WATER IN CIRCULAR ECONOMY AND RESILIENCE (WICER)

Session 3: Interactive Hands-on session
Objective: Get familiar with WICER interventions, identify the benefits of the circular approach, work together to prioritize different WICER interventions

Context:
When considering different circular approaches for urban water projects, practitioners will have to prioritize investments and interventions. This prioritization depends on numerous local political, social and geographic factors that differ from region to region. However, the following practical guiding questions and steps help and give orientation based on economic, financial and country specific factors; practitioners may use to structure their prioritization process.

1	MUNICIPALITY OBJECTIVES	To what extent do projects – and the associated WICER actions – align with the municipality and region policy objectives?
2	ECONOMIC METRICS	How relevant are the various benefits expected to be?
		Are the expected benefits easy to quantify?
3	FINANCIAL METRICS	How relevant are the various revenues and savings expected to be?
		Are innovative financing and funding options relevant and easy to implement?

Economic and financial assessments are the foundation for a successful WICER project

Economic analysis	Determination of economic feasibility	A WICER strategy should only be implemented if the benefits to the economy of the strategy outweigh the costs.
	Optimization of WICER strategy	The economic assessment can support identification and optimization of the WICER strategy yielding the highest economic value.
	Justification of government contributions	Many urban water projects do not have a positive financial return. Therefore , they require a government contribution (e.g. subsidies). This contribution is (only) justified when the WICER strategy creates economic value, and the project contributes to the value of the strategy.
	Identification of funding solutions	The identification of distribution of benefits and costs provides input for the funding strategy. Stakeholders having costs should be compensated, beneficiaries can be asked for a financial contribution.
Financial analysis	Determination of financial feasibility	To ensure the financial feasibility of a WICER project, it should have an adequate funding and financing strategy, both in the short term (financing of investments) and in the long term (covering of O&M costs)
	Optimization of financing and delivery strategy	The financial analysis helps determining how the project can be financed and delivered in the most cost-effective way

CHOSE ONE OPTION:

Option A: Do you want to work on a real case presented by someone at the table? Quickly discuss the water problem/project you are working on and decide if you want to choose a real utility/municipality/region. If so, the chosen person will explain the context and challenge to the team, and continue to the questions below. Even if you are not directly in charge of the project, imagine you are the municipality/water utility in charge for the purpose of the exercise.

Option B: Use the challenge described for the hypothetical "WICER City".
The WICER city has been facing acute water scarcity. The meteorological and hydrological data indicate a decline in precipitation over the past three decades. The WICER River, which flows through the city, runs almost dry for about seven months a year on average. The limited availability of surface water, combined with pollution of the WICER River, has led to the overexploitation of groundwater resources. Groundwater serves as a vital water supply source for the city (around 85 percent of total water use), which extends to all residents, government institutions, commercial entities, and more than 100 industries (including several large industrial users located clustered in a new industrial park). Water scarcity is having negative effects on the municipality's development initiatives and economy. The city has a wastewater treatment plant (WWTP) with a capacity to treat the city's wastewater. However, less than 70 percent of urban households are connected to the sewerage network and the WWTP operates below its capacity and expected efficiency, with energy costs in the WWTP remaining high. Sewage from the new industrial park is not collected and its untreated wastewater is discharged into the environment, resulting in the severe pollution of the city's surface and ground water. To increase its resilience and become more circular and sustainable, the municipality wants to:

- Diversify its water supply sources
- Increase wastewater treatment capacity
- Regenerate and preserve the environment, specially decreasing the pollution in the river, and addressing the overexploitation of groundwater.
- Become more financially sustainable

Discussion Questions:

- If you want, assess the city/utility/project using the WICER tool – discuss the results
- PRIORITIZATION EXERCICE: Given the challenge and the main goals for the municipality, which actions would you prioritize and why? You can use the given template below to identify interventions and benefits or any other framework to prioritize interventions.
- ECONOMIC AND FINANCIAL ANALISIS: Use the given templates below to do a qualitative economic and financial analysis of one (or two) of the proposed interventions.
    - What are the positive and negative effects from the circular approach when compared to the traditional/linear approach? What are suitable indicators for the quantification of the costs and benefits?
    - Are there potential operation and maintenance savings and/or additional revenues compared to the linear approach?
    - Are there any alternative funding and financing options that that can enhance financial feasibility?
- CHALLENGES: What do you think will be the main challenges to implement those interventions? How would you address the challenges?

