FOR RESTRICTED CIRCULATION ISSN - 0971 - 5002

ISH-NEWS

Website : http://www.ish.net.in E-mail : ish_office@reddiffmail.com

THE INDIAN SOCIETY FOR HYDRAULICS

VOL 31 No. 2 July 2022

ANNOUNCEMENTS FOR ANNUAL ISH AWARDS 2022

Nomination for S.N. Gupta Memorial Lecture

Prof. Vijay Kumar Gupta of Colorado University, Boulder (USA) has donated a sum of ₹ 2.5 lakhs towards hosting a memorial lecture in the field of Hydraulics and Hydrological Engineering in the name of his father, late Shri S.N. Gupta, former Secretary, CBIP and Director of U.P. Irrigation Research Institute, Roorkee. The lecture series was started from the year 2003. Nominations are invited for delivering the lecture in this series. This award is given alternatively to a young scientist/ academician/ researcher below 45 years and a senior scientist / academician / researcher. **This year it is the turn of young scientist/ academician/ researcher**.

The nomination letter should contain information about his expertise of the topic on which he will speak. Self nominations are generally discouraged. The lecture would be held during 27th International Conference HYDRO 2022 at Department of Civil Engineering, Punjab Engineering College (PEC), Chandigarh. The nominations should be submitted to the ISH Secretariat for further processing. The last date for receiving nominations is 30th Sept, 2022.

Nomination for ISH R J Garde Life Time Achievement Award

The Indian Society for Hydraulics has instituted R J Garde Life-Time Achievement Award for Hydraulic Engineer / Scientist from India who has contributed significantly in the field of hydraulic engineering and water resources. The award consists of ₹ 10,000/- and a citation. **Nominations/proposals are invited from the ISH Life members**. Self-nominations are generally discouraged. The nominations should be submitted to the ISH Secretariat for further processing. The last date for receiving nominations is 30th Sept, 2022.

Nomination for Prof. R J Garde Young Researcher Award

ISH constituted this Award in memory of Late Prof. R.J. Garde with the deposit offered by his family and his students to promote the young researchers in the field of Hydraulics and Hydrology. It shall be awarded in the form of a cash prize of ₹ 10000/-, a memento and a certificate. This year the award shall be presented during the International HYDRO Conference 2022 of the ISH to be held at Department of Civil Engineering, Punjab Engineering College (PEC), Chandigarh. The nominations should be submitted to the ISH Secretariat for further processing. The award shall be given to young engineers, scientists and researchers who have not completed 45 years of age. The award will be open to Indian Nationals only. The award shall be given mainly for the work done in India in the area of Water Resources Engineering in general and Hydraulic Engineering in particular. ONE complete nomination package **(Single.pdf file)** should be submitted to the ISH in the form of soft copy by 30th Sept, 2022. The following information must be included in the nomination.

1. Name of the Candidate with complete postal address and mobile number, E-mail, date of birth, age, on last date of nomination
2. Letter of nomination including a statement of not more than 500 words of the Significant Contributions and / or national/international impact and future potential.
3. Two letters of recommendation
4. Chronology of education
5. Chronology of jobs held
6. Complete list of referred publications in journals and conferences (Scanned copies of the first page of five most recent Journal publications are to be attached)
7. Certificate of age should also be attached
8. Any other relevant information

Nomination for Prof. U.C. Kothyari Best M Tech & Ph D thesis Award

ISH Constituted this Award from the year 2013 to encourage the young Indian students of recognized educational institutions in the area of Water Resources Engineering in general and Hydraulic Engineering in particular (Water Resources, Environment, Coastal Engineering). **The Dissertation/ Thesis must have been successfully defended during September 30, 2021 to August 31, 2022.** The award will be in the form of a cash prize of ₹ 5,000/- for the M.Tech dissertation and ₹ 10,000/- for the Ph.D thesis and a certificate. This year the award shall be presented during the International HYDRO Conference 2022 of the ISH to be held at Department of Civil Engineering, Punjab Engineering College (PEC), Chandigarh. The nomination should be forwarded jointly by the candidate and the thesis supervisor from a recognized educational institution to the ISH Secretariat for further processing. The award shall be given to young engineering, scientific or research students of Indian nationals. The last date for receiving nomination is 30th Sept, 2022. The nomination should be sent as an email attachment to the Secretary, ISH at the following Email address : ish_office@rediffmail.com, hard copies are not necessary.

It should contain the following:

(i) A cover letter that should include one-paragraph CV of the candidate and supervisor,

(ii) Pdf file of the dissertation/thesis not exceeding 10 MB in size,

(iii) Any other recognition received for the dissertation/thesis, Journal papers published based on the work, transfer of technology, if happened,

(iv) Names and affiliations of the referees, who acted as examiners,

(v) Copies of the examiners' reports, if possible – not mandatory.

ISH assures full confidentiality/copyright of the dissertation/thesis, which will be used only for the purpose of deciding the awards.

Announcement for International Conference HYDRO 2022

Department of Civil Engineering, Punjab Engineering College (PEC), Chandigarh and The Indian Society for Hydraulics (ISH) are jointly hosting 'International Conference HYDRO 2022" on Hydraulics, Water Resources, Environmental, and Coastal Engineering, December 22-24, 2022 at Department of Civil Engineering, Punjab Engineering College (PEC), Chandigarh.

The "HYDRO 2022 International Conference" represents a link in the chain of such "Hydro" conference organised annually in India over a period of last two decades under the auspices of The Indian Society for Hydraulics. The conference would provide a forum for presentation and exchange of knowledge and research experience gained in the field of hydraulics, water resources, and coastal engineering by scientists, academicians, practising engineers and consultants.

Extended versions of the selected papers presented in the conference may be published in ISH Journal of Hydraulic Engineering, Taylor & Francis, UK.

