

[THEME 5 COORDINATION]

Theme 5 Concept Note **Thematic Process, 11th World Water Forum**

- **Theme Number:** 5
- **Theme Title:** Innovation for water management
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- **Topic Coordinators:**
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 - **5B** : Korea Water Resources Corporation, K-water / (Asia Water Council), Mr. Taiwhan Kim
 - **5C** : International Office for Water (OiEau), Mrs. Marjorie Germain-Lupi, Project manager
 - **5D** : Climate and Water Initiative, Dr. Lama Elhatow, Senior Expert on Environmental Geopolitics and Sustainability Integration
 - **5E** : UNESCO, Mrs. Rahmah Elfithri, Chief of section, Capacity Development & Water Family Coordination

I. Theme Overview

- **Rationale and Context**

Innovation plays a decisive role in strengthening water security and sustainability and directly contributes to the achievement of SDG 6. It supports improvements in efficiency, access, quality, and resilience of water and sanitation services, while enabling more integrated and sustainable water resources management through inclusive governance, data-informed decision-making, and enhanced cooperation, particularly at basin and watershed levels. In this context, the Global Acceleration Framework for SDG 6, adopted by UN Water, identifies innovation as one of the five critical accelerators to fast-track progress towards SDG 6 and the water-related targets of the 2030 Agenda.

According to the OECD¹, innovation refers to the implementation of a new or significantly improved product, process, organizational or business method that has been effectively brought into use. **Applied to water management, innovation therefore goes beyond the generation of new ideas; it is fundamentally about effective implementation. It entails**

¹ “an innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)”. OECD & Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation*, 4th Edition, OECD Publishing, Paris. Also, previous definition refers to the implementation of a new or significantly improved product (good or service), process, marketing method, or organizational method in business practices, workplace organization, or external relations

translating not only technological but also institutional, social, organizational, and financial solutions into operational, scalable, and locally adapted arrangements that move beyond business-as-usual. By focusing on real-world deployment and measurable impact, innovation becomes a critical enabler of water security, climate resilience and long-term sustainability.

Innovating for sustainable water access and management also contributes directly to several interconnected Sustainable Development Goals:

- **SDG 2 (Zero Hunger)**, through more efficient and climate-smart water use in agriculture and improved water allocation;-
- **SDG 3 (Health and Wellbeing)**, by expanding safe and sustainable water and wastewater services and reducing waterborne diseases;-**being**)-borne diseases;
- **SDG 13 (Climate Action)**, by strengthening adaptive capacity, predictive approaches, and risk-informed decision-making;
- **SDGs 14 and 15**, by supporting the protection and restoration of aquatic and terrestrial ecosystems;
- **SDG 17 (Partnerships)**, by fostering collaboration among public, private, academic, and civil society actors.

Accordingly, Theme 5 integrates cross-cutting issues such as:

- **climate resilience**, by promoting adaptive and predictive solutions, decision-support tools, local knowledge, and cooperation at all levels;
- **gender and youth inclusion**, by supporting inclusive innovation processes, capacity and skills development, and by strengthening the attractiveness of the water sector;
- **digital innovation**, through new data production (including Earth observation) and management processes, AI, smart water systems, digital twins;
- **partnerships**, by connecting solution and knowledge providers, project owners, public authorities, and users;
- **Investment and finance**, by developing and highlighting investment opportunities through innovative projects and programmes;

- **Key Challenges and Opportunities**

Despite strong potential, innovative solutions for water management remains under-implemented, especially in developing contexts, due to a combination of factors:

- operational barriers;
- Language barriers (including linguistic, cultural, and technical);
- fragmented data systems;
- limited access to finance;
- unclear pathways to scale from pilots (including lifecycle operation and maintenance, and financing);

- limited human and institutional adoption capacity;
- socio-institutional barriers (low trust, weak recognition of community knowledge, gender and youth barriers);
- inappropriate regulation and risk-averse practices driven by the imperative of service continuity and limited culture of new approaches;
- procurement rules that disadvantage SMEs and startups;
- insufficient alignment between proposed solutions and local socio-economic, environmental, and operational contexts;
- emerging governance issues such as cybersecurity and data protection for AI-systems.

