Case Studies

Solutions for a sustainable development of urban areas

TECHNISCHE UNIVERSITÄT DARMSTADT

IWA Cities of the Future Workshop
Istanbul, 7-11 February 2011

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SEMIZENTRAL GERMANY

On the way towards higher resource-efficiency

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- The “classical” alternative, decentralized approach for new development areas
  - Hamburg Jenfeld, Germany
  - Hammarby, Sweden
- Solutions for “combined” challenges – hybrid (?) solutions
  - Semizentral Hanoi, Vietnam
- Transformation Processes

Hammarby Sjöstad
– an eco-friendly part of town

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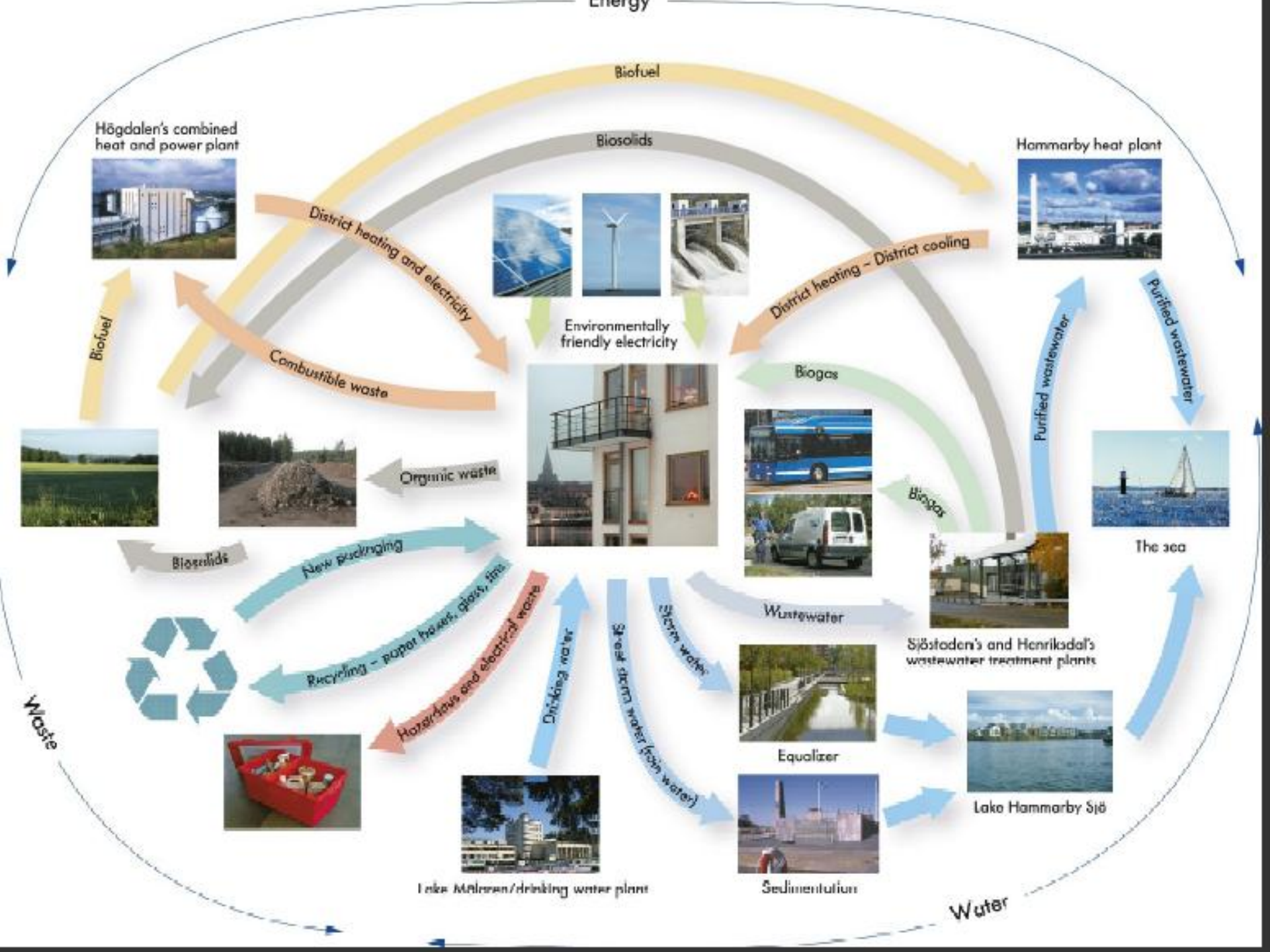
- new district in Stockholm
- „equipped“ with strong environmental requirements on
  - buildings,
  - traffic environment and
  - technical installations → the “Eco Cycle Model”
- Basic characteristics
  - Former industrial wasteland
  - till 2018: 11,000 household with about 20,000 people


