Water Quality and Security in Asia Pacific: What 3R and Circular Economy can Offer?

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8th Regional 3R Forum in Asia and the Pacific
9–12 April, 2018, Indore, India

Plenary Session 1: 3R and Clean Water
3R Forum Position Paper

- 35 page Document
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  - 3. Water Security
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  - 5. Water governance and Government Initiatives
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Cities and Water Security: Thirsty Asia
Threats to Water Security

Asia & Pacific is facing the double edged sword of increased water demand but decreased freshwater resources due to wastewater pollution.

Prime causes of region’s poor water security state:

- Heavy population,
- Accelerated urbanization rate
- Intensified industrial development
- Extensive agricultural development
- Prone to climate induced disasters
Water Security with relation to SDGs
### Linkage of Water with 17 Global Goals of Sustainability

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<tr>
<th>#</th>
<th>Goal</th>
<th>Sub-goals</th>
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<td>No Hunger</td>
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<td>Reduced inequalities</td>
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**Goal #6 (Exclusive); Goals # 4, 10, 16 (Not directly relevant) and Other 13 Goals (with some relevance)**
Water Availability and Supply Challenges

- Increase in water demand: projected to increase to 2.8 billion m³ in 2025 and 3.2 billion m³ in 2050
- Water sources depletion exacerbated by climate change and disaster impacts
- Increasing agricultural and industrial demands
- High water losses; non-revenue water up to 50% in cities like Delhi

Source: India Water Portal (2012)
Case: Rapid Urbanisation in Bangalore

- Bangalore has seen a rapid, unchecked urbanisation in the wake of the IT sector-fuelled economic boom of the late 1990s
- **1005%**: increase in paved surfaces between 1973 and 2016,
- **88%**: decline of the city’s vegetation between 1973 and 2016,
- **85%**: decline in water bodies between 2000 and 2014

Source: The Guardian, 2017
Case: Cauvery River Water Dispute

- Water conflict: Sharing the waters of the Cauvery River between Karnataka and Tamil Nadu states
- Both states heavily dependent on Cauvery rivers for agricultural purposes
- Problem exacerbated by inadequate rainfall in both the states
- Controversy has not yet met a consensual end as of today

Source: Indian Express (2016)
Cape Town Water Crisis

- Cape Town in South Africa may be the first major city to run out of water!
- The ongoing unprecedented drought that began in 2015 has put Cape Town with less than 100 days worth of water left in the reservoirs.
- 2015-2017 has been the driest 3-year period, since 1933. This is attributed to El Nino weather pattern and climate change (UCT).
- The population has grown up by 79% whilst dam water storage increased by mere 15%, since 1995.
- The city was declared reeling under the worst drought of the century in the end of May 2017.
- Dam levels are predicted to decline to critically low levels, and the city has made plans for ‘Day Zero’, when dam storage reaches 13.5% and municipal water supply will largely be shut off.

Volume of water stored (Giga-litres)

Picture Courtesy: CSAG and The Straights Time
3R Principles towards Clean Water Solutions
Overview of 3R Strategies for Water Security

Supply side management
- Source and watershed protection
- Rainwater harvesting
- Wastewater reuse and resource recovery

Demand side management
- Reducing water and reusing water
- Water rating and pricing
- Policy and regulation

Challenges
- Population growth
- Economic and industrial growth
- Environmental challenges
- Technical challenges

More emphasis on Demand-side
Water Use Reduction through Demand Management
Improving Irrigation Efficiency

- Choosing right irrigation technology (such as sprinkler and drip irrigation)
- Application of irrigation scheduling by considering local climate and soil information to determine crop water requirements
- Regulated deficit irrigation (i.e., imposing water stress on certain crops that have drought-tolerant life stages by taking care of the plant growth pattern)
- Underground lining system and Mulching to minimise losses
Innovative Water Saving Appliances

**Eco Toilet**
Can save around 85% of water consumption by combining washstand and toilet bowl.

**Tandem**
- Washstand
- Urinals

WASUP - washing machine integrated with toilet flush
Water Reuse and Recycle: Circular Water Economy
Water Economy … Linear to Circular

- Apply systems thinking
  - Holistic and systemic approach for water resources management
  - Example: improving farming practices for improved water quality

- Move to closed loop systems
  - Retaining water resources for reuse

- Extract cascaded value
  - Process of extracting value at a series of stages beginning with high value products such as specialist chemicals, followed by fertilisers, energy, water and bio-solids

Rain Water Harvesting
Cornerstone of the urban circular economy

Source: Jefferies (2017)
Source: IWA (2016)
Circular Water Economy: Closing the Water Cycle
Decentralised Water and Wastewater Treatment

Water Treatment Plant
Wastewater Treatment Plant
Maintaining Water Quality Through Wastewater Reclaim and Reuse

Even though WW is 99.98% pure water, the 0.02% contaminants are still a problem.
Water Governance and Government Initiatives (Policy Solutions)
Promoting Social Awareness and Acceptance for Wastewater Reuse: Lessons from NEWater, Singapore

- ‘NEWater’: Terminology itself was carefully chosen to emphasize its ultra-clean nature
- Key success factors:
  - Strong governmental and administrative support
  - Credible reference projects
  - Technology demonstration
  - Water safety assessment
  - Assurance and endorsement from experts
  - Media engagement
Conclusions

1. Key Takeaways
2. The Way Forward
Key Takeaways

• Circular Water Economy improves upon the existing ‘Linear’ Cycle of water treatment after extraction and before disposal, to move to reuse and recycle model by including water component into the value chain and life cycle
• The focus should be shifted from Centralised plants to Decentralised or On-site water and wastewater management
• Demand-side Management for water conservation is emphasised over Supply-side Management
• Water resources should be priced to reduce water demand and thereby promote sustainable water consumption. Polluters Pay Principle and Private Public Partnership offers financing option for water security
• Integrated Water Resource Management through policies and government initiatives and social acceptance
• Urban Resilience should be improved through proper water management
Policy Relevant Discussion Questions …

• Why Centralised plants for water and waste water treatment are continued to be planned and commissioned instead of more effective decentralised or on-site water and waste water management which are economical, suitable for different site conditions, and offer better control and easier operation? How can the transition from centralised to decentralised systems be made?

• Is it right for water stressed Asia - Pacific countries to continue with ‘Linear’ cycle of water and waste water treatment instead of shifting to Circular Economy? How can the concept of circular water economy of water be applied to harness natural water cycles to regulate flow, maintain high quality and insure against disasters?

• How can water security, which is an indispensable part of SDGs (as a standalone Goal 6), be linked to other goals to approach water management holistically as a development goal?

• Are our urban areas climate change-resilient through proper water management? How can we make our cities more resilient to disasters?

• With lack of availability of fresh water resources, shouldn’t the ‘Reduce’ option be emphasized more, than ‘Reuse’ and ‘Recycle’ option by policy makers for water management?
Thank You!