Following e-mail and web pages provide more details of the conference.

a) Visit the webpage https://pec.ac.in/hydro-2022/. The detailed program will be made available on the website: www.pec.ac.in

b) Visit the webpage web: https://www.ish.net.in for brochure OR contact on email hydro2022@pec.edu.in for any queries related to the conference

ISH EC members for 2022 - 2024

The following members elected unopposed to the Executive Council of The Indian Society for Hydraulics for the period 2022 - 2024:

1	**Dr. M.C. Deo**	Professor Emiratus, IIT, Bombay
2	**Dr. R. S. Kankara**	Director, CWPRS, Pune
3	**Dr. T. I. Eldho**	Professor, IIT, Bombay
4	**Dr. L.R. Ranganath**	Ex. Scientist 'E', CWPRS, Pune
5	**Dr. P.L. Patel**	Professor, SVNIT, Surat
6	**Dr. R.G .Patil**	Scientist 'E', CWPRS, Pune
7	**Dr. V. Jothiprakash**	Professor, IIT, Bombay
8	**Dr. H.L. Tiwari**	Professor, MANIT, Bhopal
9	**Dr. J.D. Agrawal**	Ex Scientist 'E', CWPRS, Pune
10	**Dr. D.G. Regulwar**	Prof, GCOE, Pune
11	**Shri. R.M. Khatsuria**	Ex. Joint Director, CWPRS, Pune
12	**Shri Amit Kulhare**	Scientist 'C', CWPRS, Pune
13	**Dr. K.K.Khatua**	Professor, NIT, Rourkela
14	**Dr. Vikas Garg**	Professor, CU, Haryana
15	**Dr. A.K.Singh**	Scientist 'B', CWPRS, Pune
16	**Dr. Javed Alam**	Prof, AMU, Dept of Civil Engg, Aligarh
17	**Dr. S.M.Goel**	Retd. Professor, DU, New Delhi

The following members are Ex-Officio members as per the ISH Constitution.

I. Prof. M.C. Deo (Past President)
II. Dr. L. R. Ranganath, CWPRS, Pune (Past Secretary)

ISH Office bearers for 2022 - 2024

The following Office Bearers (2022 - 2024) were elected unanimously during the EC meeting.

President	:	**Dr. R.S. Kankara**
Vice President	:	**Dr. R.G. Patil**
Vice President	:	**Prof. T. I. Eldho**
Secretary	:	**Shri Amit Kulhare**
Treasurer	:	**Dr. A.K. Singh**
Chairman Editorial Board	:	**Prof. M. C. Deo**

THE INDIAN SOCIETY FOR HYDRAULICS

(FIXED DEPOSIT AND SAVING BANK COMPARATIVE BALANCE STATEMENT)

As on 20-Dec-2021

Canara Bank(S.B A/c No. 25801010000822)
Customer ID 30433962 — ₹ 2,63,677

Sr. No.	Name of Bank	Date of Deposit	Date of Maturity	Amount Rs.	Rate of Interest
1	Canara Bank, Khadakwasla, P.O. R.S., Pune - 411024 **(8 FDs)**	26-Aug-21	26-Aug-24	800000	5.25%
		08-May-19	08-May-22	1413862	6.00%
		02-Jul-19	02-Jul-22	784373	6.60%
		07-Mar-17	07-Mar-22	307723	6.90%
		07-Mar-17	07-Mar-22	228914	6.90%
		09-Mar-20	09-Mar-23	481441	6.25%
		09-Mar-20	09-Mar-23	842524	6.25%
		30-May-20	30-May-23	478995	5.70%
			Total FD amount with Canara Bank	₹ 53,37,832	
			Grand Total	₹ 56,01,509	
			(Rupees Fifty six lakh one thousand five hundred and nine only)		

As on 27-June-2022

Canara Bank(S.B A/c No. 25801010000822)
Customer ID 30433962 — ₹ 4,43,212

Sr. No.	Name of Bank	Date of Deposit	Date of Maturity	Amount Rs.	Rate of Interest
1	Canara Bank, Khadakwasla, P.O. R.S., Pune - 411024 **(8 FDs)**	26-Aug-21	26-Aug-24	800000	5.25%
		08-May-22	08-May-25	1663473	5.45%
		02-Jul-19	02-Jul-22	784373	6.60%
		07-Mar-22	07-Mar-27	419730	5.50%
		07-Mar-22	07-Mar-27	317886	5.50%
		09-Mar-20	09-Mar-23	481441	6.25%
		09-Mar-20	09-Mar-23	842524	6.25%
		30-May-20	30-May-23	478995	5.70%
			Total FD amount with Canara Bank	₹ 57,88,422	
			Grand Total	₹ 62,31,634	
			(Rupees Sixty two lakh thirty one thousand six hundred and thirty four only)		

Member in News

Dr. R.S. Kankara
President, ISH

Dr. R.S. Kankara took over the charge of Director CWPRS on 28 February 2022. He did his M.Sc. & M.Phil. in Applied Mathematics from Agra University and obtained PhD from Anna University, Chennai for his work on Coastal Processes Modelling for Gulf of Kachchh in ICZM perspective. He has specialized in Coastal Hydrodynamics, Wave-Structure Interaction, Sediment Transport, Coastal Vulnerability Assessment (Tsunami, Storm Surges, Oil Spill, Erosion etc.), Environmental Impact Assessment, Inlet Dynamics, Design of Coastal Protection Schemes, Hydro-Meteorological data observations in Coastal Waters, Shoreline Change Monitoring, preparation of Integrated Coastal Management Plans and Appraisal of Coastal Engineering/Management projects etc.

Dr. R.S. Kankara has more than 29 years of extensive research experience in Coastal Engineering and Shoreline Management related aspects. He has progressively held technical-scientific-managerial positions at premier research organizations i.e., CWPRS and the Ministry of Earth Sciences (National Centre for Coastal Research, Chennai). All through his career, he has worked on research projects to address various coastal problems of societal relevance and help sustainable coastal development of the Indian coast. He led their inception, design and implementation which involved researchers/engineers from various universities and national institutions.

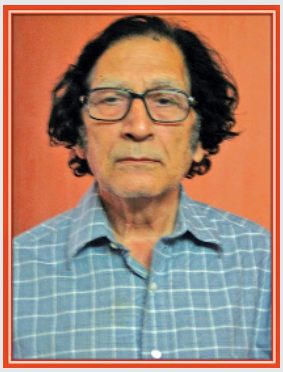
Dr. R.S. Kankara has authored more than 80 scientific publications in peer-reviewed journals, proceedings and delivered more than 50 invited talks in national/international workshops and meetings. He has successfully carried out more than 30 research projects and has prepared about 25 technical research reports. He is reviewer for many National and International reputed scientific journals related to Coastal Engineering and Earth Sciences. He is a Life member of the Indian Society of Hydraulics and Ocean Society of India.

Prof. Vallam Sundar

Alumni Association, College of Engineering, Guindy, Chennai, bestowed its prestigious Distinguished Alumni Award on Prof. Vallam Sundar for his exemplary stature and contribution in the category of renowned Professor from an Academic Institute.