Energy
Biofuel
Högdalen's combined heat and power plant
Biosolids
Hammarby heat plant
District heating and electricity
District heating – District cooling
Biofuel
Combustible waste
Environmentally friendly electricity
Purified wastewater
Purified wastewater
Biogas
Biogas
Organic waste
The sea
Biosolids
New packaging
Recycling – paper, boxes, glass, tins
Hazardous and electrical waste
Drinking water
Storm water
Wastewater
Sjöstaden's and Henriksdal's wastewater treatment plants
Waste
Storm water
Storm water (rain water)
Equalizer
Lake Hammarby Sjö
Lake Mälaren/drinking water plant
Sedimentation
Water

Hammarby Sjöstad
– an eco-friendly part of town

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- Goals
  - creating a residential environment based on sustainable resource usage
  - Energy consumption and waste production are to be minimized while
  - resource saving, reusing and recycling are maximized
  - Halve the environmental burden – compared to 1990

- Implementation
  - waste is incinerated to produce energy - both electricity and district heating
  - re-use of thermal energy / source of renewable energy: waste heat from treated wastewater is used for heating up the water in the district heating system
  - wastewater is collected in one flow, treated and “products” used
    - purified wastewater for industrial use
    - biogas for households and fuel-substitute for cars

http://www.hammarbysjostad.se/

World-wide noticed

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- Holistic approach

- In 2007 the district had around 12,500 visitors
- Exporting the idea to Russia, Great Britain and to China

- Evaluation: 30% to 40% more eco-friendly than other districts

- People are part of the system:
  75% „hardware“,
  25% to live within

www.sweden.se/de/

HAMBURG WASSER Kompetenz Netzwerk

Conversion of the former Lettow-Vorbeck Barracks into a new residential area

www.hamburgwasser.de/hamburg-water-cycle.html

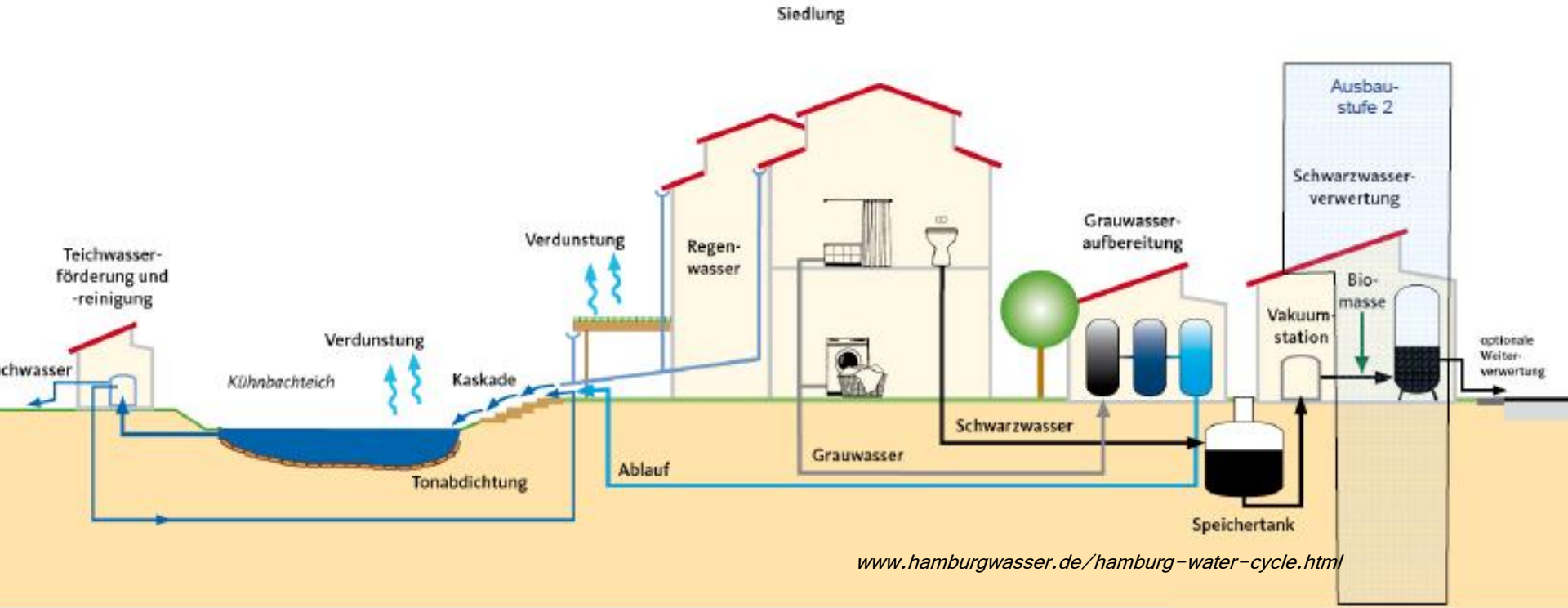
New urban residential area in Hamburg-Jenfeld - HAMBURG WATER Cycle

