[TOPIC COORDINATORS]

Topic Concept Note Template

Thematic Process, 11th World Water Forum

*This template should be completed through collaborative discussions among Topic Coordination Group Members under the leadership of each Topic Coordinator, and submitted to Theme Coordinators **by January 30th, 2026,** after which it will undergo final review by the Co-Chairs of the 11th Forum Thematic Process.*

- **Theme Number:** *1*
- **Theme Title:** Water Security
- **Topic Number:** 1D
- **Topic Title:** Closing the Loop on Water Resources Management
- **Topic Coordinator:** Daugherty Water for Food Global Institute (DWFI) – Christopher Neale, Director of Research

I. Topic Overview

Rationale and Context

As climate extremes (floods and droughts) are becoming more prevalent, there is a need to re-examine existing water management systems in river basins around the world and implement infrastructure to increase resilience and shift from a linear water use towards circular, closed-loop systems that integrate water re-use. This is particularly important in multi-use basins that include agricultural, urban, industrial, recreational and nature uses of water. Global Water Intelligence (GWI) data show that today's urban resilience capacity to extreme weather events is globally 6 times short of projected intensity by 2040. To guarantee safe water supply in cities around the world there's need for major capital investments. Snow-driven basins that depend on the accumulation of a winter snowpack as a water supply have become vulnerable to changes in precipitation patterns with early winter rains, and rain over snow events in late winter that have led to significant flooding. Recent examples of such events have occurred in central and southern Asia, northern California and in the Andes mountains in South America. In arid desertic and semi-arid regions of the world, circular water management is not an option but a necessity, often implemented through innovative combinations of water reuse, desalination, managed aquifer recharge, and basin-scale governance mechanisms. In addition to the technical challenges, the water governance and policy framework varies in different countries and needs to be examined in the context of water reuse in addition to potential transboundary issues. Technological advancements in sensors and communication, AI driven decision making and water treatment will contribute to the efficient management of the agricultural and urban/industrial systems and offer an opportunity for training and inclusion of youth of different genders. The financing of these changes, infrastructure and technological advancements need to

be studied considering the advantages and outputs of improved circular water systems. The intended changes will align with SDG 6 (clean water and sanitation), SDG 11 (sustainable cities and communities), SDG 13 (climate action), and others.

Objectives of the Topic

Technical Objectives: Describe technical issues and solutions to cope with climate-induced extremes that can contribute to improved circular water management in multi-use basins and urban areas as well as financing of these systems.

Policy and Institutional Objectives: Examine the implications of governance and policy in different regions of the world under different water reuse scenarios.

Capacity Building and Knowledge Objectives: Discuss the technological knowledge needs for implementation and management of circular systems and sub-components.

II. Key Issues, Opportunities, and Scope

Key Challenges

- Lack of infrastructure to cope with climate extreme events and water re-use within river basins and urban areas
- Governance and policy adjustments needed to manage multi-use basins and reuse of water
- Social and cultural barriers towards public acceptance on the use of reclaimed water and processes such as purification, desalination and reuse in urban and agricultural areas.
- Insufficient financing for technologies for water treatment and reuse within urban, industrial and agricultural sectors

Opportunities and Strategic Importance

- Create a common framework for water resource analysis in multi-use basins for identification of infrastructure needs in river basins and urban areas to cope with climate extremes
- Adoption of a circular approach to wastewater management, for instance by extracting critical raw materials from sludges (looking at the connection with the fertilizers' value-chain)
- Examine financial needs and strengthen public/private partnerships to accelerate the innovation and deployment of circular water solutions.
- Favouring the attention to water efficiency by the water-intensive industries through a Water Positive approach, producing new water for the community and protecting the ecosystem around production systems

- Leverage digitalization and AI to improve system efficiency and enable data-driven decision making in circular water management systems

Proposed Priorities of the Topic / Guiding Questions

- Why do we need "closing the loop" and circular economic principles in Water Resource Management
- How does "closing the loop" strengthen water security and climate resilience for relevant SGDs?
- How could the industry help the community to preserve water flow around its value-chain?
- How could investment in the water sector correctly consider non-financial revenues in new financial metrics?
- What's the role of cities in the development of a circular approach to water management? How could nature-based solutions be promoted?
- How should closed-loop water systems be adapted to different regional contexts and increasing climate extremes?
- Which uses and sectors do not require freshwater quality and therefore offer the greatest potential for safe and effective water reuse?
- How can cross-sector partnerships be strengthened to scale circular water solutions?
- How can governance and regulations can foster circular water management?

Proposed Sessions of the Topic

1.Infrastructure Needs for Water Re-use at Basin and Urban Scales

Core Focus

Identifying basin characteristics and infrastructure needs for flood control, additional storage for drought mitigation, groundwater recharge systems and nature-based solutions in multi-use basins that include agricultural, urban and industrial areas

Key Dimensions

- Approaches for optimal analysis of infrastructure needs and cost comparisons under different physical and climatic conditions
- Present examples of successful implementations around the world of closed-loop circular water management and climate resilient municipalities
- Reducing water demands and increasing efficiency in agriculture, industry and urban distribution and use.

Cross-Cutting Considerations

- Establishing appropriate management and governance frameworks.

- Identifying finance opportunities for infrastructure
- Foster cross-regional learning on policy integration, multi-stakeholder partnerships, and sustainable financing for circular water systems.

