of The Institution of Engineers(India), Kerala State Centre Voice of Kerala Engineers

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## Happy Onam



### CHAIRMAN SPEAKS

Prof. (Dr.) M. Jayaraju FIE



Dear Members,

The month of August,2022 is significant for all of us.It was on 15 August,2022 that the 75th Anniversary of India's independence from the British was celebrated. Independence Day was celebrated at Kerala State Centre by hoisting the National Flag. Let us remember the words of the great Engineer - Statesman, Sir. M. Visvesvaraya regarding Indian Independence." The Indian mind needs to be familiarised with the principles of modern progress, a universal impulse for enquiry and enterprise awakened and earnest thinking and effort promoted."

This year,2022 is also significant for Members of IEI KSC since it is the 75th Anniversary of the formation of IEI Kerala State Centre.

Till 1947 there was no Centre of IEI in Kerala.So in 1947 a Centre was established under the name Trivandrum Local Centre in the campus of old College of Engineering, Trivandrum at PMG Junction. The building was on lease and in the 1950s it was shifted to its own building in the present premises at Vellayambalam.

In this connection at the State Committee Meeting on 24 - 8 - 2022, it was decided to celebrate the 75th Anniversary in a grand manner, year long.

Regarding the lease land, discussions are continuing with Government.Wednesday Talks are going on with latest Techni cal Topics.

The 717th National Council Meeting was held from 2 - 4 September 2022 at IIM, Nagpur.

On 6 September 2022 Onam was celebrated at KSC with the active participation of Members and Staff.

### ONAM CELEBRATION

On 6<sup>th</sup> September 2022 Onam was celebrated at IEI Kerala State Centre with active participation of Members and Staff.



### HONORARY SECRETARY'S DESK

Er.Roy Mathew, MIE



#### Upcoming Events

**09-09-2022** Royal Charter Day Celebrations in Webinar mode. Jointly organized by all IEI Local Centres in association with IEI Kerala State Centre on Friday, 9th September 2022 at 6.00 pm to 8.00 pm. Panellists: Er.V B Singh,FIE & Dr.M P Sukumaran Nair, FIE.

Theme: Royal charter: Its Legal status and Present Scenario.

**15-09-2022** Celebration of 55thEngineers' Day. Lecture on the theme"Smart Engineering for a Better World" by Dr. Suresh Subramoniam, Professor & Director, CET School of Management, Thiruvananthapuram.

**28-09-2022** Technical Talk on 'Advance Materials used in Launch Vehicles and Satellites', Dr.P.Ramesh Narayan, Group Director (Retd), Material & Metallurgy Group, VSSC.

**02-10-2022** Gandhi Jayanthi Celebration and World Habitat Day.

### CELEBRATION OF 75<sup>TH</sup> YEAR OF INDEPENDENCE

The Institution of Engineers (India), Kerala State Centre celebrated the 75<sup>th</sup> year of Independence in IEI Kerala State Centre, Visvesvaraya Bhavan, Thiruvananthapuram.

On 13<sup>th</sup> August 2022 morning Prof (Dr) M Jayaraju, FIE Chairman hoisted National Flag. Er.Roy Mathew, MIE, Honorary Secretary, State Centre Committee Members and staff of KSC attended.

As per the direction from Government of India, this year IEI Kerala State Centre observed Independence day from 13<sup>th</sup> to 15<sup>th</sup> August 2022 all over the nation.

On 15<sup>th</sup> August 2022 evening the national flag was lowered by Prof (Dr) M Jayaraju, FIE Chairman in the presence of Committee Members.



A Century of Service to the Nation

## Technical Session 1

### “Flood Modelling and Inferences from a study for Trivandrum City” by Dr. Santhosh G Thampi.

Dr. Santhosh G Thampi is working as a Professor in NIT, Calicut. Dr. Santhosh is a member of various professional institutions including Indian Water Association (IWA), International Association of for Hydraulic Research (IAHR), Life member of Indian Water Works Association Member, Indian Water Resources Society etc. Dr. Santhosh has also served as Visiting Professor, Water Engineering and Management, School of Engineering and Technology, Asian Institute of Technology, Bangkok under the faculty secondment by the MHRD, Government of India.

