IAHR 2027 World Congress Topics

Pillar A: Climate Change Adaptation and Mitigation

Theme A-1: Climate Change Adaptation

Special Sessions:

SS-06 Integrated Flood Risk Management from Science to Practice *(Flood Risk Assessment, Hazard Mapping, Risk Governance, Mitigation Strategies, Adaptive Management, Climate Change Adaption)*

SS-08 Digital Twin of Detailed River Basin Morphology and Hydraulic Structures for Advanced Basin Management *(Digital Twin, Flood, Inundation, River Basin, Hydraulic Structures)*

SS-12 Advances and Guidelines for Water Resources Management: Adaptation Under Evolving Climate *(Climate-sensitive design, Adaptation, Guidelines, Decision making under change)*

SS-27 Buoyancy-Driven Flows *(Gravity currents, Internal waves, Atmospheric flows, Oceanic flows, Natural ventilation)*

SS-32 Integrated Water Resilience in Arid Regions: Diversified Portfolios, Digital Systems, and Adaptive Governance *(Integrated Water Resilience, Non-Conventional Water Portfolios, Water-Energy-Environment Trade-offs, Brine Resource Recovery, Adaptive Governance, Digital Water Systems)*

SS-38 Transboundary Rivers and Water Security under a Changing Climate: The Role of Water Information System? *(Transboundary Water Resources, Water Security, Climate Change, Hydrodynamic Modeling, Sediment and Water Quality, Water Information System)*

SS-48 Climate Adaptation of Water Infrastructure: Towards a Shared Engineering Framework *(Climate change adaptation, Water infrastructure, Climate risk and vulnerability assessment, Resilience, Adaptation strategies)*

SS-50 Securing Water for All: Leveraging Non-Conventional Resources to Accelerate SDG 6 *(Non-conventional water resources, alternative water source, water scarcity, adaptation, policy and practices, knowledge sharing)*

Theme A-2: Water and Nature

Special Sessions:

SS-01 Ecohydraulics: Biophysical Interactions in Natural and Engineered Aquatic Systems *(Ecohydraulics, Flow–vegetation–sediment feedbacks, Restoration & climate resilience)*

SS-03 AI and Data-Driven Ecohydraulics: Monitoring, Modelling, and Design *(Ecohydraulics, Intelligent Environmental Sensing, Artificial Intelligence, Machine Learning)*

SS-14 Nature-Based Solutions for Upstream Catchments and Small Streams *(Nature-based Solutions, Ecohydraulics, Upstream catchments and small streams)*

SS-15 Nature-Based Solutions for Urban Areas *(Nature-based Solutions, Ecohydraulics, Urban areas)*

SS-16 Nature-Based Solutions for Large Rivers *(Nature-based Solutions, Ecohydraulics, Large rivers)*

SS-17 Nature-Based Solutions for Coasts and Estuaries *(Nature-based Solutions, Ecohydraulics, Estuaries and coasts)*

SS-51 Accelerating Implementation of Nature-Based Solutions at Scale to Address Climate Risk *(Adaptive Management, Climate Resilience, Decision-making)*

Theme A-3: Hydro-Environment Engineering and Society

Special Sessions:

SS-33 Binding Without Erasure: River Monitoring, Plural Evidence and Environmental Obligation in Transboundary Governance *(River Governance, Environmental Evidence, Adaptive Water Resources Management)*

Pillar B: Water Engineering and Energy, Ecological and Digital Transition

Theme B-1: Hydropower and water related renewable energy

Special Sessions:

SS-44 Advancing Hydropower through Multidisciplinary Research for Resilient Water and Energy Systems *(Hydropower Flexibility, Reservoir Operations, Digital Hydropower, Water–Energy Nexus, Climate Adaptation, Environmental Sustainability)*

SS-57 Climate Change and Marine Energy: Towards Sustainable and Resilient Coastal and Offshore Systems *(Marine Renewable Energy, Offshore Wind Energy, Wave Energy, Climate Change Adaptation and Resilience, Energy Transition, Decarbonization)*

Theme B-2: Water engineering for inland water bodies

Special Sessions:

SS-05 Advances in Monitoring Extreme River Flows Across the Hydrologic Spectrum *(Advanced streamflow monitoring methods, Drought, Flood)*

SS-09 Ice Processes in Inland and Transitional Waters *(River and lake ice, Ice dynamics, Climate variability)*

SS-10 Sediment Transport and River Training in Alluvial Rivers: Current Understanding and Open Challenges *(Alluvial River hydraulics, Turbulence monitoring and modelling, Scour protection and river training works)*

SS-21 Plastic Transport in Rivers: Connecting Empiricism and Modelling *(Microplastics and Litter, Multiphase flow, Numerical modeling)*

SS-26 Advances in Environmental Fluid Mechanics *(Fluid Mechanics, Modelling, Numerics)*

SS-31 High-Fidelity 3D CFD and CFD–DEM Methods for Predictive Bed Morphodynamics *(High-Fidelity 3D CFD, CFD–DEM and Multiphase Sediment Modelling, Morphodynamic Model Verification and Validation)*

SS-40 Dam Reservoir Sedimentation: Challenges and Management Solutions *(Reservoir sedimentation, Sustainable management and operation, Monitoring, Numerical modelling, Case studies)*

SS-45 Non-contact and surrogate measurements of river hydrodynamics and sediment transport across scales: from observation to modelling in the era of AI *(Non-contact and surrogate measurements; image velocimetry and radar; discharge and velocity distribution; sediment transport; monitoring-modelling integration; data-driven and AI-based models)*

Theme B-3: Water engineering and society

Special Sessions:

SS-25 Water Security in Latin America: From Local Experiences to the Construction of a Regional Metric *(Water Security Index, Regional / Transboundary Water Assessment, Cooperative Governance & Coordinated Decision-Making)*

SS-42 Co-Evolving Human–Water Systems: From Socio-Hydrological Science to Policy and Community Decisions *(Socio-Hydrology, Coupled Human–Water Systems, Human–Water Feedback, Participatory Modeling, Water Governance)*

Theme B-4: Irrigation, drainage and pollution control

Special Sessions:

