



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

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C. Visvanathan

Professor

Environmental Engineering and Management
Asian Institute of Technology

Email: visu@ait.asia

Webpage: <http://www.faculty.ait.ac.th/visu/>

3R Forum Position Paper

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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

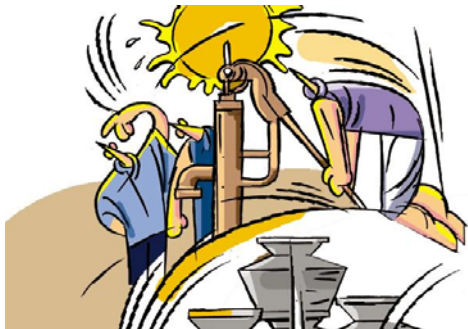
Linkage of Water with 17 Global Goals of Sustainability

#	Goal	Sub-goals																				
1	No Poverty	1.1	1.2	1.3	1.4	1.5	1.a	1.b														
2	No Hunger	2.1	2.2	2.3	2.4	2.5	2a	2.b	2.c													
3	Health	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	3.a	3.b	3.c	3.d								
4	Education	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.1	4.b	4.c											
5	Gender Equality	5.1	5.2	5.3	5.4	5.5	5.6	5.a	5.b	5.c												
6	Water and Sanitation	6.1	6.2	6.3	6.4	6.5	6.6	6.a	6.b													
7	Energy	7.1	7.2	7.3	7.a	7.b																
8	Economy	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	8.10	8.a	8.b	8.c								
9	Infrastructure	9.1	9.2	9.3	9.4	9.5	9.a	9.b	9.c													
10	Inequality	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.a	10.b	10.c											
11	Cities	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.a	11.b	11.c											
12	SCP	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.a	12.b	12.c										
13	Climate Change	13.1	13.2	13.3	13.a	13.b																
14	Marine Life	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.a	14.B	14.c											
15	Ecosystem	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	15.a	15.b	15.c									
16	Reduced inequalities	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	16.10	16.a										
17	Global	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	17.10	17.11	17.12	17.13	17.14	17.15	17.16	17.17	17.18	17.19		
#	Goal	Sub-goals																				

Goal #6 (Exclusive); Goals # 4, 10, 16 (Not directly relevant) and Other 13 Goals (with some relevance)

Water Security Situation in India

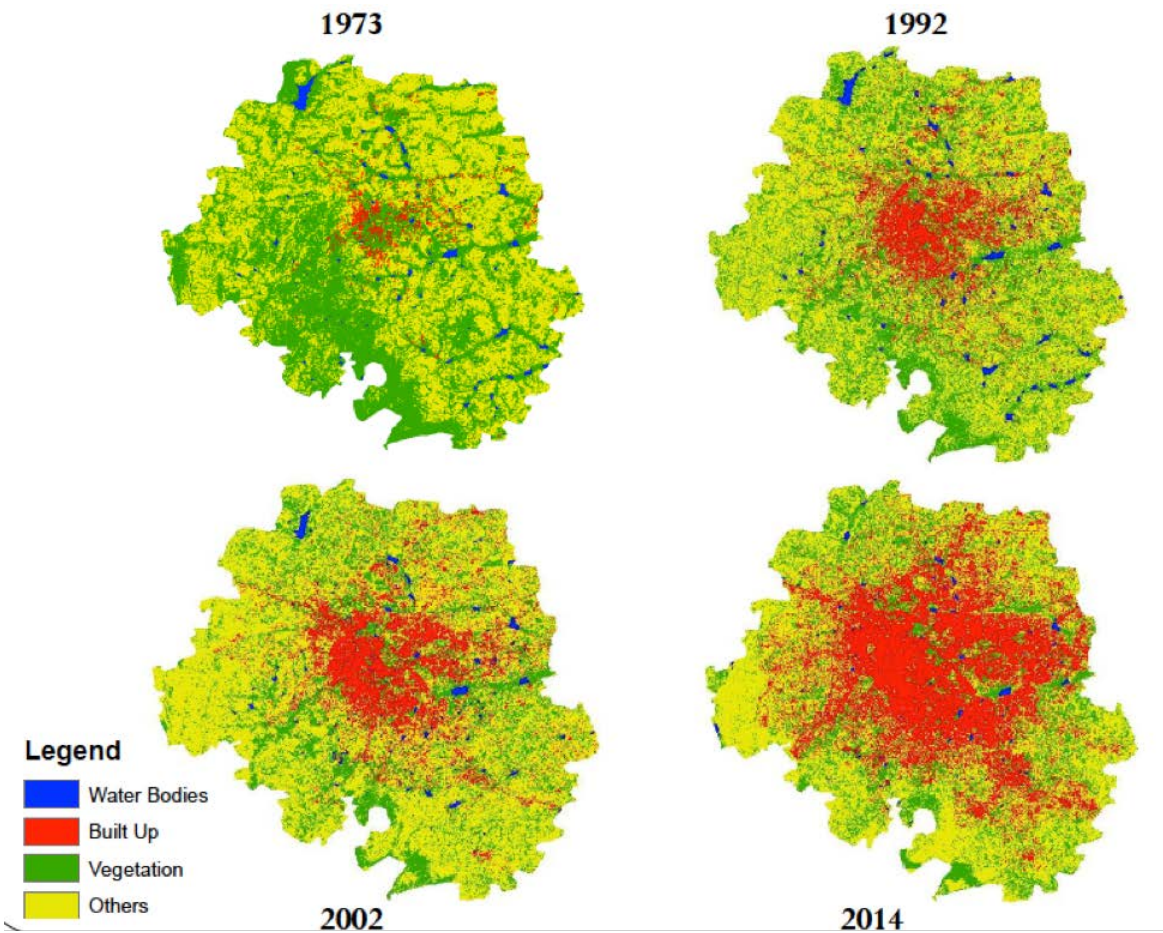
Water Availability and Supply Challenges