At the same time, urgent need of accelerating SDG6 achievement, growing international momentum on water and sanitation, rapid advances in digital technologies, growing citizen engagement, increased impacts of climate risks, and emerging challenges such as IA, create strong opportunities to transform water management systems.

This theme aligns with major global agendas, including:

- The **2030 Agenda for Sustainable Development**, the **Paris Agreement**, by supporting climate adaptation and resilience in water systems;
- The **Sendai Framework for Disaster Risk Reduction**, through improved forecasting, early warning, and risk-informed decision-making; it particularly intends to contribute to the **2026 and 2028 UN water conferences**,

• Thematic Logic

The five topics under this theme as per the official framework are :

Topic No.	Topic Title	Brief Focus Description (less than 5 sentences)
5A	<i>Hydro informatics and AI Tools for Water management: Hydro informatics and AI Tools for Water Management: Leveraging AI, Earth observation, and digital tools with strong governance, cybersecurity, and tech-sector collaboration.</i>	This topic focuses on the use of tools for decisions, especially the application of AI, hydro-informatics, and digital tools to support operational and strategic decision-making in water management. It emphasizes forecasting, early warning systems, and decision-support tools that translate complex data into actionable insights for practitioners and policymakers.
5B	<i>Deploying cutting-edge water technology: Moving from pilots to full-scale adoption of innovative technologies, environmentally sound and socially equitable over the long term, including reuse, desalination, and smart sensors.</i>	This topic aims to accelerate the transition from pilot innovations to large-scale, long-term deployment of cutting-edge water technologies by strengthening technical, institutional, and financial conditions for effective implementation. It aims to embed proven solutions into routine water management through robust governance, lifecycle-based planning, inclusive capacity

		building, and engagement of women, youth, and local communities to ensure resilient, equitable, and sustainable water services.
5C	<i>Data and overcoming the lasting challenge: Modernizing water information systems with real-time data, digital twins, and decision-support innovations.</i>	The objective of this topic is to advance data systems & infrastructure, focusing on the foundations of water data systems, including data governance, interoperability, system architecture, and real-time data integration. It aims to modernize water information systems by enabling reliable, shared, and interoperable data ecosystems that underpin advanced analytics, digital twins, and decision-support tools.
5D	<i>Engaging citizen science and community-based knowledge: Combining traditional knowledge and citizen-led innovation with technologies tailored through local participation</i>	The objective of this topic is to advance action-oriented and initiative-driven outcomes that strengthen water management by systematically integrating citizen science and community-based knowledge into water governance, monitoring, and decision-making processes. It seeks to strengthen technical capacity and credibility by equipping project initiators—including NGOs, governments, and academic institutions—with methodological guidance, appropriate tools, equipment, and quality assurance mechanisms that enhance the reliability and usability of community-generated data. The topic also aims to promote policy and institutional integration by identifying pathways to embed citizen science within national and local water monitoring frameworks, SDG 6 reporting processes, and inter-institutional collaboration across sectors. Additionally, it focuses on enhancing water literacy and inclusive participation by assessing knowledge gaps within different societal groups. Finally, it aims to build the capacities of communities, youth, and women to actively contribute to data collection, interpretation, and water-related decision-making.
5E	<i>Knowledge sharing: Advancing open data, peer learning, capacity building, and lifelong training opportunities.</i>	The objective of Topic 5E is to enhance global water governance by expanding access to knowledge, open data, and lifelong

		capacity-building opportunities for professionals, institutions, communities, youth, women and marginalized stakeholders. It aims to strengthen science-policy interfaces, promote inclusive capacity development, and support sustainable, coordinated mechanisms that empower all stakeholders to design and implement innovative water solutions.
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Together, the five topics under theme 5 provide a comprehensive framework for analyzing the key challenges of implementing innovative solution in the water sector. While Topic 5A focuses on the use of data for decision-making, Topic 5C addresses how data systems are structured, governed, and shared. On one hand digital tools, data, and AI enable science-informed decision-making and policy development while cutting-edge technologies (Topic 5B), including both high-tech and frugal, nature-based or decentralized solutions adapted to diverse socio-economic contexts, move from pilots to implementation at scale. .On the other hand citizen science citizen science (Topic 5D) and knowledge sharing and capacity development (Topic 5E) are core structural enablers that ensure adoption, legitimacy, and long-term institutionalization of innovation, rather than complementary components. To capitalize on existing synergies and provide a clear, action-oriented framework, Theme 5 is designed as a pathway to accelerate innovation from early concepts to operational deployment in the water sector. The theme articulation will support the practical implementation of innovative approaches that strengthen water resources management, service delivery, and governance.