SS-11 Advances in Marine and Freshwater Outfall Systems: Innovations in Modelling, Design, and Environmental Protection *(Outfall systems, Climate change adaptation, Digital transformation)*

SS-43 Karst Coastal Aquifers under Pressure: Monitoring, Digital Tools and Management of Seawater Intrusion in the Mediterranean Basin *(Coastal Karst Aquifers, Seawater Intrusion, Groundwater Monitoring, Hydrogeological Modelling, Submarine Groundwater Discharge, Adaptive Groundwater Management)*

SS-46 Advances in Soil-Plant Sensing and Data Analysis for Precision and Smart Irrigation Management with Conventional and Alternative Water Sources *(hyperspectral sensing; spatial data analysis; precision*

irrigation and fertigation; sensor- and robot-based data acquisition and decision making/crop management; decision support systems; reclaimed water reuse)

SS-52 Advancing Groundwater Sustainability and Regional Water Security in Agricultural Landscapes *(Agricultural water security, Groundwater sustainability, Ecohydrology, Conservation, Hydrologic Modeling, Barriers to Adoption)*

Theme B-5: Water engineering for water infrastructures

Special Sessions:

SS-04 Transient Flows in Hydraulic Systems *(Hydraulic transients, Dam break, Tidal bores, Tsunamis)*

SS-13 Scour around Hydraulic and Coastal Structures *(Hydrodynamic-structure interaction, Foundation design, Scour protection)*

SS-19 Hydraulic Challenges of Ageing Infrastructure *(Ageing Infrastructure, Climate change adaptation, Structural health monitoring)*

SS-20 Fundamental Flow Hydraulics at Hydraulic Structures *(Hydraulic Design, Numerical Modelling, Laboratory Experiments)*

SS-28 Digital Empowerment of Whole-Process Water Allocation *(Water Allocation, Digital Twin, Artificial Intelligence)*

SS-37 Smoothed Particle Hydrodynamics (SPH) and Its Applications in Hydraulic Engineering *(Smoothed Particle Hydrodynamics; free-surface hydraulics; fluid-structure interaction)*

SS-47 Next-Generation of Fluid-Structure Interaction Modeling for Off- and Near-Shore, Estuarine and Fluvial Infrastructure Resilience *(Fluid-soil-structure interaction, Infrastructure resilience, Scour mechanics, Multiphysics modelling, Non-intrusive sensing, Digital twins and AI-driven diagnostics)*

Pillar C: Improving Resilience Against Water Hazards and Disasters

Theme C-1: Climate Change Mitigation and hydraulic-infrastructure resilience

Special Sessions:

SS-18 Digital Ecohydraulics for River Resilience: Integrating Remote Sensing, Machine Learning, and Advanced Modelling *(Digital Ecohydraulics, Remote Sensing, Machine Learning, Hydromorphological Modelling)*

SS-22 Resilience against climate change in the Asia-Pacific Region *(Climate trends, Nature-based solutions and engineered strategies, Community-led resilience initiatives)*

SS-23 Intelligent Early Warning Systems: Machine Learning Integration for Hydrometeorological and Tsunami Hazard Management *(Physics-Informed Neural Networks (PINNs), Intelligent Early Warning Systems (EWS), Responsible AI (bias & data deserts))*

SS-29 Digital-Intelligent Empowerment of Flash Flood Disaster Prevention *(Flash Flood Early Warning, Digital Twin, AI-based Hydrological Simulation)*

SS-30 Debris and Driftwood Accumulation at Hydraulic Structures *(Driftwood and floating debris, Hydraulic structures, Flood resilience and debris management)*

SS-35 AI-Enabled Multi-Hazard Assessment for Water Systems and Water-Related Risk Reduction *(Compound and cascading hazards, Water infrastructure vulnerability, Cross-domain data interoperability)*

SS-39 From Hydraulic Processes to Resilient Bridge Management under Hydrological Extremes *(Bridge; Hydraulics; hydrodynamics; Scour; Climate change; Risk)*

SS-49 Smart Water: Digital Water and Responses to Climate Change *(Smart Water, Climate Change Adaptation, Digital Twin, AI-Powered Hydrological Forecasting, Real-Time Monitoring, Data-Driven Resilience)*

SS-54 Basin-scale Water and Sediment Modelling and Regulation: from the Source to the Estuary in Large Rivers *(Large regulated rivers, source-to-estuary connectivity, basin-scale modelling, water and sediment budgets, reservoir cascade operations, flood and sediment hazards, low flows)*

Theme C-2: Urban water cycle, industrial water and water treatment

Special Sessions:

SS-07 Theory and Applications of Smart Water Networks *(Smart Water Networks, Autonomous & adaptive control, AI–Hydraulics Verification & Safety)*

SS-24 From Scarcity to Smart Management: Solutions for Intermittent Water Supply Systems *(Intermittent Water Supply (IWS), Digital Transformation (Sensors & IoT), Intermittence Modelling & Management)*

SS-34 Cities Don't Fail in Silos: Governing Water-Energy-Cooling Dependencies for Metropolitan Resilience *(Urban water resilience, Cascading infrastructure risk, Water-energy nexus)*

SS-36 Digital Transition in Water Utilities: Governance, Organizational Change and Operational Value *(Digital Transition, Digital Water Strategy, Governance and Accountability of Digital Decisions)*

SS-53 Water for Growing Cities: Bridging Science, Innovation and Governance for Water-Neutral Urban Development in Central Asia and Beyond *(Water-Neutral Urban Development; Rapidly Growing Cities; Integrated Urban Water Planning; Central Asia; Water Reuse; Urban Water Governance; Transferable Solutions)*

Theme C-3: Deltas, coastal and maritime engineering

Special Sessions:

SS-02 Ecohydraulics in Coastal and Riparian Zones as Critical Interfaces under Change *(Coastal zone, Riparian zone, Transitional ecosystem, Ecohydraulics process)*

SS-41 Integrated Observations and Modelling of Estuarine and Lagoon Dynamics *(Estuaries and lagoons, hydro-morphodynamics, stratification and exchange flows, biogeochemical transport, in-situ observations, numerical modeling and forecasting)*