EXAMPLES OF POTENTIAL WICER INTERVENTIONS (1/2)

WICER Outcomes	Actions under WICER Framework	Examples of potential Interventions
DELIVER RESILIENT AND INCLUSIVE SERVICES	**Action 1 - Plan and invest for climate and non-climate uncertainties**	• Preparation of a city-level climate action plan • Preparation of a strategic plan to enhance the resilience of utilities/water related infrastructure • Preparation of disaster risk management and contingency plan • Preparation of a compendium of climate-proofing interventions in the water and sanitation sector • Plan urban water resources with a basin-level approach
	Action 2 - Diversify water supply sources	• Preparation of a basin plan to identify and protect conventional and unconventional sources of water • Re-use of treated wastewater (non-potable and potable uses) • Rainwater harvesting • Desalination (centralized and de-centralized options) • Development of additional water sources and integrated storage solutions in the form of artificial tanks and ponds, stormwater capture (including combining surface with groundwater sources)

	Action 3 - Maximize the use of existing infrastructure	• Retrofitting/rehabilitation of existing infrastructure, which can include
		  • Development of audits to assess real capacity of existing infrastructure before expanding
		  • Preparation of an asset management plan to assess resilience and risks
		  • Development of plans to ensure the connectivity of all households
		• Use of technology for enhancing efficiency of existing infrastructure (e.g., real time monitoring of water)

DESIGN OUT WASTE AND POLLUTION	**Action 4 - Be energy efficient and use renewable energy**	• Use of energy efficient equipment and processes, which shall also include
		  • Development of energy efficiency audits
		  • Improve operations of pumping systems
		  • Implement SCADA software solutions
		• Implement load management techniques to reduce energy costs
		• Use of renewable energy for running the utility/plant operations – solar, wind
		• Generation of energy using bio-gas, hydroelectric energy, and co-digestion from wastewater treatment process

	Action 5 - Optimize operations	• Reduction of non-revenue water (NRW) • Audits in treatment plants to improve efficiency and reduce chemical and energy needs • Improvement in institutional, operational and technical aspects.

EXAMPLES OF POTENTIAL WICER INTERVENTIONS (2/2)