II. Cross-Process Dialogue and Cooperation

This section guides each Theme Coordinator to conceptualize the collaborative dialogues to be co-developed with other processes:

- Political processes:

- **Ministerial and parliamentary:** 1) What legal and regulatory reforms and tools, including procurement rules, need to be adapted or designed to enable and support the deployment and implementation of innovative approaches? 2) Responding to emerging governance challenges, including cybersecurity and data protection risks associated with the use of digital and AI tools in water and wastewater services, and resources management systems. 3) High level panel on lesson learned from other sectors that commonly applied innovative approach in their daily operations (energy, transport...).
- **Local authorities:** Addressing risk aversion in the water and sanitation sector, linked to the critical need for service continuity and limited familiarity with innovative solutions and approaches- how bridging institutional and cultural gaps between

innovation providers and public authorities to build trust, mutual understanding, and adoption

- **Basin authorities:** Strengthening transboundary cooperation through shared data, and joint monitoring program.

- **Regional processes:**

- According to the priorities' issues set under each regional process, a case-based discussions on successful and failed relevant innovative practices adoption could be organized.
- What mechanism to better align local needs, contexts, and proposed solutions, including socio-economic conditions (local capacities, affordability, and institutional settings), as well as environmental and operational constraints?

III. Objectives, expected outcomes and deliverables

1. Objectives

Theme 5 focuses on innovative pathways to effectively implement solution : deploying solutions that are operational, interoperable, inclusive and financially sustainable. The objective through the Forum is to **accelerate the transition from innovative concepts to implemented, scalable, and impactful solutions** contributing directly to the achievement of SDG 6 and its interlinkages with other global goals. The **overall objective is to link innovation directly to real-world operations, long-term performance, and scalability across diverse climatic, social and institutional settings.**

The ambitions are :

- Technically, to accelerate the adoption of technical, institutional, financial innovation.
- On the policy side, to identify the regulatory and governance adjustments that can remove obstacles to scale innovative solution.
- Institutionally, to strengthen the connection between innovation providers, project owners, and investors.

2. Delivery approach

Theme 5 is built around the thematic sessions proposed by the working groups. These sessions remain the primary entry point of the programme and form the core of the discussions and activities developed under the Theme.

To strengthen coherence across the different topics and help translate discussions into operational outcomes, Theme 5 is supported by a cross-cutting **Implementation Framework**. This framework was developed based on the priorities, challenges and opportunities identified across the proposed sessions. Its purpose is not to replace or dilute the thematic contributions, but rather to connect them through shared implementation challenges and practical action pathways.

The overall approach seeks to balance strategic dialogue, technical exchange and project acceleration, with a strong focus on scaling existing initiatives and fostering practical collaboration among institutions, practitioners, innovators, investors and local actors. **The priority is to build on existing initiatives, and to strengthen learning from other sectors where innovative practices are commonly applied.**

2.1. Two complementary operational formats

Expert Exchanges

The Expert Exchanges will provide a strategic and technical dialogue space where policymakers, practitioners, innovators, researchers and investors can identify the main barriers limiting the uptake of innovation in the water sector and discuss practical solutions. These sessions will focus on concrete implementation challenges, including:

- integration of AI and digital tools into water operations;
- data accessibility, interoperability and governance;
- enabling regulatory and institutional frameworks;
- inclusive innovation approaches;
- support mechanisms for local start-ups, entrepreneurs, young professional and community-led initiatives.

The discussions will also draw lessons from sectors such as energy and transport, where digitalization, performance-based contracting and innovation-friendly regulation have already enabled large-scale deployment.

Beyond knowledge exchange, the objective is to generate actionable guidance for governments, utilities and institutions on governance models, procurement approaches and enabling frameworks that can facilitate the operational deployment of innovation in water and sanitation systems.

