



Water In Circular Economy and Resilience

**11th International Workshop on
Decentralized Domestic
Wastewater Treatment in Asia**

Presented by

**Midori Makino
World Bank**

November 28, 2023

Overview of World Bank Group



- International organization **owned by 189 member countries** – its owners are its clients.
- Purpose is to **end extreme poverty** and **promote shared prosperity on a livable planet**. These goals are aligned with the UN Sustainable Development Goals.
- The **world's largest source of development finance and expertise** – **70+ years** of financing development projects.



**World Bank Headquarters
Washington, DC**

Overview of World Bank Group



IBRD

INTERNATIONAL BANK FOR
RECONSTRUCTION AND
DEVELOPMENT

Provides loans to
governments of middle-
income countries.



IDA

INTERNATIONAL
DEVELOPMENT
ASSOCIATION

Provides loans and grants
to governments of lower-
income countries.



IFC

INTERNATIONAL
FINANCE
CORPORATION

Promotes development by financing
private sector enterprises in
developing countries.



MIGA

MULTILATERAL
INVESTMENT
GUARANTEE AGENCY

Promotes foreign direct
investment into developing
countries by offering political
risk insurance (guarantees)
to investors and lenders.



ICSID

INTERNATIONAL CENTRE
FOR THE SETTLEMENT OF
INVESTMENT DISPUTES

Provides international
facilities for conciliation and
arbitration of investment
disputes.

World Bank provides \$45.9 Billion in Financial Assistance through 12,000 Projects Worldwide