Dr Santhosh G Thampi, in his talk, informed about different types of floods viz. Flash Flood, Coastal flood due to high tides as well as storms, River flood, Urban flood which occurs when drainage system overflows during heavy rain.

Dr Santhosh mentioned that Thiruvananthapuram has vastly transformed over decades due to large scale urbanisation. A thorough study is required on:

- Natural river and stream network flowing through the city
- Stormwater drainage network
- Land use
- Climate variability
- Impact of climate change on fluvial flood

All the above details are to be worked out to create an urban model for the flood management measures for the city.

The following methodology should be adopted towards processing the mitigation measures.

- 1.Data collection is very important as there is no spatial data nor climate data are available.
- 2.Run off and flood simulation in the PCSWMM software to be done.
- 3.Calibration on the observed flood path to be taken up.
- 4.Create an Urban Flood Model.
- 5.Carry out flood mapping for future scenario
- 6.Prepare Flood Risk Management Framework.

Some details on hydraulic components through Hydrodynamic Model PCSWMM on computed flood depth was done at Thampanoor on 31.07.2018. Some more flood prone areas in the city like Plammodu, Kannammoola, Pulimoodu, Bakery Junction, Murinjapalam, East Fort and Vanchiyoor.

A few of the structural measures for protection were identified and proposed include:

- Aquaduct
- Barrage
- River improvement
- Debris Flow Barrier
- Detention Ponds

- Diversion channel
- Tunnel

Some of the non-structural measures include:

- Early Warning Systems (EWS)
- Raising Public Awareness
- Planning of Solid and Liquid waste removal from the path of flow

## Technical Session 2

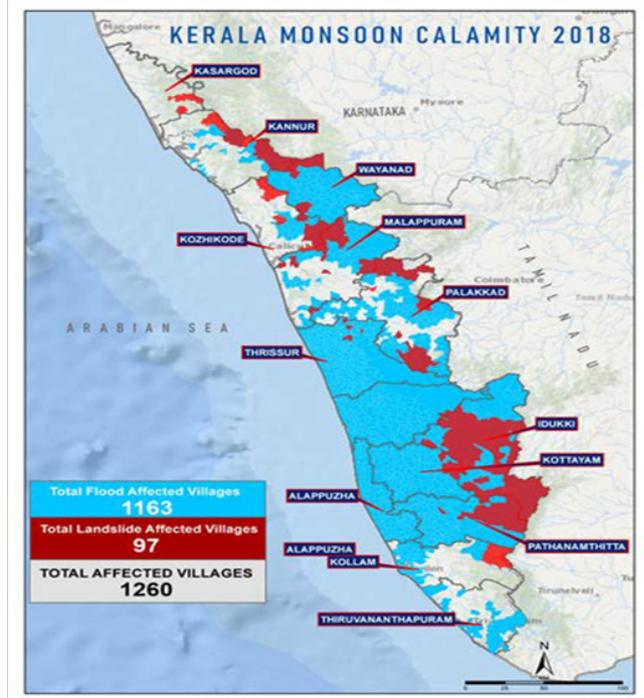
“Floods – Resilience Measures” by Dr. Sekhar Lukose Kuriakose

Dr. Sekhar Lukose Kuriakose is Member Secreatry, KSDMA and Head (Scientist), State Emergency Operations Centre, Government of Kerala. Dr. Sekhar led the development of the institutional mechanism of disaster management in Kerala and the establishment of the State and District Emergency Operations Centres. Dr. Sekhar, is also a visiting faculty and scientist at University of Twente, The Netherlands and fosters The Netherlands-Kerala knowledge exchange in Disaster Risk Reduction.