WICER Outcomes	Actions under WICER Framework	Potential Interventions

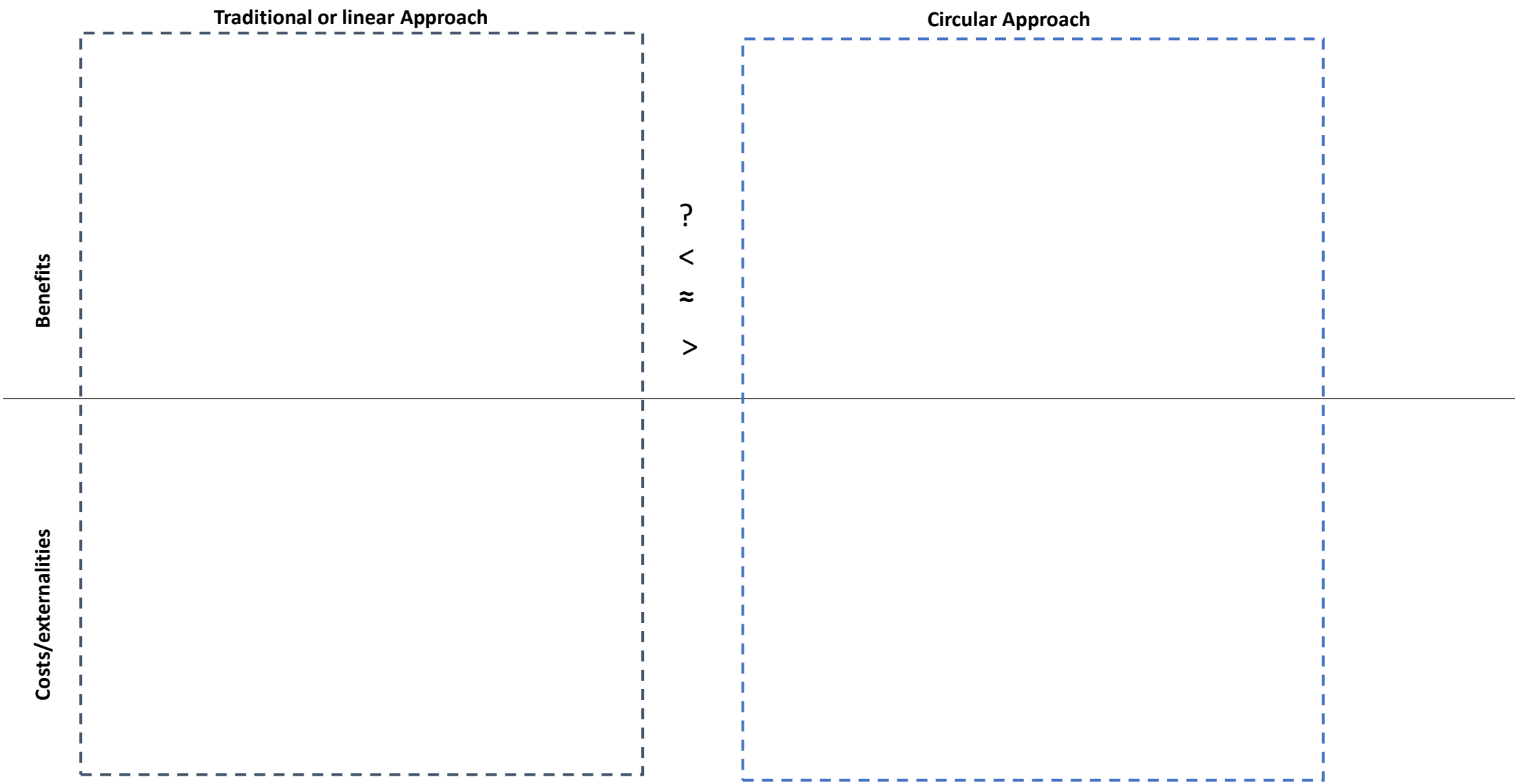
DESIGN OUT WASTE AND POLLUTION	**Action 6 - Recover resources**	• Recovery of water, sludge (bio-solids), energy (bio-gas, hydro energy), or minerals from wastewater
		  • Treat wastewater to different quality levels adapted to the requirements of each potential end user (fit for purpose approach)
		  • Recover thermal energy from water and wastewater to heat and cool residential and other buildings
		  • Recover biogas to be sold to cities as gas for heating and cooking, as vehicle fuel or to be used in the treatment plant to reduce energy needs
		  • Recover sludge (biosolids) to be used as compost or fertilizer in agriculture, or as compost in gardens and golf courses
		  • Recover other resources within the water cycle
		(The project design should include resource recovery aspects from the beginning)

PRESERVE AND REGENERATE NATURAL SYSTEMS	**Action 7 - Incorporate nature-based solutions**	• Nature based treatment solutions • Nature based rejuvenation of water-bodies • Enhancing urban resilience through the sponge city concept • Integrated stormwater management in parks and green spaces • Nature based coastal protection (All the above interventions may consider combining nature-based solutions with grey infrastructure)
	Action 8 - Restore degraded land and watersheds	• Restoration and protection of degraded land, wetland and watersheds using wastewater (fully/partially treated), nutrients and organic matter • Prevention/reduction of pollution source at source (e.g. promotion of zero discharge policies)
	Action 9 - Recharge and manage aquifers	• Use of treated wastewater for recharging aquifers • Watershed management techniques for enhancing groundwater collection • Capture and use of urban stormwater (detention ponds, infiltration systems, nature-based solutions) for aquifer recharge