Linkages
This theme aligns with discussions in other topics:

- Non-conventional water resources (Topic 1A)
- Climate resilience and adaptation (Topic 1C)
- Innovation for water management (Theme 5)

2. <u>Water Reuse as a Pillar of Water Security and Climate Resilience</u>

Core Focus
Positioning treated wastewater as a **safe, reliable, and strategic resource** for agriculture, industry, and urban use.

Key Dimensions

- Sector-specific approaches are required to address the distinct needs of agriculture, industry, and urban use.
- Treated wastewater reuse can significantly reduce pressure on conventional water resources, while enhancing climate resilience and drought preparedness.
- Industrial wastewater reuse and inter-sectoral exchange can generate additional financial and resource value through circular approaches, including reverse osmosis brine management, selective mineral recovery (e.g., salts and critical elements), and integration with industrial symbiosis and zero-liquid discharge strategies.
- Demonstrating economic viability through productive reuse models (e.g., irrigating high-value crops, enabling cost recovery within short timeframes)

Cross-Cutting Considerations

- Establishing appropriate quality standards and risk management frameworks.
- Addressing environmental and management issues on the use of by-products from water treatment (sludge) and de-salination processes.
- Addressing public acceptance, ethical considerations, and religious perceptions surrounding reuse in the Middle East and other regions of the world
- Strengthening role of reuse in drought preparedness, climate adaptation, and resilience planning through long-term strategies.

Linkages
This theme directly aligns with broader Forum discussions on:

- Non-conventional water resources (Topic 1A)
- Climate resilience and adaptation (Topic 1C)
- Innovation for Water Management (Theme 5)

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3. <u>Governance and Enabling Frameworks for Circular Water Management</u>

Core Focus
Strengthening **institutional, regulatory, and policy frameworks** to support loop closure and coordinated water reuse systems.

Key Dimensions

- Effective circular water management requires cross-sectoral coordination among water uses in agriculture, industry, and urban institutions.
- Integrated governance models that balance central coordination with institutional collaboration while clarifying roles and responsibilities.
- Regulatory frameworks that enable reuse, circular systems, and shared infrastructure.

Regional and Strategic Aspects

- Regional cooperation and knowledge platforms are essential for harmonizing approaches and sharing good practices.
- Circular water governance contributes to water diplomacy, institutional trust, and regional resilience.
- Capacity building as a cornerstone, including training, knowledge transfer, and empowering the next generation of water professionals which is a fundamental aspect.

Linkages: Theme 4 (Water Governance and Diplomacy), Capacity Building (5E), Theme 2 (Water Finance)

4. <u>Financing Closed-Loop Circular Water Systems – Valuing Reuse and Resource Recovery</u>

Core Focus
Transforming circular water solutions into **bankable, scalable, and investable systems**.

Key Dimensions

- Economic valuation of water reuse should consider environmental costs, long-term benefits, and resilience gains.

- Affordability is critical, particularly for farmers and food systems, to avoid transferring excessive costs to end users, balancing production costs with food security and market sustainability

Financing Instruments and Alignment

- Innovative business models, financing mechanisms and public–private partnerships can accelerate implementation and scale engaging the private sector in circular water investments
- Aligning circular closed-loop water projects with climate finance, green finance, and environmental objectives strengthens investment attractiveness.
- Exploring the concept of Water Credits or Volumetric Water Benefits to attract new capital from the private side and industry.

Strategic Outcomes

- Strengthening water valuation as a foundation for sustainable financing
- Demonstrate the use of innovative business models in the sector
- Linking short-term service delivery with long-term water security and resilience

Linkages: Water Finance (2A, 2B), Valuing Water (6A), Water Security (1A)

III. Expected Outcomes and Deliverables

Policy and Strategic Outcomes

- Clear policy and governance messages on circular water management
- Enhanced visibility of successful reuse and resource recovery models
- Improved alignment between water reuse, climate resilience, and finance agendas
- Strengthened regional and international cooperation on closing the water loop
- Action-oriented contributions feeding into post-WWF11 processes and future milestones

Technical and Knowledge Deliverables

- Case studies and best practices on basin-scale circular infrastructure, water reuse systems, and valuable resource recovery.
- Knowledge transfer on enabling tools, digital technologies, and monitoring approaches to support effective circular water management

Partnerships and Financing Outcomes

- Public-private partnership models for water reuse, circular infrastructure and resource recovery projects.
- Mobilization of investment and opportunities for scaling-up of closed-loop water systems.

Actions and Initiatives for Implementation

- Summary of main lessons learned from the sessions and proposed actions by the coordination group

- List of examples of implementation of circular reuse of water in different basins and urban areas around the world including the financing of these systems

Communication and Visibility

- Preparation of key messages for communication in social media and partner communication channels

IV. Monitoring and Post-Forum Action

- Continue to promote findings and knowledge on the topic through communication and social media platforms and participation in related conferences
- Develop and promote educational materials on the topic
- Prepare summary of outcomes and information for inclusion in next World Water Forum

V. Proposed Cross-Process Dialogue Areas

- Within Theme 1*:*

Dialogue with related topics under theme such as 1C (Integrated Water Resource Management) 1E (Securing Water for Food Security) on water use in multi-use basins.

- With Other Themes:

- Engagement with Theme 2 (Water Finance) on innovative financing mechanisms for circular water development.
- Engagement with Theme 3 (Water for Humans and Nature) on water treatment for reuse in urban, industrial and agricultural sectors.
- Engagement with Theme 4 (Water Governance and Diplomacy) on managing circular water development in transboundary basins.