Professor Vallam Sundar is currently Professor Emeritus, Department of Ocean Engineering, IT Madras. After obtaining his M.S, and PhD, he joined the faculty of IIT, Madras and in four decades in the Department of Ocean Engineering, he had supervised 28 PhDs, 14 M.S., 12 M Tech theses in India and 9 graduate theses in Germany. **Prof. Vallam Sundar** was involved in offering solutions to a variety of Coastal and Ocean engineering-related problems over the past four decades. These solutions have been instrumental in the development of fishing harbours along the Indian sea coast apart from offering solutions to coastal erosion problems. One of his significant contributions is the solution to the coastal erosion problem along the North of Chennai harbour that had been experiencing continuous erosion despite several other solutions which were offered over the last five decades. The adoption of the groyne field as a solution to the problem of coastal erosion, not only solved the problem but also enhanced the formation of the beach, for which he was awarded the National Design Award in Environmental Engineering in 2008 from the Institution of Engineers.

OBITUARY



Prof. Prabhata Kumar Swamee
(09.11.1940 – 18.04.2022)

Prof. Prabhata Kumar Swamee, Distinguished Professor Emeritus, ITM University, Gurgaon, passed away on April 18, 2022. He had also served as the Honorary Professor Emeritus at The Northcap University, Gurgaon till his untimely demise.

He obtained his degree of B.E. (Civil Engineering) in 1962, obtained his M.E. (Hydraulic Engineering) in 1966 and completed his PhD in civil engineering in 1974 from the University of Roorkee, Roorkee.

With almost sixty years of teaching, research, and industry experience in water resources engineering, Prof. Swamee held several positions, namely: Assistant Engineer, U.P. Jal Nigam (1962-64); Lecturer Regional Engineering College, Srinagar (1966-68); Lecturer Regional Engineering College, Jaipur (1968-69). Also, at the University of Roorkee, he held the following positions: Senior Research Fellow (1969-72), Lecturer (1972-73), Reader (1973-85), and Professor (1985-2001). After the name change, the University of Roorkee became IIT Roorkee, where he carried out the role of Emeritus Fellow (2002-08). At the National Institute of Technology, Jalandhar, he was a Professor (2008-10) and at IIT. Kanpur. He was a Visiting Faculty (2012- 2013), from 2013 until his last days, he held a Distinguished Professor Emeritus position at ITM University Gurgaon. Also, from 2015 until his last days, he held an Honorary Professor Emeritus position at The Northcap University, Gurgaon.

Prof. Swamee has also co-authored 2 books, has to his credit more than 110 papers published in international journals and guided 19 PhD dissertations. His last paper was published in December 2021. As a recognition during his career, he was appointed as a Fellow of the Indian National Academy of Engineering and the Indian Society for Hydraulics, Pune.

List of New ISH Life Members Joined from January 2022 to June 2022

Member No.	Name	Intstitute
1558	Mr. Amit Jain	SVNIT, Surat
1559	Dr. Saif Said	Z.H college of Engg., AMU, Aligarh
1560	Dr. Surendar Natarajan	Sri Sivasubramaniya Nadar College of Engg, Kalavakkam
1561	Mr. S. P. Vikraman	Anna University Chennai
1562	Ms. Manaswinee Patnaik	Govt. College of Engg. Kalahandi, Odisha
1563	Mr. Sandeep Soni	NIT Raipur
1564	Mr. Panvalkar Govind A.	CWPRS,Pune
1565	Dr. Rutuja M. Chavan	MANIT, Bhopal
1566	Mr. Indrajeet Sahu	NIT Raipur
1567	Dr. Venu Prasad H. D.	CWRDM, Kozhikode, Kerala
1568	Shri Mahendra Pandurang Barde	Sr. Counsultant (Working on DRIP-currently)
1569	Shri Vijay Suryawanshi	Department of Water Resources & Ocean Engg. NITK, Surathkal
1570	Ayilobeni Kikon	Department of Water Resources & Ocean Engg. NITK, Surathkal
1571	Shri Sachin Kumar	Department of Civil Engg. MANIT, Bhopal
1572	Shri Ankur Vishwakarma	Department of Civil Engg. MANIT, Bhopal

GROYNE FIELDS FOR COASTAL PROTECTION ALONG KERALA COAST

V. Sundar and S. A. Sannasiraj

Professors, Department of Ocean Engineering, Indian Institute of Technology Madras

Abstract

The maritime state, Kerala located along the southwest coast of the Indian peninsula, extends from Trivandrum district (8° 17′ 41.03′′ N, 77° 5′ 37.29′′ E) in the South to Kasaragod district (12° 45′ 20.76′′ N, 74° 51′ 58.92′′ E) in the North, exposed to the waves from the Arabian Sea. The shoreline is extremely dynamic due to the impact of waves, tides, currents, coastal orientation and other associated occasional coastal hazards. Prior to the 2004 Indian Ocean tsunami, a standardized seawall section had been preferred for highly eroding coastal stretches in the state; post the coastal hazards experienced due to tsunami impact, several other structures have been considered for coastal protection. Amongst the different coastal protection structures, the transitional groyne fields has yielded desirable results. As it was felt essential to quantify the performance assessment of these measures an exercise using DSAS (Digital Shoreline Analysis System) tool was carried out, to identify the pros and cons of the transitional groyne field across different coastal stretches.

Keywords: Coastal protection measures; Groynes; DSAS; performance assessment, shoreline mapping.

Introduction

The coastal stretch of Kerala along the southwest of the Indian peninsula extends over a distance of about 590 km encompassing 9 coastal districts. The coast mostly comprises of sandy beaches, lush green backwaters and riverine inlets; with tourism and fisheries contributing to the major economic growth of the state. The maritime state of Kerala experiences southwest and northeast monsoon annually. The wave direction and speed vary seasonally along the west coast of India. The Kerala coast witnesses a tidal range of 1m or less and current velocities up to 0.40 m/s. The magnitude and direction of littoral drift along the coast is mostly predominant towards the north, with a few exceptions. A map highlighting the coastal districts of Kerala is shown in Fig 1. Greeshma and Jairaj (2014) studied coastal erosion in Kerala coastline and concluded that the rate of erosion is more pronounced across the southern districts (Poovar - 8° 19' 2.9424" N 77° 4' 15.096" E to Punnapura - 9° 26' 24.2952"

N 76° 20' 36.1392" E) , moderate at central districts (Fort Kochi - 9° 57' 56.2212" N 76° 14' 31.6824" E to Ponnani - 10° 46' 3.0144" N 75° 55' 33.1788" E), and lesser along the northern region (Beyypore - 11° 10' 23.2428" N 75° 48' 14.4504" E to Kasaragod - 12° 29' 54.6072" N 74° 59' 13.7544" E).

