SAARC
Disaster Management Centre (IU)

SDMC (IU) ANNUAL REPORT

2024-25

Contents

1. Background

South Asia is spread over approximately 5 million square kilometres with varied climate regions including the tropical monsoons region in the south, the sub-tropical region in the middle, and the temperate/alpine region in the north and far north. The South Asian countries, face unique challenges due to their varying topographies and climatic conditions. The South Asia region is comprised of Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The region covers roughly 11.50 per cent of the Asian continent and approximately 3.50 per cent of the land surface area of the world (World Bank, 2018). The region is home to a population of nearly 2 billion, constituting around 24.15 per cent of the world's population (7.95 billion), as of 2020 (World Bank n.d.) South Asia accounts for around 4.35 per cent of the world's gross domestic product (GDP) and is characterized by the highest concentrations of vulnerable populations (ADPC, 2024).

Disaster risk is increasing across the globe and more people in South Asia, and their assets, are increasingly vulnerable and exposed to that risk. The increased frequency and intensity of hazard events around the world confirms what the IPCC's Sixth Assessment Report (AR6) has mentioned that as global warming climbs beyond 1.5°C (2.7°F), the world faces a new and unprecedented level of climate hazards (UNDRR, 2024).

Recognizing the need quite timely, the SAARC Disaster Management Centre (SDMC-IU) was set-up at the Gujarat Institute of Disaster Management (GIDM) Campus in Gandhinagar, Gujarat, India in November 2016 with a vision to be a Centre of Excellence for regional cooperation and specialised service delivery to Member States for Disaster Risk Reduction (DRR), Response and Recovery for Sustainable Development.

2. Scope of Work

SDMC (IU) is working to give a fillip to regional cooperation for holistic management of disaster risk in the SAARC region. It serves the Member States by providing policy advice, technical support on system development, capacity building services and training. The Centre facilitates exchange of information and expertise for effective and efficient management of disaster risk. The Centre undertakes projects and programmes to serve the needs of the Member States. It seeks to expand from a 'knowledge sharing' organisation to an 'action-response' organisation and develop Standard Operating Procedures, tools, guidelines and methodologies for different types and phases of disasters.

It is vital for SDMC (IU) to have cooperation and technical collaboration for regional Disaster Management and Disaster Risk Reduction (DRR) and for making material contribution to the lives of vulnerable population and those exposed by the natural hazards and human induced disasters. The centre is entrusted with the responsibility to support Member States in their DRR initiatives through application of Science & Technology, knowledge from multiple disciplines, exchange of good practices, capacity development, collaborative research and networking in line with the global priorities and goals and other relevant frameworks adopted by Member States.

In addition, the SDMC (IU) has been re-established with an expanded role by merging four erstwhile SAARC Centres namely (1) SAARC Disaster Management Centre (SDMC– New Delhi, India); (2) SAARC Meteorological Research Centre (SMRC - Dhaka, Bangladesh); (3) SAARC Forestry Centre (SFC - Thimphu, Bhutan); and (4) SAARC Coastal Zone Management Centre (SCZMC - Male, Maldives). Disaster Risk Reduction relevant functions of these centres are also a part of the scope of work for SDMC(IU) now.

3. Vision

To be a Centre of Excellence for regional cooperation and specialised service delivery to Member States for Disaster Risk Reduction (DRR), Response, Recovery and Sustainable Development.

4. Mission

To support Member States in their DRR initiatives through application of Science & Technology, knowledge from multiple disciplines, exchange of good practices, capacity development, collaborative research and networking in line with the global priorities and goals and other relevant frameworks adopted by Member States.

5. Functions of SDMC (IU)

1. Provide assistance in formulation of Policies, Strategies and Sustainable Development Frameworks in relation to Disaster Management and Disaster Risk Reduction.
2. Undertake/ promote research for better understanding of the various meteorological phenomena of particular interest to the SAARC Region, with a view to enhance the capability of National Meteorological Services (NMSs) of the Member States, particularly in the field of early warning to provide support for preparedness and management of natural hazards involving relevant knowledge and operational institutions in India.

3. Collect, compile, document and disseminate data, information, case studies, indigenous knowledge and good practices relating to disaster risk reduction, and sustainable development.
4. Compile and collate information for the region required for weather forecasting and monitoring special weather phenomena.
5. Strengthen regional response mechanisms to reduce loss of lives, injuries and to provide timely humanitarian assistance to people affected by disasters.
6. To identify organisations in the region dealing with relevant key focus areas, facilitate interaction, promote coordination and cooperation amongst institutions (ministries, authorities, inter-governmental organisations, international organisations, non-governmental organisations, funding agencies, etc.) and other stakeholders involved through networking for the exchange of experiences, information, data, expertise, knowledge and technology transfer in the key focus areas of SDMC.
7. Organise training workshops, conferences, seminars, lectures for various stakeholders on key priority/focus areas of the Member States and on various aspects of disaster management.
8. Develop educational materials and conduct academic and professional courses on key priority/focus areas.
9. Develop training modules on various aspects of key priority/focus areas and conduct programmes for Training of Trainers including simulation exercises.
10. Coordinate SAADMEx with the Member States.
11. Analyse information, undertake research and disseminate research findings on key priority/focus areas among the Member States.
12. Undertake preparation of databases, publication of journals, research papers and books, and establish and maintain online resource centre in furtherance of the aforesaid objectives.
13. Collaborate with other global, regional and national centres of excellence to achieve synergies in programmes and activities.
14. Conduct studies on assessment and management of disaster risks posing a threat to inclusive and sustainable development in South Asia.
15. Undertake research, projects, programmes contributing towards mitigating the impact of trans-boundary disasters.
16. Facilitate from within and outside the region supply of emergency needs in times of disaster, in line with SAARC disaster response mechanisms.
17. Facilitate exchange of experiences and technical support among Member States on National Action Plans for Disaster Risk Reduction.

6. Activities in the Financial Year 2024-25

6.1 Preparation of Activity Plan

SDMC (IU) had prepared its annual Activity Plan for FY 2024-2025 based on the discussion in eight Inter-Ministerial Committee (IMC) Meeting and shared with MEA, GoI. Based on the administrative and financial approval received from MEA, GoI, following capacity building programs/ webinars were conducted.

6.2 Capacity Building Programs Organised

#	Name of the program	No. of Participants	Presence of Member States	Date
1	Virtual Workshop on Building Resilient Cities Strategies for Effective Urban Flood Management.	43	Five Member States (Except Afghanistan, Bangladesh and Bhutan)	27th – 29th January 2025
2	Virtual Workshop on Enhancing Sustainability & Resilience of Water Infrastructure for Disaster Risk Reduction & Resilience in South Asia	48	Six Member States (Except Afghanistan, Maldives)	25th – 27th March 2025

Note: the Details about the Virtual Workshops are given as Annexure A and Annexure B, respectively.

6.3 Other Programs

#	Activity	Action Taken
1	Publications*	One volume of the Newsletter has been published. Annual report for FY 2024-25 prepared.
2	Web Portal	SDMC (IU) updates its portal with all the necessary information/ data on regular basis.

*Copy of the Newsletter is given as Annexure C.

7. Financial Status for the FY 2024-2025 (₹)

Total Funds available as on date 01/04/2024	Fund Released during FY 2024-25	Expenditure incurred during FY 2024-25	Unspent Fund
50,77,926.00	**00.00**	**45,67,778.00**	**5,10,148.00**

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Annexure A

SAARC

Disaster Management Centre (IU)

Technical Proceedings of Workshop on **Building Resilient Cities: Strategies for Effective Urban Flood Management**

Contents

Introduction

Urban flooding in the SAARC region is an escalating threat, driven by a combination of climate change, rapid urbanization, and inadequate infrastructure and governance. As cities continue to expand, informal settlements often develop in flood-prone areas, lacking proper drainage systems, flood protection, and effective urban planning. Combined with extreme weather, such as heavy rainfall and rising sea levels, urban flooding is now a major issue in cities across the SAARC member states. In 2024, more than 50 million people were affected in all of these member states.

The impacts of urban flooding in the SAARC region are devastating, with widespread loss of life, displacement of populations and destruction of homes, infrastructure and essential services like water supply, sanitation and healthcare. The projections show that climate change could increase the economic cost of urban floods in South Asia by up to $23 billion annually by 2050. Vulnerable communities, particularly those living in informal settlements in flood-prone areas, are the most affected, often suffering from poor recovery due to limited resources. In addition, floods result in significant environmental damage, eroding soil, polluting rivers and lakes and destroying vital wetlands that naturally help mitigate flooding. The contamination of water sources also increases the risk of waterborne diseases, exacerbating the public health crisis.

Despite these challenges, many cities in the SAARC region and globally are making strides in reducing urban flood risks and building resilience. These cities are adopting innovative solutions such as nature-based approaches, including green infrastructure (e.g., parks, wetlands, and permeable surfaces), improved urban planning and upgraded drainage systems. This workshop will serve as a platform to learn from these successful practices, share experiences and explore strategies to enhance urban flood resilience. By raising awareness of effective flood management techniques and fostering regional collaboration, the workshop will equip participants with the knowledge and tools necessary to build more resilient cities through both technological and nature-based solutions.

Aim

The aim of the Training Workshop on Building Resilient Cities: Strategies for Effective Urban Flood Management for the SAARC Region is to equip participants with the knowledge, tools and strategies necessary to address urban flooding challenges in rapidly growing cities. The workshop will focus on practical approaches to reduce urban flood risks, build resilience and integrate sustainable solutions, including nature-based strategies, in urban planning and disaster risk management.

Objectives

1. Raise awareness about the growing threat of urban flooding in SAARC cities, its impacts and the urgent need for effective flood management strategies to ensure urban resilience.
2. Share successful case studies and good practices from cities in the SAARC region and globally that have effectively reduced flood risks and built resilience through innovative solutions, including green infrastructure, improved drainage systems and urban planning.
3. Highlight the role of nature-based solutions, such as wetlands, green roofs, permeable surfaces, etc. in managing storm water and enhancing urban flood resilience.
4. Create a platform for participants to collaborate, share experiences and discuss the challenges and opportunities in urban flood management across the SAARC region.

Workshop Overview

The SAARC Disaster Management Centre (IU) organized the virtual workshop on '**Building Resilient Cities: Strategies for Effective Urban Flood Management**' during 27-29 January 2025 for the SAARC Member States.

The workshop brought together 43 officials from five SAARC Member States: India, Maldives, Nepal, Pakistan and Sri Lanka. Participants represented various departments within their respective countries, including National Disaster Management Authorities, Response Forces, Ministries of Home and Foreign Affairs, Local Government, Urban Development & Housing Departments., etc.

The three-day virtual workshop featured a comprehensive blend of technical sessions and case studies presented by experts in their respective fields. The sessions provided valuable insights into urban flood management strategies, innovative solutions and good practices. On the final day, each participating country delivered detailed presentations highlighting their successful initiatives, good practices and the challenges they face in managing urban floods. They also shared practical solutions and mitigation strategies adopted to address these pressing issues.

This report provides a detailed account of the workshop proceedings, capturing key discussions, expert insights and country presentations. For further reference, the complete workshop agenda and the list of participants are included as Annexure 1 and Annexure 2, respectively.

Proceedings of the Sessions

Inaugural Session

Mr. Nisarg Dave, I/c Specialist, SDMC (IU) welcomed all the participants to the three-day virtual workshop on '**Building Resilient Cities: Strategies for Effective Urban Flood Management** 'from 27-29 January 2025.

Dr. Rajiv Kumar Gupta IAS (Retd.), Director, SDMC (IU) addressed the delegates and highlighted the need of effective urban flood management in South Asian Region. He emphasized the devastating impacts of urban floods, including the displacement of communities, damage to infrastructure and contamination of water supplies, which left millions vulnerable to health and livelihood risks. He stressed the urgent need for a shift from reactive responses to proactive, sustainable solutions. These include flood-resilient infrastructure, integrated urban management plans, IoT-based early warning systems, rainwater harvesting, and nature-based approaches like the "sponge city" model.

He highlighted the importance of public-private partnerships (PPP) and collaborative regional efforts to tackle urban flooding comprehensively. The workshop, he noted, would explore regional risks, innovative techniques and case studies while fostering dialogue on building resilient urban infrastructure and long-term recovery.

