



Proceedings of International Webinar on
Integrated Water Resource Management
solutions for Kerala
(25, 26 November- 1 December 2021)

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Executive Summary

The Netherlands and Kerala are engaged in a digital knowledge exchange collaboration since 2018 for making Kerala more disaster resilient. As part of the engagement, an International Webinar on Integrated Water Resource Management solutions for Kerala was held on 25, 26 November and 1st December 2021. Hon'ble Minister for Revenue inaugurated the webinar. The webinar had two thematic sessions, one to discuss the requirements of Kerala in mainstreaming 'Risk Informed Spatial Planning' and the second on 'Integrated Water Resource Management'. Technical capacity building requirements of Kerala in these domains were discussed and experts from various Universities and institutions in the Netherlands shared their knowledge with the counterparts in Kerala. The webinar concluded with the following recommendations:

Expected Assistance/Co-operation in Disaster Risk Reduction

1. Technical support for setting up a Centre of Excellence for Resilience Building of Local Governments at KILA (4 Technical Universities Network of the Netherlands)
Technical support in co-creation of a Centre of Excellence in Anticipatory Actions at KSDMA (The Red Cross Red Crescent Climate Centre, The Netherlands)
2. Technical collaboration for co-developing and maintaining Risk Changes, the integrated decision support system for risk informed spatial planning (ITC Centre for Disaster Resilience, Univ. of Twente)
3. Capacity building support from the 4TU network to the technical staff of Disaster Management Authorities and the Local Self Government Department Planning in risk informed spatial planning (4 Technical Universities Network of the Netherlands)
4. Technical support for downscaling climate change scenarios using CMIP6 models (CORDEX) for facilitating climate change adaptation at hyper local levels (1 to 5 km) [KNMI Global]
5. Technical support for improving weather forecasts at hyper local scales for integration into Early Warning Systems (KNMI Global)

Expected Assistance/Co-operation in Integrated Water Resource Management (IWRM)

1. Materializing IWRM concept in Kerala
2. Mitigation of urban flooding and sharing of institutional mechanisms prevailing in the Netherlands in flood plain management/zoning
3. Alternate materials to reduce the use of hard rock for flood management - sharing of case studies/experience/technology transfer etc.
4. Capacity building in the field of water resources management through various measures including modelling techniques.
5. Room For River - the concept into practice

These expectations can be met only through long term institutionalised collaboration under the framework of '**Living with water by managing risks in a changing climate**'. Priorities needs to be defined and focussed efforts are needed to realise the expectations.

Accordingly, for 2021-22, the programme may focus on

1. **technical assistance and capacity building for co-developing and maintaining Risk Changes, the integrated decision support system for risk informed spatial planning (with ITC Centre for Disaster Resilience, Univ. of Twente)**
2. **technical assistance and capacity building for mainstreaming the concept of Room for River in the Water Resource Management Sector of Kerala**

Preface

Introduction

Kerala, located in the south-west coast of India is highly vulnerable to natural hazards, the occurrence of which is being exacerbated due to climate change. Bound by the Arabian sea in the west and the Western Ghats in the east, the state has 39 hazards categorized under natural hazards in the Kerala State Disaster Management Plan. Among the various natural hazards, floods are the most common in Kerala. Riverine flooding is a recurring event consequent to heavy or continuous rainfall exceeding the absorptive capacity of soil and flow capacity of streams and rivers. This causes a water course to overflow its banks onto flood plains; which by definition is a relatively flat land adjacent to a natural water course, composed primarily of unconsolidated depositional material derived from sediments transported by the related stream and subjected to periodic flooding. Hazard interactions between rainfall-runoff, and infiltration which cause slope stability and the loosening of materials also contribute to flash floods. Landslides may block river channels, and dam break floods can result in cascading disasters. Sediments from mass movements will fill up water reservoirs reducing their capacity. Flood plains are therefore 'flood prone' and are hazardous if the developmental activities in them exceed an acceptable level. Frequency of inundation depends essentially on rainfall, channel slope, relative height of the banks, materials that make up stream banks and land use in flood plain. Reclamation and settlement in floodplain areas is a major cause of flood damage in Kerala. Nearly 14.5% of the state's land area is prone to floods, and in the case of some districts the proportion is as high as 50%. Flood return probability of the State for varying return periods from 1 in 10 to 1 in 500 years (Eg. Figure 1) have been prepared by KSDMA with the technical assistance of United Nations Environment Programme.

Until 2018, the worst known flood event in Kerala in the last 100 years occurred when Periyar River breached its banks in 1924. However, between June 1 and August 18, 2018, Kerala experienced the worst ever floods in its history since 1924. During this period, the State received cumulative rainfall that was 42% in excess of the normal average. During 15-17 August, some areas received 3000 to 4000 mm of rain. The torrential rains triggered several landslides and forced the release of excess water from 37 dams across the State, adding to the impact of floods. According to the reports by the Government of Kerala, 1,259 out of 1,664 villages spread across its 14 districts were affected. Seven districts were worst hit severely they being Alappuzha, Ernakulam, Idukki, Kottayam, Pathanamthitta, Thrissur and Wayanad-where the whole district was notified as flood affected. The devastating floods and landslides have affected 5.4 million people, displaced 1.4 million people, and took 450 lives (22 May – 29 August 2018). The Post Disaster Needs Assessment Report estimated a total recovery need of 4400 million USD. The year 2019 also witnessed floods and landslides in the state wherein 1038 villages from 13 districts were notified as affected by floods & landslides and 151 lives were lost. Sectors like housing, power, agriculture were affected badly. The coastline of Kerala is equally hazard prone; 55% of the State's coastline is hazard prone (Figure 2).