SS-55 Mediterranean Waters under Global Change: Biodiversity Assessment, Habitat Restoration and Biological Remediation *(Mediterranean Sea, semi-enclosed and transitional waters; marine caves; biodiversity assessment; habitat degradation, monitoring, restoration; biological remediation; sustainable ecosystem management; global change)*

SS-56 From Research Results to Policy Impact: Capitalizing IPA ADRION Projects for Marine and Coastal Biodiversity Conservation *(Coastal Dune Ecosystems; Biodiversity Conservation; Nature-Based Solutions; Coastal Restoration; Climate Change Adaptation; Ecosystem Resilience; Soft Engineering; Coastal Vulnerability Assessment)*

Details of Special Sessions

Pillar A: Climate Change Adaptation and Mitigation

Theme A-1: Climate Change Adaptation

Special Sessions:

SS-06 Integrated Flood Risk Management from Science to Practice

Flood risk is intensifying globally because of interacting drivers, including anthropogenic climate change, demographic growth, urbanization, land-use transformation, and the deterioration of critical infrastructure. Despite substantial methodological advances, particularly in high-resolution hydrodynamic modelling, remote sensing, real-time monitoring, and digital communication technologies, the transfer of scientific knowledge into practice remains inconsistent. This session aims to advance the science –practice interface in IFRM.

Keywords: Flood Risk Assessment, Hazard Mapping, Risk Governance, Mitigation Strategies, Adaptive Management, Climate Change Adaption

SS-08 Digital Twin of Detailed River Basin Morphology and Hydraulic Structures for Advanced Basin Management

Recent advances in digital twin technologies are transforming river basin management by enabling integrated, data-driven understanding of complex hydrological and hydraulic processes. Contributions are invited that address the generation, integration, and utilization of detailed digital representations of river basins, including automated model construction from heterogeneous geospatial data, real-time or near-real-time simulation, and scenario-based analysis for flood management.

Keywords: Digital Twin, Flood, Inundation, River Basin, Hydraulic Structures

SS-12 Advances and Guidelines for Water Resources Management: Adaptation Under Evolving Climate

This session addresses the critical need for robust water resources management guidelines in the face of climate change and variability, focusing on the transition from traditional methodologies to adaptive frameworks. By exploring hydrologic design under nonstationary climate, the proposal moves beyond static historical data to incorporate the complexities of climate change projections and uncertainty into infrastructure planning.

Keywords: Climate-sensitive design, Adaptation, Guidelines, Decision making under change

SS-27 Buoyancy-Driven Flows

The session is open to contributions from all types of natural and engineered flows that involve buoyancy as a main driving force. This session will cover all environmental, industrial, and geophysical flow problems spanning both aquatic, terrestrial, and atmospheric environments, where density and thermal gradients can drive transport and mixing dynamics. Contributions can be either on fundamental or applied research topics in these or related areas, and can present findings from experimental, analytical, computational and/or field studies.

Keywords: Gravity currents, Internal waves, Atmospheric flows, Oceanic flows, Natural ventilation

SS-32 Integrated Water Resilience in Arid Regions: Diversified Portfolios, Digital Systems, and Adaptive Governance

This special session addresses how arid and water-scarce regions can design and implement integrated water-resilience portfolios that combine multiple supply sources, digital systems, environmental safeguards, and adaptive governance. Rather than treating desalination, wastewater reuse, smart networks, brine management, resource recovery, or decentralized supply as stand-alone solutions, contributions must examine how two or more of these elements interact within coherent resilience strategies.

Keywords: Integrated Water Resilience, Non-Conventional Water Portfolios, Water-Energy-Environment Trade-offs, Brine Resource Recovery, Adaptive Governance, Digital Water Systems

SS-38 Transboundary Rivers and Water Security under a Changing Climate: The Role of Water Information System?

Transboundary rivers are essential sources of water for drinking, agriculture, industry, hydropower, navigation, and ecosystems. This special session provides an interdisciplinary platform for researchers, engineers, water-resource managers, and practitioners to exchange knowledge and experience on transboundary rivers under changing climatic conditions. Emphasis will be placed on advanced hydraulic and hydrological modelling, data

and information exchange, remote sensing, artificial intelligence, and integrated decision-support tools to address emerging transboundary water challenges and the development of the needed Water Information System.
Keywords: Transboundary Water Resources, Water Security, Climate Change, Hydrodynamic Modeling, Sediment and Water Quality, Water Information System.

SS-48 Climate Adaptation of Water Infrastructure: Towards a Shared Engineering Framework
Climate change poses growing challenges for water infrastructure, making robust risk assessment and adaptation increasingly important. The session will bring together researchers, engineers, infrastructure operators and decision-makers to share scientific advances, methodological developments, engineering approaches, practical experience and case studies across different water-infrastructure systems. Contributions should help identify methodological challenges, knowledge gaps and transferable practices for connecting climate information, infrastructure vulnerability and risk to implementable adaptation strategies.

Keywords: Climate change adaptation, Water infrastructure, Climate risk and vulnerability assessment, Resilience, Adaptation strategies

SS-50 Securing Water for All: Leveraging Non-Conventional Resources to Accelerate SDG 6
This special session focuses on policy frameworks and practical experiences of non-conventional water utilization. It addresses major challenges including non-conventional water application, standard implementation, multi-stakeholder coordination and cost-benefit balance under climate change and growing water scarcity. The session aims to advance joint knowledge building of non-conventional water as a strategic alternative water source, provide practical references for global water security, and promote mutual experience-sharing between China's water sector and the worldwide water community.
Keywords: Non-conventional water resources, alternative water source, water scarcity, adaptation, policy and practices, knowledge sharing

Theme A-2: Water and Nature

Special Sessions:
SS-01 Ecohydraulics: Biophysical Interactions in Natural and Engineered Aquatic Systems
Aquatic systems, from headwater streams to rivers, lakes, deltas, and estuaries, are dynamic environments shaped by interacting hydraulic, ecological, and geomorphic processes. Increasing climate variability and human pressures make understanding these interactions critical for sustaining ecosystem function while meeting societal water needs. This session focuses on Ecohydraulics of riverine, lake and estuarine systems, highlighting advances that inform management, restoration, and climate resilience.
Keywords: Ecohydraulics, Flow–vegetation–sediment feedback, Restoration & climate resilience