In conclusion, the speaker urged participants to move from awareness to action and use this workshop as a platform for shared learning and innovation, contributing to the achievement of key Sustainable Development Goals

The inaugural session concluded with a group photo as mentioned below:

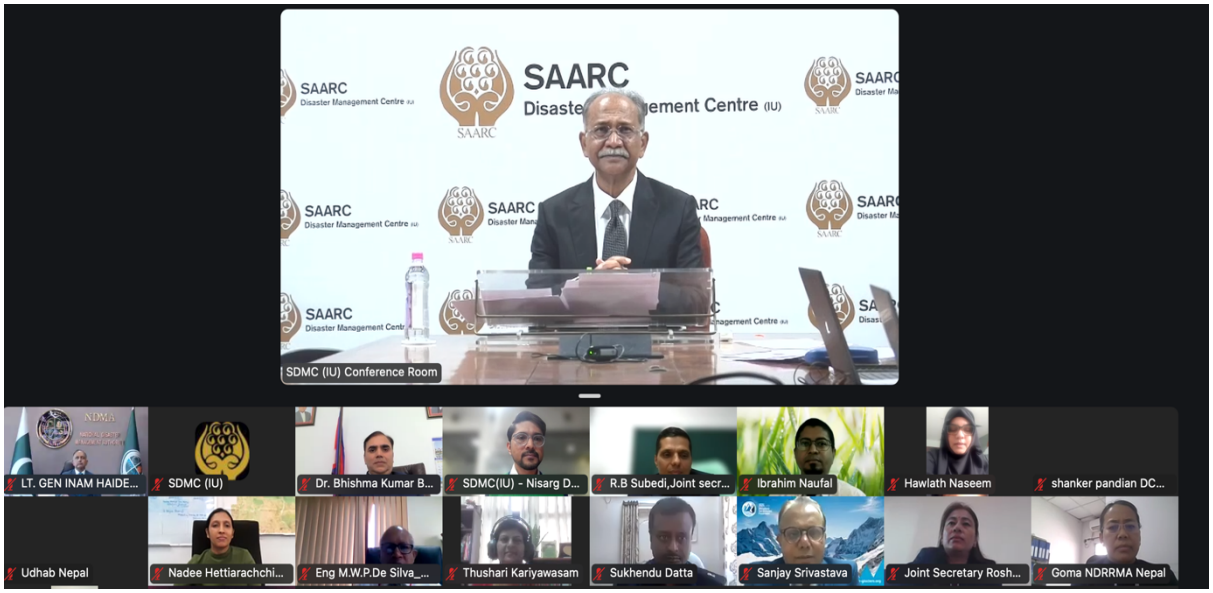

Figure 1 Director, SDMC (IU) and delegates from SAARC Member States during the group photo. Dated on 27th January 2025

Technical Sessions

1. Extreme Weather Events and Urban Floods: Risks and Opportunities in the SAARC Region
Dr. Sanjay Srivastava, Chief of Disaster Risk Reduction, UNESCAP

Dr. Srivastava delivered a comprehensive session on the economic losses caused by extreme weather events and outlined actionable strategies for countries in the region. Drawing from the findings of the UNESCAP Disaster Report for South and South West Asia 2024, he highlighted that over the past five decades, approximately 3 billion people were affected, and 1 million fatalities were recorded. Economic damages amounted to $485 billion, accounting for 17% of total disaster-related losses in the Asia-Pacific region.

He identified several multi-hazard risk hotspots across South Asia, including:

- Hindu Kush Himalaya Region: Prone to glacial lake outburst floods (GLOF), earthquakes and avalanches
- Indus River Basin: Vulnerable to floods and droughts
- Ganga-Brahmaputra-Meghna River Basin: Affected by floods and droughts
- Indian Ocean Region: Susceptible to tsunamis

In these densely populated areas, risks are escalating due to urbanization, population growth, limited resources and unplanned development. Alarmingly, more than 50% of the population in South Asia is projected to reside in 26 cities classified as extreme high-risk zones.

Dr. Srivastava emphasized the need for increased investments in adaptation, noting that current investments are insufficient and not risk-informed compared to the Average Annual Losses (AAL). He further stressed the adverse impact of disasters and climate risks on key Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action), SDG 1 (No Poverty), SDG 11 (Sustainable Cities and Communities) and SDG 15 (Life on Land).

To address these challenges, he recommended:

- Investing in Early Warning Systems for All: Including sector-specific early warnings
- Nature-based Solutions (NbS): For environmental restoration
- Comprehensive Disaster and Climate Risk Management: Leveraging opportunities for better preparedness
- Technology Clusters: Promoting science-based technologies for climate, agriculture, and health, alongside innovative technologies for infrastructure and energy
- Data Science and Geospatial Technology: For risk assessment and decision-making

Dr. Srivastava also encouraged participants to utilize the UNESCAP Risk and Resilience Portal for supporting risk-informed adaptation and resilience strategies. Citing the 2004 Tsunami as an example, he underscored the importance of regional cooperation in disaster preparedness and response.

2. Smart Cities and Floods: Innovative Techniques for Urban Flood Reduction
Mr. Kamlesh Yagnik, Chief Resilience Officer, Surat

The session highlighted Surat's transformation into a model for urban flood management and climate resilience in India. As the eighth-largest and fourth-fastest-growing city, Surat has faced recurring floods, with the 2006 flood being one of the most devastating. Post the construction of the Ukai Dam, flooding patterns changed, prompting the city to adopt a comprehensive, multi-pronged approach to flood mitigation.

Key initiatives undertaken by the city include:

- Infrastructure Improvements: Construction of embankments, flood retention walls and an upgraded stormwater drainage system.
- Proactive Measures: Removal of encroachments along riverbanks, establishment of an early warning system and the development of disaster management plans at both city and ward levels.
- Technology Integration: Use of advanced rainfall forecast models, such as the Multi-Model Ensemble Model (IMD), Weather Research and Forecasting Model (European sources), and Global Forecast System (NASA), to generate inflow forecasts for the Ukai Dam and assess flood scenarios across wards.
- Risk Communication: Implementation of an innovative color-coded pole system to communicate flood risk to the public.
- Slum Relocation: Resettlement of communities to EWS housing, ensuring better safety and living conditions.

To further enhance climate resilience, Surat has installed automatic weather stations and participates in the Asian Cities Climate Change Resilience Network. Collaboration with national agencies, including the Indian Meteorological Department (IMD), IIT Delhi, and the Narmada Water Resources & Water Supply Department, Government of Gujarat plays a crucial role in risk assessment, reservoir management, and early warning systems.

The city updates its Disaster Management Plans annually in coordination with Gujarat State Disaster management authority (GSDMA), and each zone maintains its own Zone Disaster Management Plan (ZDMP) with regular training on flood management for local teams.

During the interactive session, delegates from Nepal and Pakistan inquired about community reactions to the relocation process and associated challenges. The speaker highlighted the importance of community engagement and long-term stakeholder

consultations in facilitating smooth relocations and establishing necessary social infrastructure. The insights shared underscored Surat's commitment to continuous improvement and building a more resilient and adaptive urban environment.

3. Community Engagement and Citizen Participation in Flood Risk Reduction

Dr. Sumedha Dua, Sustainable Environment and Ecological Development Society (SEEDS)

Dr. Dua presented an insightful session on the critical role of community engagement and the application of technology in flood risk reduction in India. Highlighting the country's vulnerability, she noted that India ranks second in disaster risk according to the World Risk Index 2022, with floods causing widespread loss of life and severe economic disruptions.

To address these challenges, SEEDS has leveraged technology for improved risk assessment using AI and machine learning models. Key initiatives include:

- Localized Impact Assessments: AI models generate hyper-local assessments to identify vulnerabilities and predict flood impacts.
- Cyclone Fani Case Study: High-resolution satellite imagery was used to identify building roof types. With assistance from Microsoft scientists, a training dataset of 50,000 roofs was developed to inform disaster preparedness.
- AI for Resilient Cities Model: This model follows a structured four-step process:
    - Developing a cluster-wise hazard risk register
    - Creating a risk scoring matrix
    - Conducting hyper-local assessments
    - Generating outputs, including risk reports, dashboards, and geospatial data categorized by roof types

The model has been successfully scaled to address multiple hazards, such as heatwaves, earthquakes and floods. During Cyclone Nivar, the AI model identified over 30 vulnerable areas in Chennai, enabling advisories and targeted preparedness efforts. Volunteers played a vital role in assisting community groups during Cyclones Nisarga (2020) and Tauktae (2021) as well.

Dr. Dua underscored the significant benefits of AI-driven risk assessments, including:

- Enhanced Community Resilience: By facilitating timely evacuations and issuing actionable advisories
- Economic Protection: Minimizing household asset losses, safeguarding livelihoods and reducing debt burdens
- Health and Sanitation Improvements: Ensuring secure drinking water and reducing waterborne disease risks
- Government Collaboration: Partnering with government agencies for surveys, awareness campaigns and workshops

In conclusion, Dr. Dua emphasized that AI-led hyper-local assessments empower communities, increase accountability and strengthen resilience against disasters.

4. Building Resilient Urban Infrastructure and Services

Dr. Umamaheshwaran Rajsekhar, Coalition of Disaster Resilient Infrastructure (CDRI)

Dr. Rajsekhar provided a comprehensive overview of the Coalition for Disaster Resilient Infrastructure (CDRI), a global partnership that brings together national governments, UN agencies, multilateral development banks, the private sector and knowledge institutions. The coalition's primary goal is to enhance the resilience of infrastructure systems against climate and disaster risks, contributing to sustainable development.

Key Discussion Highlights:

- Impact of Hazards on Infrastructure: Dr. Rajsekhar highlighted the vulnerability of critical urban sectors, such as mobility, buildings, energy and water, to climate-related hazards.
- Urban Infrastructure Resilience Program (UIRP): This initiative aims to improve urban livability in low- and middle-income countries through resilient infrastructure planning and data-driven decision-making to manage urban shocks and stresses.
- Urban Planning Solutions: Dr. Rajsekhar emphasized the importance of network-based planning over traditional Land Use and Land Cover (LULC) approaches.

Case Studies and Innovative Solutions:

- Nature-Based Solutions (NbS): Examples included the Green Pedestrian Axis in Tokyo, East Kolkata Wetlands Management, Adyar River Restoration in Chennai and Mangrove Management in Mumbai.
- Engineering Solutions: Notable examples included flood barriers at The Maeslantkering in Rotterdam and The Thames Barrier in London; advanced storm water management at the Floodwater Diversion Facility in Tokyo, Storm water Storage Scheme in Hong Kong, and the Chicago Deep Tunnel; and rainwater harvesting initiatives at both community and building levels, such as Parkroyal Collection Pickering in Singapore.
- Hybrid Solutions: Good practices included the Wetland Restoration Project in Dhaka and the Chulalongkorn University Centenary Park.

Policy Solutions: Dr. Rajsekhar emphasized the need for comprehensive flood management strategies, including:

- Land use planning and building regulations to prevent development in flood-prone areas
- Storm water harvesting ordinances and flood risk maps

- Flood risk assets registers and awareness programs for community preparedness
- Emergency response plans and technical guidance through a code of practice
- Financial mechanisms, including revenue sources, subsidies, and incentives

Dr. Rajsekhar emphasized the critical need for developing state-of-the-art urban infrastructure to enhance resilience against disasters. He highlighted the importance of establishing dedicated city disaster management cells to coordinate preparedness and response efforts effectively. Additionally, he stressed the need for maintaining comprehensive repositories of floodplain maps to guide urban planning and risk assessment. Implementing advanced dam management systems was identified as a key measure to control water flow during extreme weather events. Strengthening early warning mechanisms to ensure timely alerts and proactive measures was also underscored as a crucial component for safeguarding urban communities. He concluded by emphasizing that urban resilience requires a collaborative approach involving government agencies, community stakeholders, and technological innovations to build safer, more sustainable cities.

5. Integrating Nature-Based Solutions into Urban Flood Management
Dr. M. B. Joshi, Consultant, Gujarat Institute of Disaster Management

Dr. Joshi highlighted the multifaceted challenges associated with urban flood management, emphasizing the impact of rapid urbanization, climate change and aging infrastructure. He explained how urbanization exerts pressure on natural watercourses, increasing flood risks as impervious surfaces such as roads and buildings limit water infiltration and heighten runoff volumes. Climate change compounds this issue by altering precipitation patterns, leading to more frequent and intense rainfall events, thereby increasing both the frequency and severity of urban floods. Additionally, aging flood infrastructure in many urban areas lacks the capacity to manage rising runoff volumes and remains prone to failures.

To address these challenges, Dr. Joshi outlined several flood conveyance strategies, including channel improvements, floodplain restoration, and the construction of bypass channels. He shared examples of effective flood management practices from various regions in India, such as the innovative flood mitigation measures at Khambhati Khuva and the Ukai Dam in Surat, Gujarat, as well as traditional water management systems at Jaigarh Fort in Rajasthan.