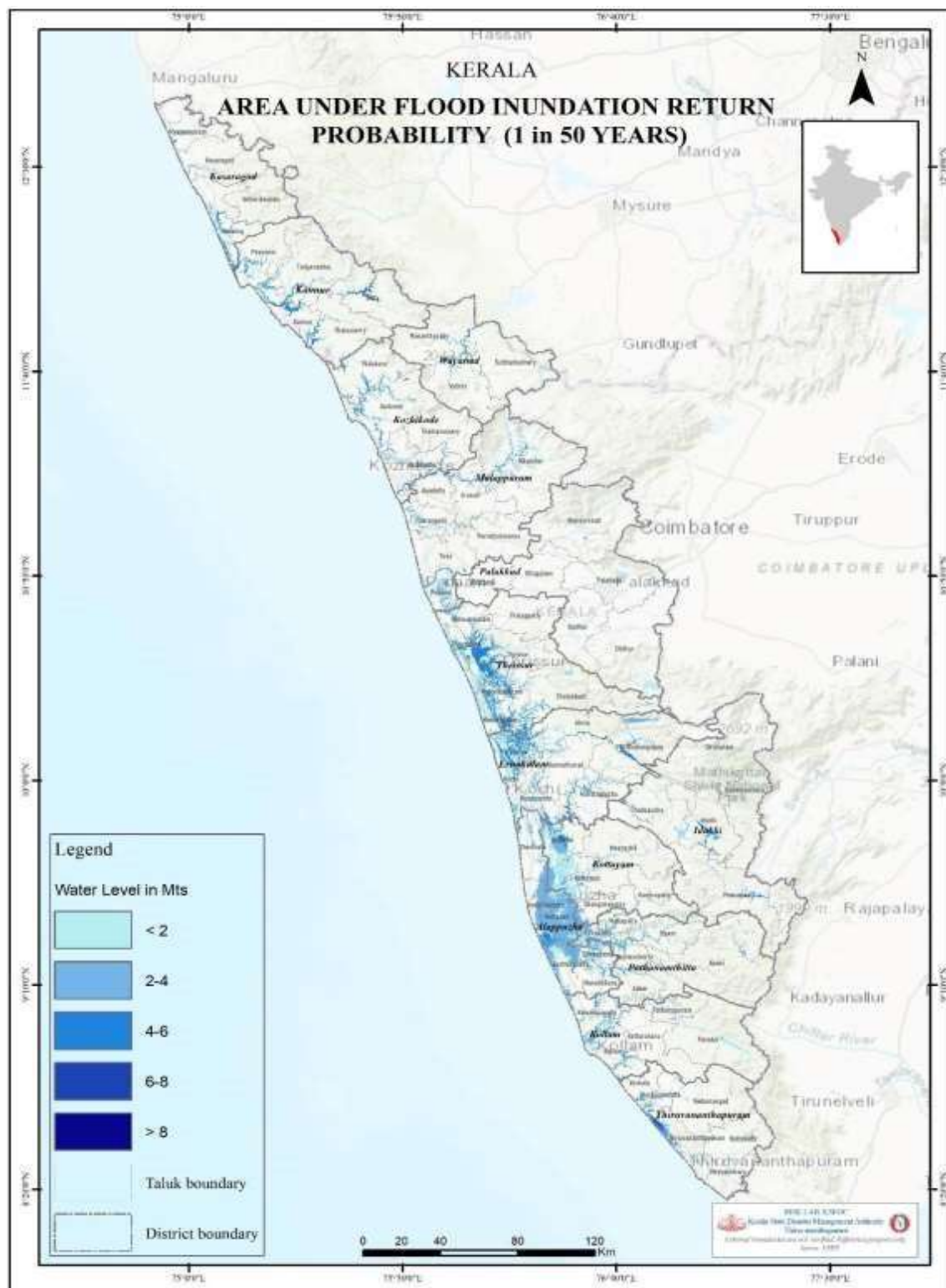


Figure 1: Flood probability – Area and depth of inundation (1 in 50 years)

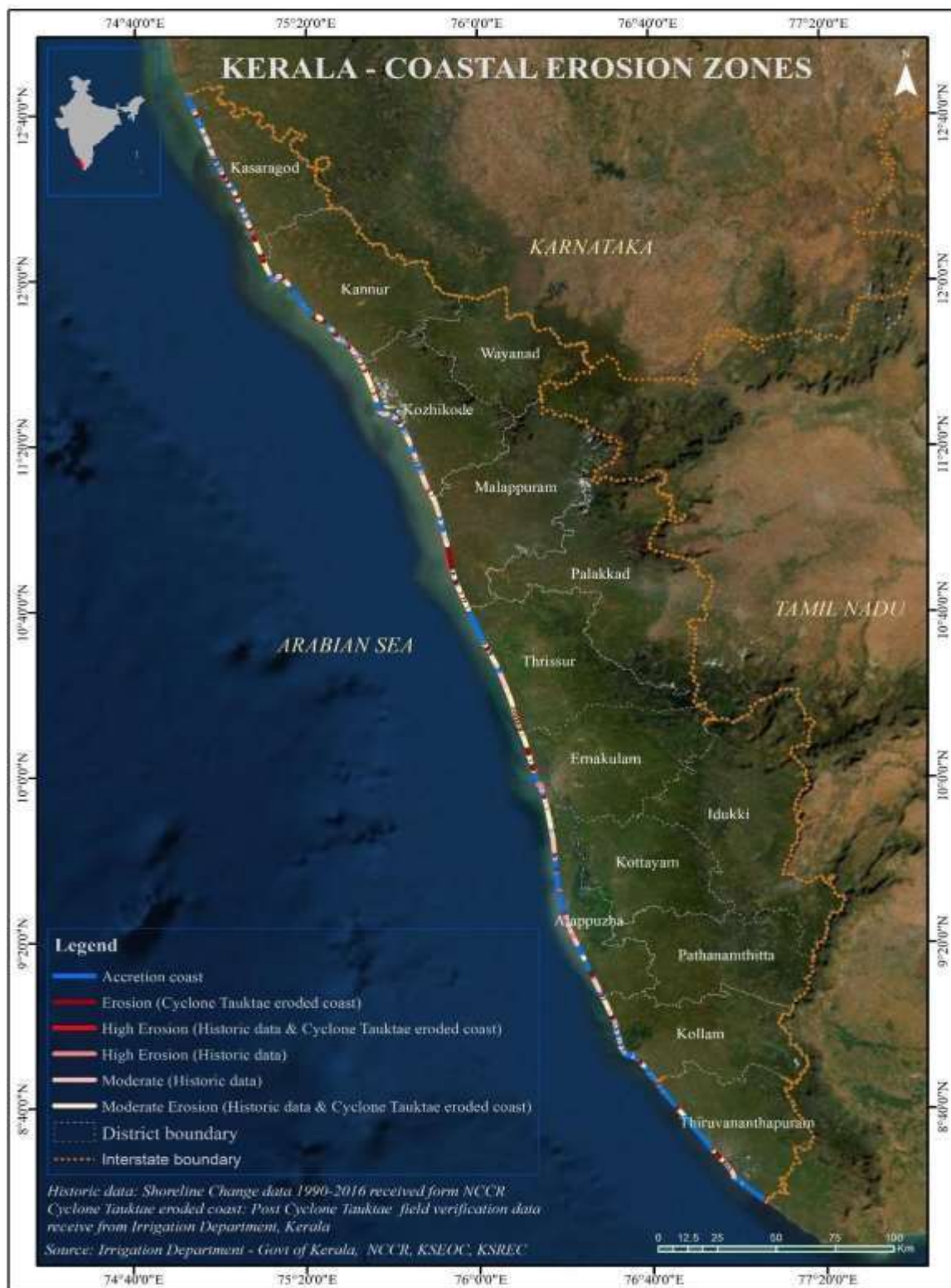


Figure 2: Coastal erosion zones

Need for consultation

The hazards happening in one part of the world can no longer be dealt in isolation. A systemic approach is the need of the hour especially when climate change-triggered events are on the rise. Assessing the systemic vulnerability of Kerala with respect to hydro-meteorological hazards is

essential. Considering the extreme weather scenarios, Kerala, with its long coastline and 44 rivers, must learn to live with water. In a state where land is a scarce commodity and the density of population is 860 persons per square kilometre, challenges like “Making Room for the River” seem to be a tall order task. Such water challenges call for international cooperation, exchange of knowledge and expertise. Lessons from international best practices when adapted to suit the local context could pave the way to solutions that are not only successful but also sustainable.

The Netherlands, despite its long coastline, two-thirds of its area being vulnerable to flooding and the majority of its population living below sea level, is a country which has tamed its water to a great extent. The country is celebrated for its expertise in flood control, water management and its efforts in international capacity building in resilience building. The Netherlands works with other nations to tackle water related issues and thereby promote resilience and this inter-boundary cooperation is a role model. Expertise of the Netherlands is sought to help Kerala in addressing the problems pertaining to building long term resilience to hydro-meteorological hazards.

It is often misunderstood that there are quick fixes for combating the vagaries of climate extremes. The resurgence story of The Netherlands from a severely flood affected country to being one of the most disaster resilient country is underscored by the collective acceptance of the fact that there are no quick fixes to combating climate extremes. Every step, whether policy or execution of projects, are data and science driven and involves careful planning. Solutions are arrived at after careful data analysis; spatial planning is undertaken and implementation is carried out in a mission mode with medium to long term focus by multi-disciplinary teams. These vast experiences of the Netherlands in evolving as resilient country provides lessons for building a disaster and climate change adaptive Nava Kerala as envisaged by the Government. Three seminars are planned under the programme, they being:

1. 25-11-2021: Risk informed spatial planning
2. 26-11-2021: Integrated water resource management
3. 1-12-2021: Risk Informed Spatial Planning and way forward in the Netherlands-Kerala collaboration for resilience building

Domains of consultation

Risk informed spatial planning

Risk is an ever-evolving dynamic situation of a society requiring continuous assessment with disaggregated data of underlying hazards and vulnerabilities in an integrated decision-making platform. Such an integrated platform is the key to developing a prudent decision support system for not only concurrent response planning, but also medium to long term climate change adaption planning and all aspects of good governance. A database that can cater to comprehensive decision making essentially should have geographic variables, socio-economic variables, environmental fluxes and impact data. Through this session of the seminar, best practices for the management of such databases and their use in the assessment of risks for adaptive spatial planning is to be presented to the audience.