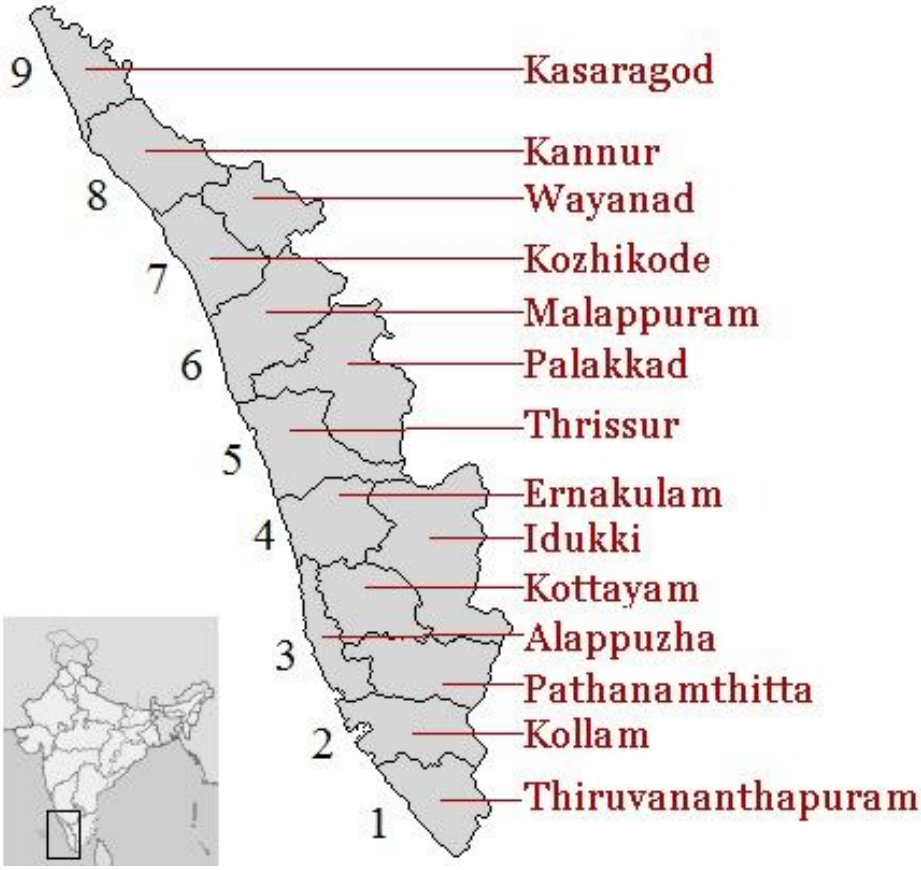


Fig 1: Kerala map and Districts (https://www.justkerala.in/districts-in-kerala)

Chandramohan (1988) was one of the earliest investigators to report the characteristics of longshore sediment transport along the Kerala coast. Remote sensing provides information on a large area and it is helpful in remotely identifying and monitoring various coastal features and serves vital in the development of coastal measures (Chandrasekar et al., 2000). The shoreline changes have been monitored by various researchers using ArcGIS in different parts of India (Sreekala et al., 1998; Nandi et al., 2016; Saranathan et al., 2011; Natesan et al., 2013; Kankara et al., 2015).

Traditionally remote sensing data has been effectively utilized to study the shoreline dynamics. The selection criteria for adapting the remotely sensed data in shoreline change analysis is dependent on its cost, pixel resolution, and measurement scale (Cracknell, 1999).

Integration of remote sensing techniques with geographical information system (GIS) is a viable and cost-effective method to encompass spatial data with high resolution and multispectral database (Chand and Acharya, 2010). Globally, the qualitative and quantitative analysis of shoreline spatial-temporal variations has been addressed by several studies (Sundar et al., 2014; Nandi et al., 2016;).

Methodology

General

The remotely collected data from satellite imagery, such as the Google Earth timeline imagery, can furnish valuable preliminary data to understand the dynamic behaviour of shoreline variation in a localized stretch. The comprehensive effect of shoreline changes can be understood by employing statistical approaches (Dolan et al., 1991). Two such statistical approaches namely End Point Rate (EPR) and Linear Regression Rate (LRR) are adopted in this study.

For identifying the shoreline delineation during the various seasons, the DSAS tool was used. A baseline created with a 150m buffer from the 1990 shoreline was applied to generate a transect for computing the shoreline change rate. The selection of shape and relative positioning of the baseline is crucial since it directly impacts the measure of rate calculations in DSAS (Thieler, 2005). For an accurate analysis, season-wise satellite images were downloaded from USGS and digitized. The extracted shoreline from 2000 to 2020 that intersects at each transect has been used for calculating the shoreline change rate.

Uncertainty evaluation

The uncertainties which are associated with the quality of the data used due to the aerial photography uncertainty(Ω_{AP}), the image geo-referencing error(Ω_G), GPS positioning error(Ω_{GPS}) uncertainty due to high tide level (Ω_{WL}), all these in addition to the shoreline digitization error(Ω_D) which are compiled together to estimate the total shoreline positioning error(Ω_T).

$$\Omega_T^2 = \Omega_G^2 + \Omega_D^2 + \Omega_{AP}^2 + \Omega_{WL}^2 + \Omega_{GPS}^2 \quad (1)$$

The default aerial photography uncertainty was 3m. The difference between the high-water line and the low water line was 1m. The total shoreline position accuracy is given by,

$$\Omega_T^2 = 0 + 0 + 3^2 + 1^2 + 0;\ \Omega_T = 3.16\text{m} \quad (2)$$

End Point Rate

The End Point Rate (EPR) was calculated by dividing the shoreline change by the time elapsed between the oldest and the most recent shoreline. The major advantages of the EPR are the ease of computation and the minimal requirement of only two shoreline data. The extracted digital shorelines then were superposed to identify the shoreline change over the number of years. When the shoreline keeps fluctuating about a mean point, i.e., accreting and eroding throughout different seasons of the year, the observed value of the end point rate would be a minimum.