Overview of World Bank Water Global Practice



A Water Secure World for All



**Sustain
Water
Resources**

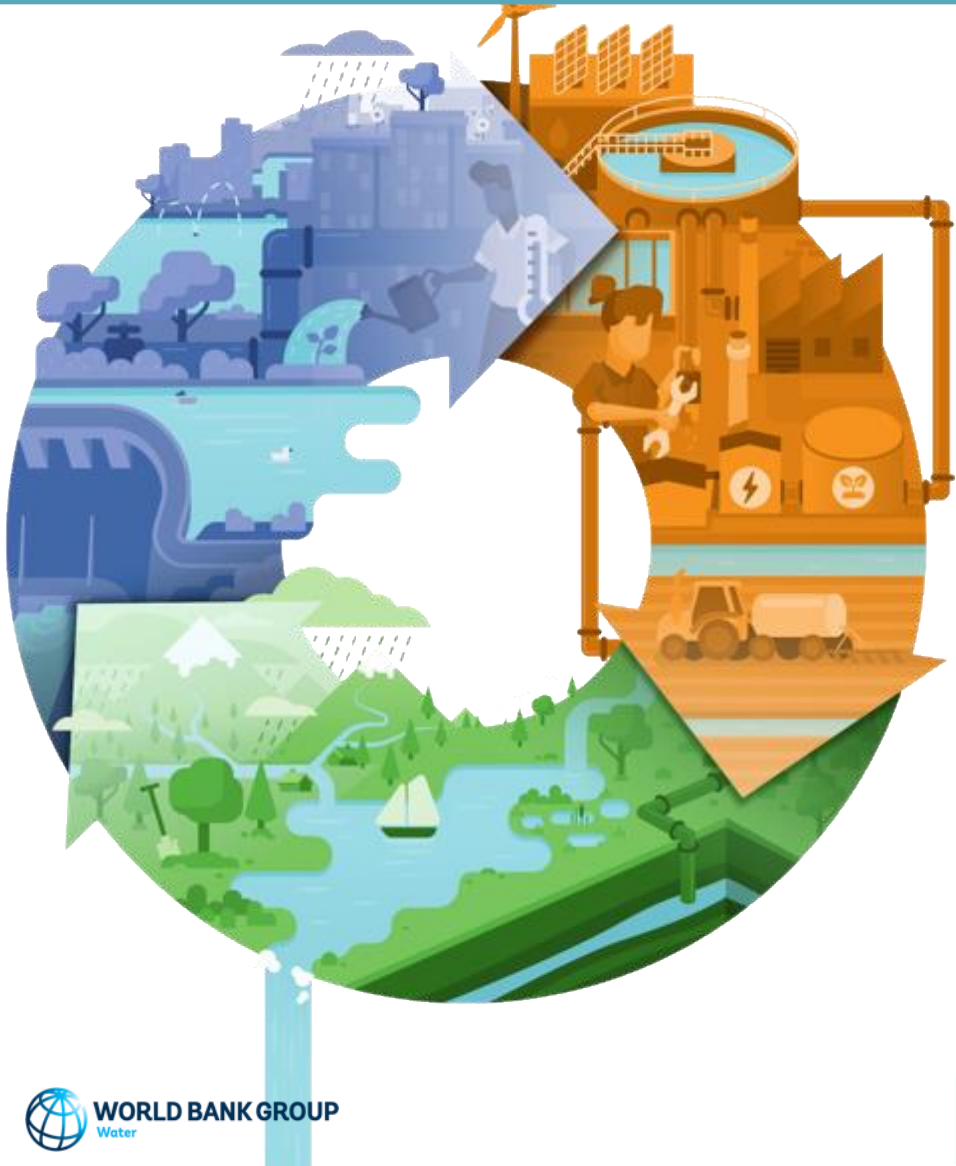


**Deliver
Services**



**Build
Resilience**

Agenda for WICER Presentation

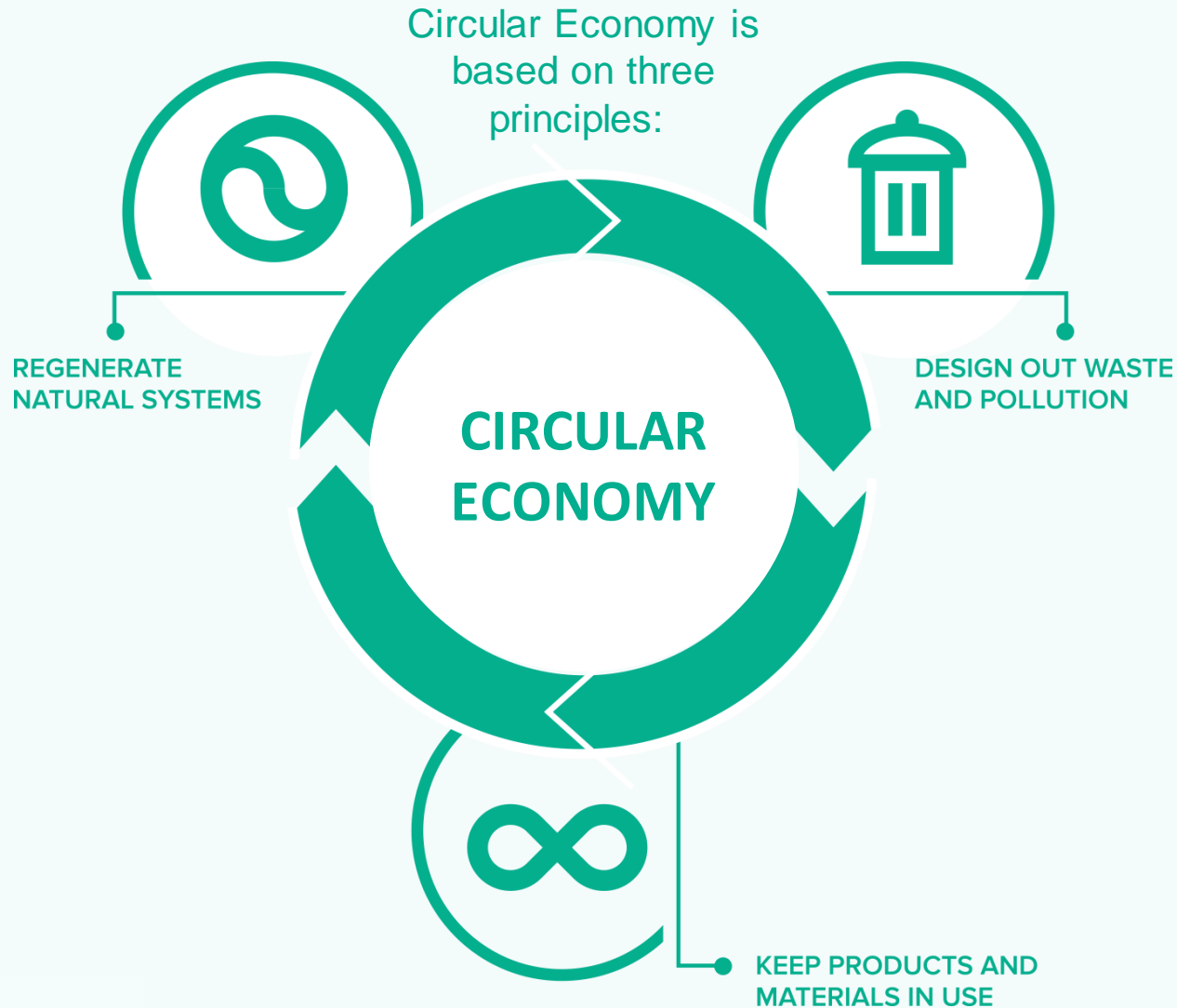