Integrated water resource management

The experience of the Netherlands in Integrated Water Management is world renowned based on their expertise in forming policies and plans with a combination of both hard and soft solutions. In this session Kerala will share their experiences/constraints in managing water resources in an

integrated and holistic manner. Experts from the Netherlands will share their experience in planning and implementing More Room for the River project, Meuse Works which has been developed as a part of IWRM. The positive impact of the same was evident in the 2021 Limburg floods. The experience sharing will enable to identify common grounds for fostering further long-term collaborations for project design, planning, implementation and mitigation of extreme events.

[Risk informed spatial planning and future collaborations](#)

Risk informed spatial planning is a key to medium to long term resilience building. A key to the success to the resilience building. Risk informed early actions have kept Netherlands relatively more resilient to various risks as compared to even many other European states. Availability of disaggregated quality cadastral and socio-economic data with focus on risk informed planning is essential. Development of appropriate capacities for risk informed planning is crucial. This session will focus on needs for risk informed planning and the future collaboration potential between the professionals and academia of the Netherlands with that of Kerala.

Guidance

This document deals primarily with inauguration address and the summary of findings. It mainly contains the issues noted by the participants from India from each presentation made during the first and second webinars. This is followed by the synthesis and key takeaways made during the third, also final webinar. Furthermore the presentations from the two technical sessions, video links to the webinars, are listed one by one.

Inauguration address

Adv. K. Rajan, Minister for Revenue and Housing, Government of Kerala

Summary

The focus of all collaboration under this programme should be based on two pillars, they being Risk Informed Spatial Planning and Integrated Water Resource Management. The Government of Kerala look forward to fostering specific institutional collaborations with Government of the Netherlands, Water Resources Department of Kerala, State Disaster Management Authority and Centres of Excellence in the Netherlands and Dutch Universities in research, knowledge sharing, experience sharing and eventually leading to the development of a Global Centre of Excellence for Disaster Resilient Technologies.

Good morning,

Distinguished members of the panel. I am very pleased to address this unique and important forum which has brought together many eminent experts. Kerala, located in the south-west part of India, is a state which is highly vulnerable to natural hazards. With the impact of climate change, frequent extreme climatic events have become a common issue in the state. A prime example of this is the 23 low pressure systems of different intensities that have been formed in the Bay of Bengal and the Arabian Sea in 2021. Among the various natural hazards, floods are the most common in Kerala. Nearly 14.5% of the state's land area is prone to floods and during the extreme events, the damages caused and the lives lost due to flooding in this area is a continuous cause of concern.

The Glasgow COP26 UN Climate Change Conference reiterated Code Red for Humanity and it reminded the need for risk informed spatial planning at local levels for resilience building of the vulnerable societies.

The Netherlands, with 26% of the country below sea level, is always the best example of how human ingenuity could overcome adversities caused by natural forces and become world leaders in water management. After the devastating floods of 2018 in Kerala, the Hon'ble Chief Minister visited the Netherlands to explore cooperation in water management and flood prevention on the invitation of the Dutch Government. Their Majesties The King and Queen of the Netherlands visited Kerala and reassured the Government level support to the State. Let me remind you, the association between Kerala and the Netherlands dates back to the 17th Century through trade and through the Dutch Admiral who was later the General of Travancore Army, Mr. de Lenoy.

As a result of the collaboration, the Dutch Model of 'More Room for River' was incorporated in the Rebuild Kerala Initiative. Initiatives in those lines have already proven its merit in the State. This seminar series on building resilience to disasters look forward to enhanced cooperation between Kerala and the Netherlands.

India is one of the focus countries of the Partners for Water Programme of the Netherlands. It is understood that the Netherlands Water Partnership (NWP) mission is focusing on flood management, resilient cities, sustainable water supply and nature-based solutions; river basin management and lake restoration. These are essential components of risk informed spatial planning.

The Government of Kerala is particularly interested in institutionalising Risk Informed Spatial Planning and Land Administration for resilience building under the India-The Netherlands Water Partnership. We are committed to fostering this relationship on a long term basis. I am particularly pleased to see that the lessons of good Land Administration with Risk Informed Spatial Planning from the Netherlands are being shared in these seminars.

The focus of all collaboration under this programme should be based on two pillars, they being Risk Informed Spatial Planning and Integrated Water Resource Management. The Government of Kerala look forward to fostering specific institutional collaborations with Government of the Netherlands, Water Resources Department of Kerala, State Disaster Management Authority and Centres of Excellence in the Netherlands and Dutch Universities in research, knowledge sharing, experience sharing and eventually leading to the development of a Global Centre of Excellence for Disaster Resilient Technologies.

I wish all success to this virtual seminar series and look forward to many more knowledge exchanges between India, and particularly Kerala and The Netherlands.

[Mr. Gert Heijkoop, Consular General of the Netherlands to India, Bangalor](#)

The Netherlands is willing to share its 1000 years of experience and expertise in water engineering and disaster resilience building with the World. Through our universities and institutions who have water engineering experts trained at University of Delft and University of Twente we will be able to support Kerala in achieving resilience. The Disaster Risk Reduction Mission of 2018 and the visit of Their Majesties, The King and Queen of Netherlands to Kerala in 2019 are a reassurance from the Netherlands that the country stands in support of Kerala to become more flood resilient.

[Mr. Bhakt Bhusan IFS, Second Secretary, Indian Embassy, The Netherlands](#)

The Indian Embassy offers its support to the Netherlands – Kerala partnership.

[Mr. Guus Schutjes, Program Manager, RVO Partners for Water](#)

The partners for water is the share of the Netherlands in helping countries to access the expertise of the Netherlands in managing water and deltas in the context of climate adaption. We are pleased to note that we could support Kerala since 2018 through our expertise in integrated water resource management and disaster risk reduction. We hope that the results of the seminars will give structured outputs which may find space in the next Partners for Water programme.

[Mr. Pranab Jyothi Nath IAS, Secretary, Water Resources, Kerala](#)

Kerala has benefited from the cooperation with the Netherlands particularly through the framework of more room for water. We expect to learn how to bring all stakeholders into the integrated planning and implementation of water engineering project and to orient the officers such as planner, engineers,

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policy makers from the Netherlands. Kerala Government will provide all necessary support to the collaboration.

[Drs. Fernanda Van der Velde, RVO](#)

There will be very serious challenges due to Climate Change. The expert talks in the next two days will give some insights into the skills and expertise in disaster resilience and IWRM. On 1st December we will, in a high level discuss the road map for future collaboration and take it to the round table for formalising the projects.

Summary of findings

Technical Session 1: Risk informed spatial planning, 25th of November 2021

Data Management for Risk Assessment – expectations from the experts

Presented by Dr Sekhar L Kuriakose

The speaker explained that Kerala desires to attain the following from the collaboration with the Netherlands.

Capacity building for Multi Hazard Vulnerability and Risk Assessment, Integrated Water Resources Management and Land Administration.

Integrated data collection and storage systems for hazard linked data collection.

Methods of data analysis – early warning and climate change future forecasts

Experience of the Netherlands in Risk informed spatial planning

Assessment of cascading hazards and consequent impacts.

Integrated near real-time data gathering and analytical tools for risk management

Presented by Ir. Matthijs Lemans

The presentation focused on real time decision making based on detection of an event data collection and transforming data into information for early warning to inhabitants.

Assistance is required for capacity building for organizing intensive data, its analysis, modelling based on Kerala terrain and transforming that to useful information.