He also presented case studies around the world, such as Water-Sensitive Urban Design in Rotterdam, Netherlands; Green Infrastructure initiatives in Chicago, USA; Cloudburst Management in Copenhagen, Denmark; and Comprehensive Flood Management practices in Singapore. These examples illustrated a range of innovative approaches that have successfully addressed flood risks while enhancing urban resilience.

Dr. Joshi concluded by critically addressing the gap between theoretical frameworks and their real-world applications. He emphasized the need for customized solutions tailored to the unique challenges of different urban areas, stressing that a one-size-fits-all approach is inadequate. With over two-thirds of the global population expected to reside in urban areas by 2050, he underscored the immense long-term value of investing in well-planned and resilient cities.

He further recommended that stormwater drainage planning incorporate climate resilience measures using Representative Concentration Pathway (RCP) 8.5 or higher scenarios. While acknowledging significant progress in urban planning and infrastructure development, Dr. Joshi emphasized the importance of continuous knowledge sharing and collaborative efforts to drive sustainable and effective urban flood management solutions for the future.

Case Studies

Case Study1: Innovative Approaches to Urban Flood Risk Reduction (South Korea)
Mr. Sanjaya Bhatia, Head, UNDRR GETI ONEA

Mr. Sanjaya Bhatia introduced the Making Cities Resilient (MCR2030) initiative and provided valuable insights into its role as a city network for knowledge sharing on urban resilience. He highlighted that the initiative offers a self-assessment tool to assist local governments in adopting people- and nature-centered, multi-hazard approaches to early warning systems.

As a case study, Mr. Bhatia presented the Disaster Resilience Scorecard Application for Flood Risk Reduction in Ulsan Metropolitan City, South Korea. Ulsan has been conducting annual scorecard assessment workshops led by the Ulsan Research Institute since 2018. The outcomes of these assessments inform policy enhancements and the development of new urban resilience strategies. Under MCR2030, Ulsan is creating a comprehensive Urban Master Plan based on risk analysis, integrating disaster risk prevention into urban management strategies and ensuring risk assessments for development projects. Notable efforts include the development of an ecological city around the Taehwa River and the preservation of a 40km bamboo forest, which functions as a natural disaster buffer and vital habitat for migratory birds. Additionally, Ulsan is collaborating with the National Disaster Management Research Institute to strengthen disaster preparedness.

The speaker highlighted the Leading City Project under MCR2030, which emphasizes green infrastructure through water circulation strategies. Key disaster mitigation measures include the seismic reinforcement of public facilities and bolstering the resilience of lifelines and public services.

Beyond Ulsan, Mr. Bhatia presented other notable initiatives. He mentioned Korea Safe Net, a unified broadcast system designed for rapid emergency responses, and

Jakarta's Smart Emergency Response System, which integrates multiple crowdsourced platforms into a centralized control room for real-time flood forecasting and emergency management. In the context of transboundary risk management, the Central Asian Flood Early Warning System (CAFEWS) was highlighted as a shared virtual platform for data exchange, weather monitoring and flood forecasting, serving countries such as Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan and Afghanistan. This initiative enhances regional disaster preparedness by delivering accurate hydrometeorological information.

Mr. Bhatia also emphasized the importance of multipurpose infrastructure projects, citing the Kuala Lumpur Stormwater Management and Road Tunnel (SMART) as a global best practice. This innovative tunnel diverts floodwater from the city's financial district while serving as a roadway. Its dual-function design ensures a high safety margin essential for critical infrastructure. Since its inception, the SMART tunnel has been activated 114 times, successfully preventing at least seven major flash floods and saving hundreds of millions in potential economic losses.

Concluding the session, Mr. Bhatia referenced the catastrophic Dubai floods of 2024, urging delegates to acknowledge the increasing intensity of natural hazards and the unprecedented scale of losses and damages. He emphasized the urgent need for proactive disaster risk reduction measures and global collaboration to build resilient urban environments.

Case Study 2: Rebuilding Resilience: Lessons learned from recent floods to improve long term recovery
Dr. Sekhar L. Kuriakose, Kerala State Disaster Management Authority

Kerala has been recognized for its proactive disaster management efforts, emphasizing human resource development, institutional strengthening at both state and district levels and the decentralization of disaster management to Local Self-Governments (LSGs). The state has also prioritized climate change awareness and disaster risk reduction through resilient housing initiatives.

In 2018, Kerala experienced catastrophic floods that affected all 14 districts and submerged 687 sq. km of land. Additionally, a multi-hazard scenario unfolded as landslides impacted 1,260 villages, further exacerbating the crisis. In response, the 2019 Local Government Disaster Management Plans (LGDMPs) marked a paradigm shift by empowering LSGs as frontline entities with the necessary authority, funds, and resources to implement disaster resilience measures effectively. This initiative has focused on downscaling spatial risk information for localized planning, ensuring comprehensive disaster management plans for all LSGs, and addressing climate change impacts at the grassroots level.

To enhance disaster communication, the CAP-integrated Location-Based Public Messaging System, developed by CDoT with funding from NDMA, has been operational

in Kerala since 2018. Furthermore, KaWaCHaM, an advanced disaster warning system integrating alerts, sirens, and global weather models, has significantly improved the state's early disaster preparedness and public safety.

Key initiatives undertaken include Operation Breakthrough (2019), which addresses pluvial flooding, the construction of resilient housing for indigenous communities, and the integration of social technology alongside technical solutions. These measures reflect Kerala's commitment to an inclusive approach to Disaster Risk Reduction (DRR), emphasizing the empowerment of local governments and communities as the cornerstone of true resilience, rather than relying solely on technological advancements.

The workshop discussions underscored the importance of continued investment in local-level resilience strategies, community participation, and innovative solutions that balance social and technological interventions. These efforts collectively contribute to a more sustainable and adaptive disaster management framework for Kerala and serve as a model for other regions facing similar challenges.

Case Study 3: Lessons learned from Recent Flood: Improving Response and Preparedness

Mr. Piyush Anand IPS, Director General, National Disaster Response Force (NDRF)

Mr. Piyush presented an in-depth overview of India's vulnerability to natural hazards and the critical role of the National Disaster Response Force (NDRF) in flood management. He outlined that India faces a spectrum of disasters, including earthquakes, droughts, floods, cyclones and landslides. The NDRF operates across the country, with its presence established at 68 locations, comprising 16 battalion headquarters, 28 Regional Response Centres and 24 Temporary Placement Locations.

Mr. Piyush highlighted NDRF's deployment in major flood incidents, including the Srinagar Floods (2014), Chennai Floods (2015), Silchar Floods (2022), Delhi Floods (2023), Vadodara Floods (2024) and the most recent Vijayawada Floods (2024).

Addressing the challenges in flood management, he identified issues such as unreliable rainfall forecasting, inadequate stormwater drainage systems and the simultaneous release of reservoir waters that intensify urban flooding. High-density settlements in floodplains, resource shortages, power outages and communication breakdowns further complicate response efforts. Post-flood complications, including health risks, drinking water scarcity, sanitation issues and difficulties in animal evacuation, are compounded by misinformation, media pressure and public panic.

During rescue operations, challenges include evacuation reluctance, prioritization dilemmas, navigation difficulties in narrow lanes and law and order concerns. Life-threatening hazards for responders and coordination difficulties when local officials are unavailable also delay effective relief efforts.

Mr. Piyush highlighted the significant improvements in NDRF's preparedness and response capabilities, driven by lessons learned from past incidents. He emphasized key strategies such as the tactical pre-positioning of NDRF and State Disaster response Force (SDRF) teams in hotspot cities to ensure rapid response during emergencies. Mock exercises and capacity-building initiatives have been pivotal in enhancing operational efficiency and disaster readiness. Strengthened inter-agency coordination, communication redundancies and the adoption of a clear Incident Response System (IRS) were also underlined as critical measures for streamlined disaster management. Community involvement plays a vital role, with local guides and trained first responders, including Aapda Mitras and NYKS volunteers, contributing effectively to response efforts.

Mr. Piyush concluded by stressing the need for continued investment in capacity building, technological advancements and greater community engagement to ensure effective flood risk management and disaster response.

Country Presentations

Innovative Nature-Based Solutions into Urban Flood Management

1. India

Mr. Chandan Singh, Under Secretary (Mitigation), National Disaster Management Authority, India

Mr. Chandan Singh provided valuable insights into India's disaster management initiatives led by the National Disaster Management Authority (NDMA). He outlined NDMA's key responsibilities, including the development of national policies, plans, and guidelines addressing various hazards, facility-specific measures, and cross-cutting issues. NDMA also plays a pivotal role in formulating disaster preparedness plans for different ministries, securing necessary approvals, and offering technical guidance to states and Union Territories (UTs).

Focusing on the workshop's central theme, Mr. Singh highlighted NDMA's efforts in flood management, including the development of guidelines, standard operating procedures (SOPs), and related protocols. Given India's susceptibility to multiple hazards, he stressed the critical need for proactive disaster risk reduction to safeguard lives and infrastructure.

He detailed several key flood management initiatives outlined in NDMA's guidelines, such as the enactment of Flood Plain Zoning Regulations, the implementation of flash flood forecasting and early warning systems, and the establishment of river basin organizations like the Brahmaputra Board and the Ganga Flood Control Commission (GFCC) to manage floods across various river basins. Additionally, he discussed the Urban Flood Risk Management Program (UFRMP), a comprehensive initiative running from 2021 to 2026 that aims to develop integrated flood management solutions in

major cities, including Mumbai, Chennai, Kolkata, Bengaluru, Hyderabad, Ahmedabad, and Pune.

Concluding his presentation, Mr. Singh updated the delegates on the progress of UFRMP and other ongoing initiatives, emphasizing NDMA's commitment to strengthening India's resilience against disasters.

2. Maldives

Mr. Ibrahim Naufal, Contract Management Engineer, Ministry of Construction, Housing, and Infrastructure, Maldives

Mr. Ibrahim Naufal provided an overview of the Maldives, highlighting its geographical characteristics, total area, and vulnerability to climate change and rising sea levels. He explained that flooding in the Maldives primarily results from two types: pluvial flooding, caused by heavy rainfall, and coastal flooding, triggered by swells and storm surges. Due to the country's flat terrain and island-based geography, flood depth is typically less than 1 meter.

According to the Maldives Meteorological Service, the country receives an annual average rainfall of 2,000mm to 2,200mm. To mitigate flooding, the government has implemented various measures, including installing pumping stations, enhancing drainage systems, and designing coastal infrastructure with a 50-year lifespan while factoring in sea level rise.

Concluding his presentation, Mr. Naufal highlighted the significant economic impact of climate-induced disasters, with flood-related damages contributing millions of dollars between 2015 and 2022. He expressed his appreciation to the SDMC (IU) team for organizing the virtual workshop on this critical topic.

3. Nepal

Mr. Bhishma Kumar Bhusal, Joint Secretary, Ministry of Home Affairs, Nepal

Mr. Bhishma Kumar Bhusal emphasized Nepal's high susceptibility to various disasters, including earthquakes, floods and avalanches, ranking it as one of the most disaster-prone countries in the world. Among these hazards, floods account for approximately 40% of annual disasters, followed closely by landslides. He referenced the major floods in July 2024 and a Glacial Lake Outburst Flood (GLOF) in August, underscoring Nepal's ongoing vulnerability.

To enhance disaster preparedness, the National Disaster Risk Reduction and Management Authority (NDRRMA) has been installing multi-hazard Early Warning Systems (EWS) in high-risk areas. The BIPAD information ecosystem, a comprehensive digital platform, includes a web portal, mobile applications, an e-learning system, and a Reconstruction Management Information System (RMIS).

Addressing Nepal's key challenges—unplanned urbanization, damage to water infrastructure, and shifting river courses—he outlined several strategies:

- River protection and management
- Restoration of cultural and historical sites
- Improvement of river water quality and availability
- Capacity-building initiatives

Additionally, he highlighted new urban development projects such as the Valley Ring Road Development, beautification of the Bagmati River, river embankments, and strengthening of sewage treatment plants. During the Q&A session, Mr. Bhusal addressed concerns about last-mile connectivity for the BIPAD portal, emphasizing its role as a people-centered Multi-Hazard Early Warning System (MHEWS) designed for broad accessibility.