- 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 upto 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

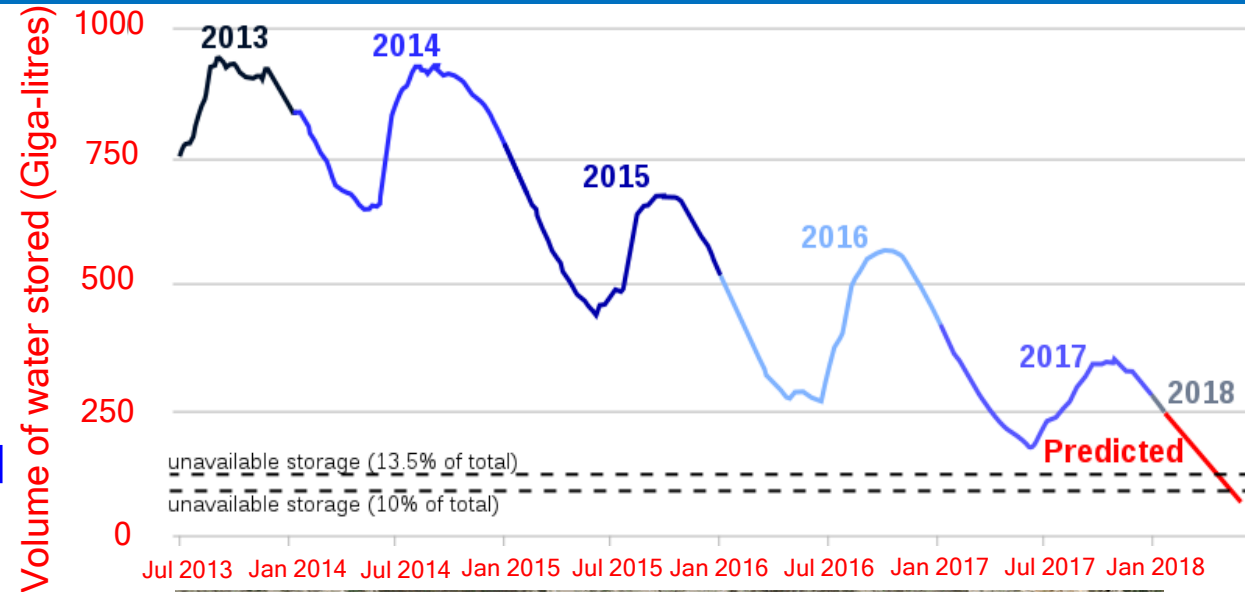
- Water conflict: Sharing the waters of the Cauvery River between Karnataka and Tamil Nadu states
- Both states heavily dependent on Cauvery rivers for agricultural purposes
- Problem exacerbated by inadequate rainfall in both the states
- Controversy has not yet met a consensual end as of today



