The water energy nexus in the urban context – A suggestion for a multi- inter- and transdisciplinary approach for sustainable development

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Contribution to the workshop: Understanding the Water-Energy-Food Nexus and its implications for governance

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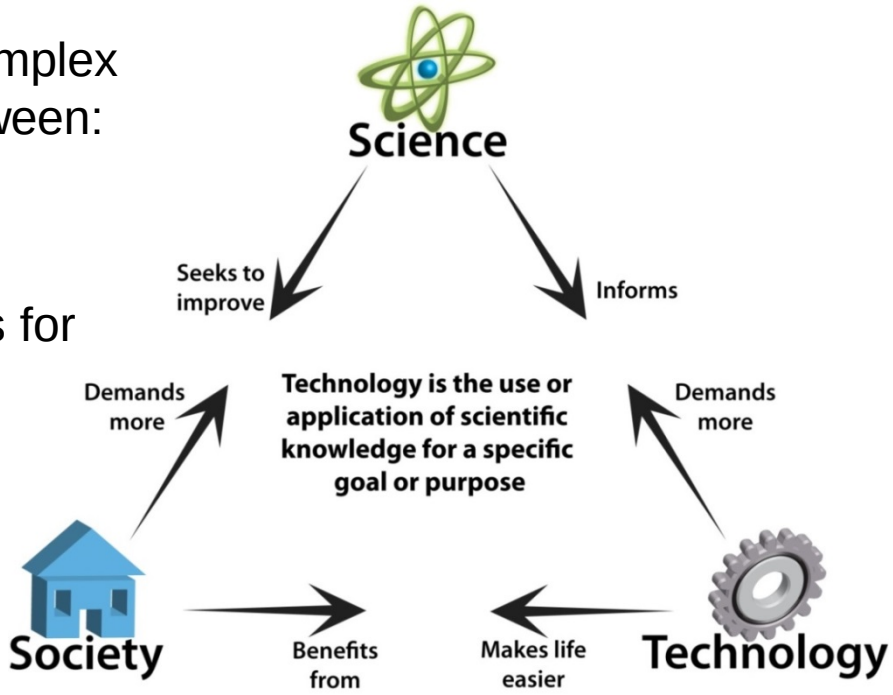
Introduction of ITAS

Tasks:

Understanding the complex interrelationships between:

…and the implications for governance.



- Analysis, use and development of methods for technology assessment and systems analysis

→ Development of action strategies for sustainable development

→ Policy advice and participation in the public debate

Urban water infrastructures

Background

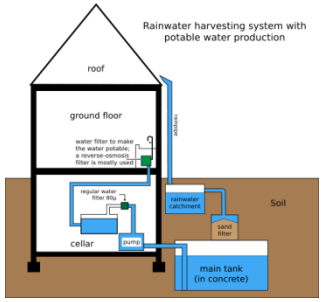
- Restructuring of water infrastructures necessary
  → Potential to introduce alternative technologies (e.g. grey water recycling)

Source: Morio (author), https://commons.wikimedia.org/wiki/File:Skyscrapers_Shinjuku_25_January_2004_rev.jpg