4. Pakistan

Ms. Zahra Hassan, GM, Tech Early Warning, National Disaster Management Authority, Pakistan

Ms. Zahra Hassan provided an in-depth overview of Pakistan's disaster risks and the proactive measures implemented by NDMA, Pakistan. She highlighted the National Emergency Operation Centre, showcasing graphical representations and real-time data monitoring, which enhance risk communication and outreach across the country.

Key flood management strategies include:

- Advanced forecasting systems
- GIS and Remote Sensing (RS) technologies for exposure assessment
- GIS-based Urban Flood Risk Assessment and HEC-RAS modeling for rivers such as Indus and Kabul and cities like Bahawalpur and Mardan.

She also discussed infrastructure loss assessments, emphasizing Pakistan's first national-level Infrastructure Risk Atlas. This initiative maps high-risk areas based on infrastructure vulnerabilities to floods and earthquakes, utilizing detailed building-type data. To improve disaster response, NDMA has established material hubs stocked with wooden planks, CGI sheets, bamboo and light-gauge components. These pre-positioned resources ensure immediate reconstruction support for communities affected by disasters.

5. Sri Lanka

Mrs. Asanka Weerasinghe, Sri Lanka Land Development Corporation under Ministry of Urban Development Construction and Hosuing, Sri Lanka

Mrs. Asanka Weerasinghe discussed Sri Lanka's flood management challenges, focusing on its 103 river basins and major waterways, particularly the Kelani River Basin, which spans 2,230 sq. km. She referenced the devastating floods in Colombo

in November 2010, which exposed weaknesses in the city's drainage infrastructure, particularly within the Metro Colombo catchment.

Key causes of flooding in Colombo Metropolitan Area include:

- Overflow of the Kelani River
- Canal overtopping due to heavy rainfall
- Rapid urbanization and encroachment
- Loss of wetlands, reducing flood storage capacity

To enhance flood resilience, Sri Lanka has implemented both structural and non-structural interventions:

- Improving canal conveyance capacity
- Enhancing secondary drainage systems
- Preserving wetlands for flood absorption
- Minimizing impervious surfaces to reduce runoff

Implementing an Integrated Flood Management System, featuring:

- SCADA-based flood control monitoring
- Real-time weather and water level tracking
- Early warning systems
- Flood risk assessments

She also expressed concerns about ongoing challenges such as increasing rainfall intensity, rapid urban expansion and insufficient maintenance of drainage infrastructure. She emphasized that addressing these issues requires targeted strategic interventions, enhanced wetland management and comprehensive long-term flood mitigation planning for Metro Colombo.

Closing Session

The workshop concluded with closing remarks delivered by the Director, SDMC (IU). Over the three days, participants explored diverse topics, including technical solutions, policy frameworks and practical strategies to enhance urban flood resilience. Case studies from SAARC nations and other regions provided valuable lessons and actionable insights. The Director expressed sincere gratitude to the SAARC Secretariat for their coordination and to the member state governments for nominating enthusiastic participants who enriched the discussions. Special appreciation was extended to the distinguished speakers for their insightful presentations and to the participants for their active engagement.

Acknowledging the hard work and dedication of the SDMC (IU) team, the Director highlighted the seamless execution of the event and its significant contributions to knowledge sharing. Concluding on a positive note, the Director expressed hope that the knowledge gained during the workshop would strengthen future efforts in building resilient urban environments and disaster management strategies.

Annexure 1 - Agenda

Day 1: 27th January 2025		
Time	**Session**	**Resource Persons**
10:45 - 11:00	**Welcome and Inaugural Session** • Welcome • Participant introduction • Inauguration and Introduction to the workshop	**Dr. Rajiv Kumar Gupta,** Director SDMC (IU)
11:00 - 11:30	**Session 1: Extreme Weather Events and Urban Floods: Risks and Opportunities in the SAARC Region** • Geographic, climatic and urbanization trends driving urban floods • Historical flood events and lessons learned • Urban Hydrology and Flood Mechanisms • Highlights of urban risks and emerging opportunities	**Mr. Sanjay Srivastava** Chief of DRR, UNESCAP
11:30 - 12:00	**Session 2: Smart Cities and Floods: Innovative Techniques for Urban Risk Reduction** • Flood forecasting and early warning systems • Smart water management technologies and GIS-based solutions • Dynamic Drainage Control Systems • Use of Satellite Imagery and advanced monitoring systems	**Mr. Kamlesh Yagnik** Chief Resilience Officer Surat
12.00 - 12.30	**Session 3: Community Engagement and Citizen Participation in Flood Risk Reduction** • Assessment of Flood hazard, dimensions of vulnerability and risk through inclusive participatory approach • Example of local DRR strategies and action plans	**Dr. Sumedha Dua,** Sustainable Environment And Ecological Development Society (SEEDS)

Day 2: 28th January 2025		
Time	**Session**	**Resource Persons**
10:45 – 11:15	**Session 4: Building Resilient Urban Infrastructure & Services** • Designing flood-resilient infrastructure, Land use and planning • Implementation of National building codes (NBCs) and standards • Retrofitting of existing infrastructure to withstand floods.	**Dr. Umamaheshwaran Rajsekhar** Advisor Urban Resilience Coalition for Disaster Resilient Infrastructure (CDRI)

11:15 – 11:45	**Case Study 1: Innovative Approaches to Urban Flood Risk Reduction (South Korea)**	**Mr. Sanjaya Bhatia** Head, UNDRR GETI ONEA
11:45 – 12:15	**Case Study 2: Rebuilding Resilience: Lessons from Recent Flood to Improve Long-Term Recovery**	**Dr. Sekhar L. Kuriakose** Member Secretary, Kerala State Disaster Management Authority
12.15 – 12.45	**Case Study 3: Lessons Learned from Recent Flood: Improving Response and Preparedness**	**Mr. Piyush Anand** Director General National Disaster Response Force

Day 3: 29th January 2025		
Time	Session	Resource Persons
10:45 – 11:15	**Session 5: Integrating Nature-Based Solutions into Urban Flood Management** • Interventions like Flood conveyance; Water retention and detention methods, controlling bank erosions, impact reductions • Examples of Wetland restoration, meander restoration, reviving of old channels, removing water barriers • Implementation, operational challenges and solutions	**Dr. M. B. Joshi** Consultant, GIDM
11.15 - 13.15	**Session 6: Innovative Approaches to Urban Flood Risk Reduction: Lessons from SAARC Member States** (15 min. each)	**Representatives of SAARC Member States**
	1. India	*Mr. Chandan Singh*
	2. Maldives	*Mr. Ibrahim Naufal*
	3. Nepal	*Mr. Bhishma Kumar Bhusal*
	4. Pakistan	*Ms. Zahra Hassan*
	5. Sri Lanka	*Mrs. Asanka Weerashinghe*
13:15 – 13:30	**Closing Ceremony** • Wrap up & Closing remarks	**Dr. Rajiv Kumar Gupta,** Director SDMC (IU)

Annexure 2 - List of Participants

#	Country Name	Flag	Participant's Name	Designation	Department
1	India		Mr. S Shanker Pandian	Deputy Commandant	4th Battalion National Disaster Response Force
2	India		Mr. Sukhendu Datta	Deputy Commandant	10th Battalion National Disaster Response Force
3	India		Mr. Chandan Singh	Under Secretary-Mitigation	National Disaster Management Authority
4	India		Mr. Antony Joh Moothedan	Consultant – Urban Flood	National Disaster Management Authority
5	India		Mr. Amarjeet Kumar	Assistant Professor	National Institute of Disaster Management
6	India		Ms. Avipsha Mohanty	Young Professional	RID Division, National Institute of Disaster Management
7	India		Dr. Vipul Nakum	Manager – DRR	GIFT City, Gujarat
8	India		Dr. Sandeep Pandey	Associate Professor cum Senior Program Manager	Gujarat Institute of Disaster Management
9	India		Ms. Anusha Vyas	Research Associate cum Program Coordinator	Gujarat Institute of Disaster Management
10	Maldives		Mr. Mohamed Rafeeq	Minister of State	Ministry of Cities, Local Government and Public Works
11	Maldives		Mr. Mohamed Ali	Deputy Minister	Ministry of Cities, Local Government and Public Works
12	Maldives		Ms. Aishath Huma	Environmental and Social	Ministry of Construction, Housing and Infrastructure

#	Country Name	Flag	Participant's Name	Designation	Department
				Safeguard Specialist,	
13	Maldives		Mr. Ibrahim Naufal	Contract Management Engineer	Ministry of Construction, Housing and Infrastructure
14	Maldives		Mr. Aman Khaleel	Senior Planning Analyst	Ministry of Finance and Planning
15	Maldives		Ms. Aishath Anha Haisham	Senior Policy Officer	Ministry of Finance and Planning
16	Maldives		Ms. Faroosha Ali Naseer	Director	National Disaster Management Authority
17	Maldives		Ms. Aishath Ilma	Manager	National Disaster Management Authority
18	Maldives		Ms. Aminath Shaufa	Senior Administrative Officer	National Disaster Management Authority
19	Maldives		Ms. Hawlath Naseem	Assistant Director	Ministry of Foreign Affairs
20	Nepal		Mr. Bhisma Kumar Bhusal	Joint Secretary	Ministry of Foreign Affairs
21	Nepal		Ms. Roshni Kumari Shrestha	Joint Secretary	Ministry of Home Affairs
22	Nepal		Mr. Rambandhu Subedi	Joint Secretary	Ministry of Home Affairs
23	Nepal		Mr. Dijan Bhattarai	Under Secretary	Ministry of Home Affairs
24	Nepal		Ms. Hiradevi Paudel	Under Secretary	Ministry of Home Affairs
25	Nepal		Ms. Gomadevi Chemjong	Under Secretary	Ministry of Home Affairs
26	Nepal		Mr. Roshan Shrestha	Deputy Director	General, Department of Urban Development and Building Construction

#	Country Name	Flag	Participant's Name	Designation	Department
27	Nepal		Mr. Safal Shrestha	District Commissioner	kathmandu Valley Development Authority
28	Nepal		Mr. Uddhab Nepal	C.D.E.	Ministry of Urban Development
29	Nepal		Mr. Arjun Ghimire	Section Officer	Ministry of Foreign Affairs
30	Pakistan		Ms. Saba Shahzadi	AM Hydrology, Tech EW	National Disaster Management Authority
31	Pakistan		Mr. Muhammad Umair	DM Hydrology, Tech EW	National Disaster Management Authority
32	Pakistan		Mr. Saleem Malik	Executive Director (Climate & Disaster Risk Financing)	National Disaster Management Authority
33	Pakistan		Mr. Muhammad Razi	Director, Policy-DRR	National Disaster Management Authority
34	Pakistan		Mr. Saleem Raza	Executive Director, IA&PD wing	National Disaster Management Authority
35	Pakistan		Mr. Zohaib Jamal Khan	Manager (Policy), DRR Wing	National Disaster Management Authority
36	Pakistan		Mr. Muhammad Nawaz	Assistant Manager (Infrastructure) IA&PD wing	National Disaster Management Authority
37	Pakistan		Mr. Abdul Latif	Deputy Director, CDRF	National Disaster Management Authority
38	Sri Lanka		Ms. A.A.A.K.K. Seneviratne	Director (Mitigation, Research & Development)	Disaster Management Centre
39	Sri Lanka		Brigadier T.N.K. Perera	Director (Operations)	Disaster Management Centre
40	Sri Lanka		Mrs. Udya Abeysinghe	Assistant Director (Preparedness)	Disaster Management Centre

#	Country Name	Flag	Participant's Name	Designation	Department
41	Sri Lanka		Wing Comm. G P Dissanayaka	Assistant Director (Colombo Dist.)	Disaster Management Centre
42	Sri Lanka		Mr. Eng M.W.P.De Silva	Director General (Urban Development)	Ministry of Urban Development, Construction & Housing
43	Sri Lanka		Ms. M G Thushari Kariyawasam	Deputy Director (Landscape Consultancy)	Urban Development Authority

Annexure B

SAARC
Disaster Management Centre (IU)

Technical Proceedings

A Virtual Workshop on Enhancing Sustainability & Resilience of Water Infrastructure for Disaster Risk Reduction & Management in South Asia

March 25-27, 2025

Contents

Introduction

Background

South Asia, home to about 2 billion people, is one of the world's most disaster-prone regions, experiencing 39% of global disaster occurrences, with a majority linked to water-related hazards such as floods, droughts, cyclones, flash floods, landslides and water quality emergencies. Each year, floods affect over 120 million people in the region, causing economic losses exceeding $10 billion, while cyclones, particularly in coastal areas like the Bay of Bengal and Arabian Sea, result in damages of over $8 billion and threaten 80 million coastal residents. Droughts influence 40% of South Asia's agricultural land, placing the livelihoods of over 500 million people at risk and causing $7 billion in annual losses. Over the last two decades, water-related disasters have disproportionately affected vulnerable populations, with an estimated 1.8 billion people impacted. During droughts, the depletion of nearby water sources forces individuals to spend significantly more time, energy and money fetching water, while during floods, water contamination leads to 40% of children under the age of five suffering from waterborne diseases.