Dr. Sekhar, at the outset, pointed out the 7 targets to be addressed for flood risk reduction in the city by the year 2030. They are:

- Disaster Mortality
- No of people affected
- Economic loss
- Infrastructure damage
- DRR at National /Local level
- International Cooperation
- EWS and DR information

The State has initiated a few measures for becoming a safe state over the past few years. They are:



2012 - 2017: Human Resource State and District Institutional Strengthening

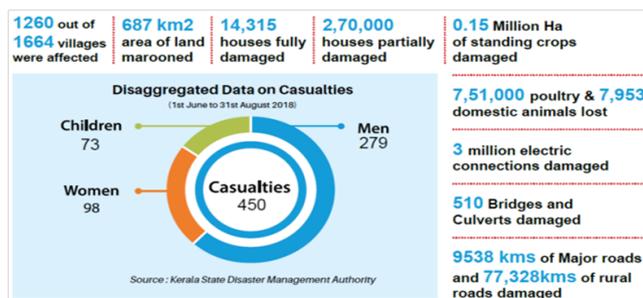
2017 – 2022: Decentralisation – devolution of governance from District level to local level

2022 – 2027: Resilient houses – Climate change and DRR awareness (to build 77 lakh dwellings)

Dr. Sekhar also gave a comparison of the damages causes during the flood caused in 1924 and in 2018.

In 1924 flood, while 10,000 fatality was recorded, there is no consolidated data or record available of the economic losses incurred.

In 2018 flood, all the 14 districts were affected, 1260/1644 villages were affected, 687 sq. kilometres land was flooded, morn 5000 landslides were recorded and 33,000 houses were damaged.



In 2019, a paradigm shift of decentralising Disaster Management with major responsibilities moved to local self-governments. A comprehensive attempt to prepare Disaster Management Plan of all local state governments in the state was also initiated named “DurantaNivaranaPadhathi”.

Dr Sekhar spelled out the actions that were being initiated. They are:

- Warning system – Location based managing services, Sirens and Strobe lights for informing residents
- Weather forecast system – Nearly 1000 schools have been installed with rain gauges
- Minding gaps in Disaster Management – Disabilities inclusive, Transgender inclusive, Palliative care inclusive, Indigenous people inclusive
- Harnessing human spirits – Nearly 10,000 official volunteers have been identified
- Mock drills were conducted to give awareness to the residents in the moist vulnerable area
- In Challanam beach, project by Irrigation department to install tetrapods in 7 km stretch coastal area
- is initiated at 254 Crore Rupees.
- Apart from the above, resilient houses for Indigenous people are also important and being initiated.

Dr Sekhar concluded his talk with the following remarks:

- Technology for technology’s sake is not enough.

Technology should be utilised for social awareness also.

- Social technology should be the the new term that should be in place to mitigate disasters
- Resilience building should be initiated and expedited. For this, Dr Sekhar exhorted the engineers to approach the local governments and volunteer themselves to provide their services for such social development activities.

### Technical Session 3

“3<sup>rd</sup> Generation Flood Mitigation System Integrated with Water Resource Management” – by

Ir. Dr. Saravanan Mariappan

Ir. Dr. Saravanan Mariappan is a registered Professional Engineer with the Board of Engineers Malaysia, a member of ACEM, SPAN, Malaysian Storm Water Organisation, Certified EIA consultant. He is also a certified consultant for Erosion and Sediment Control (CPESC) and Sustainable Energy Photovoltaic System Designer. Currently, Dr. Mariappan is a Director of Nexus EC SdnBhd, an Engineering Consultancy firm based in Malaysia and provides cost effective solutions in the field of Flood Mitigation and Engineering Forensic. Dr Mariappan pursued his Ph D in Global Environmental Studies from Kyoto University, Japan, after completing his Bachelor and Masters Degrees in Civil and Geotechnical Engineering respectively from the University of Malaya.