SS-03 AI and Data-Driven Ecohydraulics: Monitoring, Modelling, and Design
Recent advances in artificial intelligence (AI), coupled with rapid improvements in data storage capacity, cloud computing, high-resolution sensing technologies, and remote observation platforms, have created unprecedented opportunities for data-driven research across Ecohydraulics. This session welcomes contributions that leverage emerging AI methodologies and data-driven approaches to advance Ecohydraulics understanding and practice.
Keywords: Ecohydraulics, Intelligent Environmental Sensing, Artificial Intelligence, Machine Learning

SS-14 Nature-Based Solutions for Upstream Catchments and Small Streams
This session considers nature-based solutions in headwaters, upstream catchments and small streams. It examines hydrological and Ecohydraulics processes, restoration effectiveness, monitoring and upscaling, highlighting how distributed interventions can reduce runoff and erosion, improve habitat and water quality, and strengthen climate resilience. Contributions will connect scientific evidence and practical experience in Nature-based solutions, Upstream catchments, Small streams, with attention to transferable methods and implementation.
Keywords: Nature-based solutions; Upstream catchments; Small streams

SS-15 Nature-Based Solutions for Urban Areas
This session examines nature-based solutions for urban water challenges, including stormwater, flooding, heat and water quality. Contributions address design, Ecohydraulics performance, monitoring, modelling and governance of blue-green systems, with emphasis on integration with grey infrastructure and evidence of scalable urban

benefits. Contributions will connect scientific evidence and practical experience in Nature-based solutions, Urban Ecohydraulics, Blue-green infrastructure, with attention to transferable methods and implementation.
Keywords: Nature-based solutions; Urban Ecohydraulics; Blue-green infrastructure

SS-16 Nature-Based Solutions for Large Rivers
This session explores nature-based solutions for large rivers, addressing restoration, flood-risk reduction, sediment dynamics, habitat connectivity and navigation constraints. It combines Ecohydraulics science, modelling, monitoring and implementation experience to evaluate performance, trade-offs and long-term resilience at reach and basin scales. Contributions will connect scientific evidence and practical experience in Nature-based solutions, Large rivers, River restoration, with attention to transferable methods and implementation.
Keywords: Nature-based solutions; Large rivers; River restoration

SS-17 Nature-Based Solutions for Coasts and Estuaries
This session focuses on nature-based solutions for estuaries and coasts, including wetlands, dunes, reefs and hybrid measures. Contributions investigate hydrodynamic and ecological performance, sediment processes, monitoring, design and governance, supporting resilient shoreline management under sea-level rise and changing storm conditions. Contributions will connect scientific evidence and practical experience in Nature-based solutions, Estuaries, Coastal resilience, with attention to transferable methods and implementation.
Keywords: Nature-based solutions; Estuaries; Coastal resilience

SS-51 Accelerating Implementation of Nature-Based Solutions at Scale to Address Climate Risk
During the past 5 years there has been an increasing expectation of government agencies to implement Nature Based Solutions (NbS) swiftly. Three recent global comprehensive bibliographic analyses collectively scanned over 37,000 publications and provided detailed analyses of nearly 1000 articles. This session will facilitate dialogue between government representatives, NGO enablers and IAHR experts to explore ways of accelerating NbS.
Keywords: Adaptive Management, Climate Resilience, Decision-making

Theme A-3: Hydro-Environment Engineering and Society

Special Sessions:
SS-33 Binding Without Erasure: River Monitoring, Plural Evidence and Environmental Obligation in Transboundary Governance
Rivers are material systems, ecological communities, historical archives, territories, legal objects and, in some jurisdictions, legal or relational subjects. This session asks a consequential question: how can heterogeneous knowledge become institutionally binding without being reduced to a single metric, epistemic or juridical form? Contributions will trace how river science and monitoring evidence travel across scales and jurisdictions, with particular attention to international and transboundary river-basin case studies.
Keywords: River Governance, Environmental Evidence, Adaptive Water Resources Management

Pillar B: Water Engineering and Energy, Ecological and Digital Transition

Theme B-1: Hydropower and water related renewable energy

Special Sessions:

SS-44 Advancing Hydropower through Multidisciplinary Research for Resilient Water and Energy Systems

Hydropower is essential for the transition towards resilient, low-carbon water and energy systems. This special session will bring together multidisciplinary research on the coordinated advancement of hydropower technology, reservoir operation, digitalisation and environmental performance. The session will also address climate-resilient reservoir operation, water–energy trade-offs, environmental flows, hydropeaking impacts, sediment and ecosystem considerations, and the integration of hydropower within renewable and hybrid energy systems.

Keywords: Hydropower Flexibility, Reservoir Operations, Digital Hydropower, Water–Energy Nexus, Climate Adaptation, Environmental Sustainability

SS-57 Climate Change and Marine Energy: Towards Sustainable and Resilient Coastal and Offshore Systems

Climate change and the energy transition are reshaping offshore wind and wave energy development. While these technologies support decarbonization, their deployment must address resource uncertainty, extreme metocean conditions, sea-level rise, technological maturity, infrastructure resilience, environmental sustainability, and coastal impacts. This Special Session will convene researchers, engineers, and stakeholders from marine energy, coastal engineering, oceanography, and climate science to examine these interactions and identify shared strategies for developing resilient renewable energy systems that support climate mitigation and adaptation in coastal communities.

Keywords: Marine Renewable Energy, Offshore Wind Energy, Wave Energy, Climate Change Adaptation and Resilience, Energy Transition, Decarbonization)

Theme B-2: Water engineering for inland water bodies

Special Sessions:

SS-05 Advances in Monitoring Extreme River Flows Across the Hydrologic Spectrum

Among the focal topics for the special session are new innovative monitoring approaches for: - Spatiotemporal gradually varied flows (unsteady, non-uniform flow regimes) - Flood flows through vegetated floodplains-Runoff- and tide-modulated flows-Extreme flows observed with remote sensing technologies-Low technology/low-cost techniques for any of the above flows By highlighting advances in observation and monitoring strategies for both low-flow and high-flow extremes, this session aims to foster cross-disciplinary dialogue and accelerate the development of robust, scalable, and actionable river-monitoring capabilities.