The damage to critical water infrastructure has been severe, with 95% of reported infrastructure losses in South Asia from 2010 to 2025 attributed to water-related disasters. This has reduced access to clean drinking water for over 400 million people annually, disrupted sanitation systems, and damaged irrigation infrastructure critical for food security. These challenges have significantly hindered progress toward SDG 6, with 29% of South Asians still lacking access to safely managed drinking water services and 45% without adequate sanitation in 2025. The region faces a growing climate resilience finance gap for water infrastructure, estimated at $50 billion annually, underscoring the urgent need for innovative financial solutions.

This virtual program seeks to address these critical challenges by bringing together stakeholders, including policymakers, disaster management practitioners, water resource experts, and international organizations. It aims to foster knowledge sharing, promote regional collaboration, and advocate for innovative policies to enhance water infrastructure resilience. By creating actionable pathways to mitigate water-related disaster risks, the program will help safeguard communities, strengthen regional cooperation and accelerate progress toward sustainable development in South Asia.

Aim and Objectives:

The aim of the workshop is to bring together key stakeholders from SAARC Member States to share knowledge and insights on the challenges posed by water-related

disasters such as floods, droughts, and cyclones. The workshop will focus on enhancing the resilience of water infrastructure in the region, fostering regional collaboration and discussing the urgent need for innovative policies and financial solutions to address the impact of these disasters on communities and infrastructure.

The primary objectives of this workshop are;

- Provide participants with in-depth knowledge of the region's vulnerability to water-related hazards, their impacts on communities and cascading effects on critical infrastructure.
- Explore innovative solutions, including structural and non-structural measures such as nature-based solutions, climate-resilient design and retrofitting existing systems.
- Foster dialogue among South Asian nations to address transboundary water-related challenges and promote joint disaster risk reduction strategies.
- Discuss barriers such as inadequate regulatory frameworks, institutional capacity and enforcement mechanisms.
- Share success stories, case studies and global examples to inspire local and regional solutions for improving water infrastructure resilience.
- Identify and advocate for innovative financing models like public-private partnerships, green bonds and resilience funds to close the water infrastructure financing gap in South Asia.

Workshop Overview

The SAARC Disaster Management Centre (IU), Gandhinagar had organized a virtual workshop on '**Enhancing Sustainability & Resilience of Water Infrastructure for Disaster Risk Reduction & Management in South Asia**' on 25-27 March 2025 for the SAARC Member States.

The workshop was attended by 48 officials from six SAARC member states—Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka. These participants represented various key Offices/ organisations, including National Disaster Management Authorities, Disaster Response Forces, ministries responsible for Water Supply, Climate Change, Environment, Housing, and Urban Affairs, etc. in their respective countries.

The sessions were conducted by international experts, academicians and development organizations, offering a balanced mix of theory and practical insights. They included technical discussions and case studies from the South Asian region. On the final day, participating countries presented their good practices, shared challenges and discussed solutions implemented to enhance the sustainability and resilience of water infrastructure.

This Report contains details of the proceedings carried out during the course of the Workshop. The detailed agenda of the workshop and the list of participants is given as Annexure 1 and Annexure 2 respectively.

Proceedings of the Sessions

Inaugural Session

Mr. Nisarg Dave, I/c Specialist, SDMC (IU) welcomed all the participants to the three-day virtual workshop on 'Enhancing Sustainability & Resilience of Water Infrastructure for Disaster Risk Reduction & Management in South Asia'.

Dr. Rajiv Kumar Gupta, Director, SDMC (IU), delivered the keynote address, underscoring the critical need for a collective approach to disaster risk reduction. He stressed the importance of transboundary collaboration in managing water-related challenges, particularly in a region where water resources are shared across multiple nations. Dr. Gupta highlighted the increasing frequency and intensity of water-related disasters such as floods, droughts, and cyclones, which pose severe risks to lives, livelihoods, and infrastructure.

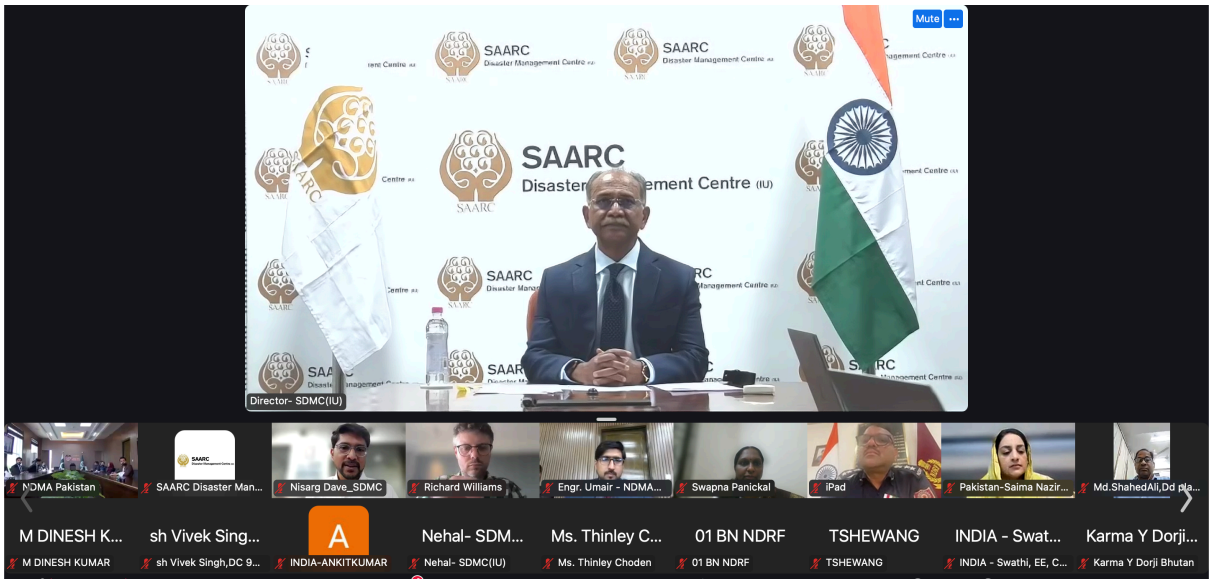

Figure 1 Director, SDMC (IU) and delegates from SAARC Member States during the group photo. Dated on 25th March 2025

He urged SAARC member states to work together in strengthening policy frameworks, technological innovations, and community-based initiatives to mitigate disaster risks. Dr. Gupta emphasized that sustainable water infrastructure is crucial for disaster resilience, economic stability, and long-term development in South Asia.

Acknowledging the support of the SAARC Secretariat, he expressed gratitude for its role in facilitating such regional initiatives. He also extended appreciation to the governments of the participating countries for their commitment and engagement in this crucial dialogue.

Dr. Gupta concluded by expressing optimism about the workshop's outcomes, looking forward to fruitful discussions, exchange of good practices, and the formulation of actionable strategies that will contribute to a more resilient and sustainable South Asia.

Following the Inaugural Session, the workshop proceeded with a series of technical sessions and case studies, fostering an engaging and insightful learning experience. Participants demonstrated keen interest, making the workshop a valuable platform for deliberate discussions, knowledge exchange and collaboration. The interactive nature of the sessions encouraged the sharing of diverse perspectives and good practices across the SAARC region.

Technical Sessions

1. Changing Climate: Need for Sustainable & Resilient Water Infrastructure
Dr. Swapna Panickal, Centre for Climate Change Research, Indian Institute of Tropical Meteorology

Dr. Swapna's presentation centered on the growing global water stress, a phenomenon intricately linked to climate change and human activities. She began by highlighting the geographical distribution of water-stressed regions using a world map, emphasizing the role of increasing population and demands in exacerbating this issue.

- **Climate Change as a Primary Driver:**
    - Rising global temperatures, particularly in oceans, lead to detrimental effects like coral bleaching, algae blooms and eutrophication.
    - The amplified greenhouse effect, driven by higher concentrations of greenhouse gases, further accelerates this warming trend.

The impact of temperature changes extends to precipitation patterns. With rising surface temperatures, there's a significant increase in atmospheric moisture content, roughly by ~24% during 1886-2095 over the Indian subcontinent. Simultaneously, a reduction in vertical wind shear creates an environment conducive to localized convection, resulting in an increased frequency of extreme precipitation events. This

relationship between temperature and atmospheric moisture is essentially exponential, meaning even small temperature increases can result in large moisture shifts.

- **Monsoon Variability and Research Efforts:**
    - A 152-year analysis (1871-2023) of all-India monsoon rainfall reveals a concerning trend: an increased frequency of monsoon droughts in the latter half of the period.
    - The Centre for Climate Change Research (CCCR) at IITM, Pune, is at the forefront of addressing these climate challenges.
    - Using the IITM Earth System Model (IITM-ESM), researchers aim to assess long-term global and regional climate changes, specifically focusing on the Indian subcontinent.
    - The objective is to create a Climate Services Information System to better deal with the increasing climate extremes.

The increasing global temperature is projected to intensify the hydrological cycle, leading to more frequent and severe extreme events. This underscores the urgent need for sustainable and resilient water infrastructure. Ultimately, mitigation measures are crucial for reducing the magnitude of global warming's impact on water resources, thereby minimizing the necessity for extensive adaptation efforts.

2. How can we work with the river? Infrastructure, river dynamics and nature-based solutions

Prof Richard Williams School of Geographical & Earth Sciences, University of Glasgow, United Kingdom

The discussion focused on geomorphology, riverscapes and nature-based solutions for managing Philippine rivers. It highlighted how natural factors, ecology and human activities—such as quarrying and flood control—shape river forms. The Bucao River, Cagayan River and Abulug River were presented as examples of meandering rivers affected by these factors. The Philippines has high river diversity, with almost all channel planform patterns present, making classification and management complex. Understanding river planform mobility and the interaction of geomorphic processes is crucial for sustainable river management.

A nature-based approach was emphasized, advocating for working with rivers rather than controlling them. The use of satellite data was suggested as a low-cost method

to monitor river migration and assess risks to critical infrastructure like bridges and roads. The discussion also stressed the importance of respecting river diversity, assessing river conditions and integrating emerging technologies for effective river governance.

Key Messages from the session are as follows

- Rivers should be worked with, not controlled.
- Each river is unique; its natural diversity must be respected.
- Rivers are interconnected systems; upstream actions affect downstream conditions.
- Investing in prevention saves lives and reduces recurring damage.
- Local communities are knowledge holders, not just stakeholders.
- Long-term planning is crucial for sustainable river management.
- Collaboration and continuous learning are key to building capacity.

3. Compatible fusion of nature-based & innovative solutions for improving resilience of water infrastructure

Prof. Trevor Hoey Pro Vice-Chancellor International & Sustainability, Brunel University of London

The session covered several key concepts related to environmental management and sustainable development. Prof. Hoey introduced Brunel University London and highlighted Isambard Kingdom Brunel's significant engineering contributions. The focus then shifted to river restoration, outlining four main types: full restoration, rehabilitation, enhancement and creation, with examples provided from Singapore's Kallang River and Scotland's Culbin dunes. The importance of Natural Flood Management (NFM) was emphasized, stressing the need for innovative, scalable and holistic approaches that consider physical, biological, economic and social factors. The scale of intervention should match the problem and transparent communication about synergies and trade-offs is crucial.

The presentation then delved into the identification of Sustainable Development Goal interlinkages using the DPIR framework, combining literature review, stakeholder consultation and expert judgment. A case study from the Luanhe River basin illustrated the complexities of upstream-downstream interactions, specifically the trade-offs between economic benefits from cage aquaculture and the resulting water pollution impacting downstream regions. The abrupt ban on aquaculture highlighted

the importance of considering long-term environmental impacts and socioeconomic consequences in policy decisions.

The overall conclusions reiterated the need for innovative, integrated, and scalable responses to climate change, emphasizing the importance of understanding and managing synergies and trade-offs through effective communication and consultation.