Catchment scale modelling of cascading hazards for scenario based spatial planning – OpenLISEM

Presented by Prof. Dr. Victor Jetten

The topic focused on developing multi hazard modelling using OpenLISEM software. As the flood event not only should focus on water it is a mix of debris derived from upstream flash floods, fallen trees and large debris. Hence landslides and sediments also should be considered in modelling.

OpenLISEM did integrate many of these, however uncertainty in soil properties is still a challenge.

Practical tools for integrated water resources management for daily use- Models to support spatial planning (and resilience in Kerala)

Presented by Dr. Ir. Bas Kolen

- Risk analyses and flood risk data can support experts, decision makers for Selection of measures (prevention, spatial planning, emergency management) for effective Flood Control.
- (Open) database for existing Flood risk data owned and maintained by Dutch Government, which includes data pertaining to Flood scenarios, rainfall, levees, Flood probabilities, Risk maps, Warning, evacuation and shelter etc. This data is used for Policy making, Spatial adaptation, Emergency preparation, public awareness, etc.
- Multi-layer safety to support selection of (cost effective) measures, viz. Prevention, Sustainable spatial planning and Crisis/Disaster Management.

- Possible tools for (daily) flood risk-based management.
- To gather, maintain existing flood risk information and make this information for Governments and experts.
- Selection of measures: prevention, land use planning and emergency management (multiple layer safety) as well as types of measures.
- Real time flood risk management – daily flood control: forecasting.
- What we expect from Netherlands
- Guidance and capacity building for developing a unified database data pertaining to Flood scenarios for future policy making and special planning.

Risk Changes – The integrated risk assessment tool

Presented by Prof. Dr. C.J van Westen

This session dealt with “Risk Changes” an open-source tool for dynamic multi-hazard risk assessment and risk informed spatial planning related decision making. The session detailed the factors that motivated for developing the risk assessment tool and development of the same as a Spatial Decision Support System (DSS) for risk management. The explained that this tool can be used for risk assessment (analysing current risk, risk reduction alternatives along with future scenarios), decision making, and multi-hazard interactions, , performing cost-benefit analysis (in order to evaluate optimal risk reduction alternatives), multi-criteria evaluation etc. This tool is also flexible in terms of data requirement and can be used at local level by users with limited modelling expertise along with availability of integration of expert opinion. The speaker illustrated the technical and decision support modules of the tool and experts for performing particular tasks.

Risk informed spatial planning – data requirements and best practices

Presented by Prof. Dr. Richard Sliuzas

Spatial Planning – Accommodate Society and space.

Process in which according to sets of rules and procedures space is being planned for its use, taking into consideration the private and public interests.

Spatial Planning in Netherlands was presented in detail. The human element of spatial decisions needs to be considered.

National and Provincial Govt can make an integration plan in case National/Provincial interests are at stake.

LATEST DEVELOPMENTS – INTEGRATION OF ENVIRONMENTAL PLANNING LAW

to modernise, harmonise and simplify current rules on land use planning, environmental protection, nature conservation, construction of buildings, protection of cultural heritage, water management, urban and rural redevelopment, development of major public and private works and mining and earth removal and integrate these rules into one legal framework.

ROOM FOR THE RIVER PHILOSOPHY AND PROJECTS

Nine main water management measures:

1. Lowering of flood plain
2. Deepening the summer bed

3. Lowering perpendicular groynes and building attracting groynes
4. Water retention
5. Dyke relocation
6. Depoldering
7. Removing obstacles
8. High water channel
9. Strengthening Dykes

PLANNING SUPPORT AND GROUP DECISION ROOM

- Methods and tools for collaborative planning and decision making
- Building upon experiences involving transdisciplinary groups
- Developing and testing interfaces for collaborative planning

Early Warning, Climatic Change, Integrated Data Collection for Analysis.

Technical Session 2: Integrated water resource management, 26th of November 2021

First presentation was done by Ir. Alex Varghese, CE (I&A). His presentation mainly focuses on three sectors:

Urban Flooding:

Enumerated reason and how it is affecting the daily life of people. Explained short, medium and long-term measures. Emphasised areas of collaboration needed between the Netherlands & Kerala.

Coastal Erosion:

Brief description regarding the characteristics of Kerala coast. Mentioned about sea attack and coastal erosion in the state and the difficulties faced by the people. Presented the short term & long term solutions implemented in the State. Emphasised the non-availability of rock in the state for the construction of coastal protective structures.

Requested Netherlands expertise in finding a solution to replace rocks for the construction of coastal protection structures.

Issues in Kuttanad

Presented general characteristic of Kuttanad, present scenario and problems facing etc. Emphasised the concept “Room for River” and how the concept is going to be implemented in Kuttanad.

Capacity requirements for Integrated Water Resources Management and Flood Resilience Building in Kerala

Sri.Priyesh commenced his presentation by inviting special focus on the water resources scenario of the State. Despite having 44 rivers contributing 70 BCM, utilisable yield from these rivers were only 42 BCM with the rest is let off as run-off. From the run-off, hardly 5.2 BCM is stored in different reservoirs to meet various needs, which is insufficient during lean times. It was also informed that while the State has been negotiating floods continuously since 2018, lean years like 2013, 2016 were also pointed out wherein significant finance had to be found out by the State to tackle drought. It is with this contrary situation, need of Integrated Water Resources Management (IWRM) was thrust. It was suggested that under Navakeralam 2.0, watershed plans at panchayath levels and block level masterplans that has already been developed under Harithakeralam needs to be re-

looked. With this, the successful “kattakada Model” can be expanded to other regions in the State as well. Different initiatives by the State since 2018 floods was also showcased which included Flood Forecasting in Periyar/Chalakydy Basin, Installation of Real Time Data Acquisition System (RTDASS), State Water Resources Information System (WRIS). Request was made with Netherlands in transferring their knowledge in watershed modelling with their tools so that each watershed can be modelled by the engineer ie, Assistant Engineer of each panchayath. This will result in large transformation of the water resources sector. While concluding it was informed the need to have a continuous collaboration of Water Resources Department, SDMA with Netherlands. The collaboration shall be with both major players in the water sector as well as with Universities which ultimately shall pave way for creating a global centre for excellence in Water Sector in the State.

Urban Flood Management Dike designs, management and automated systems for river flood management

Mr. Dolman begins his presentation focussing on three areas:

1. Urban Water Transitions (UWT) framework
2. Design and planning approaches
3. Case study of Zwolle, NL

Climate change impacts on water sector has strong influence in urban water management and resilience. The second part of his presentation was more relevant to Kerala viz. Disaster Management, Spatial Adaptation and flood Prevention. Living with water principle is not very much suitable, as far as kerala is concerned due to density of population and its topography. Sharing of experience is very much essential in imbibing the Blue-Green design principle, Green Infrastructure and Water Buffer in bicycle storage. Also, sharing of expertise with suitable model are needed for ascertaining the possibility of the concept introduced by this presentation.

Best practices -hard engineering solutions for coastal protection

Presented by Prof. Job Dronkers

Messages for Kerala Coast

- **Issues**
 1. Kerala erosion due to sand deficit as a result of sand trapping in upstream reservoirs
 2. Constructing structures has lowered the beach, leading to damage to structures.
 3. Rubble mound structures cover majority of the coastal area. Due to non availability of large sized stones, regular maintenance of these structures is not possible leading to worsening the situation.
 4. Groin construction has led to sand loss in the downdrift side
 5. No reliable models to predict the dynamics in the nearshore due to formation of mudbanks
 6. Many areas are low-lying with increased chance of flooding due to sealevel rise in the future
 7. Heavy population density in the coastal strip further adds to the problem.
- **Comparison between Netherlands and Kerala**

1. Sand transport dynamics is dominated by monsoon for Kerala whereas in Netherlands it is mostly storm dominated
2. Natural dunes and nearshore sand resources are available in Netherlands which can be used for Beach nourishment whereas the same is not possible for Kerala
3. The Dutch method of coastal protection cannot be considered for Kerala

- **Solutions**

1. Except at hotspot locations, sand nourishment does not seem to be a feasible option
2. Recovery of the Pamba sand outflow at Thottapally can be used for nourishing Kuttanad coast
3. Constant monitoring along the Kerala coast, though expensive is necessary to understand the sand balance estimates
4. Proper understanding of the sand dynamics is necessary for solving the coastal issues
5. Banning of illegal mining
6. Avoid and restrict constructions in coastal strip

Sand Engine – Building with Nature

In the presentation, Mr. Jaap emphasised the soft Coastal Engineering measures that can be adapted in Kerala coast. Then he presented a case study of Zand motor, which was built in 2011 with design life of 40 years. To carry forward this kind of beach nourishment in Kerala coast, there is a need of detailed study on availability of sand.