1. Circular Economy – what is it?

2. Water in Circular Economy and Resilience Framework (WICER)

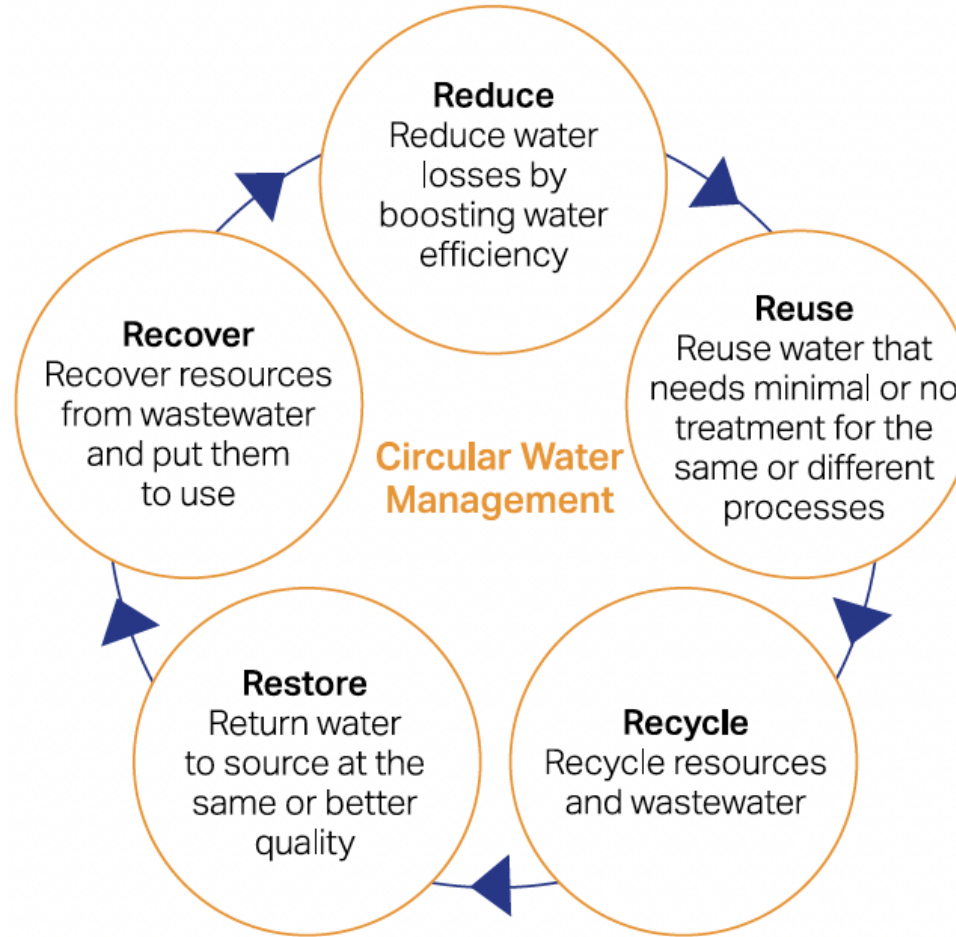
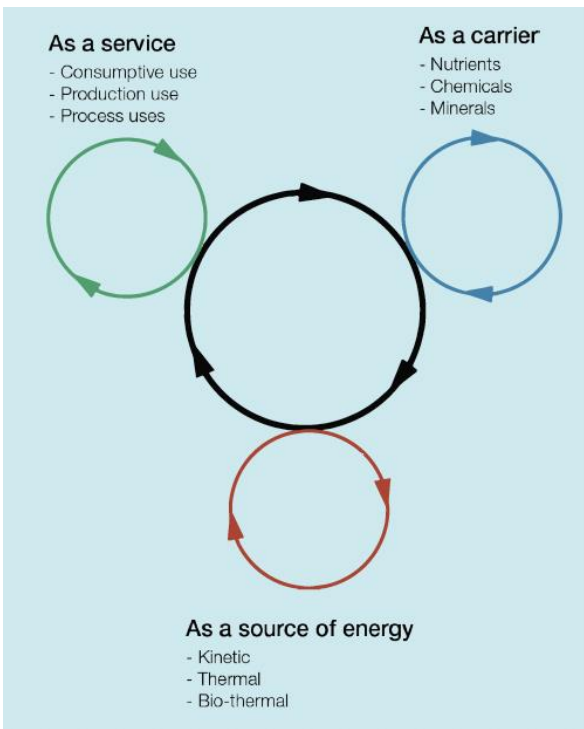
3. WICER Activities

What are the principles of Circular Economy?