Dr Saravanan mentioned in his inaugural session of his talk that ocean warmth in response to climate change can cause sea water to expand and results in rising sea levels. Flood mitigation measures, generally involve the construction of monsoon drains, flood walls, flood gates, river dykes or bunds, weirs, diversion culverts, tunnels or dams based on the suitability and characteristics of the river. Even rivers are dug deeper to increase the eater holding and flow capacity. These are conventional methods and classified under 1<sup>st</sup> and 2<sup>nd</sup> generation modes. 2<sup>nd</sup> generation mitigation measures took shape when concrete and steel technology started to dominate construction industry which includes deep detention ponds, underground diversion culverts or tunnels, weirs etc.

Despite these modes are in use, certain inland areas are still prone to flooding during wet and heavy spells of rain. This is because the existing 1<sup>st</sup> and 2<sup>nd</sup> generation flood mitigation component have limited storage or discharge capacity to mitigate excess rainwater which overflows along the existing river. The existing components are also limited to invert levels and FINITE storage and discharge capacity. Hence, additional flood management structures that can hold water and divert large volumes of excess flood water directly to the sea are needed to address the flood issues in low lying areas, due to storm surge and sea water rise. The 3<sup>rd</sup> generation component is free of invert level limitation and have INFINITE discharge capacity, making it ideal to clear excess flood water effectively and reduce loss of lives and economy.

The 3<sup>rd</sup> generation flood mitigation systems were developed with requirement to channel unlimited volume of excess flood water directly towards the sea by elevating the flood water above the high tide levels or storm surge levels before discharge to the sea. The combination of Aqueduct, Aqua arteries and Piano weir will act as third generation flood mitigation mechanism where flood water will be transferred via an elevated channel to discharge into the sea. It will have long term performance capacity. The rise in sea water levels and sea water intrusion into the rivers will be intercepted by Piano Weir, which contribute to the increase in river discharge by 15% to 20%.

The system will also act as reliable failure proof mechanism with INFINITE storage to defend low lying areas which are subject to flooding during heavy rainfall. Well implemented and well managed 3<sup>rd</sup> generation flood mitigation system will contribute in saving lives of human beings as well as reducing the potential loss of properties and economy of the nation. This will also solve water shortages by supplying water, recharging ground water and also used for irrigation purposes.

For the implementation stage the following factors are important.

- Formulation of project objective
- Data collection
- Digital area mapping
- Hydrography and Bathymetry survey
- Hydrology assessment
- Catchment characteristics
- Drainage survey
- Hydrodynamic assessment

Working out on the above factors will help out to generate the following vital details:

- Flood inundation maps
- Flood hazard maps
- Flood risk maps
- Flood evacuation maps

Then using the 3<sup>rd</sup> generation flood mitigation system through a 3<sup>rd</sup> stage modelling is widely used in Malaysia.

#### Technical Session 4

“Urban Flood Mitigation in Trivandrum” - by Er. Sunil Raj D

Er. Sunil Raj D is working as Superintending Engineer in Irrigation Department, South Circle, Trivandrum. He joined government service after completing his post-graduation in Engineering from the Government Engineering College, Thrissur and has put up 24 years of service.

In his technical presentation on “Urban Flood Mitigation in Trivandrum”, Er. Sunil Raj brought out various action points that were completed and which should be done in the coming days to mitigate the woes faced by Trivandrumites due to flood possibilities. He pointed out that one of the main issues for flood in Trivandrum is the choking of



Thoppilkadavu- Attukal



drainage network system in the city. There is a reverse flow in the drain or “thodu” due to rising flood water caused by heavy rains.

Some of the steps undertaken jointly by the Irrigation department with KWA is widening the “thodu” width to accommodate more water flowing through rather than getting stagnated and then flooding. Er Sunil Raj mentioned



that the following “thodu” widened by this period.