Questions/Tasks

I. How to organise water and energy services more efficiently? (multidisciplinarity)

II. How can technologies be used sustainably within the respective societal context? (interdisciplinarity)

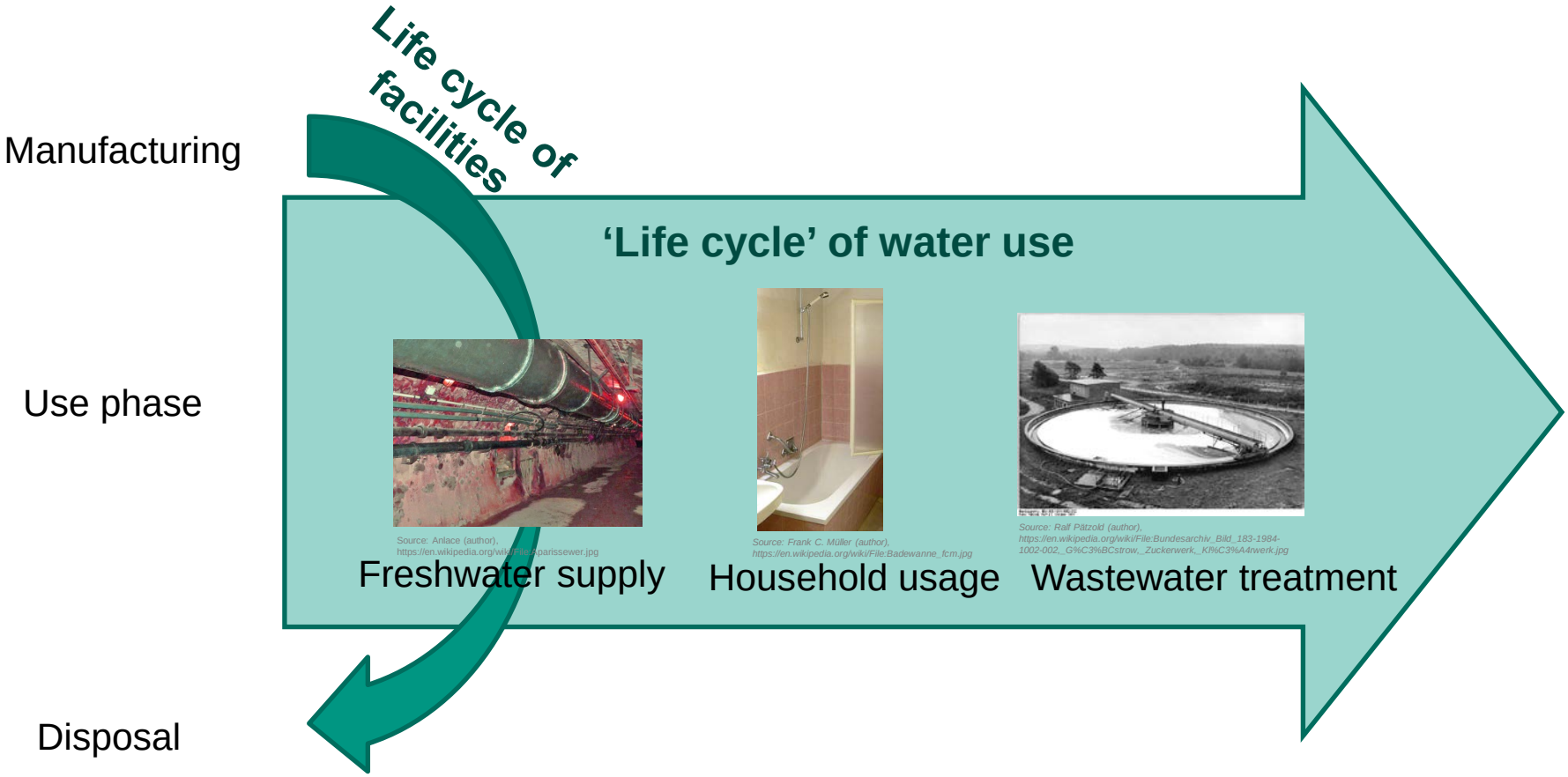


https://commons.wikimedia.org/wiki/File:Rainwater_harvesting_system.svg

III. How can stakeholders be involved? (transdisciplinarity)

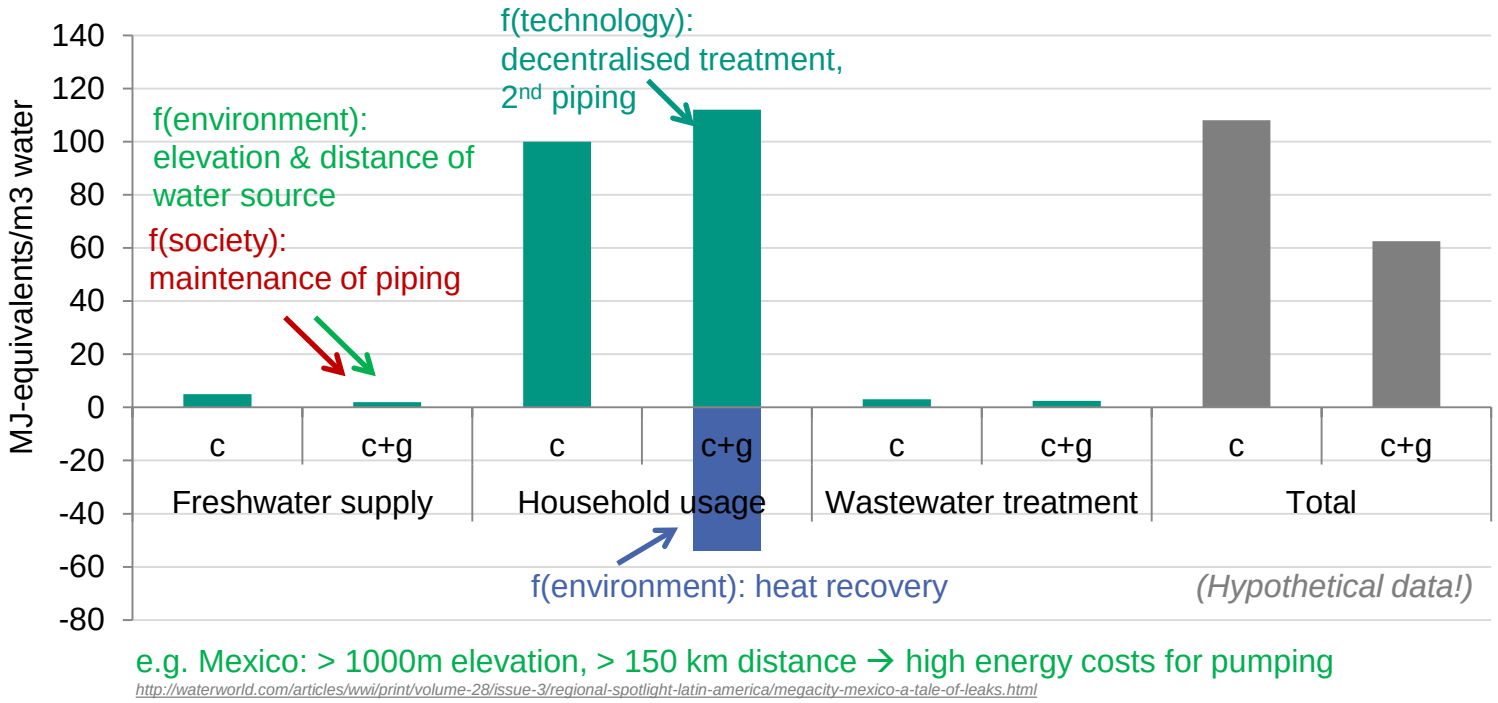
I) How to organise water and energy services more efficiently?

→First step: Life cycle thinking in order to avoid ‘burden shifting’



I) How to organise water and energy services more efficiently?

Example: Comparison of the energy demand for conventional water use (c) with the energy demand for added greywater recycling & heat recovery (c+g)



e.g. Mexico: > 1000m elevation, > 150 km distance → high energy costs for pumping

http://waterworld.com/articles/wwi/print/volume-28/issue-3/regional-spotlight-latin-america/megacity-mexico-a-tale-of-leaks.html

→ Challenges: Data collection in multiple disciplines, identification of most important parameters

II) How can technologies be used sustainably within the respective societal context?

Technologies are embedded in society (socio-technical systems)

→ How does technology affect the society?

The 'Sustainability Concept of the Helmholtz-society', Example:

- Rule: Just distribution of chances for using natural resources
- Indicator: Cost per quality of water treatment?

→ Challenges: identification of the relevant societal context, collection of appropriate indicators to evaluate the sustainability

Substantial rules		
Securing human existence	**Maintaining society's productive potential**	**Preserving society's options for development and action**
Protection of human health	Sustainable use of renewable resources	Equal access of all people to information, education and occupation
Ensuring the satisfaction of basic needs (nutrition, housing, medical care etc.)	Sustainable use of non-renewable resources	Participation in societal decision-making processes
Autonomous subsistence based on income from own work	Sustainable use of the environment as a sink for waste and emissions	Conservation of cultural heritage and cultural diversity
Just distribution of chances for using natural resources	Avoiding technical risks with potentially catastrophic impacts	Conservation of the cultural function of nature
Reduction of extreme income or wealth inequalities	Sustainable development of man-made, human and knowledge capital	Conservation of "social resources" (e. g. tolerance, solidarity or adequate conflict solution mechanisms)