Monique Berendsen – The Dutch Delta programme

Monique Berendsen started the session with a briefing of the history of flood management in Netherlands. The speaker mentioned about the floods in 1916 & 1953, high water levels in 1993/1995 and structural solutions made with dams and barriers such as construction of Afsluitdijk dam to create IJsselmeer to tackle the issue. She mentioned about the Room for RIVER/Meuse Projects. She gave a brief idea about the 2nd Delta Programme and the lessons learned from the approach. The importance of Civil Society engagement & multi government co-operation in the programme were pointed out. She explained about the adaptive strategies and flexible measures to be considered for incorporating uncertainties.

The Limburg Floods of 2020-21

Prof. Dr. Bas Jonkman, on behalf of the TFFF (Task Force Fact Finding Floods Limburg), detailed about the Facts and preliminary analysis of the recent unprecedented flood faced by Netherlands in July 2021. As large parts of Limburg were affected by heavy rainfall and flooding an exploratory fact-finding study has been conducted to collect and analysis information. As flooding impacted all parts of a community, the fact-finding study not only included hydrological and civil engineering topics; attention was also given to the social impacts of the floods, evacuation and response and the health impacts from the floods. He explained how the study was conducted and that it was mainly focused on the collection and analysis of available information which includes Meteorology and Hydrology, river science, evacuation, crisis management and emergency measures. Unprecedented

and unexpected floods awake the need of preparation for unexpected and extreme scenarios,
Improve flood warning (rainfall – discharge – crisis management) system.

Planning and implementation of more room for the river and Meuse works

Mr. Pieter-Paul began his presentation with the comparison of Netherlands and Kerala regarding its similarity in topography particularly in low lands. The findings made in PDNA 2018/DRR Report 2019 by joint Dutch and Kerala team was highlighted. The Room for the River planning concept in Netherlands and Water Resilient planning for Kerala was elaborated giving special attentions to needs during wet and dry season. General principles of Integrated Basin Flood Control and Disaster Risk Reduction was presented. He thrust in the need of applying basics of various soil conservation method as well as adopting watershed approach in managing the water resources. The “Kattakada Model” already executed successfully in the State was highlighted. It was informed that such models already available in the State could be replicated. Further, Room for River concept adopted in Netherlands was explained in details. Various strategies adopted by Netherlands while involving multi stakeholders were projected with optimisation of activities were also explained. Application of Room for River concept in Kuttanad region was explained in length. It was informed that the State had to take a call on the same by creating more space for the water both in current and future scenarios, deepening the channel beds, diverting the excess flood waters, removal of obstructions etc were pointed out. Need for restrictions in land uses by bringing in various policies were highlighted with various long term commitments wherein significant investments needs to be put in. Finally, the importance of Data management and Decisions support system was thrust wherein Netherlands could impart specific techniques in developing the same including various hydrologic and hydrodynamic models.

Theme: Risk informed spatial planning and future collaborations, 1st of December 2021

Inauguration: Dr. V.P Joy IAS, Chief Secretary, Kerala

The concluding session of the webinar was inaugurated by **Dr. V.P Joy IAS Chief Secretary, Government of Kerala**. In his opening remarks he emphasises the importance of cooperation between the Netherlands and Kerala particularly in Water Resources Management. Kerala has 44 rivers, more than 41000 public ponds and three Ramsar sites apart from its backwaters. The peculiar nature of Kerala's rainfall is gradually changing and the recent floods during 2018, 2019 and even in 2020, 2021 brought the need of management of Water resources in a more scientific manner. As far as the Netherlands is concerned, they pioneer in managing water and controlling floods. Chief Secretary also pointed out that the State should embark up a holistic view in water management instead of a fragmented approach. As a concluding remark, he welcomed the experts of the Netherlands to share their expertise and knowledge to the state, especially in Water management sector.

Keynote: Ambassador Venu Rajamony, Officer on Special Duty (External Cooperation), Government of Kerala

Dr. Venu Rajamony in his key note address emphasise the knowledge and expertise of the Netherlands in managing floods. He also mentions, as far as Kerala is concerned, no country better than the Netherlands to learn from. He flagged up the concept of Water consciousness and cited an example of people living with water and training given to children in swimming with shoes to face water related eventualities. In Kerala context he mentions about the importance of Western Ghats and its fragile nature. Thus development needs should also be taken care of nature and its importance. Climate change is affecting Europe, US in the way of huge natural calamities, we cannot prevent it, but we can manage it. Considering the huge deluge of 2018, 2019, we need the expertise of the Netherlands in managing future climate change related disasters. Considering the dynamics of water, engineering solutions may not help us, but nature based solutions (NBS) with local traditional knowledge as its practice will help us to meet Kerala's challenges – Green and Resilient Kerala

Keynote: Heine Lageveen, Consulate General of the Kingdom of The Netherlands, Deputy Consul General

Dy. Consular General: Heine Lageveen mentions about the tie-up between Kerala and the Netherlands Disaster Risk Reduction team after the devastating Kerala Flood in 2018. He expressed his country's interest in continuing in the collaboration with Kerala, particularly in knowledge sharing and technology transfer.

- Netherlands- Kerala G2G/K2K water management cooperation started in 2018 with DRR visit;
- Since then the Netherlands is committed to continue water management cooperation with Kerala;
- In 2019 there was a visit of the Chief Minister of Kerala to the Netherlands and in 2019 a state visit to Kerala (both focus on water) underline this;
- COVID-19 unfortunately meant cooperation projects were halted for some time;
- I hope that this webinar series is the start of a new G2G/K2K program with Kerala, based on knowledge exchange and capacity building.

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Introduction to the sessions

Mr. Pranab Jyothi Nath IAS, Secretary, Water Resources

Pranab Jyothi Nath, Secretary, WRD, Kerala:- In his speech, he explains the issues in implementing IWRM concept in Kerala. Considering this, he stressed the importance in continuing the tie up between Kerala and the Netherlands.

Mrs. MSc. Fernanda van der Velde, RVO

Welcome the excellencies and the participants. Thank you for your time and contribution to the seminars today and last week.

At the start of the webinar we expressed that our aim of the webinars was to exchange knowledge.

I think we succeeded in that goal, and I consider it as a base to build on further.

Like we start today, where we present the findings of the webinars and in the closing remarks we can make our path forward.

This process is quite constructive and good and to see that all the stakeholders are on board.

I agree with former speaker that it's Important to have the water consciousness and also look at the opportunities that water will give us.

Recommendations of Technical Session 1 (25-11-2021): Risk informed planning – Dr. Sekhar L. Kuriakose

The first session highlighted the need for the following technical and capacity building support in Kerala for improving the Disaster Risk Reduction efforts of the State:

Risk Informed Spatial Planning: Risk Changes, an open-source tool used in many countries was introduced. The tool needs co-development and capacity building for use in Kerala. The rich geodatabase of Kerala could be used. This tool being Open Source could be co-developed in Kerala.