Keywords: Advanced streamflow monitoring methods, Drought, Flood

SS-09 Ice Processes in Inland and Transitional Waters

Ice formation, evolution, and breakup in inland and transitional waters are governed by complex interactions between hydrodynamic, thermal, and mechanical processes operating across multiple spatial and temporal scales. Rivers, lakes, and transitional coastal basins such as brackish lagoons and estuarine systems each exhibit distinct ice regimes shaped by flow variability, wind forcing, salinity gradients, water-level fluctuations, and anthropogenic regulation.

Keywords: River and lake ice, Ice dynamics, Climate variability

SS-10 Sediment Transport and River Training in Alluvial Rivers: Current Understanding and Open Challenges

Bridges and hydraulic structures are critical elements of modern transport networks, enabling rapid and reliable movement of people and goods across rivers and other waterways. Recent advances in remote sensing and artificial intelligence (AI) provide powerful new tools to address these challenges. This session aims to bring together recent

advances on hydraulics of alluvial rivers, bridge scour, sediment transport, and river training works, with particular emphasis on the role of remote sensing and AI.
Keywords: Alluvial River hydraulics, Turbulence monitoring and modelling, Scour protection and river training works

SS-21 Plastic Transport in Rivers: Connecting Empiricism and Modelling
Plastic mobilization, transport, retention, and degradation in rivers are increasingly recognized as serious ecological and human threats. In recent years, these processes have been investigated through laboratory experiments, field studies, and numerical modelling. The goal of this special session is to bring together robust insights and data with different modelling approaches enabling the simulation of plastic movement in rivers.
Keywords: Microplastics and Litter, Multiphase flow, Numerical modelling

SS-26 Advances in Environmental Fluid Mechanics
The proposed session, "Advances in Environmental Fluid Mechanics," will provide a state-of-the-art overview of emerging theoretical, experimental, numerical and data-driven approaches in environmental fluid mechanics, with applications spanning environment, hydraulic systems, turbulence, sediment/micro-plastic and pollutant transport, multiphase flows, and climate-related transport processes. The session will address key scientific and technical challenges associated with understanding, modelling, measuring, and predicting complex environmental flows across multiple spatial and temporal scales.
Keywords: Fluid Mechanics, Modelling, Numerics

SS-31 High-Fidelity 3D CFD and CFD–DEM Methods for Predictive Bed Morphodynamics
High-fidelity three-dimensional computational fluid dynamics (CFD) is increasingly enabling process-based prediction of complex flow –sediment interactions and bed morphological evolution. This Special Session will focus specifically on high-fidelity 3D CFD methodologies for predictive bed morphodynamic across fluvial, estuarine and coastal environments. Contributions are invited on RANS, LES and DES approaches; CFD –DEM formulations; multiphase flow and sediment–fluid interaction modelling; advanced turbulence and sediment transport closures; and high-performance computing strategies for computationally intensive morphodynamic simulations.
Keywords: High-Fidelity 3D CFD, CFD–DEM and Multiphase Sediment Modelling, Morphodynamic Model Verification and Validation

SS-40 Dam Reservoir Sedimentation: Challenges and Management Solutions
Reservoir sedimentation represents a growing challenge to the long-term sustainability of water infrastructure worldwide, progressively reducing storage capacity, affecting operational performance, and disrupting sediment continuity in river systems. This special session aims to present recent scientific advances and methodological developments in sediment monitoring and modelling, Earth observation applications, sediment-related hazard assessment, sediment routing and removal techniques, and integrated management strategies.
Keywords: Reservoir sedimentation, Sustainable management and operation, Monitoring, Numerical modelling, Case studies

SS-45 Non-contact and surrogate measurements of river hydrodynamics and sediment transport across scales: from observation to modelling in the era of AI
Numerical, data-driven and AI-based models of river flow and sediment transport are only as reliable as the data used to build, calibrate and test them. At the same time, the way rivers are measured is changing. Image velocimetry from UAVs and fixed cameras, Doppler radar and satellite missions such as SWOT now observe the water surface where in-stream measurements are unsafe or impractical, while acoustic and other surrogate techniques give continuous estimates of suspended load and bedload.
Keywords: Non-contact and surrogate measurements; image velocimetry and radar; discharge and velocity distribution; sediment transport; monitoring-modelling integration; data-driven and AI-based models

Theme B-3: Water engineering and society

Special Sessions:

SS-25 Water Security in Latin America: From Local Experiences to the Construction of a Regional Metric
The Water Security Index transforms a complex concept into an objective measure capable of guiding technical, policy and strategic decisions by integrating dimensions such as availability, quality, access, infrastructure, governance and climate risk. In Latin America, several countries have already developed national or sub -national indices, although using different methodologies that reflect different realities and priorities. Rivers, aquifers and water supply systems across national borders, forming interdependent systems.
Keywords: Water Security Index, Regional / Transboundary Water Assessment, Cooperative Governance & Coordinated Decision-Making

SS-42 Co-Evolving Human–Water Systems: From Socio-Hydrological Science to Policy and Community Decisions
Water systems and societies continuously shape one another. Despite advances in climate and hydrological forecasting, these dynamic and bidirectional feedbacks remain insufficiently represented in water planning and decision-making. Coupled human–water systems research provides an interdisciplinary foundation for understanding how water availability, risk perception, livelihoods, institutions, infrastructure, and collective behavior co-evolve across spatial and temporal scales. This session will connect socio-hydrological science with practical decisions by policymakers, water managers, stakeholders, and communities.
Keywords: Socio-Hydrology, Coupled Human–Water Systems, Human–Water Feedback, Participatory Modeling, Water Governance