- Killi River – from 7.5 m width to 18 m width
- Manikandeswaram – from 12 m to 17 m width
- Thoppilkedavu - Attukal – from 10 m to 15 m width

Plastics and debris were thrown in Thakaraparambu “thodu” and it was being removed with the assistance of a recycling company which will take these dumbered plastic bottles to their recycling unit in Tamil Nadu. (Figure shown below)

In Tiruvallam canal, silt pusher, an equipment used to push the silt and waste dumped and later on removed by the machine and placed it in the land clearing the path for water flow. (Figure shown below)

Er Sunil Raj informed that the main concerns on water flooding through the canals are:

- Choking of drainage systems
- Reverse flow in the drain or “thodu” due to high flood water
- Waste dumping in “thodu” and reverse flow due to this

The long-term measures as envisaged by Er Sunil Raj include:

- Dredging of Aakulam lake to increase holding capacity
- Construction of tunnels to channelise the water flow
- Eviction of encroachments
- Land acquisition of 5 metre width on both sides of Killi River to control water overflow

Recommendations from this technical talk include:

- Cleaning of rivers and streams every month or 4 times in a year
- Inter departmental coordination and responsibility (Irrigation, KWA, Kerala Drainage department)

Er Sunil Raj concluded his talk with an advice to the city residents and urging them not to dump waste on the “thodus” and reminded that even one-hour heavy rainfall in the catchment area can create a reverse flow thereby causing a flood in the city.

“Let us aim for a waste free and flood free Trivandrum city”.

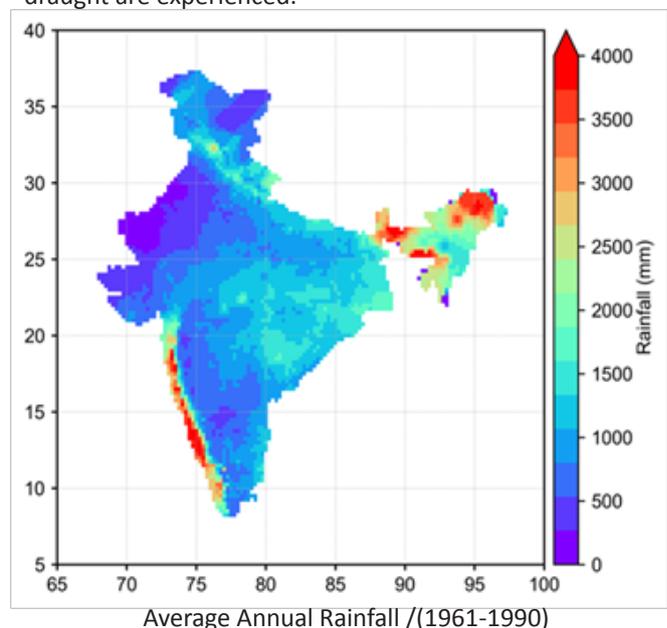
Technical Session 5

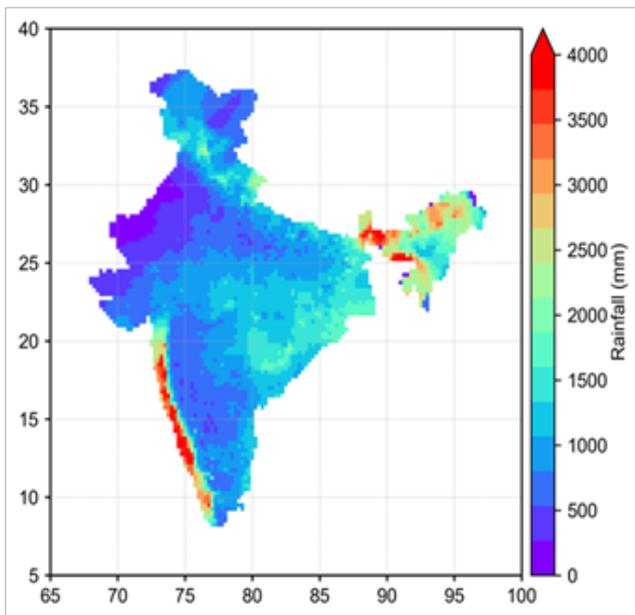
“Urban Storm Water Management in the Context of Climate Change”- by Prof. K. P. Sudheer