4. Aging Water Infrastructure: The Need for Redundancy in Water Systems

Dr. Ranjana Ray Chaudhari, Coca-Cola Department of Regional Water Studies TERI School of Advanced Studies

Dr. Chaudhari highlighted the critical challenges posed by outdated water infrastructure in rapidly urbanizing regions. It emphasized the increasing demand for water due to urban population growth and the strain on existing treatment and distribution systems. Key concerns included the deterioration of dams, declining groundwater levels, rising seawater intrusion and the need for frequent maintenance and monitoring. The presentation underscored the importance of sustainable water management practices, such as treated wastewater reuse, groundwater aquifer management and flood mitigation strategies through green-blue infrastructure. Case studies, including urban watershed restoration projects, showcased successful interventions that enhanced water resilience. A circular economy approach to water management was proposed, advocating for efficient use, conservation and infrastructure modernization to ensure long-term sustainability. The discussion reinforced the urgent need for policy reforms, technological integration and regional collaboration to secure water resources for future generations.

Case Studies

Case Study 1: Building Climate Resilient Water Infrastructure in South Asia

Dr. M. Dinesh Kumar, Executive Director, Institute for Resource Analysis and Policy

Dr. Kumar presented the critical need for climate-resilient water infrastructure in South Asia by contrasting it with conventional systems that are vulnerable to extreme hydrological events. He emphasized that resilient infrastructure must be capable of functioning under unpredictable and extreme conditions, such as consecutive droughts or unprecedented floods, which are becoming more frequent due to climate change.

Key factors affecting resilience included the predictability of weather patterns, water availability in aquifers and reservoirs and the region's precipitation patterns, which exhibited high spatial and temporal variability.

To enhance resilience, the presentation suggested adopting strategies such as utilizing long-term historical hydrological data for infrastructure design, ensuring a dependable water supply through multi-annual reservoir storage and implementing groundwater banking. Additionally, linking reservoirs and transferring water between regions with varying availability were proposed as solutions to help balance demand and supply. The presentation concluded that no single solution existed; instead, a combination of improved hydrological understanding, sustainable water management practices, and region-specific adaptations was required to build truly climate-resilient water systems.

Case Study 2: From Water Scarcity to Water Security: Gujarat's Water Infrastructure Development

Dr. M B Joshi, Consultant GIDM

Dr Joshi highlighted Gujarat's remarkable transformation from severe water scarcity to water security through strategic infrastructure development and disaster resilience measures. It showcased the state's efforts in ensuring sustainable water management and the role of innovative projects in achieving this goal.

Gujarat had faced extreme water shortages in the past, leading to water riots, long queues for domestic water and mass migration of both people and livestock in search of water. Women in rural areas endured the burden of traveling kilometers daily to fetch water. Additionally, poor water quality resulted in severe health issues such as dental and skeletal fluorosis, posing a major public health crisis.

To address this crisis, Gujarat implemented significant infrastructure development projects, positioning itself as India's leading state in water management, with a Composite Water Management Index score of 76, as recognized by NITI Aayog. The Sardar Sarovar Project on the Narmada River played a crucial role in this transformation, boasting a 7.7 MAF gross storage capacity and an extensive 69,497 km canal network, which efficiently distributed water across the state.

A major breakthrough in Gujarat's water management was the creation of manmade perennial rivers and large-scale inter-basin water transfer projects. The state established a robust network of pumping stations to lift water to drought-prone

regions like Saurashtra, ensuring a reliable supply of water through a 600 km water transfer infrastructure. These efforts greatly reduced water scarcity and provided a reliable water source for millions.

In addition to large infrastructure projects, Gujarat championed water conservation initiatives. The SAUNI Yojana linked 1,371 km of canals to existing 115 dams, ensuring better water distribution. The Sujalam Sufalam Spreading Canal Project diverted excess floodwater to water-stressed regions, further addressing scarcity. Moreover, the state invested in desalination plants along its coastline, enhancing water availability. Rainwater harvesting and groundwater recharge programs, including the construction of 1.9 lakh check dams and the rejuvenation of 2,650 Amrit Sarovar (water bodies), played a vital role in replenishing natural water sources.
Gujarat's achievements in urban and rural water security were evident, with 90% of rural Gujarat gaining access to individual tap water connections. The successful Sabarmati Riverfront project transformed a once-dry riverbed into a thriving water body. Additionally, groundwater levels significantly improved, benefiting agriculture and drinking water supply.

Case Study 3: Community Led Traditional Practices with proven Resilience against Disasters

Dr. Anurag Danda, Director & Lead- Sundarbans Program, WWF-India

The presentation focused on community-led practices for enhancing resilience against disasters in the Sundarbans, India. He highlighted the critical water infrastructure in the region, particularly embankments and freshwater ponds, which serve as essential resources for the local population. The embankments, spanning approximately 1,800km across 35 inhabited islands, have been in place since the late 18th century, while freshwater ponds exist as both public and private properties for domestic use.
He discussed the disaster risks associated with this infrastructure, emphasizing how toe-line erosion and vertical collapse due to tidal action, as well as overtopping during storm surges, have made embankments vulnerable. Similarly, freshwater ponds often face inundation during such extreme weather events, threatening water security for local communities. As a mitigation strategy, he presented dedicated freshwater ponds for domestic use, which have been protected from storm surges to ensure a sustainable supply of potable water. The case study underscored the importance of community participation in disaster preparedness and infrastructure resilience,

advocating for nature-based solutions and adaptive water management practices in the face of climate change.

Case Study 4: Advancing Climate Resilience of Water Sector in Bhutan
Ms. Thinley Choden, Principal Engineer, Water and Sanitation Division, Department of Infrastructure Development, Ministry of Infrastructure and Transport, Bhutan

Ms. Choden provided an in-depth analysis of the challenges and strategies for ensuring sustainable and resilient water infrastructure in Bhutan. She outlined how Bhutan's unique topography, extreme weather conditions and dependency on glacier-fed rivers had made water resource management particularly complex. She emphasized that climate change had exacerbated existing vulnerabilities, leading to glacier retreat, erratic monsoons, flash floods and seasonal water shortages. These factors had not only affected water availability but also posed risks to critical water infrastructure, threatening the livelihoods of local communities.

To address these pressing issues, she highlighted various adaptation measures undertaken in Bhutan. These included integrated watershed management programs, which focused on maintaining the health of water sources through afforestation, soil conservation and sustainable land-use practices. She also discussed community-led conservation initiatives, where local stakeholders were actively involved in managing and protecting water sources to ensure long-term availability. Additionally, she spoke about disaster risk reduction strategies, such as the implementation of early warning systems for floods and landslides, the development of climate-resilient water supply systems, and the promotion of cross-sector collaboration between government agencies, research institutions, and local communities.

Ms. Choden stressed the critical role of policy-driven interventions in enhancing water security and infrastructure resilience. She advocated for the integration of climate risk assessments into national planning, as well as the adoption of innovative technologies to improve water storage, distribution and conservation. Her presentation reinforced the idea that building a sustainable and resilient water management framework required a multi-stakeholder approach, ensuring that both traditional knowledge and modern scientific methods were effectively combined to mitigate climate-induced water challenges in Bhutan.

Country Presentations

Country-Specific Challenges and Solutions for Enhancing Sustainability and Resilience of Water Infrastructure

A key segment of the workshop focused on country-specific challenges and solutions in enhancing the sustainability and resilience of water infrastructure across South Asia. Experts and representatives from Bangladesh, Bhutan, India, Pakistan and Sri Lanka shared their insights, highlighting critical water management issues, disaster risks and adaptive strategies undertaken in their respective countries.

Bangladesh

Dr. Md. Sazzad Hossain, Superintending Engineer at the Hydroinformatics and Flood Forecasting Circle, Bangladesh Water Development Board, presented Bangladesh's challenges in managing floods, river erosion and salinity intrusion due to rising sea levels. He emphasized the importance of real-time flood forecasting and early warning systems to mitigate disaster impacts. Additionally, Bangladesh has been implementing embankment reinforcement projects, integrated water resource management (IWRM) and adaptive infrastructure planning to address its vulnerabilities.

Bhutan

Mr. Mahesh Pradhan, Specialist at the Department of Infrastructure Development (DoID), Ministry of Labour and Human Resources (MoLT), highlighted Bhutan's dependency on glacial-fed rivers and the growing risks of Glacial Lake Outburst Floods (GLOFs). He discussed Bhutan's efforts in hydropower resilience planning, early warning systems for GLOFs and sustainable watershed management to protect both infrastructure and communities from extreme hydrological events.

India

Mr. Antony Joh Moothedan, Project Associate (Urban Flood) at the National Disaster Management Authority (NDMA) of India, focused on flood management challenges and the increasing frequency of extreme rainfall events leading to waterlogging and drainage congestion in cities. He outlined India's strategies, including the development of climate-resilient urban planning policies, restoration of natural drainage systems and investments in smart water infrastructure, such as real-time monitoring systems and flood forecasting technologies.

Pakistan

Ms. Saima Nazir, Deputy Director (Research & Policy) at the Ministry of Climate Change & Environmental Coordination, along with **Mr. Umair Afzal** from the National Disaster Management Authority, discussed Pakistan's water scarcity issues, inefficient water distribution and increasing flood risks. They stressed the impact of climate change on Pakistan's water security and highlighted initiatives such as rainwater harvesting, the development of resilient irrigation systems, and strengthening flood protection infrastructure. They also emphasized the importance of policy reforms and regional cooperation in ensuring sustainable water management.

Sri Lanka

Ms. Udya Madhavi Abeysinghe, Assistant Director (Preparedness) at the Disaster Management Centre of Sri Lanka, highlighted the country's challenges related to droughts, flash floods and inefficient water storage systems. She presented Sri Lanka's approach to community-based water conservation programs, groundwater recharge initiatives, and the rehabilitation of traditional water storage tanks (wewas) to improve water security. Additionally, she underscored the importance of integrating disaster risk reduction (DRR) into national water management policies to build long-term resilience.

Key Takeaways

The country presentations provided a comprehensive overview of the diverse water-related challenges in South Asia, along with the innovative approaches being adopted to enhance sustainability and resilience. While each country faces unique hydrological and climatic challenges, common themes emerged, such as the need for:

- **Improved early warning systems and flood forecasting technologies**
- **Sustainable and adaptive water infrastructure**
- **Enhanced regional cooperation and policy reforms**
- **Integration of climate resilience into water management strategies**

The discussions reinforced the importance of knowledge sharing, technological advancements and collaborative efforts among SAARC member states to strengthen regional resilience in water infrastructure management.

Closing Session

The Director of SAARC Disaster Management Centre (IU) delivered the closing remarks, marking the successful conclusion of the Virtual Workshop on 'Enhancing Sustainability & Resilience of Water Infrastructure for Disaster Risk Reduction & Management in South Asia' on March 27, 2025. He expressed his appreciation to all distinguished speakers, experts, and participants for their active engagement and insightful contributions throughout the three-day workshop.

He emphasized the critical role of regional collaboration in addressing the shared challenges posed by climate change, water-related disasters and infrastructure vulnerabilities in South Asia. He highlighted the importance of integrating scientific knowledge, policy-driven solutions and community-based approaches to build resilient and sustainable water systems across the SAARC Member States.

The Director acknowledged the valuable discussions on good practices, challenges, and innovative solutions presented by the experts and the participants the member states. He reaffirmed SDMC (IU)'s commitment to supporting SAARC nations in their disaster risk reduction efforts and encouraged continuous dialogue and collaboration to build a more resilient and water-secure South Asia. He extended his gratitude to the SAARC Secretariat, national governments, expert speakers and development organizations for their support in making the workshop a success and looked forward to future initiatives that would further strengthen disaster resilience in the region.