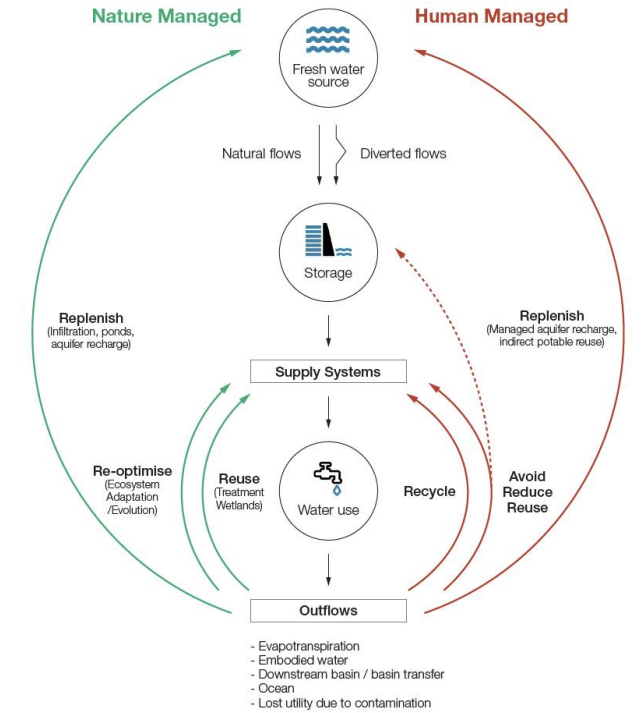


a circular model builds economic, natural, and social capital

Circular Economy in Water



'Butterfly' Diagram adapted to represent the Circular Water Economy



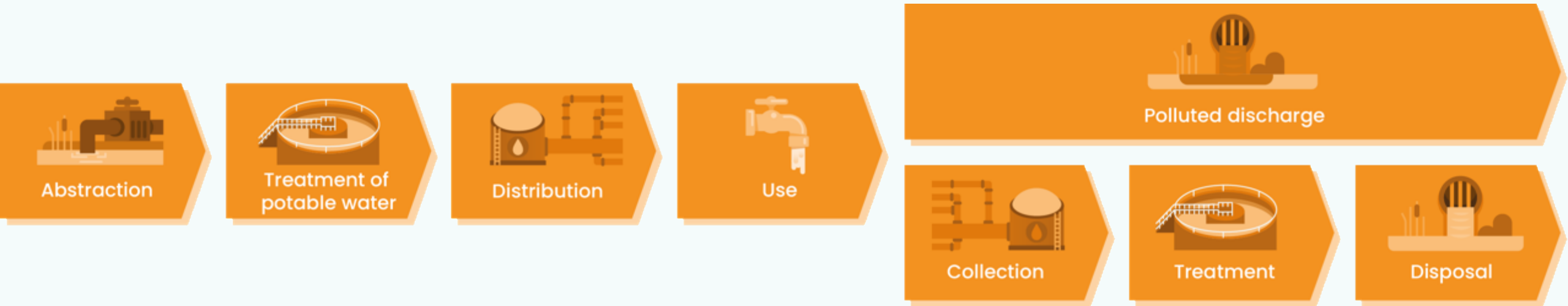
SOURCES

- **International Water Association (IWA), 2016.** "Water Utility Pathways in a Circular Economy." London.
- **World Business Council for Sustainable Development, 2017.** "Business Guide to Circular Water Management: Spotlight on Reduce, Reuse and Recycle." Geneva.
- **Ellen MacArthur Foundation, ARUP, and Antea Group, 2018.** "Water and Circular Economy." White Paper

We must shift from...

