



# Financial and economic aspects of Integrated Urban Water Management (IUWM)

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# Financial and economic challenges accompany urban water challenges



The Urban Water Cycle: need for integration within the water sector and with other urban sectors

- Selected impacts of urban sectors on water
- Selected impacts of water on urban sectors

1. Scarce budgets and insufficient funds
2. Challenging urban water investment economics:
  - Large upfront investment costs
  - Long asset life
  - Many stakeholders
  - Many linkages in water system
  - Dispersed benefits
  - Many non-financial benefits
  - Uncertainties and risks

# The IUWM is a holistic diagnostic and strategic approach...

...involving all stakeholders, leading to a comprehensive action plan/framework that prioritizes measures and investments...

...which can be implemented through a single integrated project, or a program of single or multi-sectoral interventions...

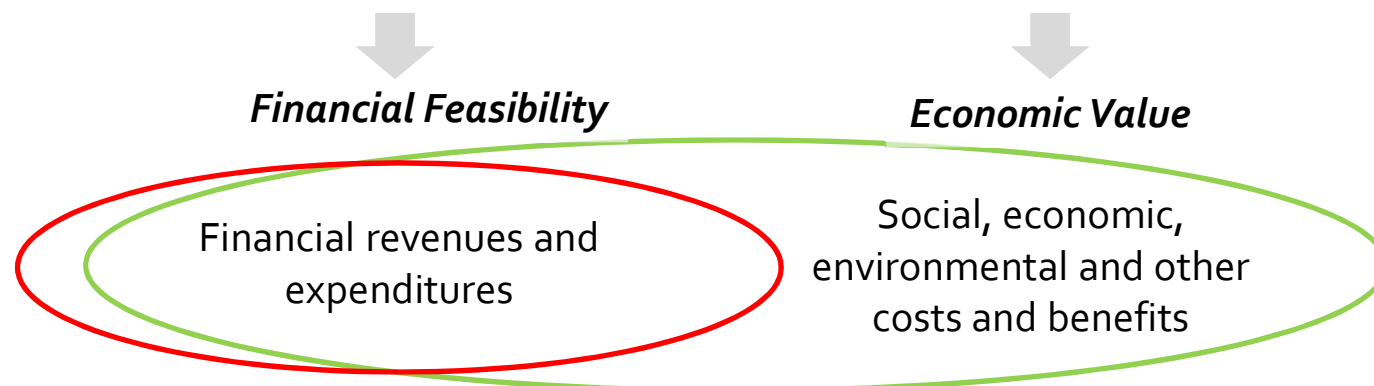
...but with all contributing to overarching goals of integrated urban water management.

## Objectives of this session

- Learn about financial and economic challenges and opportunities of IUWM
- Know the basics of how to do a financial and economic analysis of an IUWM strategy/project
- EXERCISE: Understand how to use financial and economic analysis in the design of IUWM strategies and projects that...
  - ... are **financially feasible**
  - ... are **cost-efficient**
  - ... yield the **highest economic return**
  - ... are **risk and uncertainty robust and adaptive**

# Financial versus economic assessment

	<b>Financial assessment</b> also referred to as: financial feasibility study or business case	<b>Economic assessment</b> also referred to as : Cost Benefit Analysis or Benefit Cost Assessment
<b>Answers the question</b>	Is the project financially feasible? Are funds (public and private ) available to finance the project?	Can the cost of the project be economically justified by its benefits to the economy?
<b>Effects</b>	<i>Financial impact on investors of project infrastructure (cash flows)</i>	<i>All effects on all members of society (= the economy) affected by the project (cash and non cash)</i>
<b>Valuation principle</b>	Market prices ( <i>actually paid</i> )	Economic valuation of costs (removing market distortions; opportunity costs) and benefits ( <i>willingness to pay</i> )
<b>Result</b>	Financial NPV and financial IRR	Economic NPV and economic IRR



# Financial and economic effects: cash and non-cash

A Project has **cash effects**:

- some only negative: preparation, design, construction, O&M costs
- others also positive: user charges

Projects also have **non-cash effects**, both positive and negative:

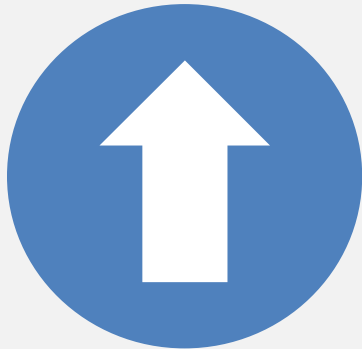
- Positive: health benefits, habitat improvement, recreation/quality of life, etc.
- Negative: noise, pollution, etc.