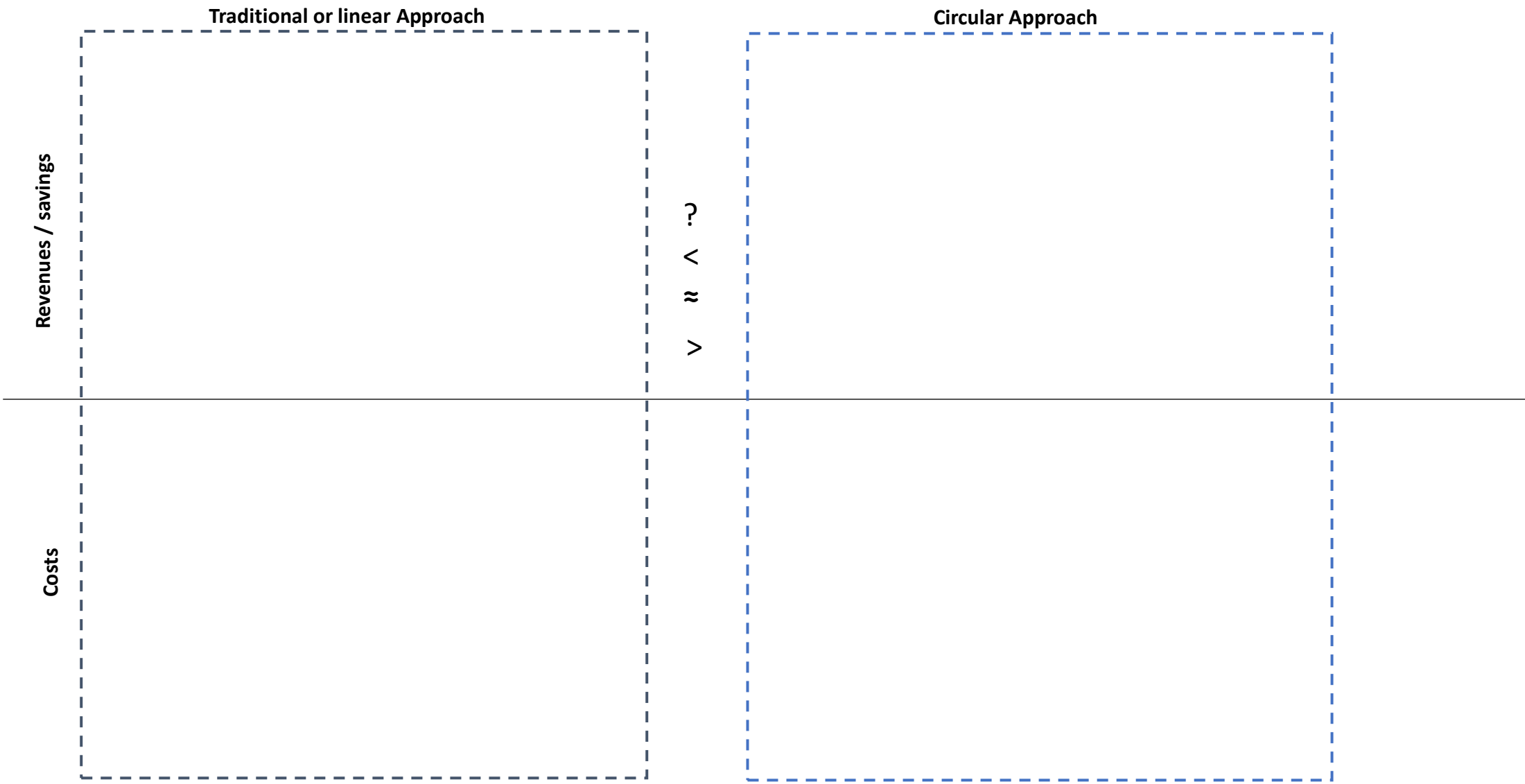
Benefits											
WICER actions and interventions											

Examples of benefits: improved water quality, savings from reduced reliance on expensive water sources in times of droughts, savings in healthcare from reduced incidences of water-born diaseses from increased wastewater reatment, reduction of CO2 equivalent of GHGs, higher gross value added by industries , value captures from restored land and watersheds, reduced energy costs, savings due tor reduced damaged and more resilience, etc…