Theme B-4: Irrigation, drainage and pollution control

Special Sessions:
SS-11 Advances in Marine and Freshwater Outfall Systems: Innovations in Modelling, Design, and Environmental Protection
This special session addresses critical advances in marine and freshwater outfall systems, focusing on innovations in modelling, design, and environmental protection. The session will advance knowledge and solutions in the water sector through presentation of cutting-edge near-field and far-field dispersion modelling techniques, demonstration of AI and machine learning applications in predictive modelling and performance optimization and sharing of international case studies showcasing sustainable outfall implementations.
Keywords: Outfall systems, Climate change adaptation, Digital transformation

SS-43 Karst Coastal Aquifers under Pressure: Monitoring, Digital Tools and Management of Seawater Intrusion in the Mediterranean Basin
Coastal karst aquifers are strategic freshwater resources throughout the Mediterranean Basin, supporting drinking-water supply, irrigation, ecosystems and economic activities. This special session will bring together researchers, water managers and public authorities to discuss recent advances in monitoring, assessment and sustainable management of coastal karst aquifers. By connecting scientific innovation with operational needs, the session aims to strengthen cooperation and support more resilient management of vulnerable coastal groundwater resources.
Keywords: Coastal Karst Aquifers, Seawater Intrusion, Groundwater Monitoring, Hydrogeological Modelling, Submarine Groundwater Discharge, Adaptive Groundwater Management

SS-46 Advances in Soil-Plant Sensing and Data Analysis for Precision and Smart Irrigation Management with Conventional and Alternative Water Sources
Soil and crop sensing are essential for smart irrigation, enabling timely monitoring of plant water status and spatial variability. Advanced data analysis transforms large datasets into actionable information for irrigation and fertigation scheduling. The session examines innovative sensors, methods for early stress detection, and interdisciplinary approaches integrating data collection and tailored algorithms. Bringing together agronomy, horticulture, statistics, mechanics, and electronics, it promotes sustainable, resilient water management using conventional and alternative resources in agriculture.
Keywords: hyperspectral sensing; spatial data analysis; precision irrigation and fertigation; sensor- and robot-based data acquisition and decision making/crop management; decision support systems; reclaimed water reuse

SS-52 Advancing Groundwater Sustainability and Regional Water Security in Agricultural Landscapes
Achieving long-term water security in water-stressed agricultural regions requires understanding groundwater availability, aquifer sustainability, and the interactions among water resources, agricultural production, and

regional management priorities. This session explores research and management approaches that address groundwater sustainability, agricultural water use, and the resilience of water resources across agricultural landscapes. Social science research explores socioeconomic, institutional, and producer-level factors influencing agricultural water management decisions and adoption of sustainable practices.
Keywords: Agricultural water security, Groundwater sustainability, Ecohydrology, Conservation, Hydrologic Modeling, Barriers to Adoption.

Theme B-5: Water engineering for water infrastructures

Special Sessions:
SS-04 Transient Flows in Hydraulic Systems
Hydraulic transients remain one of the most critical yet often underestimated phenomena affecting water systems. This special session aims at gathering high experts representing these groups in the form of keynote lectures that will explain the transient flow nature of each of these phenomena, how they are scientifically tackled, and their implications and applications in hydro-environmental infrastructure. Implicit objectives of this special session are therefore to determine commonalities among these research groups and synergize towards future research lines.
Keywords: Hydraulic transients, Dam break, Tidal bores, Tsunamis

SS-13 Scour around Hydraulic and Coastal Structures
This proposed session focuses on the critical issue of scour around hydraulic and coastal structures, a fundamental challenge affecting the safety, stability, and longevity of infrastructure such as bridge piers, offshore wind turbine foundations, pipelines, and seawalls. The session will have a strong scientific and practice-oriented focus, aiming to bridge the gap between advanced research and engineering application.
Keywords: Hydrodynamic-structure interaction, Foundation design, Scour protection

SS-19 Hydraulic Challenges of Ageing Infrastructure
This special session will address the hydraulic challenges associated with ageing water infrastructure, including dams, spillways, levees, gates, culverts, and urban drainage systems. The session will bring together recent advances in modelling, assessment, monitoring, rehabilitation, and risk-informed management, and will serve as a forum of discussion.
Keywords: Ageing Infrastructure, Climate change adaptation, Structural health monitoring

SS-20 Fundamental Flow Hydraulics at Hydraulic Structures
This session addresses the fundamental understanding of flow hydraulics that governs the design, performance, and safety of hydraulic structures. Hydraulic structures such as spillways, tunnels, culverts, energy dissipators, fish passages, and others involve a wide range of interacting flow processes. The session will highlight practical applications, emerging research needs, and recent scientific developments in the field. Contributions addressing experimental, numerical, and field-based investigations of fundamental flow processes at hydraulic structures are particularly encouraged.
Keywords: Hydraulic Design, Numerical Modelling, Laboratory Experiments

SS-28 Digital Empowerment of Whole-Process Water Allocation
Against the background of growing water scarcity, fluctuating water supply and demand patterns, and ongoing digital transformation of global water governance, traditional empirical and static water allocation modes can no longer adapt to refined, precise and real-time water resource management requirements. This proposed session focuses on the digital empowerment of whole-process water allocation, aiming to explore innovative theories, technical methods and practical paradigms for data-driven water resource deployment.
Keywords: Water Allocation, Digital Twin, Artificial Intelligence

SS-37 Smoothed Particle Hydrodynamics (SPH) and Its Applications in Hydraulic Engineering
Smoothed Particle Hydrodynamics (SPH) is increasingly used to simulate complex hydraulic flows involving large free-surface deformation, moving boundaries, impact loads, and fluid–structure or fluid–sediment interaction. This special session will connect advances in mesh-free particle methods with validated applications across inland, coastal, maritime and renewable-energy engineering. Contributions will address river and flood hydraulics; flows

around bridge piers, local scour and sediment dynamics; waves and overtopping at coastal structures; wave-energy converters; and stratified or multiphase flows around hydraulic infrastructure.
Keywords: Smoothed Particle Hydrodynamics; free-surface hydraulics; fluid-structure interaction.