These effects typically do not have a market price, nobody pays for them / receives a revenue.

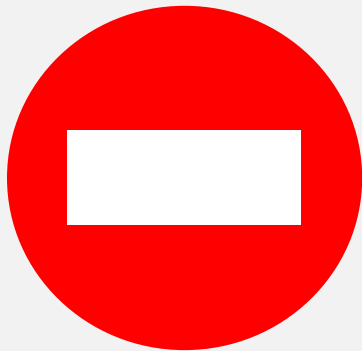
As these effects do have a value to society, they are part of the economic assessment.

# Financial and economic opportunities and challenges of integrating urban water management

## Opportunities



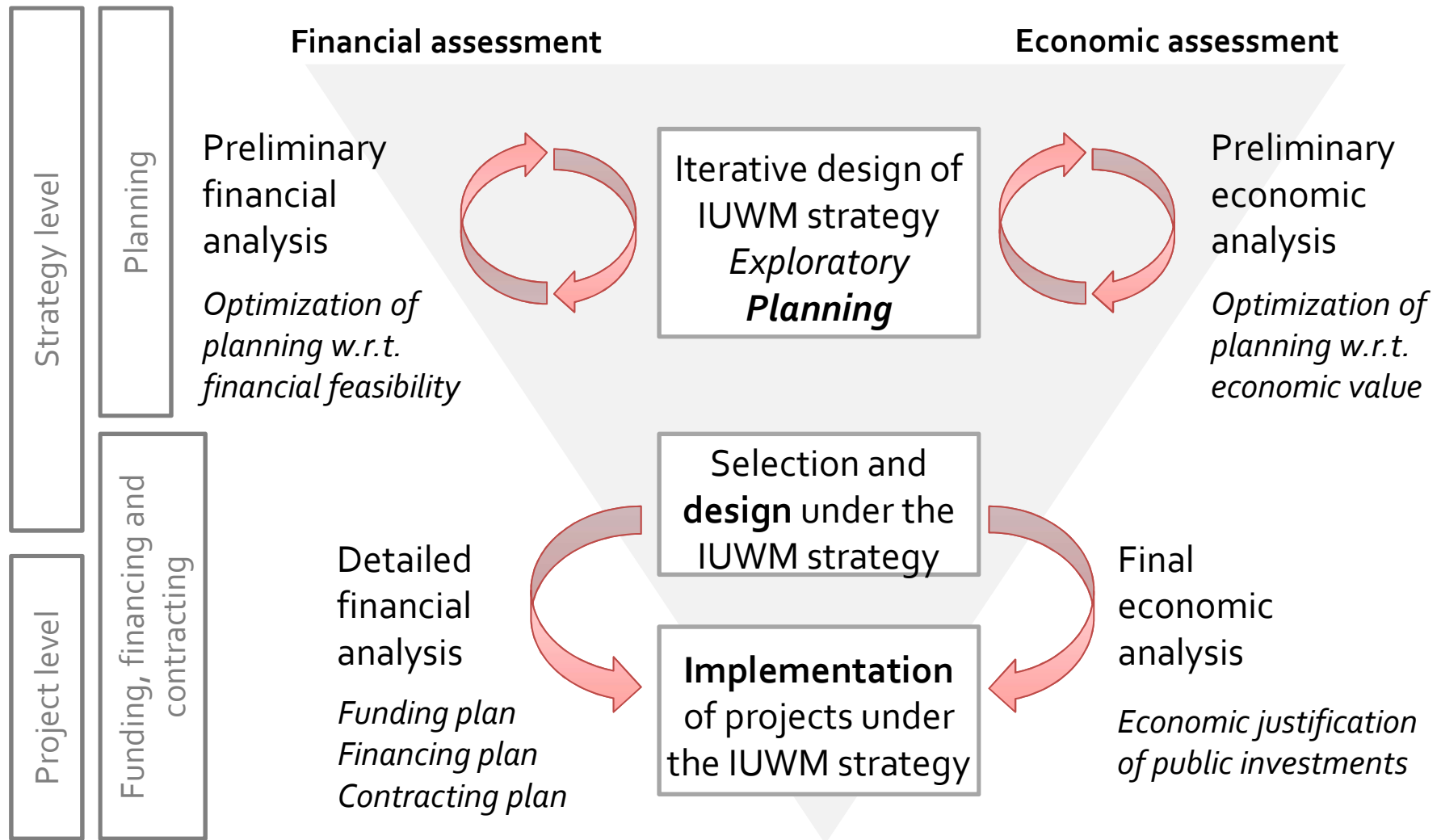
- Reduce costs and create value by exploiting linkages, synergies and long-term planning, including option for water re-use and recovery
- Steer supply and demand with financial instruments
- Fund costs with revenue generating activities
- Design adaptive solutions to respond to risks + uncertainty
- Create additional benefits by combining functions