Project Laboratory

The Project Laboratory will serve as the operational arm of Theme 5 by accelerating partnerships, project development and investment opportunities. The Laboratory may include:

- project pitching sessions;
- matchmaking and dealmaking formats;
- mentoring and project preparation support;
- collaborative workshops between solution providers and end-users.

The objective is to connect utilities, basin authorities, cities, community organizations and NGOs with technology providers, technical partners and investors.

Particular attention will be given to supporting local authorities, start-ups, youth-led initiatives and community actors in refining projects, overcoming implementation barriers and adapting solutions to local technical, institutional, social and financial conditions.

By combining project preparation, peer exchange and targeted support, the Project Laboratory aims to strengthen existing initiatives, support pilot-to-scale transitions and advance projects toward long-term operational viability and bankability.

2.2. Operational delivery tracks

To strengthen coherence across the different topics while preserving the central role of the thematic sessions, Theme 5 will be supported by a set of cross-cutting **Operational delivery tracks**. Developed from the priorities and implementation challenges identified during the 1st Stakeholder meeting and by the working groups themselves, these tracks are intended to connect related discussions, avoid overlaps by facilitating collaboration across topics, and help translate dialogue into operational outcomes.

These delivery tracks do not replace the thematic sessions. Rather, they provide shared implementation pathways through which the different topics can converge, generate synergies and contribute to concrete outputs, partnerships and scalable initiatives.

The operational delivery tracks proposed across Theme 5 include:

- **1. The Data Toolkit for Water Resource Managers :** This track will explore digital twins, monitoring platforms, interoperability solutions and citizen science approaches that improve data quality, transparency and evidence-based decision-making, to effectively connect the water management who need the solution to the data and digital tools experts and providers.
- **2. The Water AI Course :** This track will focus on practical AI applications in the water sector, while also addressing governance, cybersecurity, ethics and context adaptation challenges. Associated collaborative formats may include demonstrations, operational case-study exchanges and a certification ceremony.
- **3. From Pilot to Operation: Unlocking the Scale-up of Water Innovation :** Discussions under this track will examine the enabling conditions required to move from pilot initiatives to operational deployment at scale, including regulation, procurement, institutional readiness and cross-sector integration.
- **4. Innovative Finance Forum :** Financing will be addressed as a key cross-cutting enabler through discussions on blended finance, public-private partnerships, investment mechanisms and risk-sharing approaches. This track intends to increase the level of knowledge regarding finance issues and mechanisms, and may notably include project pitching, matchmaking and investor engagement opportunities. This tracks would be interestingly co-developed with Theme 2.

- **5. Innovative Career Hub** : This track will place strong emphasis on capacity development, inclusion and local leadership, focusing especially in youth, women, local authorities and community actors and to strengthen local capabilities, ownership and inclusive innovation ecosystem. Possible associated initiatives include mentoring activities and peer-learning opportunities.

Together, these Operational delivery tracks will help bridge discussions across all Theme 5 topics, strengthen collaboration between stakeholders, and support the transition from innovation dialogue to practical implementation and long-term impact.

3. Sessions and expected outcomes

3.1. Tentative sessions per Topic

Topic 5A	5.A.1 Integrating Earth Observation and In-Situ Data for Water Resource Management
	5.A.2 AI and Hydro-informatics for Water and Risk Management
	5.A.3 Knowledge Management and Capacity Strengthening for Operational Water Tools
Topic 5B	5.B.1 From Pilots to Operations: Unlocking the Scale-Up of Water Innovation
	5.B.2 Real-Time Operations: Using Digital and AI-Enabled Systems for Climate-Resilient Water Management
	5.B.3. Financing and Investment Pathways for Scaling Water Innovation
	<i>For information : 5.B.4 From Skills to Systems: Building the Next Generation of Water Innovators and Operators (removed by the Topic group from the official draft as included in the operational tracks Career Hub describe below)</i>
Topic 5C	5.C.1 Interoperable water information systems and collaborative data governance
	5.C.2 Digital twins and decision-support tools for water systems management
	5.C.3 Automated multi-source data integration for real-time alarm, monitoring and forecasting systems
Topic 5D	5.D.1. From Community Data to Public Decision: Making Citizen Science Count in Water Governance
	5.D.2. Youth and Women as Data Stewards: Building Inclusive Citizen Science Networks
	5.D.3. Case Studies: Citizen Science Projects — Success Stories from Science-Driven to Policy Outcomes
Topic 5E	5.E.1 Strengthening the Science-Policy interface through water education
	5.E.2 International collaboration through shared data, open science and innovative knowledge-sharing platforms
	5.E.3 Strengthening professional training through sustainable financing and specialized training institutions
	5.E.4 Peer to peer learning and inclusion: empowering youth, women, and local communities
Joint sessions	Joint session 5D -> 5A / 5C : Technology, AI, and Digital Tools for Scaling Citizen Science
	Joint session 5A /5C -> theme 2: Financing Digital Water Transformation