Annexure 1 - Program Agenda

Day 1: 25th March 2025 (Tuesday)

Time	Topic	Speakers
10:30 - 11:00	**Welcome and Inaugural Session** • Welcome • Participant introduction • Inauguration and Introduction to the workshop	**Dr. Rajiv Kumar Gupta,** Director SDMC (IU)
11:00 - 11:30	**Session 1: Changing Climate: Need for Sustainable & Resilient Water Infrastructure** • Vulnerability of South Asia from disasters point of view and the crucial role of Water Infrastructure in achieving SDGs • Projected impacts of population growth and climate change on water resources in South Asia • Recent disasters and consequences on Water Infrastructure: impacts, responses, and lessons learned	**Dr. Swapna Panickal** Centre for Climate Change Research, Indian Institute of Tropical Meteorology
11:30 - 12:00	**Case Study 1: Building Climate Resilient Water Infrastructure in South Asia**	**Dr. M. Dinesh Kumar** Executive Director, Institute for Resource Analysis and Policy
12.00 - 12.30	**Session 2: How can we work with the river? Infrastructure, river dynamics and nature-based solutions** • Design and construction: building resilient infrastructure • Maintenance and upkeep: regular maintenance to prevent deterioration. • Redundancy and backup systems: having backup systems in place to ensure continuity. • Monitoring and sensing: using sensors and monitoring systems to detect potential issues. • Regulatory Frameworks and Polices • Key Barriers to Resilient Water Infrastructure	**Prof Richard Williams** School of Geographical & Earth Sciences, University of Glasgow, UK

Day 2: 26th March 2025 (Wednesday)

Time	Topic	Speakers
10.45 - 11.15	**Session 3: Compatible fusion of Nature-based & Innovative Solutions for improving resilience of Water Infrastructure** • Restoring wetlands, mangroves, and forests to mitigate flood and drought risks. • Sponge City: Concepts to Performance • Asset management: prioritizing maintenance and upgrades based on risk and criticality. • Risk assessment and management: identifying potential risks and developing mitigation strategies. • Investing in new technologies such as smart water grids and green infrastructure. • Collaboration and information sharing with other utilities and stakeholders. • Community engagement and education	**Prof Trevor Hoey** Pro Vice-Chancellor International & Sustainability, Brunel University of London
11.15 - 11.45	**Session 4: Aging Water Infrastructure: The Need for Redundancy in Water Systems** • Dependability of age old Water supply systems (reservoirs, dams, aqueducts, conveyance & distribution network), Wastewater treatment plants, Storm-water management systems, Irrigation systems, Drinking water treatment plants • Identifying Risks and Developing Mitigation Strategies • Asset Management with the use of GIS, remote sensing and AI, IoT, Data Analytics, SCADA etc. • Water infrastructure inspection and maintenance • Major Desilting required in Dams and Canals	**Dr. Ranjana Ray Chaudhari** Coca-Cola Department of Regional Water Studies TERI School of Advanced Studies
11.45 – 12.15	**Case Study 2: From Water Scarcity to Water Security: Gujarat's Water Infrastructure Development**	**Dr. M B Joshi** Consultant GIDM
12.15 – 12.45	**Case Study 3: Community Led Traditional Practices for Resilience against Disasters**	**Dr. Anurag Danda,** Director & Lead-Sundarbans Program, WWF-India

Day 3: 27th March 2025

Time	Topic	Speakers
10.45 - 11.15	**Case Study 4: Advancing Climate Resilience of Water Sector in Bhutan (ACREWAS)**	**Ms. Thinley Choden,** Ministry of Infrastructure and Transport, Bhutan
11.15 - 13.15	**Country Specific Challenges and Solutions for Enhancing Sustainability and Resilience of Water Infrastructure**	**Representatives of SAARC Member States**
	1. Bangladesh	*Dr. Md. Sazzad Hossain*
	2. Bhutan	*Mr. Mahesh Pradhan*
	3. India	*Mr. Antony Joh Moothedan*
	4. Pakistan	*Ms. Saima Nazir and Mr. Umair Afzal*
	5. Sri Lanka	*Ms. Udya Madhavi Abeysinghe*
13:15 – 13:30	**Closing Ceremony** • Wrap up & Closing remarks	**Dr. Rajiv Kumar Gupta,** Director SDMC (IU)

Annexure 2 - List of Participants

#	Country Name	Flag	Participant's Name	Designation	Department
1	Bangladesh		Mr. Abdus Sobhan	Deputy Director (Planning)	DDM
2	Bangladesh		Mr. Dilip Kumar Saha	Deputy Director (MIM)	DDM
3	Bangladesh		Mr. Dr. Sazia Afreen	Dhaka Wasa	
4	Bangladesh		Mr. Abul Kalam Mallik,	Meteorologist	BMD
5	Bangladesh		Mr. Shahed Ali	Deputy Director (Planning)	Fisheries Department
6	Bangladesh		Mst, Salma Akter	Assistant Director	Fisheries Department
7	Bangladesh		Dr. Md. Sazzad Hossain	Superintending Engineer	Hydro informatics and Flood Forecasting Circle, Bangladesh Water Development Board
8	Bhutan		Mr. Sonam Gyelpo	Sr. Environment Officer	DECC, MoENR
9	Bhutan		Mr. Pem Dorji Tamang	Asst. Environment Officer	DECC, MoENR
10	Bhutan		Mr. Nidup Dorji	Asst. Environment Officer	DECC, MoENR
11	Bhutan		Mr. Mahesh Pradhan	Specialist	DoID, MolT
12	Bhutan		Mr. Sonam Tshewang	Executive Engineer	DLGDM, MoHA
13	Bhutan		Ms. Karma Yangzom Dorji	Environmental & Social Expert	DLGDM MoHA
14	Bhutan		Ms. Dezangmo	Programme Officer	DLGDM, MoHA
15	Bhutan		Mr. Tandin Wangchuk	Assistant Programme Officer	DLGDM MoHA
16	India		Dr. Sweta Baidya	Sr. Consultant (Cyclone)	National Disaster Management Authority

#	Country Name	Flag	Participant's Name	Designation	Department
17	India		Ms. Dipali Jindal	Sr. Consultant (Landslide),	National Disaster Management Authority
18	India		Mr. Antony Joh Moothedan	Project Associate (Urban Flood),	National Disaster Management Authority
19	India		Mr. Suneel Kumar Singh	Commandant	9th Battalion National Disaster Response Force
20	India		Mr. Hitender Pal Singh Kandari	Commandant	1st Battalion National Disaster Response Force
21	India		Dr. Sandeep Pandey	Associate Professor cum Program Manager	Gujarat Institute of Disaster Management
22	India		Mr. Ankit Rathod	Training Specialist cum Program Manager	Gujarat Institute of Disaster Management
23	India		Mr. Anurag Kumar	EE (DM)	Ministry of Housing & Urban Affairs
24	India		Mr. D.B. Gupta	EE (DM)	Ministry of Housing & Urban Affairs
25	India		Mrs. Swathi Krishnamurthy	EE (Civil)	Ministry of Housing & Urban Affairs
26	India		Mr. Mrinal Dewangan	AEE (Civil)	Ministry of Housing & Urban Affairs
27	India		Mr. A P Jacob Manohar	Associate TCP	Ministry of Housing & Urban Affairs
28	India		Mr. Anshul Abbasi		Ministry of Housing & Urban Affairs
29	Nepal		Mr. Man Bahadur Budha	Section Officer	Ministry of Home Affairs
30	Nepal		Mr. Deepak Kumar Acharya	Section Officer	Ministry of Home Affairs
31	Nepal		Mr. Ram Prasad Ghimire	Senior Divisional Engineer	Ministry of Water Supply

#	Country Name	Flag	Participant's Name	Designation	Department
32	Nepal		Ms. Anjana Maharaj	Senior Divisional Engineer	Ministry of Water Supply
33	Nepal		Mr. Rajendra Sharma	Under Secretary	Ministry of Home Affairs
34	Nepal		Mr. Ram Bahadur K.C.	Under Secretary	Ministry of Home Affairs
35	Nepal		Mr. Krishna Prasad Rijal	Senior Divisional Engineer	Ministry of Energy, Water Resources and Irrigation
36	Pakistan		Ms. Saima Nazir	Deputy Director (Research & Policy),	Ministry of Climate Change & Environmental Coordination
37	Pakistan		Mr. Muhammad Irfan		NDMA Pakistan
38	Pakistan		Dr. Shazia Akhtar	Deputy Manager,	NDMA Pakistan
39	Pakistan		Mr. Abbas Zakir Qasim	Deputy Manager,	NDMA Pakistan
40	Pakistan		Mr. Waleed Jamal		NDMA Pakistan
41	Pakistan		Mr. Abdul Hanan Hamid		NDMA Pakistan
42	Pakistan		Mr. Amar Jalil		NDMA Pakistan
43	Pakistan		Mr. Umair Afzal		NDMA Pakistan
44	Pakistan		Engr. Muhammad Nawaz Sharif	Assistant Manager	NDMA Pakistan
45	Pakistan		Mr. Muhammad Amjhad	Assistant Manager	NDMA Pakistan
46	Pakistan		Mr. Muhammad Saad Khan		NDMA Pakistan
47	Pakistan		Mr. Ali Hassan		NDMA Pakistan
48	Sri Lanka		Ms. Udya Madhavi Abeysinghe	Assistant Director (Preparedness)	Disaster Management Centre

Annexure C

SAARC Disaster Management Centre (IU)

NEWS LETTER

Vol.11 March 2025

Content

Contribute

Interested in getting involved and sharing your stories to SDMC (IU). Contact SDMC (IU) Team at pm-ro1@saarc-sdmc.org

Director's Message

Dear Readers,

I am delighted to share with you the latest edition of the SDMC (IU) newsletter as we continue our unwavering commitment to fostering a culture of disaster resilience across SAARC Member States.

Over the past few months, we have been actively organizing impactful workshops to address critical challenges facing our communities. Looking ahead, our upcoming Virtual Workshop on 'Enhancing Sustainability & Resilience of Water Infrastructure for Disaster Risk Reduction & Management in South Asia' will focus on tackling the pressing risks associated with water infrastructure and disasters.

In this edition, we bring you key updates on significant events and developments, including 20 Years of IOC Tsunami – Reflecting on progress and lessons learned; 10 Years of the Sendai Framework – Assessing its impact on disaster risk reduction; Glimpses from COP 29 (Baku, Azerbaijan) – Key discussions and outcomes; Recent Disaster events in the SAARC Region – Insights on cyclones, floods, forest fires, and more.

We invite you to explore this edition and hope you find it both insightful and informative. Your continued support and engagement are invaluable as we work toward building a safer and more resilient future.

Thank you for being part of this journey.

Yours truly,

Dr. Rajiv Kumar Gupta,
Director, SAARC Disaster Management Centre (IU)

SDMC (IU) Newsletter is published by South Asia Association of Regional Cooperation (SAARC) Disaster Management Centre (SDMC-IU) functioning at Gujarat Institute of Disaster Management (GIDM) Campus, Gandhinagar, Gujarat, India.

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Delegates from SAARC Member States participated in SDMC (IU)'s workshop on Building Resilient Cities: Strategies for Effective Flood Management

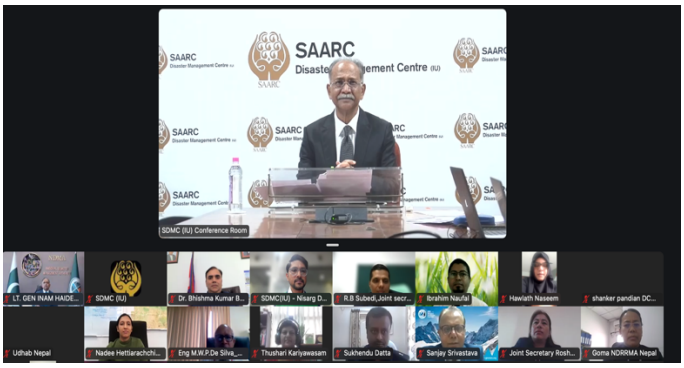


Figure 1. Dr. Rajiv Kumar Gupta, Director, SDMC (IU) addressed the delegates from the SAARC Member States during workshop on 27th January 2025.

SDMC (IU) successfully organized a virtual workshop on "Building Resilient Cities: Strategies for Effective Flood Management" from January 27-29, 2025. The workshop brought together 43 delegates from SAARC Member States, including India, Maldives, Nepal, Pakistan, and Sri Lanka. Participants represented key institutions such as National Disaster Management Authorities, Response Forces, Ministries of Home and Foreign Affairs, Local Government departments, and Urban Development & Housing agencies.

The three-day workshop featured technical sessions and case study discussions focused on effective flood management strategies. Experts from South Asia and beyond shared insights, highlighting innovative approaches to mitigating urban flood risks. On the final day, representatives from each participating country showcased their best practices, challenges, and adaptive solutions for managing urban flooding.

For access to technical session recordings and the full workshop report, visit the SDMC (IU) official website.

South Asian countries gasping in 2024: Glimpse of Cyclone Dana, Cyclone Remal, Cyclone Fengal and Cyclone Asna

As per WMO, Tropical cyclones represented 17% of weather-, climate- and water-related disasters and were responsible for one-third of both deaths (38%) and economic losses (38%) over the 50-year period. In 2024, four major tropical cyclones struck the Indian sub-continent namely Cyclone Remal, Fengal, Dana, and Asna.