Linear Regression Rate

A linear regression rate of change statistics was determined by fitting a least-squares regression line to all shoreline points chosen for the study. The regression line was placed such that the sum of the squared residuals (determined by squaring the offset distance of each data point from the regression line and adding the squared residuals together) is minimized. The linear regression rate is the slope of the regression line.

Change Rate Calculation

In this study, changes in the shoreline position are computed using four data analysis techniques (i.e., EPR and LRR). The EPR was evaluated by dividing the distance between any two shorelines by the number of years between them. This method is enormously prevalent in the calculation of the rate of movement of shoreline change, as it is widely used by different coastal researchers.

$$EPR = \frac{L_1 - L_2}{t_1 - t_2} \quad (3)$$

wherein, L_1 and L_2 are the distances separating the shoreline and baseline; t_1 and t_2 are the dates of the position of the two shorelines considered. The second method adopted was through LRR, which consists of fitting a least-squares regression line to multiple shoreline position points for a particular transect (Mahapatra et al., 2014). The shoreline change rate along each transect for all periods was computed by plotting the points where the shorelines are intersected by transects and calculating the linear regression equation,

$$L = b + mx \quad (4)$$

where, L represents the distance (m), from the baseline, x is the shoreline date intervals (years), and m is the slope of the fitted line (m/year) (i.e., represents the shoreline change rate, LRR), and b is the y-intercept (**Fig 2**).

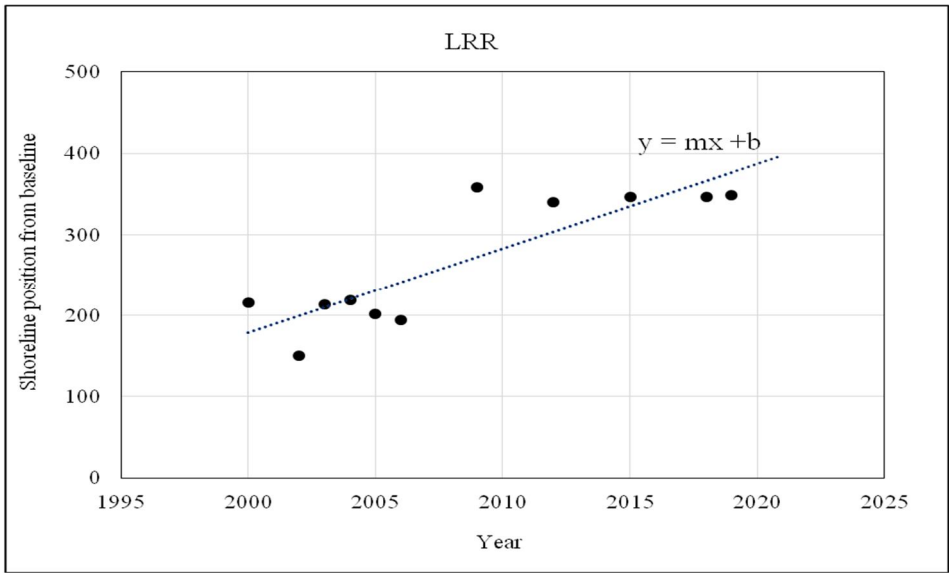


Fig 2 Linear Regression Rate of Shoreline changes

Case studies

Case 1 – Beemapally, Thiruvananthapuram District (8° 27′ 23′′ N., 76° 55′ 51.34′′ E)

The Beemapally groyne field was constructed in 2017, spanning over a distance of about 1.4km comprising of 12 groynes. Herein, the short-term shoreline changes from the year 2017 to 2021 have been analysed and the results are projected as shown in **Fig 3**. According to EPR, the groyne field experiences a high rate of accretion, the maximum and minimum accretion rates are 8 m/yr and 0.38 m/yr respectively. The EPR estimates reveal about 60% of the total number transects at Beemapally to encounter high accretion and the remainder 40% to undergo moderate accretion. According to LRR, the maximum and minimum rates of accretion are 8.75 m/yr and 0.58 m/yr respectively. LRR estimates about 70%, 20% and 10% of the transects to experience high accretion, moderate accretion and low accretion respectively. No virtual erosion has been witnessed at Beemapally over the past four years.