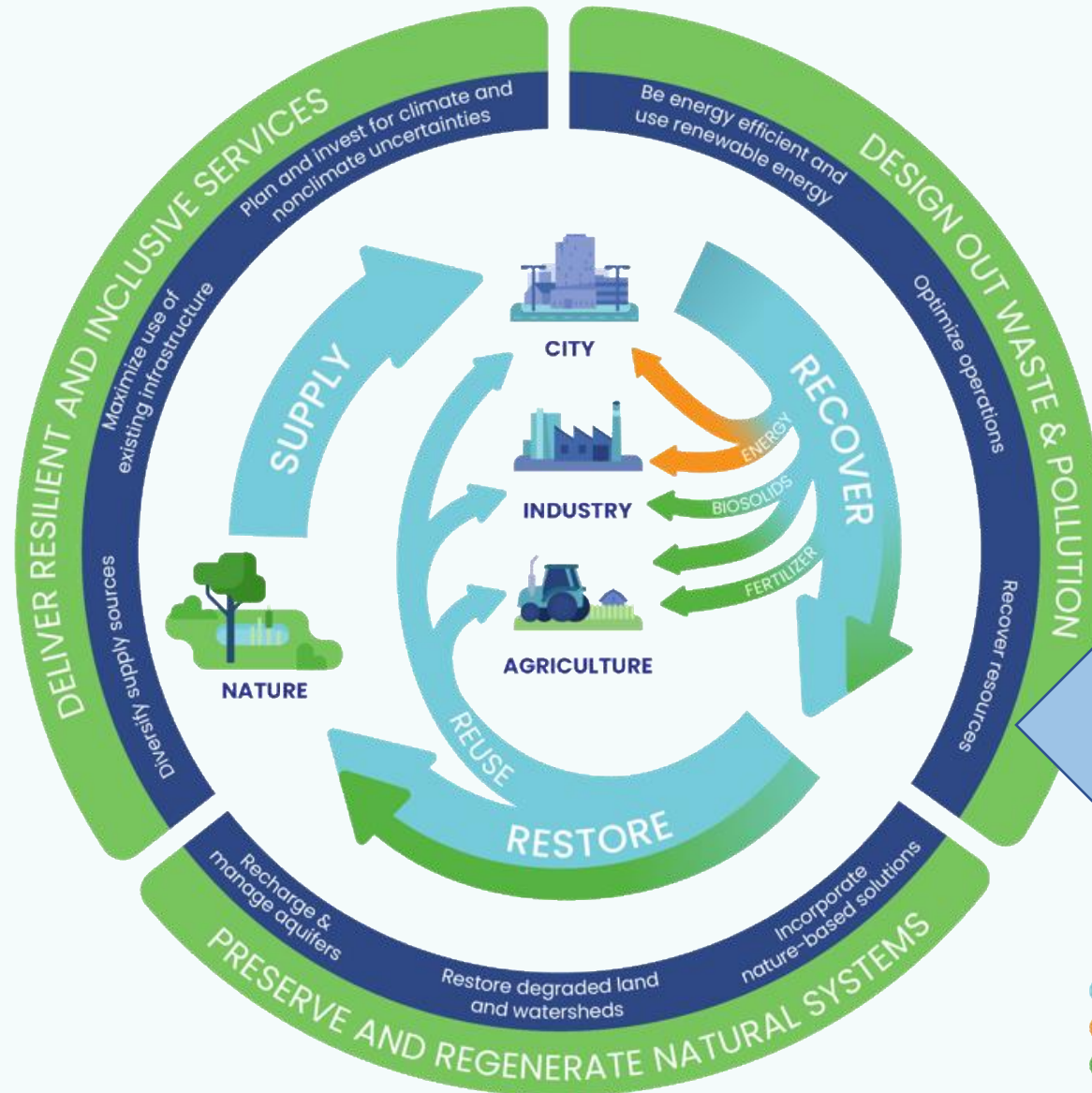


A LINEAR SYSTEM ...



To a Circular System

Water in Circular Economy and Resilience (WICER)



Focus of Conference Presentations A1, A2, A3, A4

OUTCOME 1: DELIVER RESILIENT AND INCLUSIVE SERVICES



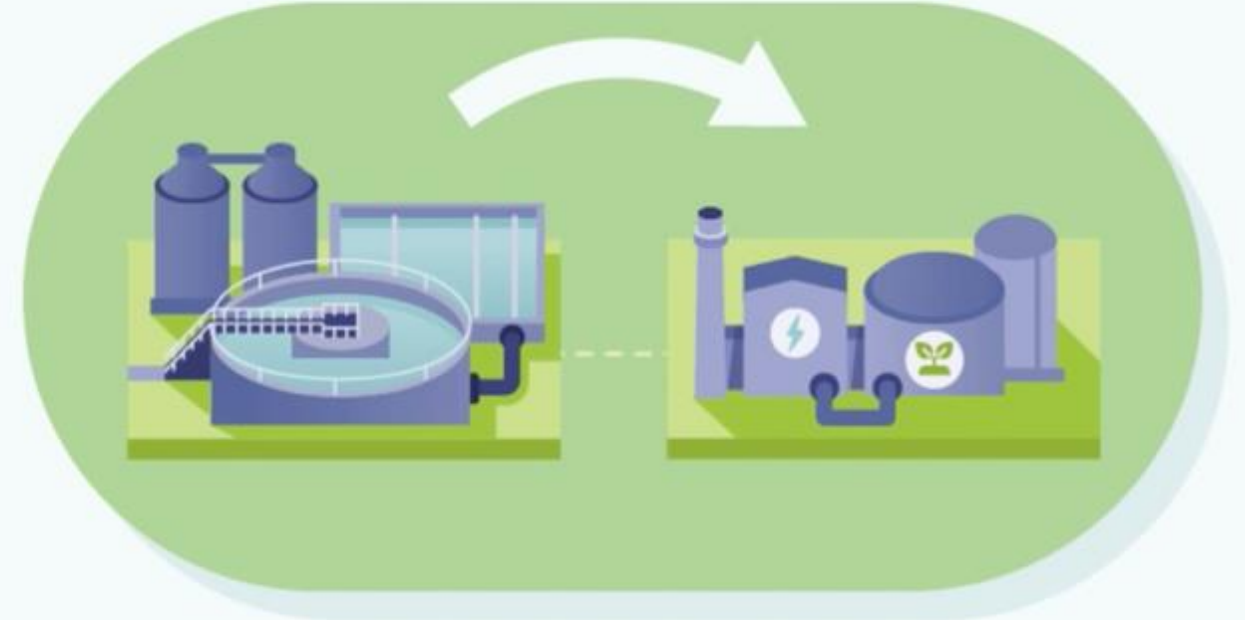
We need to plan and invest (differently) for climate and non-climate uncertainties



OUTCOME 1: DELIVER RESILIENT AND INCLUSIVE SERVICES



Maximize the use of existing infrastructure



Brazil: Optimizing WWTPs in São Paulo

Ampliação ETES ABC, Parque Novo Mondo, São Miguel e Barueri	Conventional expansion (mirroring)	Audit Optimization	Tertiary Treatment
	CapEx (USD millions)		
TOTAL	548	320	2399
Savings	228	0	2079

Full case study here: <http://hdl.handle.net/10986/36245>

OUTCOME 1: DELIVER RESILIENT AND INCLUSIVE SERVICES



Diversify supply sources

- Diversification of water supply sources (water balance)
 - including sources with different risk and cost profiles, and low vulnerabilities
- Protecting those water supply sources
- Including integrated water storage



OUTCOME 2: DESIGN OUT WASTE AND POLLUTION



Recover resources from water and wastewater



Energy



Water



Nutrients

Examples from this Conference include:

- Effluent reuse from wastewater treatment plants in India
- Kansai Airport's Johkasou
- Brewing of sake from rice cultivated by wastewater effluent in Akita prefecture
- Vegetable and flower cultivated using a combination of Johkasou effluent and biogeofilter



OUTCOME 2: DESIGN OUT WASTE AND POLLUTION



Water

Industrial processes (paper, textile, etc.)

Irrigation (agriculture, parks, etc.)