## Challenges

- Funding of lumpy upfront and investments
- Capturing economic value in financial revenues
- Balancing costs, benefits, interests for stakeholders
- Cost coverage of capital and O&M costs
- Transaction and coordination costs due to complex set of stakeholders and institutions
- Long-term horizon and uncertainty (e.g. climate change) needs flexible and adaptive approach

# Iterative economic and financial assessment





# Objective of financial analysis

- Financial analysis = financial modelling of IUWM projects to determine their financial feasibility
- Financial feasibility = sufficient revenues are available to cover the expenditures, including a normal return for lenders and investors matching with their risks
- A strategy that is NOT financially feasible, cannot be implemented. It will eventually face obstacles, either in the investment phase (investments can not be carried out, because of lack of financing), or in the operation phase (provision of low quality services, or even the termination of services, due to lack of funds for operations and maintenance)

## Economic assessment = Cost Benefit Analysis (CBA)

A CBA sums **all present and future, positive and negative effects** on the economy as a **consequence of a project** by expressing them in monetary terms.

It is about national benefits/welfare.

The valuation in monetary terms is based on the **willingness to pay**: how much are the members of society prepared to pay to obtain a positive effect (benefit) or to avoid a negative effect (cost).

The project has a positive **economic return** to society if the value of the benefits exceeds the value of the costs.

# Steps of a Cost Benefit Analysis

Definition	1	Problem analysis	What is the problem we are trying to solve with this strategy? What are the envisioned effects? Do they address the problems?
	2	Definition of strategy alternatives	What are the measures that will be taken in the strategy, compared to the situation without project (base case)
	3	Identification of costs and benefits	What are the positive and negative effects (qualitative) produced by the strategy compared to the base case?
Modeling	4	Estimation of the project costs	What are the investment and O&M costs of the strategy compared to the base case?
	5	Valuation of the benefits and costs	What is the value of the benefits of the strategy compared to the base case? And what are the (non-financial) costs?
Analysis	6	Determination of economic return	Calculation of net present value of the strategy.
	7	Risks, uncertainty, and sensitivity analysis	What are the main risks and uncertainties of the strategy? Are the results robust? How future-proof is the strategy?
	8	Distributional analysis	Who is bearing the cost? Who is experiencing negative effects? Who is benefitting from the strategy?

# Typical benefits of implementing an IUWM strategy/project

List is not exhaustive!