Integrated data collection and storage systems for hazard linked data collection: The data collection, storage and analysis methods used in the Netherlands was presented. A multi-department, spatially referenced integrated platform is essential

Early warning and climate change future forecasts: The early warning systems of the Netherlands, particularly on hydro-meteorological hazards were presented. The Dutch weather agencies climate attribution works and anticipatory action planning by Red Cross and Red Crescent Climate Centre was presented. A collaborative work on downscaling climate models for the use of local governments could be considered (CORDEX).

Experience of the Netherlands in Risk informed spatial planning: Various resilience building measures, from legal aspects to technological solutions were discussed and how the Netherlands integrates all of them through spatial risk informed planning was presented. A resilient technology focused collaboration is therefore possible.

Assessment of cascading hazards and consequent impacts: Modelling the hazard potential of individual hazard type is of the past. OpenLISEM an open-source watershed scale modelling tool was presented. The tool can simulate the effects of landslides, flash floods, fluvial floods and resultant sediment/pollution together. A collaboration on further developing and using the tool in Kerala could be considered.

Ms. Sarada Muraleedharan, Additional Chief Secretary, Local Self Government Department, Government of Kerala

In her speech, she highlighted the importance of LSGIs in managing the disasters at the grass root level, particularly after 2018. The importance of Mitigation and Resilience at the local level is very crucial and considering this, the local bodies (Grama Panchayats) in Kerala venture into preparing a community based “Disaster management Plan” for each local body with the participation of all the state holders and NGO representatives. As part of transforming DM plan to climate action, few training programmes were already conducted. She also mentions about the activities of Kerala Institute of Local Administration (KILA) and its role in imparting training in materializing the DM plan. Considering the changes already happened in weather pattern, particularly in rainfall and recurring cyclones, there is an urgent need in forecast modelling at local level. In this regard, she seeks the assistance of the Netherlands. She also expressed here interest in institutionalising the knowledge based by setting up a centre for disaster and climate resilience in KILA with the technical support of the academic institutions and research institutions of the Netherlands.

Prof. Dr. Maarten van Aalst

Making CORDEX at local government level is a challenge. The problems at the local government level are complex and cannot be seen in silos. An integrated approach to problem solving is what we need. Hyper local forecasts are still a challenge. There is a separation between long term forecasts and short term forecasts. The higher the spatial resolution that we go the uncertainties increase and

then there is unrealistic expectation. Long term modelling should be used for risk informed spatial planning. There is a scope for mutual learning particularly on integration of long term forecasts into risk informed spatial planning and short term forecasts for emergency response. The offer for collaboration is welcome and we from Red Cross and Red Crescent Climate Centre and Centre for Disaster Resilience at University of Twente will support in facilitating institutionalisation of anticipatory actions based on climate change and weather forecasts for disaster resilience building.

Prof. Dr. C.J van Westen

I am very impressed by the local level disaster management plans of Kerala, which is unique. The next step is to go for integrating this into the development plans. All the building blocks are there. Exposure analysis and Mapathon Kerala is something that I am very impressed with. More emphasis should be given for local level multi-hazard assessment. There has to be an easy-to-use tool which could be managed by local governments and they should be useful for them to use such a tool for risk informed spatial planning and looking for solutions and examine various scenarios with it. The RiskChanges is open source and we are willing to collaborate on co-developing this tool and providing capacity building support through 4 Technical Universities network to institutionalise it.

Prof. Dr. Richard Sliuzas

Community engagement and in different scales is difficult. Organising planning at various scales is a challenge. We should learn from what communities already know. There is a lot of uncertainty in the socio-economic side of risk informed spatial planning. We are open to collaborate on this domain.

Dr. Joy Elamon, Director, KILA

At the outset in his speech, Dr. Joy Elamon, elaborates the activities of KILA and its tie up with agencies like UNEP in Ecosystem Based Disaster Risk Reduction (ECODRR) training which includes climate change, Biodiversity and Disaster Management. He also highlights the importance of utilizing the potential of MGNREGS for soil and water conservation. He mentions the importance of capacity building in carry forward the DM Plan prepared at local level for which the assistance of the Netherland will help.

Mr. Rajesh P.N. Senior T.P., Kerala

He spoke about the Master Plans already prepared and their decision in having revisit the plans to incorporate the DM part in it. As a pilot project, Master plan for Mananthavady (Wayanad District) and Chengannoor (Alappuzha District) were already prepared. He expresses his willingness in accepting any kind of expertise to improve the knowledge level of the Department Staff which may help in bringing the Master plan with suggestions to mitigate/ adapt the impacts due to climate variability.

Mr. Pieter-Paul van Meel MSc (CE), Advisor Integrated Water Resources Management

Risk informed planning is needed based on best scientific models and knowledge. We are talking about water and it does not stop with planning and insight. Planning to be laid down in an IWRM planning at panchayat level with package of concrete interventions. To some extent this already exists.

Local engineers need to be trained in the concepts of IWRM at watershed / panchayat level, basin level and coastal zone protection also considering eco-engineering/building with nature etc. The need to be trained to think away from their inclination to design hard engineering structures.

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Mrs. MSc. Fernanda van de Velde

It's also important to involve the citizens with the master planning. Participation of citizens and awareness of the risks and prevention is important.

Recommendations of Technical Session 2 (26-11-2021): Integrated water resource management

Ir. Alex Varghese, Chief Engineer, Irrigation & Administration

Ir. Alex Varghese Chief Engineer (I&A) briefly summarises the proceedings of day-2, which focuses on IWRM and its implementation in Kerala scenario. He presents the crux of each presentation of the day-2 (26-11-2021), all together it comes to eight presentations. He also pointed out the importance in mitigating urban flooding particularly in Trivandrum and Cochin. Since the pace of urbanisation in the State is in high pitch, the water resources scenario needs to be taken care of with regard to its utilization and management. He also mentions the assistance/ help we received after the Flood-2018, also highlight the assistance of Dutch DRR Team in preparing Kerala IWRM Action Plan Kuttanad/ Pamba. He hopefully seek the assistance/ support of the Netherland team in carry forward the initiatives already there, and also requests transfer of knowledge and impart training for WRD technical staff.

Ir. Priyesh R. Director, IDRB

He mentions the importance of watershed plans at local level and remind about the Integrated Watershed Plans already prepared as part of Navakeralam- Harithakeralam Sub- Mission. However, considering the changes happened due to consecutive floods in 2018,2019, there is an urgent need in revisiting the Watershed Plans and make them with proposals having more resilience to climate change impacts. He also mentions the importance of these plans in formulating DM Plan at LSGI level.

Ir. Supriya, Chief Engineer (Dam Safety), KSEBL

She raised the concern regarding drastic change in the pattern of rainfall and its impact on dam management. She also flagged up the issues related with climate change, particularly in water sector. Therefore more accurate and hyper local predictions are required which could be used for dam operations planning.

Prof. Job Dronkers: TOPICS FOR FURTHER COOPERATION Kerala-Netherlands ON COASTAL PROTECTION

Objective: Knowledge of coastal sedimentation and erosion needed for effective intervention measures.

Implementation: Establishment of an operational coastal monitoring program that uses modern survey methods coupled with data processing and visualization software systems.

Objective: Maintenance and optimization of present erosion protection structures

Implementation: Evaluation of present structures – adequate construction, effectiveness, environmental impacts, erosion protection alternatives.

Objective: Coastal resilience through nature-based solutions

Implementation: Explore feasibility of (partially) restoring fluvial sand supply, feasibility of coastal nourishment with sand from offshore relict deposits, feasibility of expanding zones where dunes or mangroves develop naturally, feasibility of stimulating sand retention by beach vegetation, etc.

Objective: Enable future interventions to keep Kerala safe from sea-level rise.

Implementation: Long-term outlook of possible protection measures under different scenarios of sea level rise and socio-economic development, consequences for spatial planning policy.

Ir. Shyam Gopal, Chief Engineer, Kuttanad

The requirement of alternate materials for creating polder walls is essential in Kerala. There is a shortage of rubble and natural stones. Any initiative to develop alternate material based polder material will be of great interest.