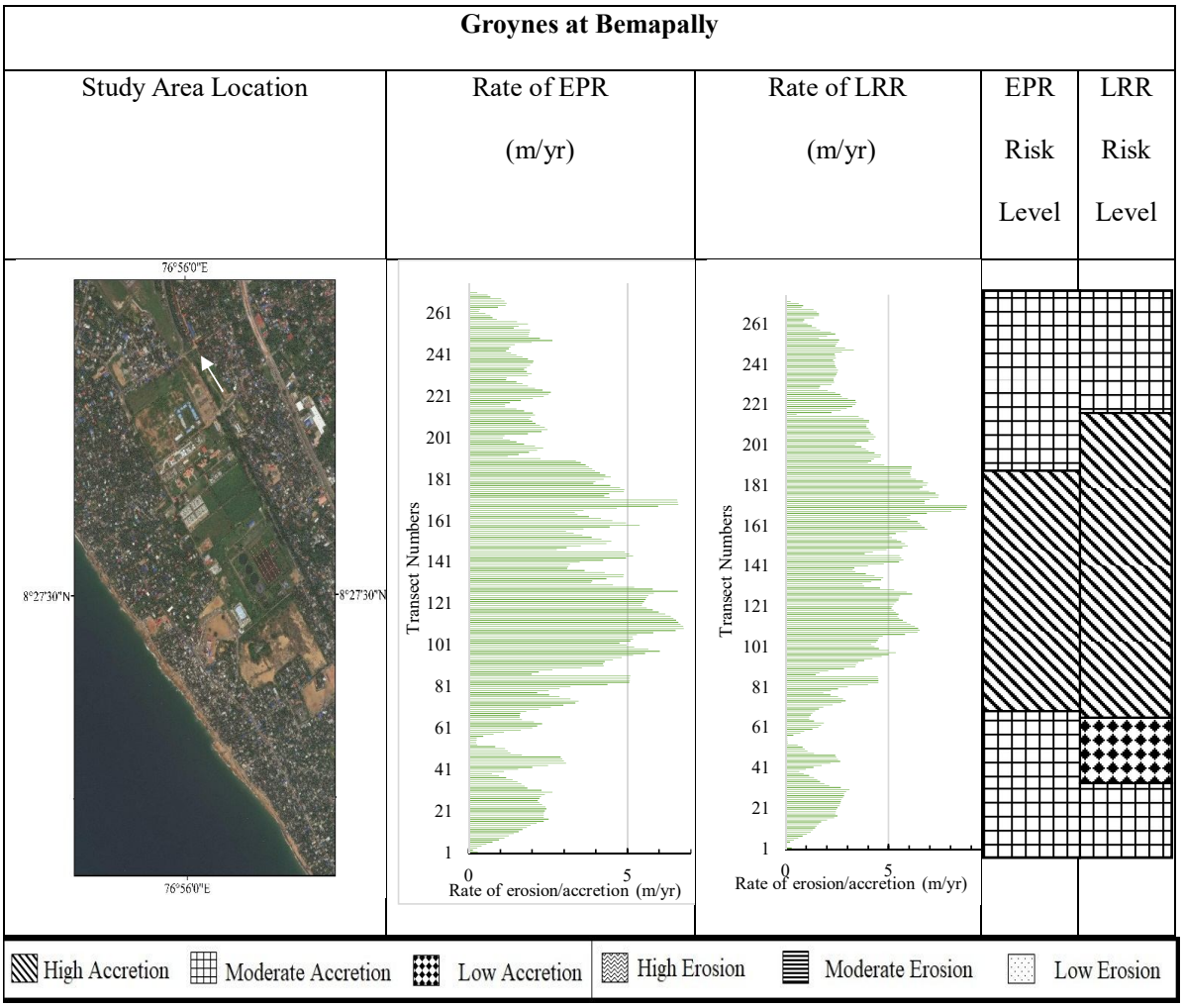


Fig 3 Rate of Erosion/Accretion at Beemapally groyne field

Case 2- Paravoor, Kollam District (8° 49′ 20′′ N., 76° 38′ 34.5′′ E) 2.28 12 2009

These 12 groynes were constructed in 2009 extending for a stretch of 2.28 km. The analysis of shoreline changes from the year 2011 to 2020 due to the groyne field along the Paravoor coast is shown in **Fig 4**. According to EPR, a maximum accretion rate and erosion rate of 14.5m/yr and -0.67 m/yr is observed. Here the mid-section transects (i.e., between 202 and 241) have been detected to undergo a higher accretion rates exceeding 10 m/yr. As per LRR, the maximum rate of accretion and erosion is observed to be about 9 m/yr and -1.2 m/yr

respectively. Here the mid-section transects (i.e., between 203 and 241) have been witnessed to experience a higher accretion rates exceeding 7m/yr.

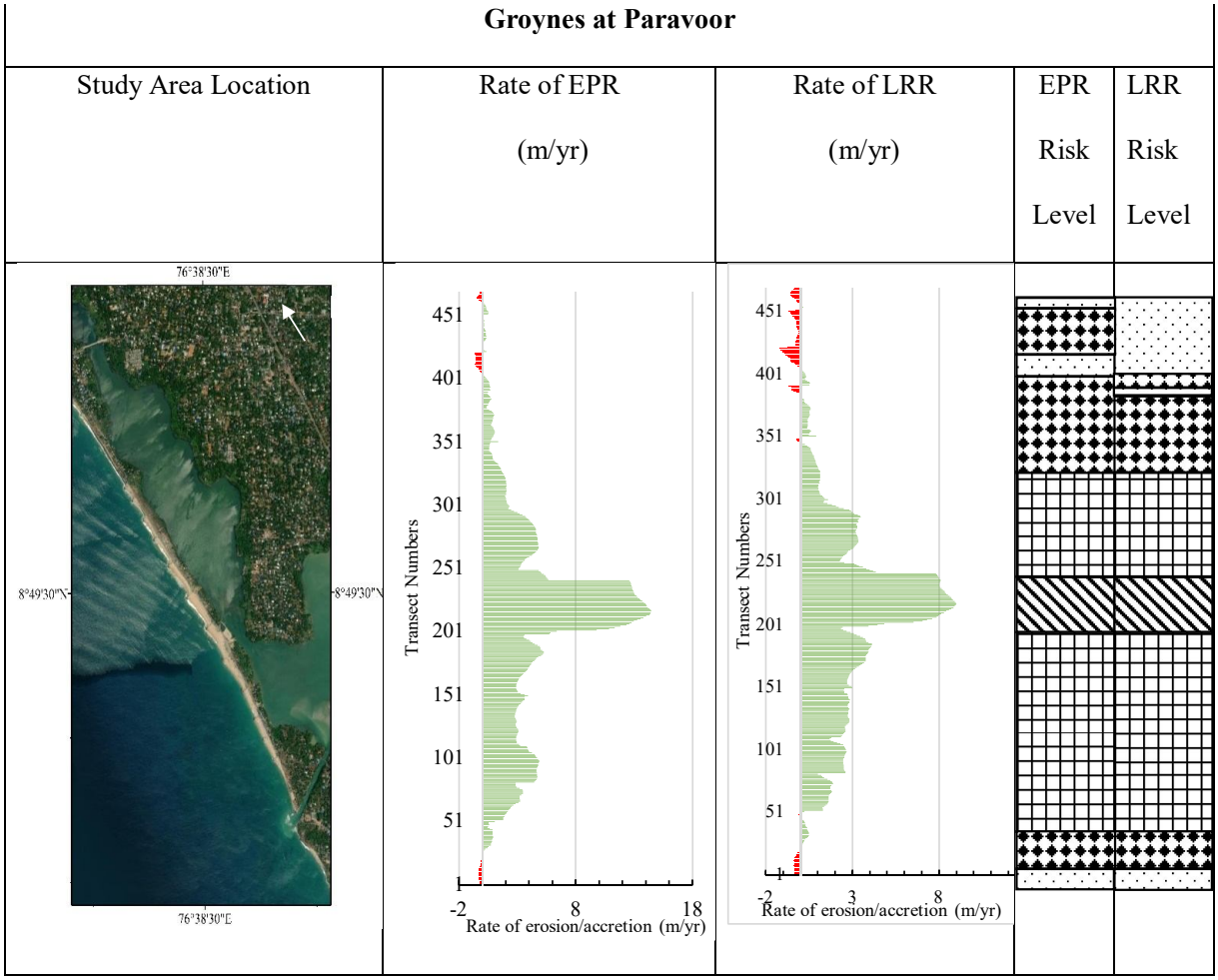


Fig 4 Rate of Erosion/Accretion at Paravoor groyne field

Case study 3- Valiazheekal, Alappuzha District (9° 8′ 50′′ N., 76° 27′ 30′′ E)

The 5 groynes at Valiazheekal were constructed in 2015 spreading across 0.5 km. The analysis of the shoreline changes due to the presence of groyne field (2015-2020) is shown in **Fig 5**. According to EPR, a moderate accretion at a maximum rate of 2m/yr and a moderate erosion especially in the northern region is observed. According to LRR, a maximum rate of accretion of about 2.2 m/yr, and the maximum rate of erosion is -0.1 m/yr is observed. The erosion is pronounced on the downstream side only and in due course of time the downstream end will also get stabilized.