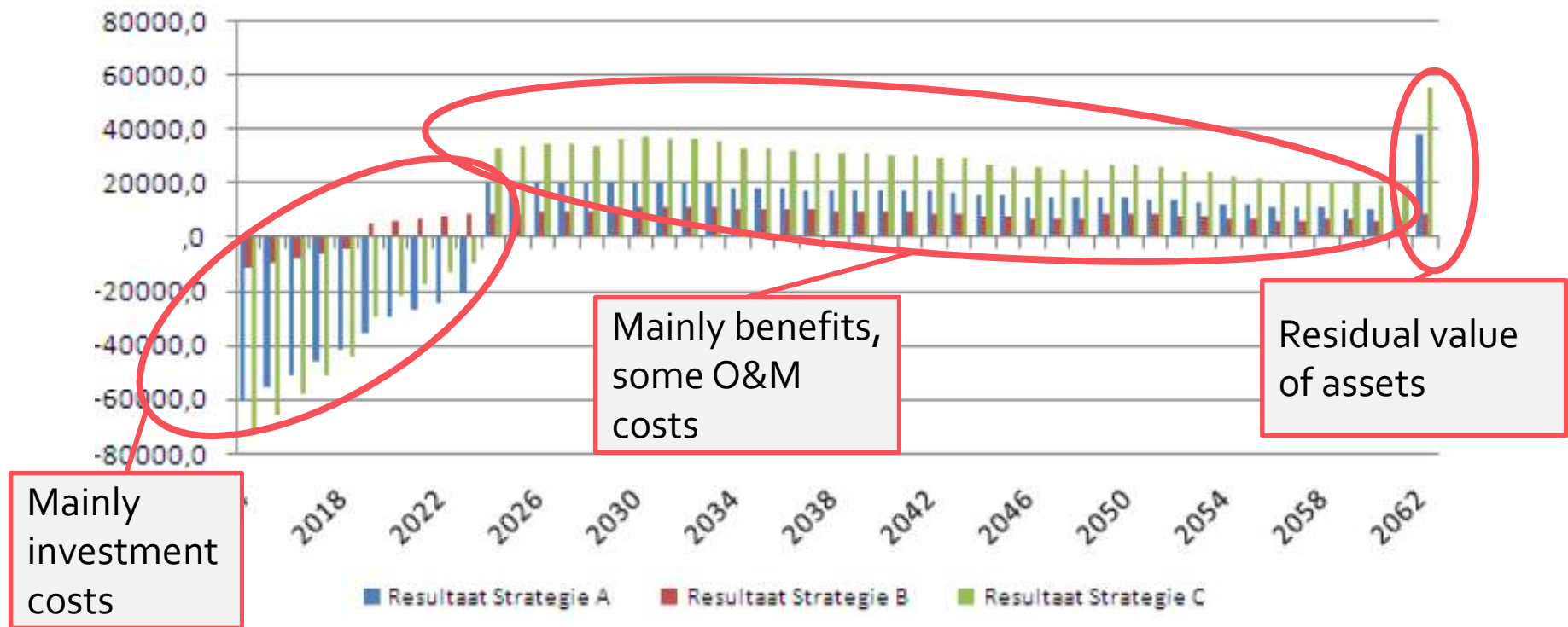
Category	Effects/benefits
Availability of water for users (quantity and quality)	<ul style="list-style-type: none"> <li>- Comfort</li> <li>- Health (better hygiene and less water-borne diseases)</li> <li>- Cost and production level of water-using economic activities</li> <li>- Value of water for downstream users (comfort, health, economic activities)</li> </ul>
Reduced depletion of non-renewable water resources	<ul style="list-style-type: none"> <li>- Future value of water resources</li> </ul>
Flood protection	<ul style="list-style-type: none"> <li>- Prevented damage and loss of life</li> <li>- Prevented disruption of economic activities</li> </ul>
Multi-purpose / green infrastructure	<ul style="list-style-type: none"> <li>- Greener cities, higher quality of city life</li> <li>- More efficient use of space</li> </ul>
Ecosystem creation/restoration	<ul style="list-style-type: none"> <li>- Economic value of ecosystems (ecosystem products, recreation, urban quality, carbon capture, biodiversity...)</li> </ul>
Labor market	<ul style="list-style-type: none"> <li>- Employment</li> <li>- Human capital development</li> </ul>
Other, depending on urban functions	<ul style="list-style-type: none"> <li>- Benefits related to transportation, energy, etc.</li> </ul>
Cost savings	<ul style="list-style-type: none"> <li>- Cost savings in the water system due to efficiency gains</li> </ul>