Prof. K.P. Sudheer is the Principal Secretary, Science and Technology Department, Govt of Kerala and also the Executive Vice President, Kerala State Council for Science, Technology and Environment. Prof K P Sudheer, is a Professor at the Environment and Water Resources Engineering Division of the Department of Civil Engineering at the Indian Institute of Technology, Chennai and is currently on deputation to the Government of Kerala. Prof Sudheer is an “Adjunct Professor” in Purdue University, USA.

Prof Sudheer took his Masters degree from IIT, Kharagpur after graduating in Agricultural Engineering from Kerala Agricultural University in 1991. Prof Sudheer took his Doctorate from IIT, Delhi and was associated with National Institute of Hydrology, Roorkee for six years and also IIT, Kanpur for a short period. Prof Sudheer is the Chairman of the Expert Committee constituted by the Kerala Government to study the “Causes of Repeated Incidence of Extreme Rainfall Events and Associated Landslide in Kerala”. As a part of active research collaborations, Prof Sudheer is also recognised as one of the “Emerging Leaders of India” by the Australia-India Institute, Melbourne, Australia.

Prof Sudheer, in his very powerful, short presentation, emphasised that during the last 30 years, we received more or less same rainfall. The slides presented demonstrates this fact. However, the intensity of rainfall has gone up. India is prone for 54% flood risk and 54% water stress as flood and draught are experienced.

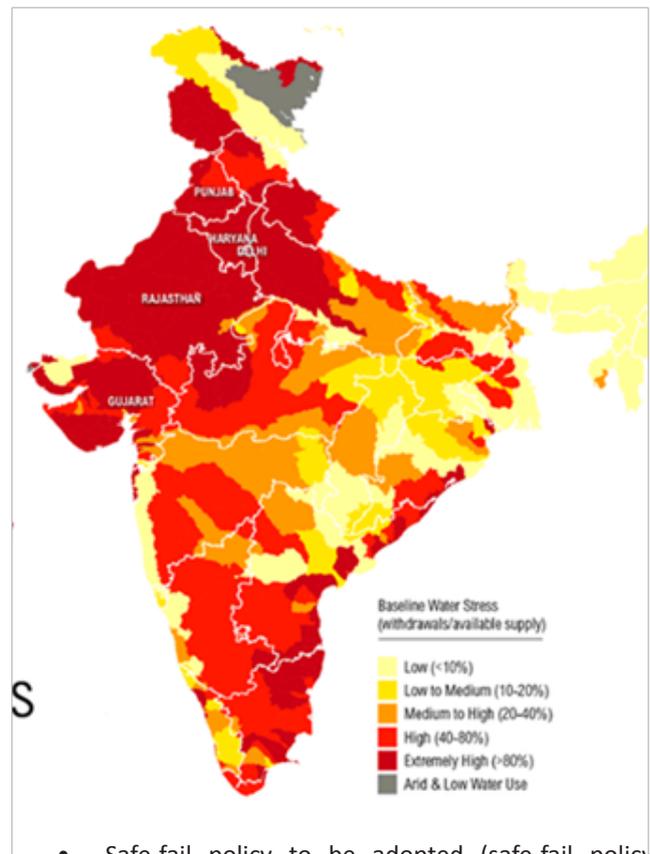
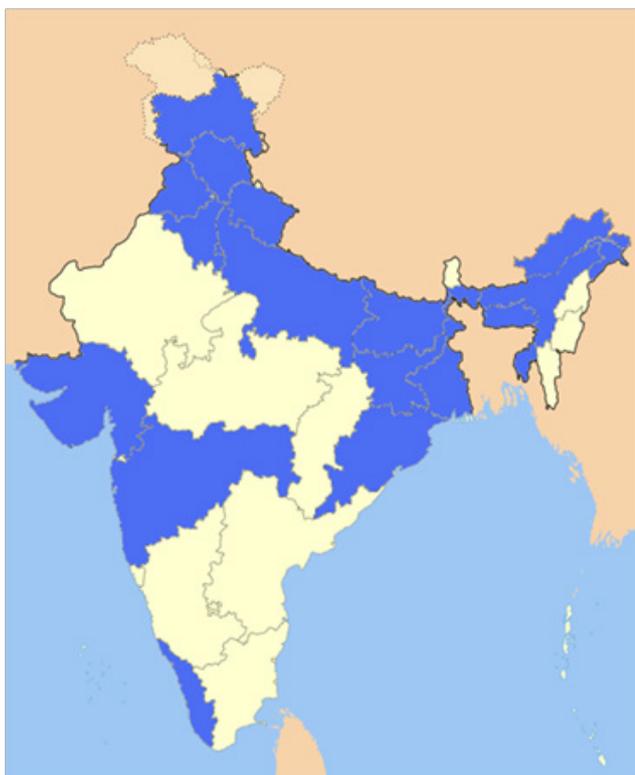