Mrs. MSC. Fernanda van der Velde, RVO, closing remarks

- A lot has been said and a lot of ideas have been shared. Ideas of protection of the coast, about capacity building on some topics.
- Now its time to look over all the ideas and get in contact how we can take them further on. And possibly we have to prioritize our activities.
- We can discuss how everything can come together in a plan that will be discussed at the next round table Probably February 2022 a Netherlands – Kerala Round Table can be organized. Mr. Heine Lageveen will take the initiative to organize the meeting.

I also look forward to establishing a good, continued communication and working arrangement with Kerala.

Mr. Ir. Luit-Jan Dijkhuis

We now have the building blocks, the requirements from Kerala. In order to apply all the building blocks, a framework is needed from the Kerala government and a prioritization is essential.

For the Room for the River programme, a framework has been drawn up with ambitions and goals. Within this framework, directions for solutions have been formulated.

Synthesis

Expected Assistance/Co-operation in Disaster Risk Reduction

1. Technical support for setting up a Centre of Excellence for Resilience Building of Local Governments at KILA (4 Technical Universities Network of the Netherlands)
2. Technical support in co-creation of a Centre of Excellence in Anticipatory Actions at KSDMA (The Red Cross Red Crescent Climate Centre, The Netherlands)
3. Technical collaboration for co-developing and maintaining Risk Changes, the integrated decision support system for risk informed spatial planning (ITC Centre for Disaster Resilience, Univ. of Twente)
4. Capacity building support from the 4TU network to the technical staff of Disaster Management Authorities and the Local Self Government Department Planning in risk informed spatial planning (4 Technical Universities Network of the Netherlands)
5. Technical support for downscaling climate change scenarios using CMIP6 models (CORDEX) for facilitating climate change adaptation at hyper local levels (1 to 5 km) [KNMI Global]
6. Technical support for improving weather forecasts at hyper local scales for integration into Early Warning Systems (KNMI Global)

Expected Assistance/Co-operation in IWRM

As an outcome of the three-day webinar, Water Resources Department and other concerned stakeholder departments expects co-operation, knowledge transfer, assistance and experience sharing in the following sectors:

1. Materializing IWRM concept in Kerala
2. Mitigation of urban flooding and sharing of institutional mechanisms prevailing in the Netherland in flood plain management/zoning
3. Alternate materials to reduce the use of hard rock for flood management- sharing of case studies/experience/technology transfer etc.
4. Capacity building in the field of water resources management through various measures including modelling techniques.
5. Room For River- the concept into practice.

Framework & immediate priorities of collaboration

The above identified expectations can be met only through long term institutionalized collaboration under the framework of '**Living with water by managing risks in a changing climate**'. Priorities need to be defined and focussed efforts are needed to realize the expectations to cope with the challenges of water safety and water security. Accordingly, for Partners for Water 2022-2027, the Dutch – Indian collaboration may focus on

1. **technical assistance and capacity building for co-developing and maintaining Risk Changes, the integrated decision support system for risk informed spatial planning (with ITC Centre for Disaster Resilience, Univ. of Twente)**
2. **technical assistance and capacity building in the field of Integrated water resources management, for example mainstreaming the concept of Room for River and modelling techniques, for the Water Resource Management Sector of Kerala with special attention for Nature based solutions and sharing institutionalizing and innovative means of reducing risks in flood management.**

Script of the webinars, links to video registration and presentations

Technical Session 1: Risk informed spatial planning

<https://vimeo.com/649992712/06ae84b601>

Inauguration			
Date and Time: 25 th November 2021, 14.30 IST to 17.00 IST 10:00 CET to 12:30 CET			
General Link for webinar 25 November https://utwente-nl.zoom.us/j/87344350095 Personal panellist links have been sent to the speakers			
Time	Speaker	Title	Remarks
14.30 IST to 14.50 IST 10:00 CET to 10:20 CET	Inauguration: 1. Hon'ble Minister for Revenue 2. Hon'ble Minister for Water Resources 3. Mr. Gert Heijkoop, Consular General of the Netherlands, Bangaluru 4. Dr. V.P Joy IAS, Chief Secretary, Kerala 5. Mr. Bhakt Bhushan IFS, Second Secretary, Indian Embassy, The Netherlands 6. Mr. Guus Schutjes, Program Manager RVO Partners for Water		

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14:50 IST to 15:00 IST 10:20 CET to 10:30 CET	Introduction to the three days seminar and expectations – drs. Fernanda Van der Velde, RVO Moderator: Dr. Sekhar L. Kuriakose		
Technical Session 1: Risk informed spatial planning			
15:00 IST to 15:10 IST 10:30 CET to 10:40 CET	Dr. Sekhar L. Kuriakose, Visiting Scientist, ITC- CDR, Univ. of Twente	Data Management for Risk Assessment – expectations from the experts	The slides will focus on data capturing gaps, analytical gaps, capacity building needs, need for a dynamic DSS & expectations from the experts Presentation Sekhar Screen2PDF.pdf

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15:10 IST to 15:25 IST 10:40 CET to 10:55 CET	Ir. Matthijs Lemans, Advisor Operational Water Management, Deltares	Enabling better real-time decision- making using Delft-FEWS	Expectation from the talk is the experience of Deltares in data gathering and analytics from environmental monitoring instruments for planning and concurrent management. The various Asian experiences of Deltares in risk reduction projects may be highlighted Delft%20FEWS%20Kerala2.pdf
15:25 IST to 15:40 IST 10:55 CET to 11:10 CET	Prof. Dr. Victor Jetten, ITC, Univ. of Twente	Catchment scale modelling of cascading hazards for scenario based spatial planning - OpenLISEM	The expectation from this talk is to share examples of catchment scale modelling of cascading hazards (flash floods, debris flows, landslides, floods) and introduction to such modelling tools which would be helpful for scenario based spatial planning. NL-Kerala-multihazard-lisem.pdf

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15:40 IST to 15:55 IST 11:10 CET to 11:25 CET	Mr. Bas Kolen, HKV consultants	Practical tools for integrated water resources management for daily use	The expectation from this talk is to understand the various models available across the globe and specific models developed by Netherlands that can be used on a daily basis HKV%20Kolen%20NWP%20India.pptx
15:55 IST to 16:10 IST 11:25 CET to 11:40 CET	Prof. Dr. C.J van Westen, ITC-CDR, Univ. of Twente	Risk Changes – The integrated risk assessment tool	The expectation from this talk is to showcase the experience of Risk Changes and how such an assessment tool could enable local risk reduction planning. Presentation%20Cees%20van%20WestenKerala%20NL.pdf
16:10 IST to 16:25 IST 11:40 CET to 11:55 CET	Prof. Dr. Richard Sliuzas, ITC, Univ. of Twente	Risk informed spatial planning – data requirements and best practices	Expectation from the talk is the experience sharing of the Netherlands on developing and maintaining detailed cadastral information and utilization of such information along with hazard information for spatial planning. Examples from global south on risk informed planning may also be highlighted. Cadaster%20planning%20and%20risk%20management%20Sliuzas.pdf

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16:25 IST to 16:45 IST 11:55 CET to 12:15 CET	Interactive session
16:45 IST to 17:00 IST 12:15 CET to 12:30 CET	Report: Dr. Sekhar L. Kuriakose/Dr. Dinand Alkema, ITC-CDR University of Twente - Recommendations for future collaboration based on the session Rapporteurs of session: Ir. Manu R and Mr. MSc. Pascal Weidema

Technical Session 2: Integrated water resource management, 26th of November 2021
<https://vimeo.com/650327316/5d2c8610f0>

Technical Session 2: Integrated water resource management			
Date and Time: 26 th November 2021, 14.30 IST to 17.00 IST 10:00 CET to 12:30 CET			
Link for webinar 26 November https://utwente-nl.zoom.us/j/89826000947 Personal panellist links have been sent to the speakers			
Time	Speaker	Title	Remarks

