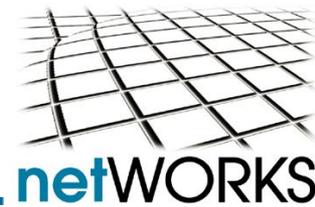


Innovative de- and semi-centralized water infrastructures – opportunities for water supply and wastewater companies

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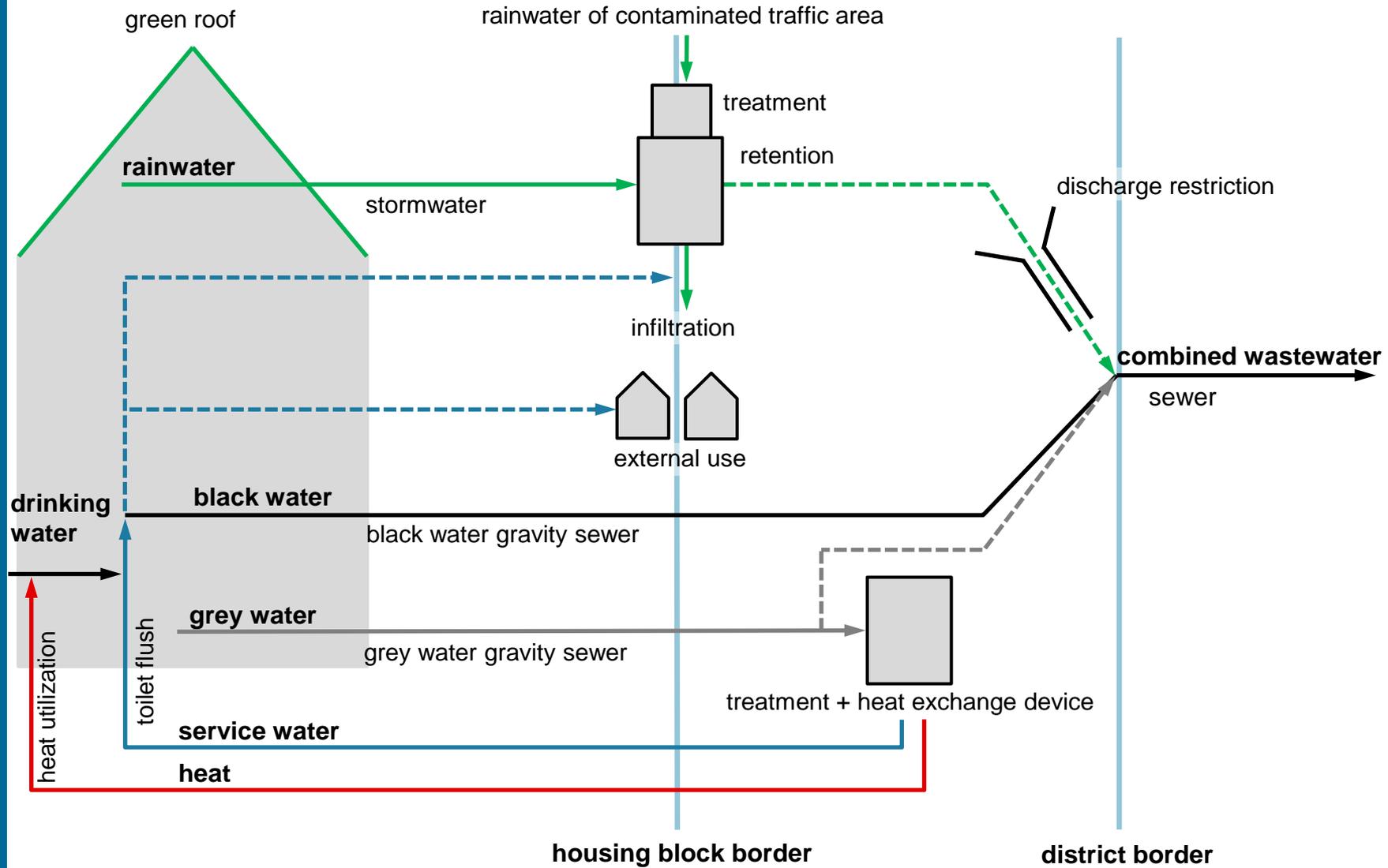
What is my starting point?



- German water management companies are facing major challenges:
 - ✓ impacts caused by climate change,
 - ✓ rising energy prices,
 - ✓ demographic change (infrastructures in regions with population decrease suffer under-utilization)
 - ✓ micro pollutants in wastewater
 - In sum, the costs per capita for operating the infrastructures and services will rise.
- At the same time, integrated and innovative water infrastructures are available with the potential to adapt urban water management to changing conditions.

- heat recovery from wastewater and its use for hot water generation and space heating,
- the collection, treatment and reuse of separated wastewater flows like grey water or rainwater for service water purposes,
- the collection and treatment of black water for efficient fermentation and biogas production, and
- de-centralized rainwater management.

Example of grey water recycling and heat recovery on the district level



- Innovative, often de- or semi-centralized infrastructures will not totally replace conventional water infrastructures.
- But, under some spatial, socio-economical, financial and ecological circumstances and conditions, they have the potential to amend and enrich the traditional shape of water infrastructures.
- In future – this is my thesis – de-, semi-centralized and centralized infrastructures will be combined, and there will be a side by side of different technologies, configurations and systems of water infrastructures.

Assuming that innovative water infrastructures gain considerable part in heterogeneous water infrastructure configurations.....