ECONOMIC ASSESSMENT



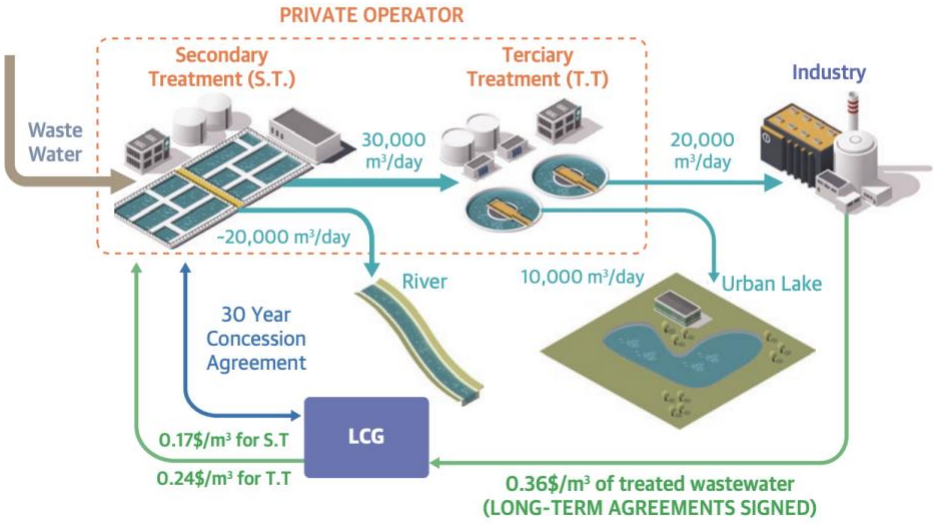
FINANCIAL ASSESSMENT



Cheat Sheet for moderator:

The WICER case is based on the real example of The Case of Lingyuan City, China

FIGURE 1. Schematic Diagram of Lingyuan Wastewater Treatment and Reuse Activities Under the World Bank Financed Project



The Lingyuan City government and the World Bank agreed that the Project would aim to increase wastewater collection and treatment and foster wastewater reuse by: (1) establishing separate drainage systems for stormwater and wastewater, (2) extending networks to increase the amount of wastewater collected and population served, (3) upgrading the WWTP into a tertiary treatment plant to improve the effluent quality of the reclaimed wastewater, and (4) enhancing pumping stations for reclaimed water. By the completion of the Project in 2017, more than 90 percent of urban households were connected and daily wastewater collection and treatment reached the WWTP capacity. Currently, 30,000 m3 /day is further treated by the tertiary treatment processes to improve the effluent quality for reuse purposes. 20,000 m3 /day of that reclaimed wastewater is reused for the operation of six industries in the new industrial park and 10,000 m3 /day is used to replenish the urban lake in order to restore urban biodiversity and maintain the shallow aquifer around the lake. The rest of the effluent, which is subjected to secondary treatment, is directly discharged into the Daling River downstream of the city, improving the river's water quality. The city government then sells the reclaimed wastewater to industries at a competitive market price of US$0.36/m3 , which is around 65 percent of the city's tap water tariff for industries. In order to secure the demand for treated wastewater, the government signed long-term agreements with six major industrial consumers to provide 20,000 m3 /day of reclaimed wastewater.

Benefits

- Improved city finances. The additional revenue from reclaimed wastewater tariffs covers all operation and maintenance costs of the tertiary wastewater treatment. The gross annual revenues from selling recycled wastewater have been around US$2.6 million since 2018
- Lower operating costs for industrial users. The reclaimed wastewater is cheaper than the urban tap water previously used for industries. Industrial users have saved US$2.83 million of direct operating costs in the past two years. Using reclaimed wastewater also results in secured industrial production by avoiding interruption or reduction in water supply, making industries more resilient to droughts.
- Protected aquifer. Approximately 7.3 million m3 per year of reclaimed wastewater is sold to industries. This means that the equivalent amount of groundwater is not being extracted

from the aquifer for this purpose, resulting in the indirect augmentation of drinking water resources and rehabilitation of the aquifer, and improved urban resilience.

- Enhanced natural amenities and biodiversity. The newly formed urban lake not only beautifies the landscape but also improves urban biodiversity, replenishes the groundwater, and provides an opportunity to increase the value of urban land (Figure 2).
- Improved city livability. The municipal wastewater collection rate has almost doubled since the commencement of the Project's implementation in 2013, increasing the urban population's coverage from 50 percent to 90 percent. Water pollution, in turn, has been greatly reduced since the amount of untreated sewerage discharged into the environment has decreased.