Replenish aquifers

Recreational use

Cooling water (power plants)

Indirect potable water



beer with reclaimed water



biogas



phosphate fertilizer



bricks



cellulose



Biofuels (algae)

OUTCOME 2: DESIGN OUT WASTE AND POLLUTION



Optimize operations

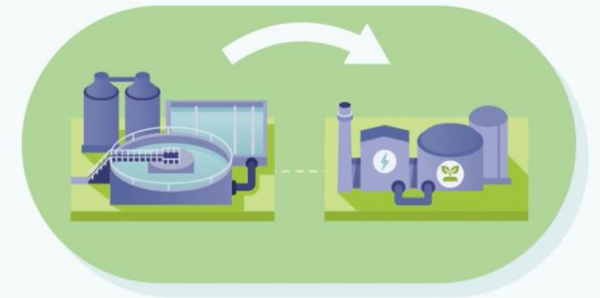
- Reduce non-revenue water
- Increase overall efficiency of processes
- Optimize the amount of energy, minerals, and chemicals used in the operation of water systems



OUTCOME 2: DESIGN OUT WASTE AND POLLUTION



Be energy efficient
and use renewable
energy



OUTCOME 2: DESIGN OUT WASTE AND POLLUTION



Solar panels in roof of
Recycled Water
Treatment Plant
Tuncurry, Australia



Solar panels in WWTP
Lianyungang, China



Floating Solar panels in
WWTP
Kraaifontein, South
Africa

Image: University of Cape Town (UCT)



OUTCOME 3: PRESERVE AND REGENERATE NATURAL SYSTEMS



- Restore degraded land and watersheds
- Manage and recharge groundwater
- Incorporate nature-based solution



OUTCOME 3: PRESERVE AND REGENERATE NATURAL SYSTEMS



Sponge cities



Upstream reforestation



Constructed wetlands as part of the wastewater treatment



Fotos: Jose Luis Valverde



Recover degraded watersheds and land



Green roofs

Cross-cutting Issues



- Create the right Policy, Institutional and Regulatory (PIR) environment
 - Examples include Johkasou Act in Japan
 - Onsite Wastewater Treatment and Recycling Regulations in Hyderabad, India
- Manage water demand & water use
- Leverage the power of digitalization
- Ensure solutions are inclusive
- Funding and financing

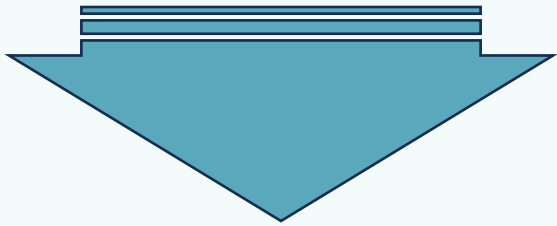


Implementing circular economy principles also makes economic and financial sense



Circular economy offers the opportunity to:

- Create additional revenue streams
- Reduce O&M costs
- Offer a better return on investment in a sector heavily subsidized



- Potential to create more innovative business models
- Potential to attract the private sector (PPP)
- Potential to tap into other sector's financing (green/climate bonds, environmental impact bonds, etc)

Investments in nature-based solutions such as upstream reforestation, can reduce treatment needs and costs



Investments in energy efficiency and reducing NRW can be recovered in less than 3 years

Self-generating renewable energy can reduce energy costs, increase system resiliency and lower GHGs