- 35,000 m², 720 accomodation units, cultural and social features, trade
- IBA-project, i. e. to be realized by about 2011 - 2013
- Low energy or passive house standard (50 – 15 kWh/m²)
- HAMBURG WATER Cycle

www.hamburgwasser.de/hamburg-water-cycle.html

New urban residential area in Hamburg-Jenfeld– HAMBURG WATER Cycle

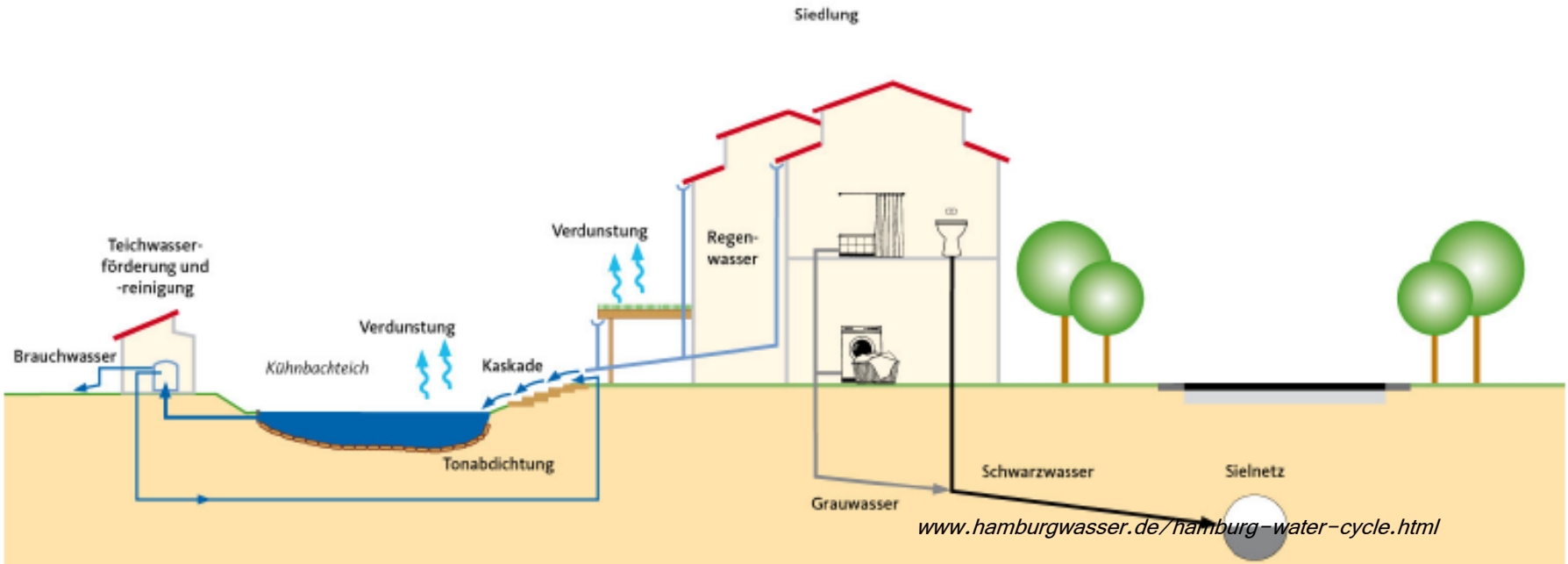
- Stormwater management completes the water cycle
- Low load on the greywater flow
- Blackwater with concentrated pollutants and valuable substances
- The supply of heating to the area is currently being investigated



www.hamburgwasser.de/hamburg-water-cycle.html

Stormwater Management

- Open drains – water „stays“ in nature



www.hamburgwasser.de/hamburg-water-cycle.html

New urban residential area in Hamburg-Jenfeld– HAMBURG WATER Cycle

Konzept „Wells“

www.hamburgwasser.de/hamburg-water-cycle.html

entnommen aus Funktionsplanung West 8 (2006)