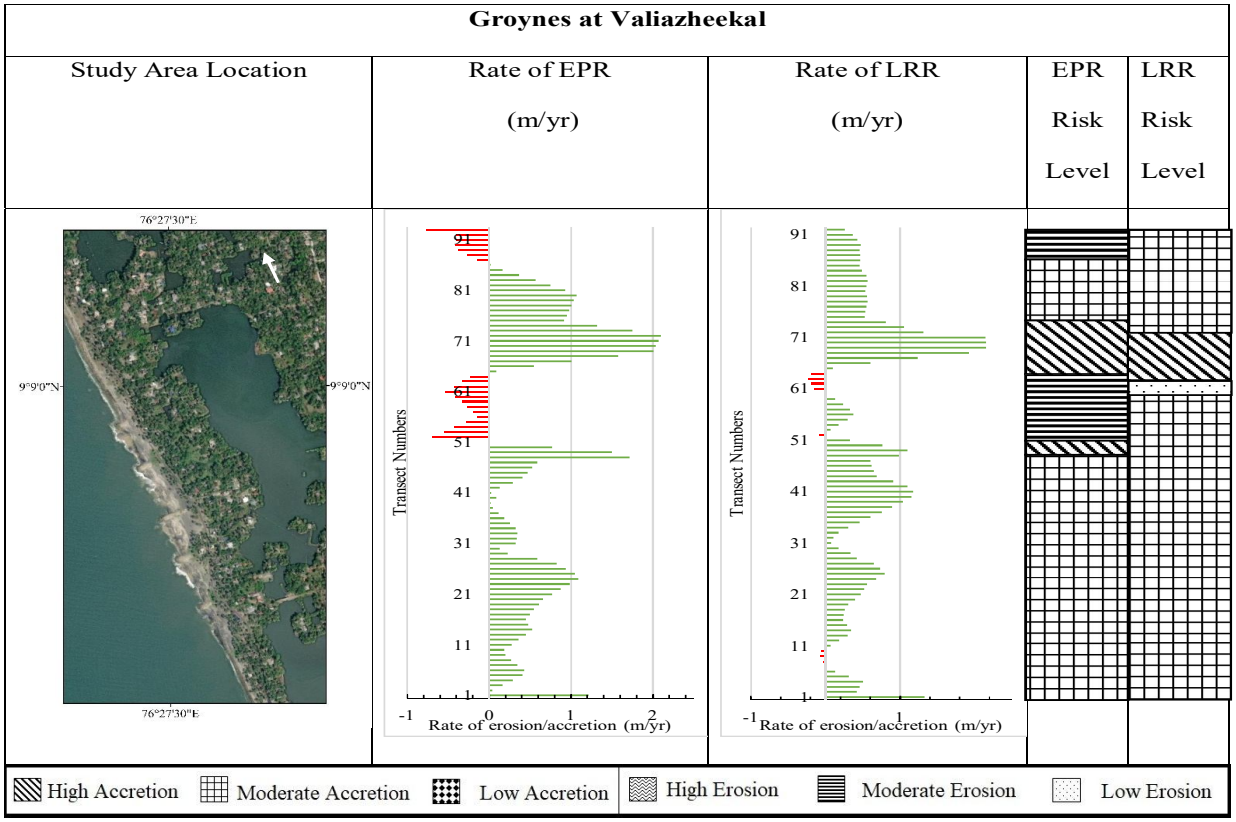


Fig 5 Rate of Erosion/Accretion at Valiazheekal Groyne field

Summary

The study details shoreline changes on the Kerala shore over the years at the Groyne field. The shoreline changes have been monitored using remote sensing techniques, Geographic Information System (GIS) mapping and the rate of erosion/accretion is calculated using DSAS. The yearly shoreline changes were examined for most of the districts of Kerala along stretches in distress due to erosion. Most of the eroding area on the Kerala coast has been restored using groyne construction, which has proved to be a great success. The details of the analysis and the results only for a few stretches is elaborated, while, the statistical analysis of shoreline change

at the Kerala coast at several other stretches considered in this study through the average rate of accretion/erosion are projected in **Table 1**.

Table 1. Summary for Rate of accretion/erosion at groyne field along Kerala coast

Districts	**Location Of groyne field**	**Max. Rate of accretion (m/yr)**		**Max. Rate of erosion (m/yr)**		**The average rate of shoreline change (m/yr)**	
		EPR	LRR	EPR	LRR	EPR	LRR
Thiruvananthapuram	Poonthura	5.55	5.97	-1.7	-1.4	0.86	1.26
	Beemapally	6.79	8.75	-	-	2.87	3.43
	Chilakkoor	3.92	4.9	-	-	2.32	2.89
Kollam	Paravoor	14.39	8.72	-0.5	-0.8	3	2
	Thanni	7.49	8.81	-0.4	-0.1	3.3	4.2
	Eraviyapuram	9	6	-	-0.2	3.9	3
	Allapad	7.98	8.3	-	-	2.6	2.69
	Parayakkadavu	5.4	4.4	-	-	2.5	1.89
	Jayanthi colony	4.8	4.2	-	-	2.6	2.16
	Azheekal	4.1	3.2	-0.2	-0.1	0.92	0.95
Alappuzha	Valiazheekal	2.1	2.1	-0.7	-0.2	0.43	0.53
	Perumpally	6.8	7.8	-	-	2.8	3
	Kallikadu	5	5.33	-1.3	-0.6	0.82	1.2
	Thirukunnapuzha 1	2.57	3	-1.4	-0.9	0.38	0.58
	Thirukunnapuzha 2	3.9	3.7	-	-	1	1.5
	Purakkad	10.84	12.4	-6.5	-5.5	3.67	3.97
	Omanapuzha	8.56	7.67	-	-	3.5	3
	Perunneramangalam	5.86	3.37	-1.1	-1.1	2.6	1.5
	Ayiramthai	5.5	3.64	-2.5	-4	2.3	1.1
Ernakulam	Fort Kochi	4.8	6.8	-1.2	-4.6	0.82	0.16
	Vypin	2	1.65	-	-	0.8	0.53
Kozhikode	Kallai	2.28	2.5	-1.3	-1.1	0.52	0.55
	Allapally	2.76	5.32	-0.6	-3	0.89	1.2

REFERENCES

Chand.P . and Acharya.P. (2010). Shoreline change and sea level rise along coast of Bhitarkanika wildlife sanctuary, Orissa: An analytical approach of remote sensing and statistical techniques, Intl jl. Of Geomatics and Geosciences, vol.1, 3, pp. 436-455.