3.2. Draft consolidation of the sessions, expected outcomes and deliverable

Sessions	Draft operational Delivery Tracks		Expected outcomes
5.A.1 Integrating Earth Observation and In Situ Data for Water Resource Management 5.C.2 Digital twins and decision support tools for water systems management 5.C.3 Automated multi source data integration for real time alarm, monitoring and forecasting systems 5.D.1 From Community Data to Public Decision: Making Citizen Science Count in Water Governance 5.D.3 Case Studies: Citizen Science Projects — Success Stories from Science-Driven to Policy Outcomes	1 The Data Toolkit for water resource managers sessions to help water resource managers have a much stronger awareness and understanding of the innovative data they could potentially use. The emphasis is on demonstrating and showcasing water data systems, including citizen-data generation that are interoperable, reliable and based on clear collection and monitoring rules.	Number of sessions 3 x 90 mins. Venue: normal meeting rooms Format Each session will have a panel of water and sanitation resource managers. Data solution providers or promoters will get 7 minutes each to ‘pitch’ the solutions to the panel. The panel can also ask questions. The panel and the audience can then vote on whether the solution either: - Goes in the Toolkit - Goes in the Sandbox (for further development) The 3 sessions will be 90 mins each and could be arranged in different ways eg - by region - by municipal type eg rural/urban/basin - data type	Expert exchanges take place between data innovators and potential users. Decision-makers are more informed of the solutions available to them. Potential new agreements between data solution providers and water resource management organizations.
5.A.2 AI and Hydro informatics for Water and Risk Management	2. The Water AI Course	Number of sessions 3x90 mins sessions.	More informed audiences about

5.B.2 Digital and AI-enabled water system for climate resilient operation Joint 5D / 5A / 5C: Technology, AI, and Digital Tools for Scaling Citizen Science	It aims to help the Forum delegates understand AI's uses in the water now and in the future. The 'Course' recognizes that there are various levels of understanding, so will have content for two different levels. Subjects to be covered include: - Uses of AI in Water and Sanitation - Governance and context-specific applications - Cybersecurity issues To give the learning course feel, attendees will be asked to register in advance for the Beginners' Level sessions and be sent pre-course materials. There could be a 'graduation' ceremony at the end. Most likely that these sessions will be held in the exhibition area.	Venues: One or more sessions in Exhibition Area – possibly at K-Water/Korean stand or Suez stand. Format Session 1: AI and Water – The Basics (Beginners level) • What is AI • How is AI currently used in water – with demonstrations Session 2: AI and Water – what are the big issues? (All levels): • Legal and regulatory issues around use of AI in water • Cybersecurity – particularly around utilities and services. • Democratizing AI - How AI and Citizen Science are complimentary. Session 3: AI and Water – what now and where next? (All levels): • How is AI being used by utilities now and • How AI is being used by industrial/agricultural users of water now and in the future. • Future applications of AI in water	what AI is and how it is applied in water. Expert exchanges on AI applications.
5.B.1 Scaling proven water technologies : financial and operational pathways	3. From pilots to operation : unlocking the scale-up of water innovation	Number of Sessions 2x90 mins learning and expertise exchange 1x90 mins Start-Up Simulator Game.	Policy recommendations