STRATEGIC OPTIONS AND BUSINESS OPPORTUNITIES FOR MUNICIPAL WATER COMPANIES

1. Water-energy nexus
2. Operation of de- and semi-centralized facilities
3. Deepen the activities in mass flow separation and water resource management

1. Water - Energy Nexus

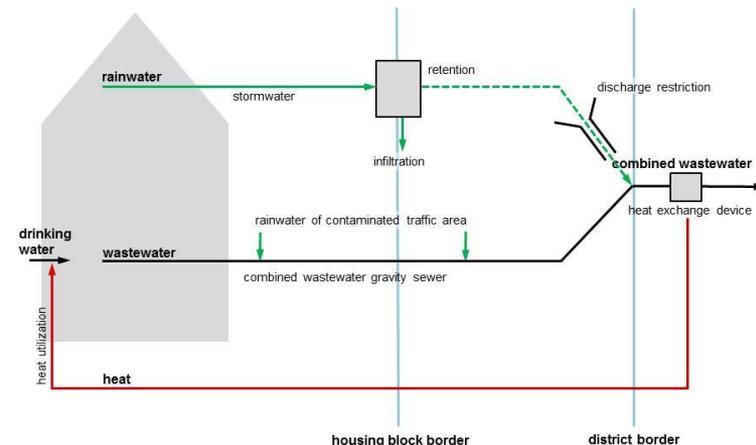
1) Water-energy nexus (1)

- Production and supply of electric power and heat on the central wastewater treatment plant:
 - ✓ optimize the energy efficiency of wastewater plants
 - ✓ utilization of the biogas potential on the plant
 - ✓ heat recovery in the effluent or sludge disposal
 - ✓ install renewable energy power plants (photovoltaic cells and wind power plants) on the plant area
 - goal: energetic self-sufficiency of treatment plants

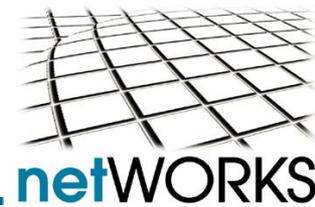
1) Water-energy nexus (2)



- Offering the sewer to third parties for heat recovery activities:
 - ✓ Pre-condition: thermal potential is significant (high and continuous flow of wastewater, temperature) (heat source) and a heat customer (heat sink) is situated close to the sewer and the heat recovery facility.
 - ✓ creation of a GIS-based map of „hot spots“ of heat potential in the sewer
 - ✓ heat market companies implement heat recovery facilities (heat exchange devices) in the sewer under the control of the water company
 - ✓ billing expenditures and efforts for the provision of the sewer (surveillance, maintenance)
 - goal: generate extra income and profit contribution (“Deckungsbeitrag”) with the company’s asset



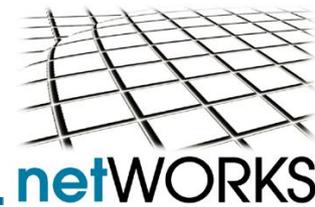
1) Water-energy nexus (3)



- Sanitary environmental engineering as a player in local load management (“Energiewende”)
 - ✓ wastewater treatment is one of the principal energy consumers
 - ✓ specific profiles of daily power demand of water supply (nighttime) and wastewater (daytime)
 - ✓ energy production units on wastewater plants
 - ✓ block-type thermal power stations can be run focused on power (“stromgeführt”) (instead of heat) and be combined with other units to “virtual power stations”

2. Operation of De- and Semi-centralized Facilities

2) Operation of de- and semi-centralized facilities



- grey water recycling, heat recovery plants or block-type thermal power stations (see “Energiewende”) in private housings
- operation and management of de- and semi-centralized facilities : control and surveillance, maintenance, care, repair and restoration of existing facilities; planning, conceptual design and project management of investment projects
- goal: profit contributions by offering services, and secure public control over correct operation of these facilities and their outcome in terms of quality and efficiency (secure water supply and ecological and hygienic wastewater management)

3. Deepen Activities in Mass Flow Separation and Water Resource Management

3) Deepen activities in mass flow separation and water resource management



- Innovative water infrastructures are grounded on the water cycle approach and on locally orientated mass flows.
- Considering these approaches and technical options it is reasonable to connect water supply and wastewater disposal (e.g. grey water recycling and reuse).
- But furthermore, it suggests the development of activities and services in preservation of water bodies and landscape.
- Generate a holistic view on grey, green and blue infrastructures.
- goal: secure and strengthen the water companies' role as the central player in managing the local water resources

- The presented strategic options and business opportunities do not exclude each other. They are combinable.
- The strategies enable water companies to develop a holistic approach and business model and to take an important role in integrated urban planning and the sustainable development of urban infrastructures.
- Urban and infrastructure planning probably will become more complex as there has to be dealt an increasing uncertainty of future developments and number of stakeholders.
- The complexity of steering and control of the infrastructure itself and the coordination of the stakeholders will rise. Thus, the demand of competencies and know-how in public service companies for planning, management and coordination rises.

- It might be necessary to develop new organizational models that are able to capture the opportunities of innovative or differentiated water infrastructures: reform the legal structures of municipal/local companies or even think of more fundamental adjustments and create new, probably hybrid (subsidiary) companies.
- By securing the municipal companies' resources and know-how, local authorities keep and secure a central "tool" for locally defined development of public services, the transition of local infrastructures, and the democratically based planning and development of the municipality.

Thank you for your attention!



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