# Risks and uncertainties

- Risks and uncertainties are inevitable in a CBA
  - The effects run into the far future (20-50 years). They are determined by many factors of which the future evolution is not known with certainty (climate change, demographic change, prices, economic growth,...)
  - The urban water system is very complex. Many physical and behavioral processes and linkages are not known with certainty.
- The identification and analysis of risks and uncertainties is important for decision-making
  - Strategies may have a positive economic return in some states of the world, but not in other ⇒ selection of robust or prudent strategies
  - Some risks/uncertainties can be reduced or their impact mitigated by taking proper actions (such as additional research to improve knowledge about uncertain variables, or contingency plans to reduce the impact of risk events if they should occur)

# Case: Rotterdam Climate Adaptation

## CBA results of three different climate adaptation strategies



# Case: Teresina Programma Lagoas do Norte



## Problem:

- Systematic severe **floods**
- Poor **drainage** network and **sanitation**
- Poor **infrastructure**
- **Economically** deprived region
- Lack of **institutional capacity**

## Conventional solution = Without project scenario.

- Lagoas do Norte would have continued to deteriorate environmentally
- Lagoons would have become an untreated wastewater and garbage disposal
- Further detrimental to economic development of the northern sector of Teresina

## Alternative solution = Integrated Urban Water Solution

### Component 1: Capacity Building

- Finance and budget
- Water supply / sanitation
- Urban environmental

### Component 2: IUWM

- Water supply expansion
- Macro/micro drainage intervention
- Rivers/lagoons intervention
- Improve roads

### Component 3: Economic Development

- Access to social programs
- Employment promotion
- Social infrastructure expansion

# Case: Teresina Programma Lagoas do Norte *Results*



- 26,000 people protected from floods

## A success story:

→ **Net benefits: ca. USD 36 million**

- Total costs: ca. USD 35 million
- Total benefits: ca. USD 71 million
- *Ex Post Evaluation, net present value*

→ **A more livable and attractive city**

→ **Second phase started with the same elements in a neighboring area**

*Before*



*After*



W  
Sa

E

Envi

Infrastructure

- 100 extreme poor families benefited from household improvements



# Interactive exercise: Bay City

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# Why conduct a financial assessment?

- ✓ To assess whether a project is financially feasible

➔ An urban water project will face implementation problems if there is no adequate funding strategy, both in the short term (financing of investments) and in the long term (covering of O&M costs)

- ✓ To determine the optimal financing and procurement strategy

➔ The financial analysis helps determining how the project can be financed and implemented in the most cost-efficient way (who invests, who finances, payment mechanisms, contract forms,...).

- ✓ To effectively manage risks

➔ As part of the financial assessment, a risk analysis is conducted and a risk management plan is established (including allocation of risks among stakeholders and measures for the prevention and mitigation of risks). If risks are not well managed, the strategy could be derailed by the occurrence of risk events.

# Why conduct an economic assessment?

- ✓ To design the best IUWM strategy, yielding the highest economic value

➔ UWM challenges often can be addressed in several ways (for instance with varying degrees of integration). The economic assessment provides input on which alternative creates the highest net value to society

- ✓ To assess whether the strategy creates economic value, or in other words, whether it is a good strategy

➔ An IUWM strategy should only be implemented if the benefits to the economy of the strategy outweigh the costs.

- ✓ To justify government subsidies to the IUWM strategy and its projects

➔ Many water projects do not have a positive financial return. Thus, they must be subsidized by the government. This subsidy is justified when the IUWM strategy creates economic value, and the project contributes to the value of the strategy.

- ✓ To identify which stakeholders have costs and/or benefits

➔ This information provides input for the funding strategy. Stakeholders having costs should be compensated, beneficiaries can be asked for a financial contribution