



The wealth of waste

**Key economic principles of water
reclamation and reuse and the steps
to apply them in practice in real
cases**

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1. Economic justification of water reuse projects
2. Financial feasibility of water reuse projects
3. Reality check: Case study
4. Conclusions

The wealth of waste

The economics of wastewater use in agriculture





- Methodology for the economic appraisal of WW reuse projects
- applies this methodology in real cases in Mexico and Spain.



Steps in an economic appraisal



- Economic justification

Are Total Benefits higher than Total Costs?

Which are there better alternatives?

➔ **Cost-benefit analysis**

- Financial feasibility

Who pays? And how?

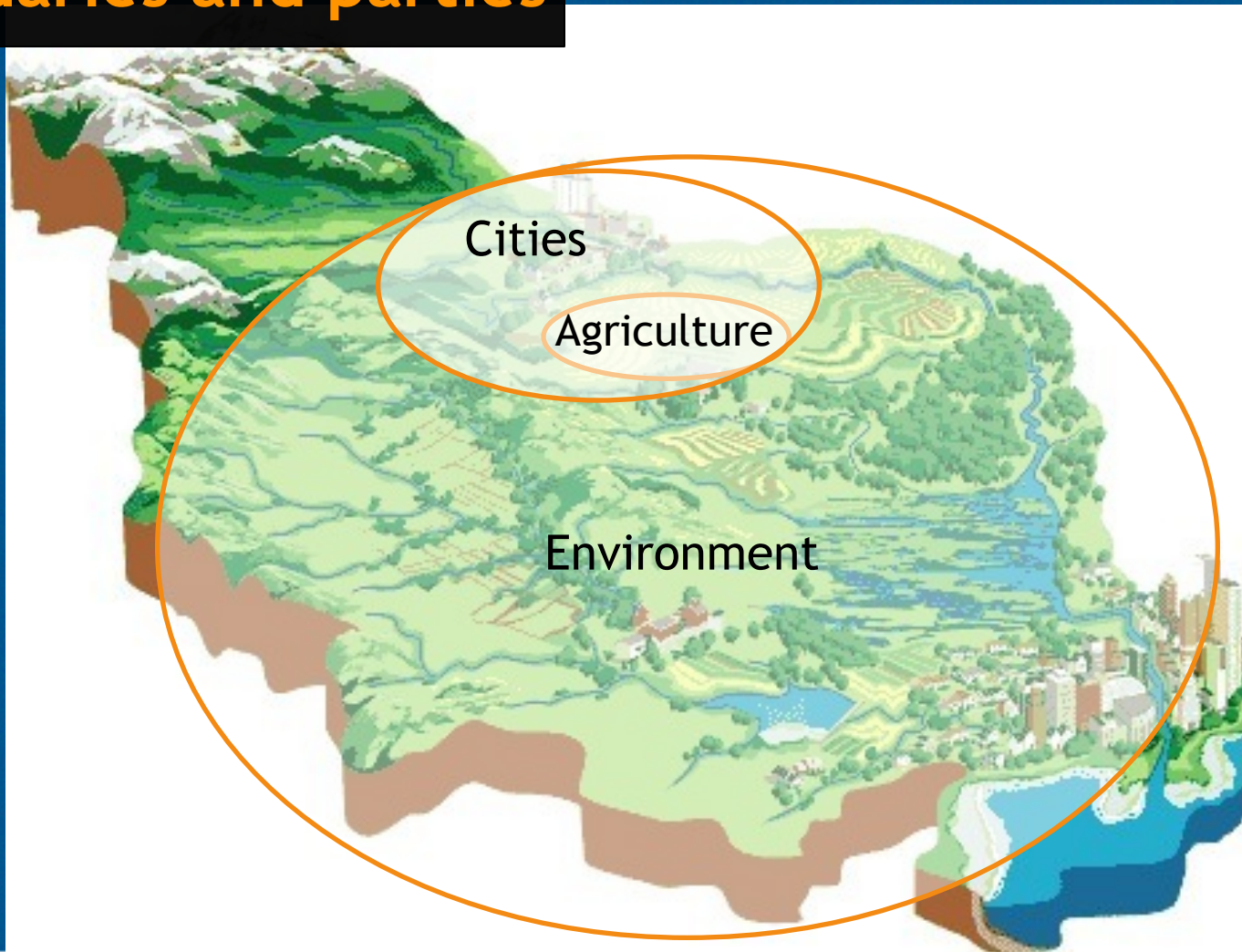
Affordability? Economic incentives for farmers?



Economic justification



Boundaries and parties





Cost-Benefit analysis

Benefits

Farmers

- Water all year round
- Nutrients and organic matter
- Avoided costs of pumping
- Increase in crop yields and foods