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



Picture Courtesy: CSAG and The Straights Time

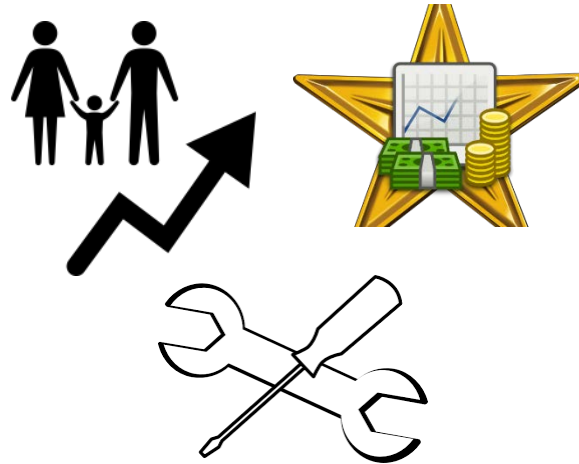
3R Principles towards Clean Water Solutions

Overview of 3R Strategies for Water Security



Supply side management

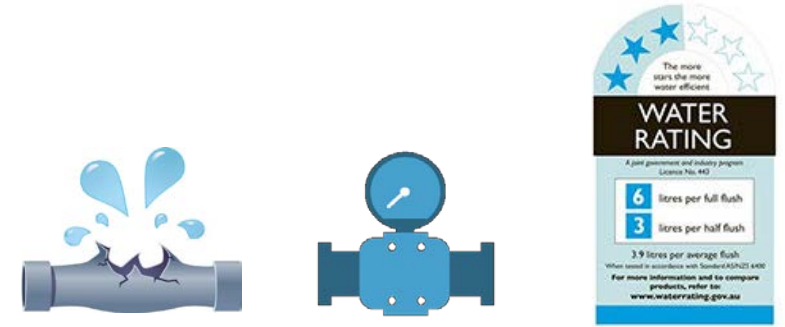
- Source and watershed protection,
- Rainwater harvesting
- Wastewater reuse and resource recovery



Challenges

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

More emphasis on Demand-side



<p>TURN IT OFF: Turn off taps while brushing your teeth, soaping clothes and scrubbing vessels.</p>	<p>FIX LEAKING TAPS: Fixing leaking taps doesn't take much, but it can save a significant amount of water.</p>	<p>TAKE A BUCKET BATH: Using a bucket instead of a shower to bathe can reduce your water consumption by 80%!</p>
<p>USE ENERGY-EFFICIENT TECHNOLOGY: Energy star rated dishwashers and washing machines use less water.</p>	<p>UPGRADE YOUR EQUIPMENT: Install faucet aerators, low-flow showerheads and toilets with smaller flush tanks.</p>	<p>RECYCLE WATER: Water treatment plants and rainwater harvesting systems can recycle water on a large scale. But to recycle water on your own, you can do simple things like using the water in which vegetables have been washed to water plants.</p>

Demand side management

- Reducing water and reusing water
- Water rating and pricing
- Policy and regulation