SS-47 Next-Generation of Fluid-Structure Interaction Modeling for Off- and Near-Shore, Estuarine and Fluvial Infrastructure Resilience
Human-built infrastructure in offshore, near-shore, estuarine and fluvial environments faces increasing hydrodynamic threats from storm surges, floods, meteo-tsunamis, waves and currents. This session focuses on next-generation approaches for coupled fluid-soil-structure interaction and resilient hydraulic and maritime infrastructure. By integrating modelling, sensing and digital workflows, the session aims to bridge fundamental hydrodynamic mechanics and engineering practice, improve design criteria and safety factors under changing climate conditions, and identify research gaps and future priorities.
Keywords: Fluid-soil-structure interaction, Infrastructure resilience, Scour mechanics, Multiphysics modelling, Non-intrusive sensing, Digital twins and AI-driven diagnostics

Pillar C: Improving Resilience Against Water Hazards and Disasters

Theme C-1: Climate Change Mitigation and hydraulic-infrastructure resilience

Special Sessions:

SS-18 Digital Ecohydraulics for River Resilience: Integrating Remote Sensing, Machine Learning, and Advanced Modelling
Earth Observation (EO) and remote sensing (RS) provide massive and rapidly expanding data streams on land and water surfaces, enabling new opportunities to quantify riverine ecosystem dynamics across multiple spatial and temporal scales. At the same time, advances in machine learning and data analytics are accelerating the extraction of physically meaningful information from EO/RS products (e.g., vegetation traits, roughness proxies, bathymetry/topography, inundation dynamics, sediment and habitat indicators).
Keywords: Digital Ecohydraulics, Remote Sensing, Machine Learning, Hydromorphological Modelling

SS-22 Resilience against climate change in the Asia-Pacific Region
The theme of the proposed session is 'Resilience against flooding and disasters in the Asia-Pacific Region'. This special session seeks contributions about the following themes in APD region: Climate trends, variability, and projections at national and sub-national levels; Nature-based solutions and engineered strategies for climate adaptation; Indigenous knowledge systems and community-led resilience initiatives; Climate finance, governance mechanisms, and institutional frameworks supporting adaptation; Adaptation measures and interventions implemented at local, regional, and national scales.
Keywords: Climate trends, Nature-based solutions and engineered strategies, Community-led resilience initiatives

SS-23 Intelligent Early Warning Systems: Machine Learning Integration for Hydrometeorological and Tsunami Hazard Management
Proposal for regional deployment of Intelligent Early Warning Systems based on physics-informed neural networks. Unlike traditional numerical models, these approaches embed differential equations directly into machine learning models enabling physically consistent predictions up to 100 times faster. The initiative aims to improve tsunami and flood management while addressing algorithmic bias and data-desert challenges through responsible AI.
Keywords: Physics-Informed Neural Networks (PINNs), Intelligent Early Warning Systems (EWS), Responsible AI (bias & data deserts)

SS-29 Digital-Intelligent Empowerment of Flash Flood Disaster Prevention
This special session aims to address the prominent characteristics of flash floods, including abrupt onset, rapid confluence, scattered impact areas and great difficulties in monitoring and management. Traditional prevention modes relying on manual inspections and empirical forecasting can no longer adapt to complex and variable mountain hydrological environments. It provides digital and intelligent solutions for resilient governance of mountain watershed flood disasters and regional water security guarantee.
Keywords: Flash Flood Early Warning, Digital Twin, AI-based Hydrological Simulation

SS-30 Debris and Driftwood Accumulation at Hydraulic Structures
This special session aims to bring together researchers and water managers from around the world who are studying or working on this issue and contributions may include field observations and monitoring, post-flood analysis, physical modelling, numerical modelling, structural loading, and operational management. The session will provide a platform for sharing recent advances, identifying knowledge gaps, and discussing how scientific evidence can be translated into practical strategies for flood-risk reduction and infrastructure resilience.
Keywords: Driftwood and floating debris, Hydraulic structures, Flood resilience and debris management

SS-35 AI-Enabled Multi-Hazard Assessment for Water Systems and Water-Related Risk Reduction
This session aims to bring together researchers exploring how artificial intelligence can support integrated multi-hazard assessment for water systems and water-related risk reduction, through shared methodologies, interoperable data workflows and real case studies. Building on a concrete Taiwan –Italy collaborative framework, the session aims to advance data-driven, multi-hazard resilience methodologies for water systems that can be transferred to water-related territories facing similar convergent risks worldwide.
Keywords: Compound and cascading hazards, Water infrastructure vulnerability, Cross-domain data interoperability

SS-39 From Hydraulic Processes to Resilient Bridge Management under Hydrological Extremes
Bridges are critical components of infrastructure systems. This special session will bring together researchers, engineers, and practitioners to advance understanding of the complex interactions between hydraulic processes, bridges and relative transport networks. It will address recent developments in integrating scour, debris accumulation, flow constriction and hydrodynamic loading with decision-making and/or management. Contributions should address bridges as integrated infrastructure systems and explicitly connect hydraulic processes with risk assessment, monitoring, maintenance, retrofitting, asset management or transport-network resilience.
Keywords: Bridge; Hydraulics; hydrodynamics; Scour; Climate change; Risk

SS-49 Smart Water: Digital Water and Responses to Climate Change
This special session explores scientific advances, technological innovations, and practical applications of digital water approaches for addressing the impacts of climate change on water systems. The session focuses on intensifying hydrological extremes, growing water-security risks under climate variability, and the gap between digital research and operational implementation. Contributions will address digital twin platforms, AI-powered hydrological forecasting, real-time monitoring networks, and data-driven strategies for climate-resilient water management.
Keywords: Smart Water, Climate Change Adaptation, Digital Twin, AI-Powered Hydrological Forecasting, Real-Time Monitoring, Data-Driven Resilience

SS-54 Basin-scale Water and Sediment Modelling and Regulation: from the Source to the Estuary in Large Rivers
In large, regulated rivers, the location and severity of hazards depend on how changes in runoff and sediment supply propagate through the river network. These effects are jointly shaped by human interventions and climate change. During the 2026 European drought, prolonged low flows on the Rhine disrupted navigation. In the Yangtze and Yellow rivers, sediment interceptions and soil conservation across catchments have reduced sediment delivery to the lower reaches and estuaries.
Keywords: Large, regulated rivers, source-to-estuary connectivity, basin-scale modelling, water and sediment budgets, reservoir cascade operations, flood and sediment hazards, low flows)