Cities

- Food Security
- Increase in water availability

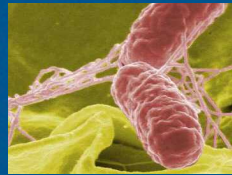
Environment

- Reduced pollution
- Less water overexploitation
- Conservation of wetlands



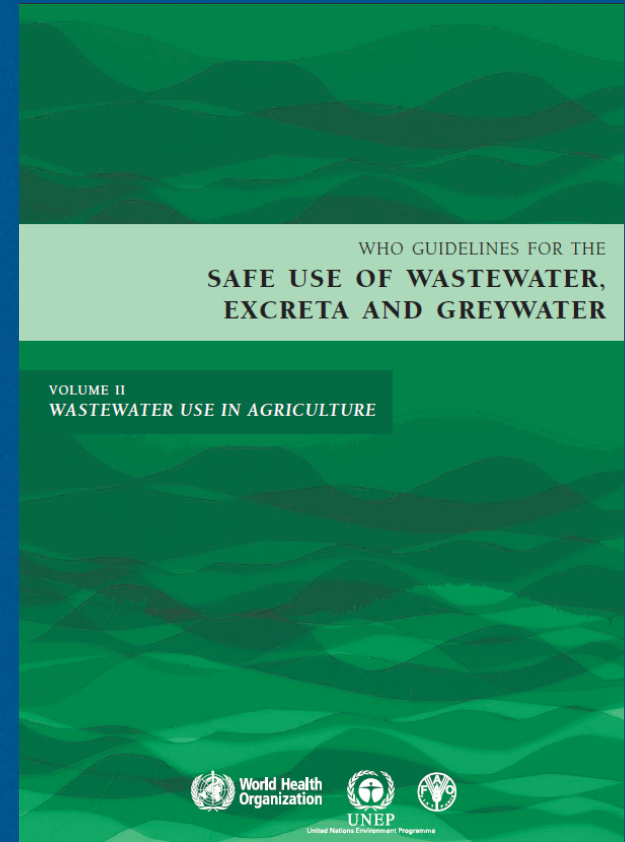
Cost-Benefit analysis

Risks



Minimizing risks → Cost

- Treatment options
- Non treatment options



Cost-Benefit analysis

Other costs

- **New infrastructure**

Water pumping, storage and conveyance

- **Environmental costs**

Environmental impacts (e.g. salinization)

- **Health costs**

Illness due to infectious and chemical agents



Cost-Benefit Analysis

If Total Benefits > Total Costs

Is the chosen **reuse approach** the most cost-beneficial approach?

Alternatives

- Water Conservation
- Desalination
- Water transfer
- Others



Financial feasibility



Financial impact on stakeholders

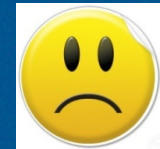
Stakeholders:

- Farmers
- Citizens
- Down-stream water users
- City authorities
- Regional or national government

Who benefits



and who loses



?

Financial instruments

- Subsidies from government
- Others
 - Soft loans
 - Payment to farmers for freshwater release
 - Water charges
 - Citizens
 - Farmers
 - Pollution taxes

A reality check

Irrigated farmland

801 ha

Reclaimed / released water

13 Mm³/yr

Cost of new **treatment units**

3.69 M€/yr

Cost of **conveying effluents**

0.12 M€/yr

Cost of **conveying released freshwater**

1.43 M€/yr

Total cost of water reuse & exchange

5.24 M€/yr

Farmers' increase in income

0.35 M€/yr

Value of water exchanged for city use

14.43 M€/yr

Total economic benefit

14.78 M€/yr

Total added value for farmers and city

9.54 M€/yr

► **Unit cost** **0.40 €/m³** ► **Unit benefit** **1.14 €/m³**

How to calculate the economic added values?

Additional water availability for the city: **13.0 Mm³/yr**
x **Water tariff per m³: 1.11 €/m³**
= Economic benefit for the city: 14.43 €/yr

+ Farmers' increase in income: 0.35 M€/yr

- Total cost of water reuse & exchange: 5.24 €/yr
(Cost of wastewater treatment and
cost of conveying **treated wastewater**
and **freshwater**)

How to finance the cost?

Additional water availability for the city: **13.0 Mm³/yr**
x **Water tariff per m³ of 1.11 €/m³**
= **Economic benefit for the city: 14.43 €/yr**

+ **Farmers' increase in income: 0.35 M€/yr**

- **Total cost of water reuse & exchange: 5.24 €/yr**
(Cost of wastewater treatment and
cost of conveying **treated wastewater**
and **freshwater**)

How to finance the cost?

Option 1

Economic benefit for the city: 14.43 €/yr - 5.24 €/yr

+ Farmers' increase in income: 0.35 M€/yr - 0.0 €/yr

= Total economic benefit: 14.78 M€/yr

- Total cost of water reuse & exchange: 5.24 €/yr

= Total added value: 9.54 €/yr

How to finance the cost?

Option 2

Economic benefit for the city:	14.43 €/yr	- 4.89 €/yr
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+ Farmers' increase in income:	0.35 M€/	- 0.35 €/yr
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= Total economic benefit:	14.78 M€/yr	
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- Total cost of water reuse & exchange:		5.24 €/yr
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= Total added value:	9.54 €/yr	
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How to finance the cost?

Option 3

Economic benefit for the city: 14.43 €/yr **- 7.24 €/yr**

+ Farmers' increase in income: 0.35 M€/yr **+ 2.0 €/yr**

= Total economic benefit: 14.78 M€/yr

- Total cost of water reuse & exchange: 5.24 €/yr

= Total added value: 9.54 €/yr



Who benefits?

	Total added value	City	Farmers
Option 1	9.54	9.19	0.35
Option 2	9.54	9.54	0
Option 3	9.54	7.19	2.35



Economic appraisal of projects (including reuse projects) is an essential tool for water planning and allocation strategies within IWRM.

The FAO report provides a sound **methodology** for the economic appraisal of reuse projects.