5.B.3 Policy and institutional pathways for system-level deployment 5.C.1 Interoperable water information systems and collaborative data governance 5.E.2 International collaboration through shared data, open science and innovative knowledge sharing platforms	This track aims at both policy-makers, service providers like utilities and start-ups and entrepreneurs for stronger mutual understanding and action on: - Policies that stimulate innovation and jobs - Governance models that are proven to stimulate innovation - Creating national and regional innovation ecosystems and pathways - Building mutual understanding of where water innovation is most needed and how it should be applied These will be mostly learning sessions but there will also be a fully interactive board game session to help people understand how water start-ups progress.	Venue: Normal meeting room. Format Sessions 1 and 2 to cover: - What type of innovation is most needed and in what contexts? - What can governments do to enable start-ups to accelerate progress and have their solutions deployed faster? - How to best develop innovation pilots at different scales? - What governance structures best support fast deployment of innovation eg off-taker models. - Are utilities fully embracing innovation into their operations? Session 3: Interactive session: The Water Start-up Game. Start-ups will be invited to explain how they originated and developed and will oversee a board game that can be played on tables to simulate the decisions start-ups need to take. Theme and topic coordinators will devise the game based on this existing card game: https://www.thestartupgame.co.uk/watch-how-to-play	Expert exchange between start-ups and potential business collaboration
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Joint 5A/5C / Theme 2 : Financing Digital Water Transformation 5.E.3.Strengthening professional training through sustainable financing and specialized training institutions	4 The Innovation Finance Forum Focused specifically on how to increase finance for innovation in water. The sessions will be at two levels – for those with little knowledge of financing innovation and start- ups but want to know more and then a second level for practitioner/expert level There will also be a pitching session for investors and small- scale start-ups in the Dragon’s Den/Shark Tank style. Expert session could be jointly designed with Theme 2 (Water Finance)	Number of sessions <i>3x 90 mins sessions</i> <i>1x90 mins pitching session</i> Venue: Normal meeting room Format Session 1: Innovation and finance – The Basics (Basic-knowledge level): - Who finances water innovation ? - What do investors look for ? - How to source innovation finance? - What are the current investors 'plays' on water innovation ? Sessions 2 and 3: Practitioner/expert level sessions to cover : - How are governments encouraging investment in water innovation ? - Where is investment in innovation being used most effectively in water ? - Which financial models are best suited to water investments? - How to finance the investment needed in to build skills and capacity in the current and future workforce? Session 4: Investor pitching session:	More informed audiences about what financing innovation in water. Expert exchange between financiers and project owners. Potential business deals through the Forum pitching event.
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		Matchmaking/deal making session for investors and start-ups/SMEs.	
5.A.3 Knowledge Management and Capacity Strengthening for Operational Water Tools 5.B.4 From Skills to Systems: Building the Next Generation of Water Innovators and Operators 5.D2 Youth and Women as Data Stewards: Building Inclusive Citizen Science Networks 5.D.3 Case Studies: Citizen Science Projects — Success Stories from Science Driven to Policy Outcomes 5.E.1 Strengthening the Science Policy interface through water education 5.E.4 Peer to peer learning and inclusion: empowering youth, women, and local communities	5 The Innovation Careers Hub This track focuses on the skills and capacity development of people – without whom there will be no innovation in the water sector. The sessions will be centered on specific groups or work-areas, for more precise and focused discussion. There will also be a specific speed networking session for young professionals in the sector to meet mentors and experienced professionals, for career progression tips and advice.	Number of sessions <i>3x 90 minute standard panel discussion sessions.</i> <i>1x90 minute career speed networking session.</i> Format Session 1: From University to Utility - How are talented graduates being fast-tracked into water utility and water services roles? Session 2: Investing in the Future innovators Part 1- Where is the business case for making professional and non-professional training investable? Part 2 - Delivering the Data Stewards: how can we nurture and develop the citizen scientists? Session 3: Are Human Resource policies actually blocking talent in water? Session 4 Career speed networking event: Either a stand-up social event or more rigid and timed, speed networking session.	

IV. Monitoring and Post-Forum Action

Follow-up actions may support preparations toward the 12th World Water Forum and contribution to the UN Water Conferences, COP processes, and regional dialogues.