Average Annual Rainfall (1991-2020)

However, there is a new normal. There is climate change which casts its spell in the seas and also on the waves. An upward rainfall trend is also predicted until 2099 due to these effects. Prof Sudheer, highlighted the importance of revisiting the design procedures in this backdrop. He stated that:

- Nature of flood is not part of the design work
- Lack of statistical tools to perform event-based design
- Possible impacts of climate changes to be incorporated



- Safe-fail policy to be adopted (safe-fail policy acknowledges failure is inevitable)

The Floods/Droughts in India are captured in the below data.

54% of India Faces High to Extremely High Flood Risk  
54% of India Faces High to Extremely High Water Stress

Prof Sudheer highlighted that event-based modelling to identify extreme rainfall events and modelling rainfall properties are very much essential. This involves simulating flood scenarios for a large sample of extreme rainfall events. This exercise also should consider rainfall projection, 54% flood risk and 54% water stress as well as Pre-Monsoon plus Monsoon rains to do a realistic analysis.

Recommendations from all speakers are compiled and given below.

Dr. Santhosh G Thampi

1. Desiltation and clearing of river and stream channels must be performed regularly.
2. Increasing green cover of the city can reduce UHI effect and increase perviousness of soil
3. Permeable pavements may be used on roads with light traffic that are regularly flooded.
4. Control runoff generation from large buildings, high rise apartments etc. by diverting stormwater directly into the ground.
5. Proper land use planning and zonation.

6. The establishment of a digital database accessible to all stakeholders.
7. Improve coordination between the various departments to devise a comprehensive plan for flood mitigation in the entire city.
8. Installation of Early Warning Systems (EWS) to provide advance notice of impending flood events.
9. Raising public awareness to the issue of urban flooding through different media to educate the public on the dangers posed by flooding events.
10. Health awareness campaigns need to be carried out to provide clear and timely advice on how to handle individual and public health during flooding events.
11. Proper planning of solid and liquid waste can help alleviate flooding and the health dangers posed by it.

Dr. Sekhar Lukose Kuriakose

Short-term Goals

1. Cleaning and desilting of drains
2. Shifting of KWA pressure pipes across canals
3. Completion of box culvert in Thampanoor

Long-term Goals

1. Restoration of water bodies
2. Widening of railway culverts at Thampanoor
3. Strengthening for solid waste management through Suchitwa mission in consultation with experts

Dr. Saravanan Mariappan

Structural Measures	Non-structural measures
Aqueduct	Flood forecasting and managing system
Levee/Bund	Educational and Awareness programme
Pump houses and Flap gates	Flood plain management
River and Drainage improvements	Developmental management
Diversion and Bye pass channels	Land use planning
Tunnels	Policy management
Detention Ponds	Data Collection