Water Use Reduction through Demand Management

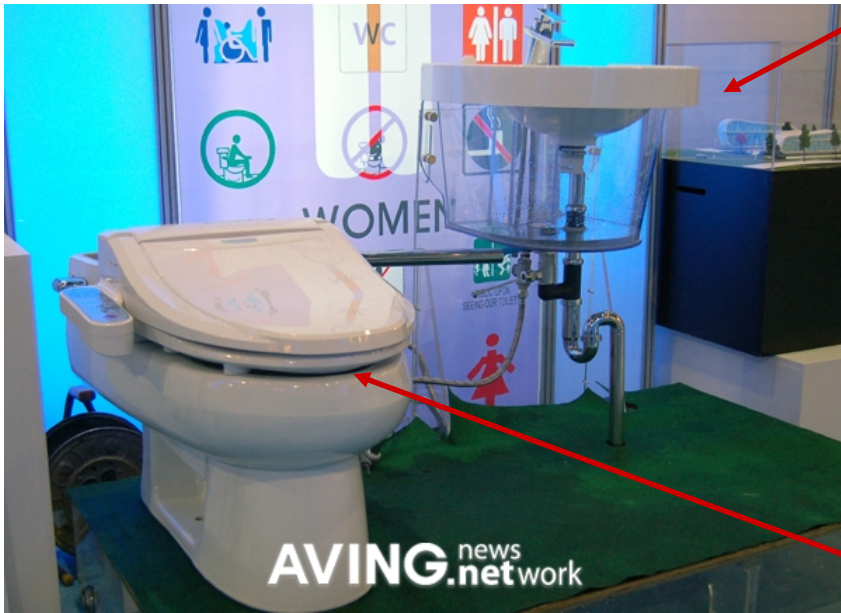
Improving Irrigation Efficiency

- 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

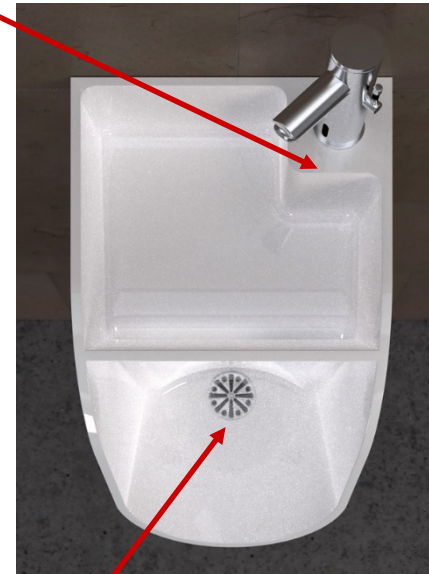


Washstand



Toilet bowl

Tandem



Urinals



WASUP- washing machine integrated with toilet flush

Can save around 85 % of water consumption by combining washstand and toilet bowl

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

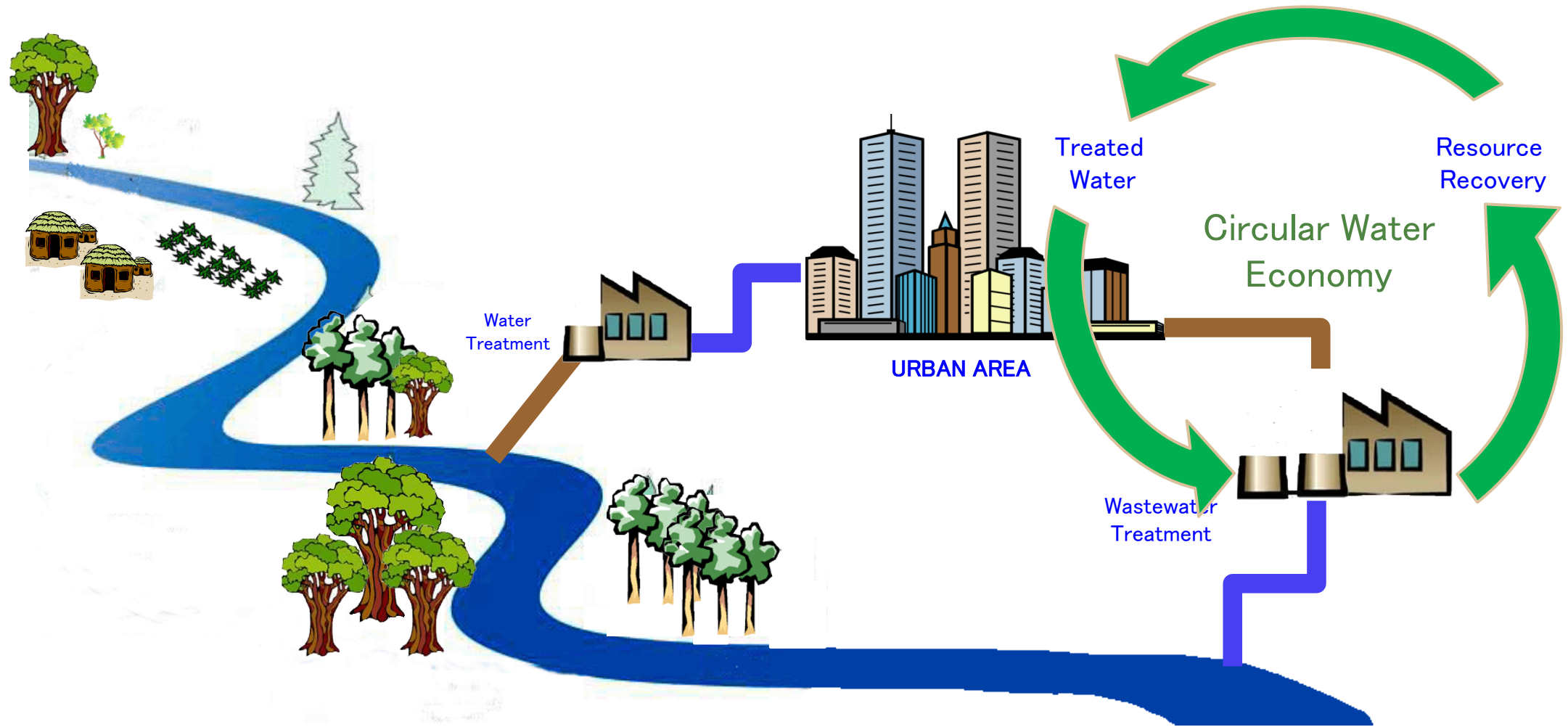
Cornerstone of the urban circular economy