Chandramohan, P. 1988. Longshore Sediment transport model with particular reference to the Indian Coast. *Ph.D. Thesis*, IIT, Madras, 210 p.

Chandrasekar, N., Cheian, A., Rajamanickam., M, Rajamanickam., G.V., 2000. "Coastal Landform Mapping between Tuticorin and Vaippar using IRS-IC data". *Indian Journal of Geomorphology* 5(1&2):114-120.

Cracknell.A.P.(1999) Remote sensing techniques in estuaries and coastal zones an update, Intl Jl of Remote sensing, vol.20, 3, pp 485-496. https://doi.org/10.1080/014311699213280

Greeshma and Jairaj (2014). Coastal vulnerability assessment along Kerala coast using Remote

Sensing and GIS taken for the study.

Ghosh, M.K., Kumar, L., Roy, C. 2015. "Monitoring the Coastline Change of Hatiya Island in Bangaladesh using Remote Sensing Techniques". *ISPRS Journal of Photogrammetry and Remote Sensing* 101, pp.137-144.

Jana, A., Biswas, A., Maiti, S., Bhattacharya, A.K. 2014. "Shoreline changes in response to sea level rise along Digha Coast, Eastern India: an analytical approach of remote sensing, GIS and statistical techniques". *Journal of coastal conservation*, 18(3), pp.145-155.

Kankara, R.S., Selvan, S.C., Markose, V.J., Rajan, B., Arokiaraj, S. 2015. "Estimation of long and short term shoreline changes along Andhra Pradesh coast using Remote Sensing and GIS Techniques". *Procedia Engineering* 116:855-862. doi:10.1016/j.proeng.2015.08.374.

Kumaravel, S., Ramkumar, T., Gurunanam, B., Suresh, M., Dharanirajan, K. 2013. "An application of remote sensing and GIS based shoreline changes studies – a case study in the Cuddalore District, East Coast of Tamil Nadu, South India". *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, 2(4), pp. 211-215.

Mahapatra M, Ratheesh R, Rajawat AS. 2014. "Shoreline change analysis along the coast of South Gujarat, India, using digital shoreline analysis system". *Journal of the Indian Society of Remote Sensing*, 42(4), pp. 869-876.

Nandi.S., Ghosh, M., Kundu, A., Dutta, D., Baksi, M. 2016. "Shoreline shifting and its prediction using remote sensing and GIS techniques: a case study of sagar Island, West Bengal (India)". *Journal of Coastal Conservation*, pp.61-80, doi- 10.1007/s11852-015-0418-4.

Natesan, U., Thulasiraman, N., Deepthi, K., Kathiravan, K. 2013. "Shorline change analysis of Vedaranyam coast, Tamil Nadu, India". *Environmental Monitoring Assessment*, 185(6), pp.5099-5109

Saranathan, E., Chandrasekaran, R., Manickaraj, D.S., Kannan, M. 2011. "Shoreline Changes in Tharangampadi Village, Nagapattinam District, Tamil Nadu, India, a case study". *Journal of the Indian Society of Remote Sensing*, 39(1), pp.107-115.

Sreekala, S.P., Baba, M., Muralikrishna, M. 1998., "Shoreline changes of Kerala coast using IRS data and aerial photographs". *Indian Journal of Geo-Marine Sciences* (IJMS), Vol.27 & 27(1), pp.144-148.

Sundar, V., Sannasiraj, S.A., Anil Kumar, G. 2014. "Post-Facto evaluation coastal protection measures along tsunami hit Kerala coast of India" *Proceedings of Indo-Japan Workshop on River Mouths, Tidal Flats and Lagoons, IIT Madras*, Chennai, India, Sep. 15-16, pp 1-20.

Thieler, E.R., Himmelstoss, E.A., Zichichi, J.L. and Miller, T.L. (2005) Digital Shoreline Analysis System (DSAS) Version 3.0; An Arc GIS Extension for Calculating Shoreline Change. U.S. Geological Survey Open-File Report, 2005-1304.

FORTHCOMING CONFERENCES / SEMINARS

Sr. No.	Name of Conference	Date	Venue and Contact Details
1	7th IAHR Europe Congress: Innovative Water Management in a Changing Climate	7-9 Sep, 2022	"Athens https://www.iahreuropecongress.org/"
2	4th International Symposium on Outfall Systems (ISOS 2021)	Sep 12, 2022	"Buenos Aires http://www.cofes.com.ar/isos2021/"
3	9th International Symposium on Hyraulic Structures 2022 (ISHS2022)	24-27 Oct, 2022	"IIT Roorkee https://ishs2022.iitr.ac.in/"
4	14th International Conference on Coasts, Ports and Marian Structures	Oct 31, 2022 - Nov 2, 2022	"Tehran https://icopmas.pmo.ir/"
5	River Flow 2022: the 11th International Conference on Fluvial Hydraulics	8-10 Nov, 2022	Online
6	23rd Congress of the Asian Pacific Division of IAHR	14-17 Dec, 2022	"Chennai, India https://doe.iitm.ac.in/iahrapd2022/"
7	"27th International Conference on Hydraulics, Water Resources, Environmental and Coastal Engineering (HYDRO-2022)"	22-24 Dec, 2022	"Punjab Engineering College, Chandigarh https://pec.ac.in/hydro-2022/"

The Indian Society for Hydraulics
as a body accepts no responsibility for the statements made by individuals.

Amit Kulhare, Secretary,
on behalf of the Indian Society for Hydraulics,
Phone No. 020-24103483

C/o. CERC Bldg. Room No.104,
Central Water & Power Research Station (CW&PRS),
PO. Khadakwasla, Research Station, Pune - 411 024 (Maharashtra), India

• Email : ish_office@rediffmail.com