Er. Sunil Raj

1. Dredging of Aakkulam Lake for raising its holding capacity.
2. Construction of a tunnel parallel to the existing tunnel at Thampanoor for speedy drainage of water preferably using Push Through technologies.
3. Reconstruction of railway bridge over Pazhavangadithodu near Uppilammoodu bridge at Vanchiyoor.
4. Eviction of encroachments and rehabilitation of public living in flood zone of river ( as per the KSDMA report, 1.58 lakh people in 93 wards of corporation are exposed to floods) mainly in

Melancode, Ambalathara, Kalady, Thampanoor and Akkulam – To be done

5. Land acquisition for 5m on either side of killi river for increasing the holding capacity of the drainage system in Jagathy, Kannettumukku, Killipalam, Attukaletc – To be done
6. Raising the height of the embankment and rectification of damaged bund/retaining walls in Thozhuvancode, Jagathy, Kannettumukku, Killipalametc – Works are in progress
7. The rivers and streams in the capital city needs to be cleaned at least once in every month as is done in Western countries.
8. If this cannot be implemented it should be ensured that they are cleaned at least 4 times yearly i.e during the summer season, in the pre-monsoon period ,after the south west monsoon and after north east monsoon
9. Responsibility shall be fixed on departmental officers who are assigned with the maintaining and up keeping of particular portion of the water body.
10. Similarly, staff from Corporation also needs to be deployed and made responsible for ensuring that wastes are not being dumped into the water bodies.
11. The system of source level collection and proper disposal of domestic wastes should be ensured.
12. A suitable officer from Disaster Management wing should oversee the activities of the above officers.
13. Suitable solid waste management and liquid waste management systems have to be developed and implemented in the city.
14. Suitable machineries for cleaning the waterbodies are to be procured and deployed for cleaning activities.

Prof. K.P.Sudheer

1. Current procedures are simple and make many assumptions
2. Nature of flood is not part of the design procedure (RRV)
3. Possible implications of climate change are in incorporated
4. Complete time-series simulation is computationally expensive
5. There is a lack of statistical tools to perform event-based design
6. A safe-fail policy acknowledges that failure is inevitable and seeks systems that can easily survive failure when it comes. Rather than rely on reducing the occurrence of failure, this policy aims at reducing the cost of that failure.
7. Event based analysis is necessary
8. Identification of extreme rainfall events
9. Modelling rainfall properties
10. Simulating flood scenarios for a large sample of extreme rainfall events

11. The optimal return period that minimizes the flooding consequences is more reliable than the failure return period
12. The design should be done for 5-year return period for safe-fail in the surrounding are under stationary climate and 6-year return period under changing climate scenario.
13. Frequent occurrence of Floods, Higher occurrences of meteorological, hydrological, agricultural droughts and Increasing temperature resulting in higher evaporative demands are the real challenges in the flood mitigation process
14. Possible redressal is Paradigm Shift in the Design of Storm Water Drainage Systems.

## Kerala State Centre- WEDNESDAY TALKS - Glimpses

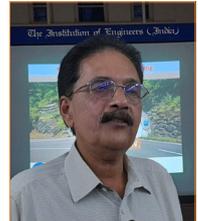
**10-08-2022** Technical Talk on “Practical Solar Energy Systems” by Mr.Sanal Kumar G, CEO, Signal Power Systems.



**17-08-2022** Technical Talk on “Multi Model Teaching Methods for Education 4.0’byDr. Manoj B.S., Professor, Department of Avionics, Indian Institute of Space Science & Technology, Thiruvananthapuram.



**24-08-2022** Technical Talk on “NATM Technology in Tunneling” by Dr.Sunil Vasudevan, Deputy Chief Engineer (Retd) PWD - Kerala.



**31-08-2022** Technical Talk on “Challenging Voyage Across the Arabian Sea’byEr. S.K.Namboothiri, F.I.E., M.I. Mar. E., Chartered Engineer, Ex-Chief Engineer, Worlder Shipping Ltd. Hon Kong.



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