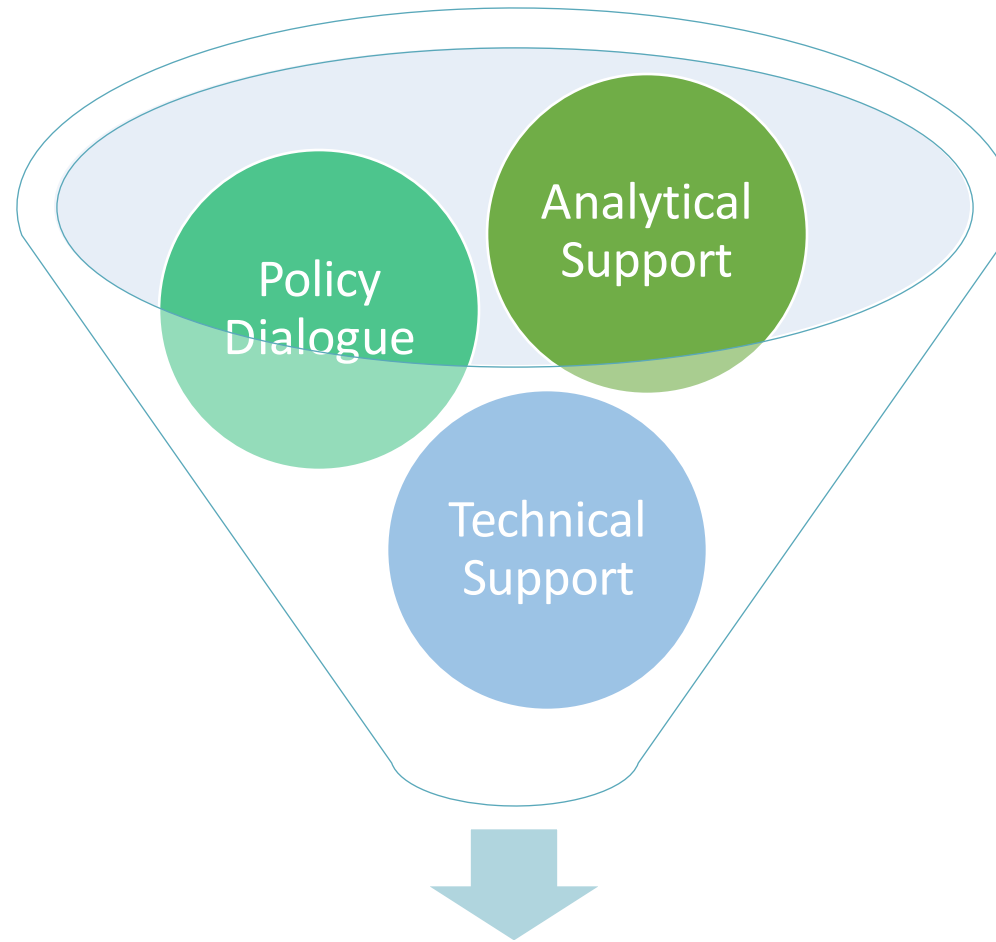


Utilities can create additional revenue streams to cover O&M costs by selling wastewater bypro

WICER in practice - How is World Bank working with clients to promote a WICER approach?



WICER

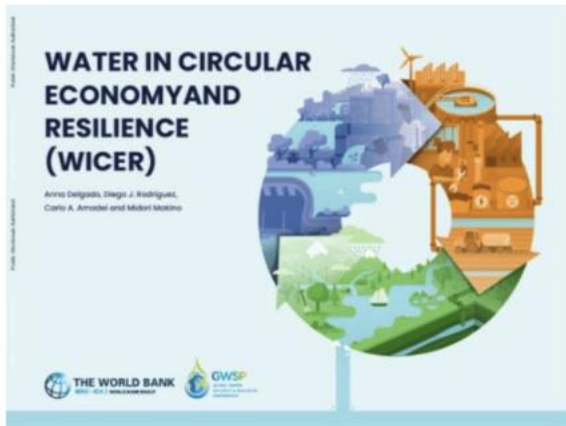


Operational Support

Creating and sharing knowledge



PUBLICATIONS:

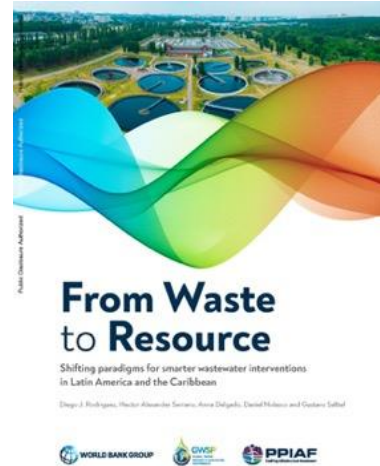


WICER - Report



Animated Video

www.worldbankgroup.org/wicer



From waste to resource - Report



Infographics, Blogs, etc.

Conferences, Webinars and other events

- Launch of the WICER Report and Initiative – webinar (Sept 2021)
- Keynote at Karachi International Water Conference
- USAID Middle East and Northern Africa (MENA) Infrastructure and Environment virtual workshop
- WaterReuse symposium 2022 session with USEPA
- World Water Forum 2022
- Singapore International Water Week (SIWW) Water Convention 2022
- IWA World Water Congress 2022
- Co-leading session at AWWA ACE22 with USEPA
- Latinosan 2022

www.worldbank.org/wicer

www.worldbank.org/wastetoresource

Documenting relevant case studies



● WICER

www.worldbank.org/wicer

● Waste to Resource

www.worldbank.org/wastetoresource



From Waste to Resource

Shifting paradigms for smarter wastewater interventions in Latin America and the Caribbean

Diogo J. Rodrigues, Hector Alvarado Sanchez, Anca Dalgado, Daniel N. Haddad and Gustavo Salfat



WATER GLOBAL PRACTICE

Water in Circular Economy and Resilience (WICER)

The Case of Lingyuan City, China

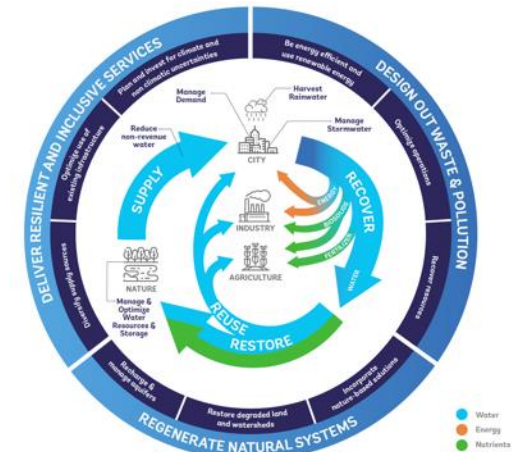
Unconventional Water Resources in a Water Scarce City: Recycling Treated Municipal Wastewater for Industrial Users and to restore the ecosystem



Context
Lingyuan City in Liaoning Province, China, is a coastal town with a population of around 600,000 people who have been facing water scarcity. The town's geographical and hydrological characteristics are similar to those of many cities in the region. In the past three decades, Lingyuan has been getting its water supply from surface water resources, which is now facing the natural average and non-traditional that could increase the drying time, which has forced the city to use its own water resources a lot more.