Source: [Jefferies \(2017\)](#)

Source: [IWA \(2016\)](#)

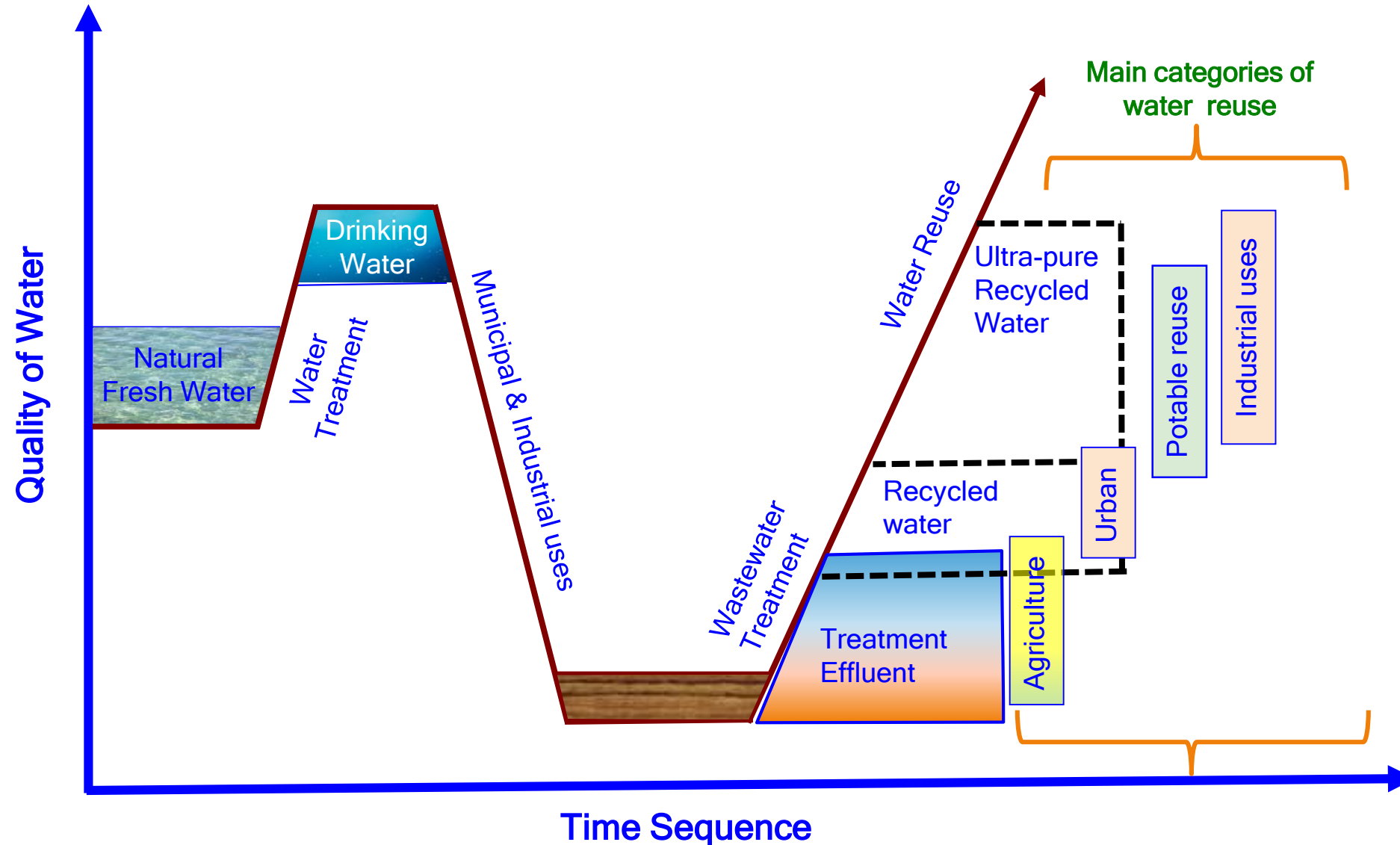
Circular Water Economy: Closing the Water Cycle



Decentralised Water and Wastewater Treatment



Maintaining Water Quality Through Wastewater Reclaim and Reuse



Even though WW is 99.98 % pure water

The 0.02% contaminants is 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!