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14.30 IST to 14.40 IST 10:00 CET to 10:10 CET	<p>Introduction to the seminar – Dr. Sekhar L. Kuriakose</p> <p>Moderator: Ir. Pieter-Paul van Meel MSc (CE)</p>		
14:40 IST to 14:55 IST 10:10 CET to 10:25 CET	<p>Ir. Alex Varghese, Chief Engineer, Irrigation and Administration, Dept. of Water Resources</p>	<ul style="list-style-type: none"> • Urban flooding • Coastal erosion in Kerala – Challenges and solutions • Issues in Kuttanad 	<p>Focus on Kerala's extreme natural/climatic events and its impacts</p> <p>Explanation on constraints on wetland management. It is expected to identify the needs through knowledge/experience from Netherlands to mitigate recurring floods. presentation_alex_varghese.pdf</p>

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14:55 IST to 15:05 IST 10:25 CET to 10:35 CET	Ir. Priyesh R., Director, Irrigation Design & Research Board, Dept. of Water Resources	Capacity requirements for integrated water management & flood resilience building in Kerala	<p>The slides will focus on data capturing gaps, analytical gaps, need for a dynamic DSS & expectations from the experts. Expectations may include:</p> <ul style="list-style-type: none"> • Designing of flood abatement structures • Watershed based modelling for flood resilience • Flood impact assessment models for deriving design inputs • Bioengineering/NbS methods for flood risk reduction • Financial and institutional frameworks for maintenance and management of flood defence systems <p>presentation_priyesh.pdf</p>
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15:05 IST to 15:25 IS 10:35 CET to 10:55 CET	MSc. Nanco Dolman, Leading Professional in Water Resilient Cities, RHDHV	Urban Flood Management; Dike designs, management and automated systems for river flood management	<p>The expectation from this talk is to share the experience of RHDHV in</p> <p>Urban Flood</p> <p>Management designs and automation of urban flood risk reduction systems. Example of use of Duck Bill valves for unidirectional flow control, flow monitored automated diversion systems etc. may be of interest;</p> <p>Expectation from the talk is the experience of RHDV in dike designs, continued health monitoring of dikes, their management and automated systems for river flood management.</p> <p>20211126_Urban%20Flood%20Management_Dolman.pdf</p>
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15:25 IST to 15:40 IST 10:55 CET to 11:10 CET	Prof. Job Dronkers	Best practices hard engineering solutions for coastal protection	The expectation from this talk is to highlight the need to carefully plan with observational data before arriving at hard engineering solutions and how the Netherlands does it. What are the different hard engineering solutions adopted to protect the coast of the Netherlands and what are the suggestions of the speaker for coastal protection in high energy coasts like that of Kerala. Messages%20for%20the%20Kerala%20coast.pdf
15:40 IST to 15:50 IST 11:10 CET to 11:20 CET	MSc Jaap Flikweert, Leading Professional Flood Resilience RHDHV	Sand Engine, Building with Nature	Progress Partner for Water project Bacton Sand Engine, Digital Twin, Virtual Coast. Kerala%20-%20NL%20webinar%20soft%20coastal%20mgt%20Jaap%20Flikweert.pdf
15:50 IST to 16:05 IST 11:20 CET to 11:35 CET	Ms. Monique Berendsen Representative, Netherlands Delta Commission	Planning Delta Commission	Planning for Netherlands Water Resilience & Security for medium and long term. Planning process, financing and public, political stakeholders' acceptance. Kerala_Monique.pdf

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16:05 IST to 16:20 IST 11:35 CET to 11:50 CET	Mr. Dr. Bas Jonkman, Technical University Delft	The Limburg Floods of 2021	The expectation from this talk is to share the experience of the recent floods in Limburg and how Meuse works reduced the overall flood Impact. presentation_Limburg_Bas_Jonkman.pdf
16:20 IST to 16:35 IST 11:50 CET to 12:05 CET	Ir. Pieter-Paul van Meel MSc (CE), Advisor, Integrated Water Resources Management, RVO	Planning and Implementation of More Room for the River & Meuse Works	Expectation from the talk is the experience of the Netherlands in the implementation of More Room for the River with stress on comprehensive medium to long term planning based on observation and modelling data and the benefits of the project. Presentation%20IWRM%20RvR%20a%20Concept.pptx
16:35 IST to 16:45 IST 12:05 CET to 12:15 CET	Interactive session		

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16:45 IST to 17:00 IST	Report: Alex Varghese/Priyesh R – Recommendations for future collaboration based on the session;
12:15 CET to 12:30 CET	Rapporteurs of session: Ir. Manu R and Mr. MSc. Pascal Weidema

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Theme 3: Risk informed spatial planning and future collaborations

<https://vimeo.com/651979611/929daa44b9>

Theme: Risk informed spatial planning and future collaborations			
Date and Time: 1 st December 2021, 14.30 IST to 17.00 IST 10:00 CET to 12:30 CET			
Specialized link will be shared to the speakers as this is a closed event			
Time	Speaker	Title	Remarks
14.30 IST to 14.45 IST 10:00 CET to 10:15 CET	Inauguration: Dr. V.P Joy IAS, Chief Secretary, Kerala Keynote: Ambassador Venu Rajamony, Officer on Special Duty (External Cooperation), Government of Kerala Introduction to the sessions: Mr. Pranab Jyothi Nath IAS, Secretary, Water Resources and Drs. Fernanda van der Velde, RVO		
14:45 IST to 15:30 IST 10:15 CET to 11:00 CET	Recommendations of Technical Session 1 (25-11-2021): Risk informed planning – Dr. Sekhar L. Kuriakose Discussion		

	<p>Kerala side – Principal Secretary, Science & Technology & EVP, KSCSTE, Commissioner Disaster Management, Chief Town Planner, Director General KILA, Chief (Agri) and Chief of Perspective Planning, Planning Board</p> <p>Netherlands side – Mr. Hein Lageveen, Deputy Consular General of the Netherlands to India, Prof. Dr. Maarten van Aalst, Director, International Red Cross Climate Centre and University of Twente, Prof. Dr. C.J van Westen, Univ. of Twente, Ir. Pieter-Paul van Meel, Drs. Fernanda van der Velde, RVO, Ir. LuitJan Dijkhuis, Ministry of Infrastructure and Water, MSc. Pascal Weidema.</p> <p>Moderator: Ir. Pieter-Paul van Meel</p>
<p>15:30 IST to 16:15 IST 11:00 CET to 11:45 CET</p>	<p>Recommendations of Technical Session 2 (26-11-2021): Integrated water resource management – Ir. Alex Varghese</p> <p>Discussion</p> <p>Kerala side – Vice Chairman, Planning Board, Additional Chief Secretary, Water Resources, Additional Chief Secretary, Environment and Climate Change, Additional Chief Secretary, Local Self Government Department, Additional Chief Secretary, Disaster Management, Chairman KSEBL, Principal Secretary, Science and Technology and EVP, Kerala State Council for Science, Technology and Environment.</p> <p>Netherlands side – Ir. Luit-Jan Dijkhuis, Ministry of Infrastructure and Water, Drs. Fernanda van der Velde, Ir. Pieter-Paul van Meel,; Prof. J. Dronkers</p> <p>Moderator: Dr. Sekhar L. Kuriakose</p>

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P.M.	Proceedings will be compiled by Ir. Manu R and Mr. MSc. Pascal Weidema and edited by Alex Varghese/Priyesh R and Sekhar L. Kuriakose, Pieter-Paul van Meel and Fernanda van der Velde.
16:15 IST to 16:45 IST 11:45 CET to 12:15 CET	Concluding remarks – Mr. Pranab Jyothi Nath IAS, Secretary, Water Resources and Drs. Fernanda van der Velde, RVO. Rapporteurs of session: Ir. Manu R and Mr. MSc. Pascal Weidema