Challenge
The limited availability of surface water, combined with pollution of the Lingyuan River, has led to the implementation of groundwater resources. Between 2005 and 2010, exploitable groundwater resources decreased by 50 percent.

Conclusion
Lingyuan serves as a pilot water supply source for the city to address the problem of local water use, which depends on groundwater, groundwater resources, conventional systems, and even those who rely on drinking water. The Lingyuan Water Resilience (WICER) model is a pilot water supply source that provides one step at a time. To address the local water supply



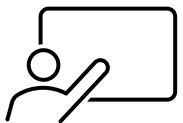
Policy Dialogue



Review of existing regulatory frameworks in Middle East and North Africa, and the Caribbean Regions (wastewater reuse and desalination)



Dialogue on regulating reuse and circular economy in Colombia & Turkey



Advice to Senegal on revision of Water and Sanitation Codes






Policy, Institutional and Regulatory (PIR) assessment to promote unconventional sources of water in South Africa

Developing Tools and Frameworks

Online quick assessment WICER Tool:

Visual results with colors (traffic light) to assess whether the project or city is circular and resilient – is your project WICER?

-  To continue
-  To improve
-  To start doing/exploring

www.wicer-tool.com

Quantifying Economic and Financial Benefits of WICER vs linear system

Economic and financial analysis and prioritization of investments using the WICER framework.



Circularity is not the end goal, but the means to achieve greater outcomes



Sustainability



Jobs created



Restored
Ecosystems

Universal
access



Equity



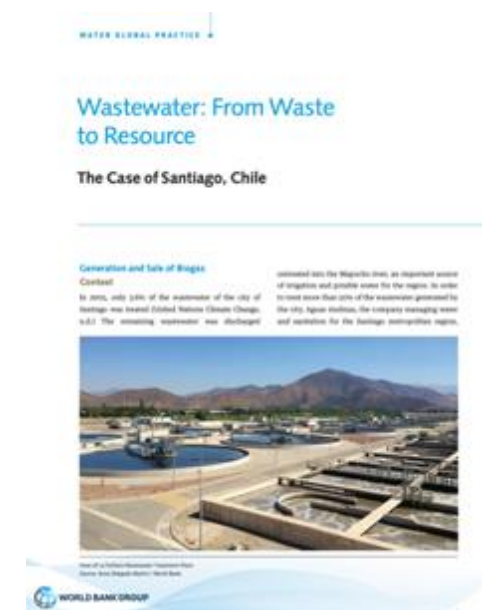
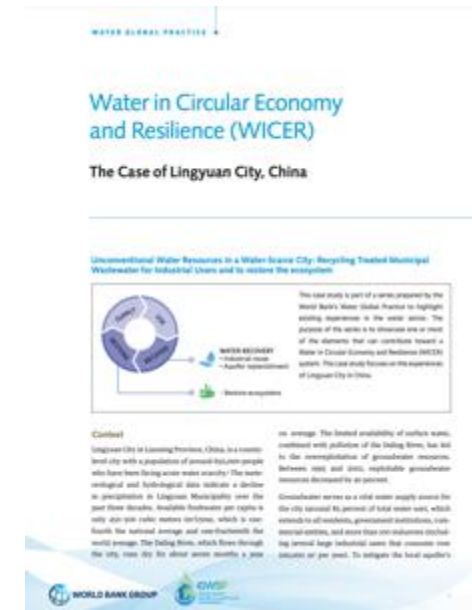
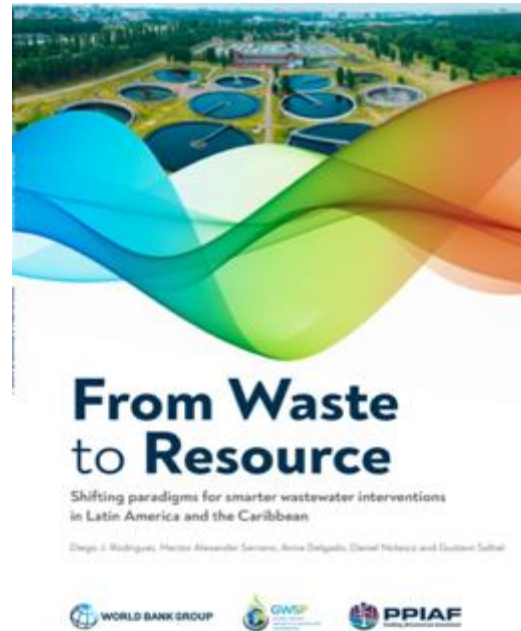
Urban prosperity

To learn more....



Reports with examples and guidelines to implement the concepts in the water sector

Several case Studies



www.worldbank.org/wicer

www.worldbank.org/wastetoresource

www.wicer-tool.com – check our new online tool!!!



Thank You!

Midori Makino, Lead Water Supply and
Sanitation Specialist, World Bank

www.worldbank.org/wicer

www.wicer-tool.com