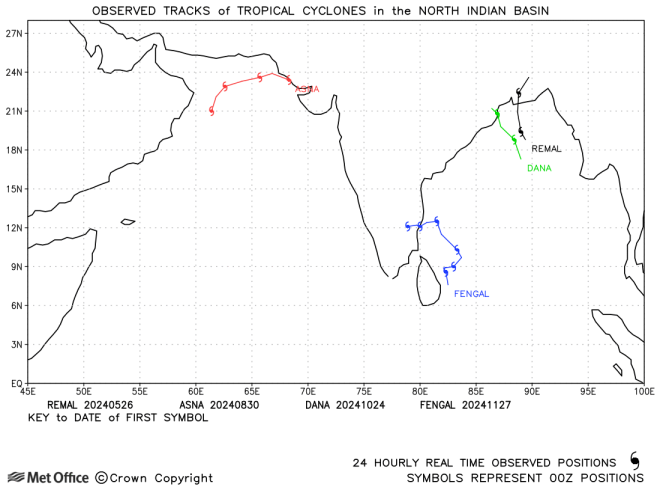


Figure 2 Cyclone Tracks in the North Indian Basin

Cyclone Remal, a severe cyclonic storm, affected the Sundarbans in parts of India and Bangladesh region in May 2024. In August, cyclone Asna had

caused torrential rains in the Kachchh district and adjoining parts of Pakistan. Since 1891, only three cyclonic storms have occurred in the Arabian Sea in August, with the most recent one before 2023 being in 1976. In October 2024, India and Bangladesh faced the severe cyclonic storm, Dana. The year ended with the Cyclonic storm Fengal. Due to the extreme weather conditions caused by Storm Fengal, rainfall exceeding 200 mm has been recorded in the Eastern, Northeastern, North Central, and Northern Provinces of Sri Lanka and parts of Tamil Nadu, India. Very strong winds, reaching speeds of up to 60 km/h, had caused damage to infrastructure, homes, and agricultural lands in these areas.

These cyclones underscore the importance of proactive disaster management measures including early warning systems, land use planning, hazard mapping, etc. Given the cyclone patterns in recent years, SAARC countries bordering the Arabian Sea and the Bay of Bengal must strengthen preparedness efforts to mitigate future risks.

20 years of the Indian Ocean Tsunami

On December 26, 2004, the Indian Ocean Tsunami struck 17 countries across Southeastern and Southern Asia, as well as Eastern and Southern Africa, causing unprecedented devastation to lives, property and infrastructure. It remains one of the deadliest disaster due to natural hazard in modern history.

Figure 3 An aerial view of the utter devastation of the Indonesian coast, between the towns of Banda Aceh and Meulaboh. Photograph taken one week after the 2004 Indian Ocean tsunami. Source: https://news.un.org/en/story/2024/12/1158556

The year 2024 marks 20 years since this catastrophic event. While significant progress has been made in scientific advancements, early warning systems, and multilateral collaborations, tsunamis continue to be low-frequency but high-intensity hazards, necessitating ongoing global efforts for preparedness and mitigation.

In response to the 2004 disaster, key institutions such as the Indian Ocean Tsunami Warning and Mitigation System (IOTWMS) and the Regional Integrated Multi-Hazard Early Warning System (RIMES) were established to enhance cross-border cooperation and disaster preparedness.

To further strengthen global awareness and action, the United Nations General Assembly designated November 5 as World Tsunami

Awareness Day in December 2015. This annual observance serves as a reminder of the continued need for preparedness, capacity-building, and resilience against tsunami threats.

As we reflect on the past two decades, it is essential to advance early warning technologies, improve community preparedness, and foster international cooperation to mitigate future tsunami risks.

Outcomes of COP 29 Baku Azerbaijan

The 29th UN Climate Change Conference (COP 29), held in Baku, Azerbaijan, resulted in significant agreements aimed at addressing climate change. A key outcome was the establishment of the New Collective Quantified Goal on Climate Finance, which sets a new framework for mobilizing global climate funding. Additionally, a Global Agreement on Carbon Market Framework was introduced to regulate and enhance international carbon trading, alongside the creation of a UN Trading System for Green Credits to support sustainable investments. The conference also extended the Lima Work Program on Gender and Climate Change for another 10 years, ensuring continued efforts toward gender-inclusive climate policies.

Climate finance and adaptation remain central to limiting global temperature rise to 1.5°C above pre-industrial levels. The UN climate process continues to be the primary platform for coordinating international climate action. The next conference, COP 30, will be held in Belém, Brazil, from November 10-21, 2025, with a focus on addressing financial gaps in climate mitigation and adaptation efforts.

Monsoon triggers Landslides, Floods in South Asian Member States

In 2024, record-breaking rainfall was observed in India, Nepal, and Bangladesh, surpassing historical precipitation levels and triggering multiple cascading risks and hazards. One of the most devastating consequences was a series of landslides in Wayanad, India, and Kathmandu Valley, Nepal. The Kerala State Disaster Management Authority (KSDMA) confirmed that the Wayanad landslide was the largest in India's recorded history, with research estimating that it triggered a debris flow of approximately six million cubic meters—enough to fill 2,400 Olympic-sized swimming pools.

Figure 4 Landslide at Chooralmala in Wayand District, Kerala India Source: The Hindu[1], 2024

According to the Global Water Monitor Report, the catastrophic event resulted in over 375 fatalities, 275 missing persons, and thousands of rescues. The Wayanad landslides were part of an increasing trend of landslide events across the Western Ghats, aligning with climate models that predict more frequent and intense rainfall due to global warming. In response, state and national governments implemented a range of disaster response and mitigation measures, addressing housing, infrastructure, psycho-social aid, and education. To enhance early warning systems (EWS), KSDMA launched "KaWaCHaM" (Kerala Warnings Crisis and Hazards Management System), an advanced disaster warning system that integrates alerts, sirens, and global weather models to strengthen early disaster preparedness and public safety.

In late September 2024, Nepal experienced exceptional late monsoon rainfall, leading to widespread flooding and landslides across the country. Several regions recorded their highest precipitation levels in over 50 years, making it one of the most extreme rainfall events in Nepal's recent history. While authorities issued nationwide alerts, the unprecedented deluge still resulted in severe destruction, claiming 244 lives.

Figure 5 Debris is seen in Kathmandu, Nepal, Monday, Sept. 30, 2024 in the aftermath of a flood caused by heavy rains | Photo Credit: AP

The disaster underscores the growing risks posed by climate change-driven extreme weather events, highlighting the urgent need for enhanced early warning systems, resilient infrastructure, and climate adaptation measures to mitigate future impacts.

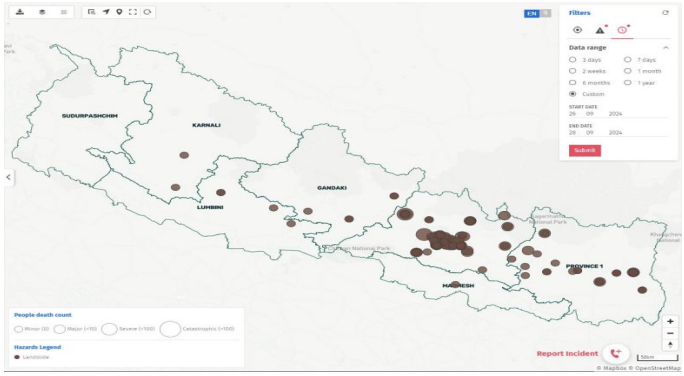


Figure 6 Landslide incidents in the Bipad Portal, an online Disaster Management system. Source: https://bipadportal.gov.np

[1] https://www.thehindu.com/news/national/kerala/wayanad-landslide-how-two-villages-vanished-overnight/article68506601.ece

Nepal Disaster Report 2024 alarms for wild fires

Figure 7 Forest Fires in Nepal dated in March 2025 Source: The Kathmandu Post

According to the Nepal Disaster Report 2024, the country has witnessed a sharp rise in certain hazards over the past six years (2018-2024), with 2,743 landslides and 19,593 fire incidents recorded among a total of 32,375 disaster events. Data from the National Disaster Risk Reduction and Management Authority (NDRRMA) indicates that alerts are regularly issued in affected districts, and local governments and fire services play a crucial role in responding to forest fires.

The increasing frequency of forest fires has raised significant concerns, particularly due to their impact on tourism, biodiversity, natural resources, and the economy. In response, authorities have issued early warnings and preparedness measures to mitigate further damage. However, addressing this growing threat requires stronger preparedness, enhanced capacity building in fire mitigation, and improved forest management. Moving forward, the key challenge lies in translating existing policies into effective action across all levels of government and stakeholders to strengthen disaster resilience in Nepal.

10 years of Sendai Framework

The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) was adopted on 18 March 2015 to address the increasing challenges brought by natural hazards and provide concrete actions to protect development gains from the risk of disasters. The Framework was adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, on March 18, 2015. There are four priority areas:

Priority 1: Understanding Disaster Risks

Priority 2: Strengthening Disaster Risk Governance to manage disaster risk

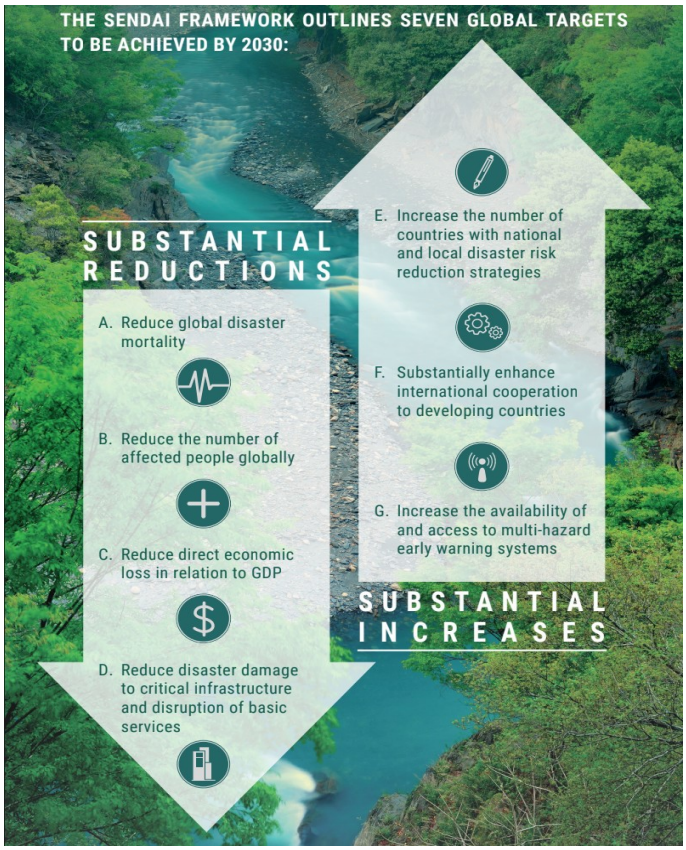
Priority 3: Investing disaster risk reduction for resilience

Priority 4: Enhancing disaster preparedness for effective response and to 'Build Back Better' in recovery, rehabilitation and reconstruction.

As per the UNDRR's Midterm[2] Review, there has been a substantial improvement in understanding the risks. However, after years of adoption of the document, we are slow and has not reached where we need to be. As 2030, nearby hope all the national and state

[2] UNDRR (2023). The Report of the Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030. UNDRR: Geneva, Switzerland.

government to course-correct, to achieve the expected outcome and goal of the Sendai Framework, and encourage risk-informed decision-making, investment and behaviour to 2030 and beyond.



Upcoming Training Workshop on Enhancing Sustainability & Resilience of Water Infrastructure for Disaster Risk Reduction & Management in South Asia

The SAARC Disaster Management Centre (IU) (SDMC-IU) is organizing a virtual workshop on "Enhancing Sustainability & Resilience of Water Infrastructure for Disaster Risk Reduction & Management in South Asia" from March 25-27, 2025. This initiative aims to address the pressing challenges posed by water-related disasters and their impact on critical

infrastructure across the region. Between 2010 and 2025, 95% of reported infrastructure losses in South Asia have been attributed to water-related disasters, leading to severe disruptions. The consequences have been far-reaching—as millions of people face reduced access to clean drinking water annually, while sanitation systems and irrigation infrastructure crucial for food security continue to suffer extensive damage. These setbacks have hindered progress toward SDG 6, with 29% of South Asians still lacking access to safely managed drinking water services and 45% without adequate sanitation in 2025. Additionally, the region faces a climate resilience finance gap of $50 billion annually, highlighting the urgent need for innovative financial solutions to strengthen water infrastructure.

This workshop will bring together policymakers, disaster management practitioners, water resource experts, etc. to discuss solutions. The program aims to foster knowledge sharing, enhance regional collaboration and advocate for innovative policies to build climate-resilient water infrastructure in South Asia.

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