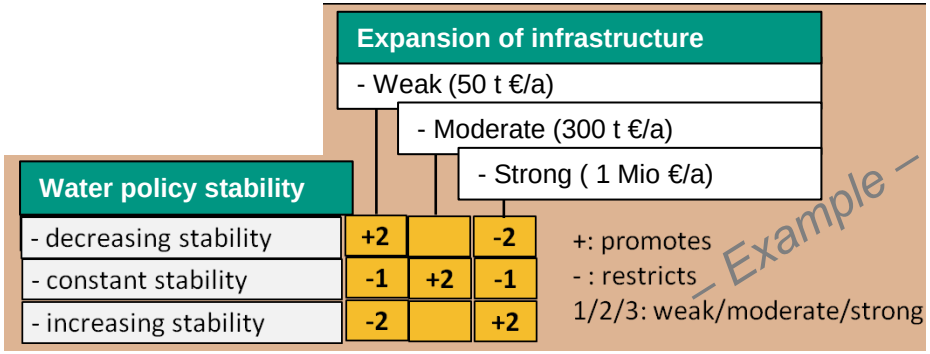
Source: Kopfmüller et al. (2009)

II) How can technologies be used sustainably within the respective societal context?

Technologies are embedded in society (socio-technical systems)

→ How does society affect the technology (b) – also in the future?

Current and future societal conditions (politics, economy, culture) and their interdependencies with technology can be considered in a semi-quantitative way with the Cross-Impact-Balance (CIB) method.



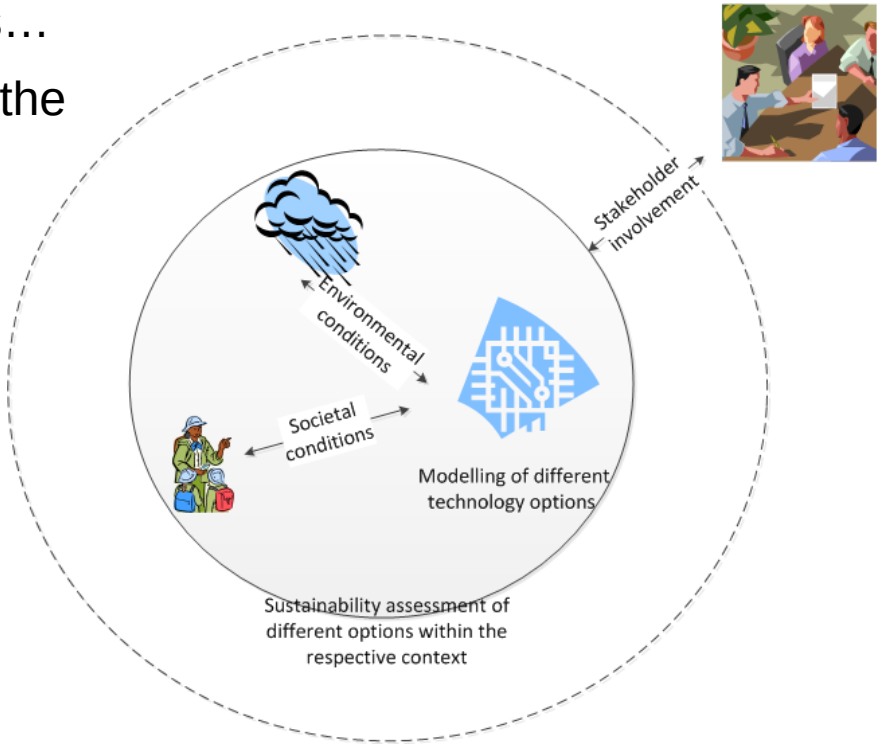
→ Challenges: Identification of relevant driving forces and societal conditions of possible future developments delivering narrative stories.

III) How can stakeholders be involved?

Stakeholder should be involved in all steps…

- Data collection about technologies and the respective societal (environmental, economical and social) conditions
- Assessment of the acceptance of technological options
- Identifying sustainability indicators
- Scenario-building with the CIB method

Methods: expert interviews, workshops, surveys



→ Challenges: confidence building, knowledge transmission

Conclusions

A multi-, inter- and trans-disciplinary approach is required to improve the water-energy nexus in a sustainable way.

Implications for governance:

- Choose technologies appropriate for the respective context.
- Consider the interaction of technologies with society.
- Involve stakeholders as far as possible.

Source: ChvhLR10 (author), https://en.wikipedia.org/wiki/File:HK_Central_Statue_Square_Legislative_Council_Building_n_Themis_s.jpg