Theme C-2: Urban water cycle, industrial water and water treatment

Special Sessions:
SS-07 Theory and Applications of Smart Water Networks
This special session aims to bridge the gap between theoretical advances and practical implementation in Smart Water Network operations, aligning with the IAHR-WSO Working Group's renewed focus on control science, physics-based intelligence, and system-wide autonomy. The session will focus on the scientific and technical

foundations necessary for transitioning from human-assisted decision support to truly autonomous, adaptive, and smart water infrastructure management.
Keywords: Smart Water Networks, Autonomous & adaptive control, AI–Hydraulics Verification & Safety

SS-24 From Scarcity to Smart Management: Solutions for Intermittent Water Supply Systems
Intermittency in water supply constitutes an operational reality in several countries in Latin America, including Brazil, where intermittent systems serve a significant portion of the population. The organization of a session on this topic would allow discussion of recent advances associated with the digital transformation of the water sector, including the emerging use of sensors, IoT and new approaches to modelling and management intermittence.
Keywords: Intermittent Water Supply (IWS), Digital Transformation (Sensors & IoT), Intermittence Modelling & Management

SS-34 Cities Don't Fail in Silos: Governing Water-Energy-Cooling Dependencies for Metropolitan Resilience
Urban water resilience cannot be governed independently from energy, cooling, communications, health services, mobility and other critical metropolitan functions. A disruption that begins in one network can propagate rapidly across the city, while sector-specific dashboards may still show acceptable asset performance. This proposed session brings together water, utility, infrastructure, resilience, digital and governance perspectives to examine how cities can identify, quantify and govern these cross-sector dependencies before they become cascading failures.
Keywords: Urban water resilience, Cascading infrastructure risk, Water-energy nexus

SS-36 Digital Transition in Water Utilities: Governance, Organizational Change and Operational Value
Contributions will address digital strategy, organizational readiness, integration of data and information, engineering and operations, data governance, procurement and investment decisions, professional competencies, accountability, regulatory alignment and the assessment of operational, environmental and societal value. Contributions primarily focused on control algorithms, hydraulic modelling, autonomous control architectures or AI methodological advances fall outside the primary scope unless their central contribution concerns organizational adoption, workflow integration, governance, accountability or measurable utility value.
Keywords: Digital Transition, Digital Water Strategy, Governance and Accountability of Digital Decisions

SS-53 Water for Growing Cities: Bridging Science, Innovation and Governance for Water-Neutral Urban Development in Central Asia and Beyond
Rapid urban growth, climate variability, ageing infrastructure and rising water demand are placing increasing pressure on urban water systems, particularly in Central Asia. In this context, water neutrality provides a framework for balancing water demand, reuse and environmental sustainability. This Special Session focuses on water-neutral planning for rapidly growing cities. The session brings together researchers, utilities, regulators, policymakers, technology providers and urban planners to support practical implementation.
Keywords: Water-Neutral Urban Development; Rapidly Growing Cities; Integrated Urban Water Planning; Central Asia; Water Reuse; Urban Water Governance; Transferable Solutions

Theme C-3: Deltas, coastal and maritime engineering

Special Sessions:
SS-02 Ecohydraulics in Coastal and Riparian Zones as Critical Interfaces under Change
Coastal and riparian zones are dynamic, ecologically vital interfaces where land and water converge, governing fluxes of water, sediment, nutrients and organisms. This session invites contributions that explore the biophysical interactions within coastal and riparian systems, with an emphasis on the interplay between hydraulics, geomorphology, and ecology communities. By fostering dialogue across these themes, this session aims to advance the science and practice of Ecohydraulics in some of the world's most productive and threatened transitional ecosystems.
Keywords: Coastal zone, Riparian zone, Transitional ecosystem, Ecohydraulics process

SS-41 Integrated Observations and Modelling of Estuarine and Lagoon Dynamics
This session aims to discuss recent advances in understanding and predicting estuarine and lagoon dynamics, including: (a) coupled hydrodynamic, morphodynamic and biogeochemical processes, with particular attention to

stratification, mixing, exchange flows and the transport of nutrients and pollutants; (b) integration of in-situ observations, remote-sensing data and numerical modelling; (c) operational estuarine and lagoon forecasting; and (d) knowledge-based applications supporting the monitoring and management of these environments under changing hydrological and climatic conditions.
Keywords: Estuaries and lagoons, hydro-morphodynamics, stratification and exchange flows, biogeochemical transport, in-situ observations, numerical modeling and forecasting

SS-55 Mediterranean Waters under Global Change: Biodiversity Assessment, Habitat Restoration and Biological Remediation
Mediterranean marine and coastal ecosystems support rich biodiversity and are increasingly exposed to anthropogenic pressures and climate change. Drawing on research in the Taranto Seas and marine caves alongside experiences from other Mediterranean sites, this special session will bring together biological, chemical, geological and technological perspectives. With biodiversity as its central focus, the session will connect biodiversity assessment, monitoring and restoration, with particular attention to semi-enclosed systems, transitional waters and marine caves.
Keywords: Mediterranean Sea, semi-enclosed and transitional waters; marine caves; biodiversity assessment; habitat degradation, monitoring, restoration; biological remediation; sustainable ecosystem management; global change.

SS-56 From Research Results to Policy Impact: Capitalizing IPA ADRION Projects for Marine and Coastal Biodiversity Conservation
Marine and coastal ecosystems provide essential ecological and socio-economic benefits but face growing pressures from urbanization, tourism, pollution, invasive species, and climate change. This session will present and compare the results of four Interreg IPA ADRION projects, PREBIODUNES, CRADLE, SAMESEA, and BLUEQ, highlighting complementary approaches to ecosystem restoration, biodiversity conservation, environmental monitoring, and sustainable coastal management. By bringing together diverse experiences, the session aims to identify transferable methodologies, shared lessons learned, and replicable solutions for the Adriatic-Ionian region and beyond.
Keywords: coastal dune ecosystems; biodiversity conservation; nature-based solutions; coastal restoration; climate change adaptation; ecosystem resilience; soft engineering; coastal vulnerability assessment.