„Compostion“ of ‚wells‘

www.hamburgwasser.de/hamburg-water-cycle.html

entnommen aus Funktionsplanung West 8 (2006)

New urban residential area in Hamburg-Jenfeld– HAMBURG WATER Cycle

Wasser als Wegbegleiter in die grüne Mitte

www.hamburgwasser.de/hamburg-water-cycle.html

Advantages of the „wells“ Concept

- Stormwater-effluent in open drains
- Filtration increases water quality of the lake
- Increased micro-climate
- Increases living quality
- Identification with the location

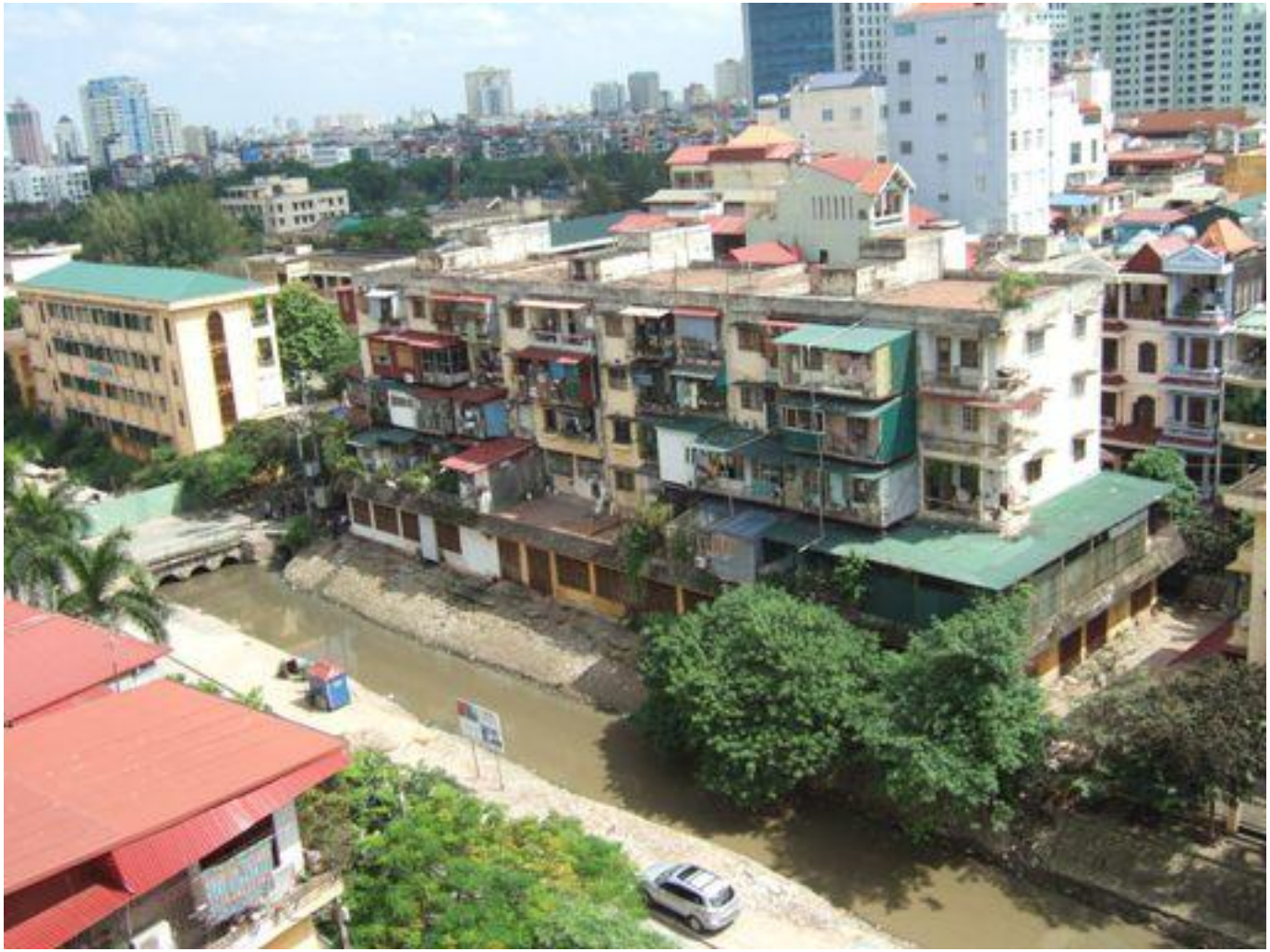
www.hamburgwasser.de/hamburg-water-cycle.html

Advantages of the HAMBURG WATER Cycle

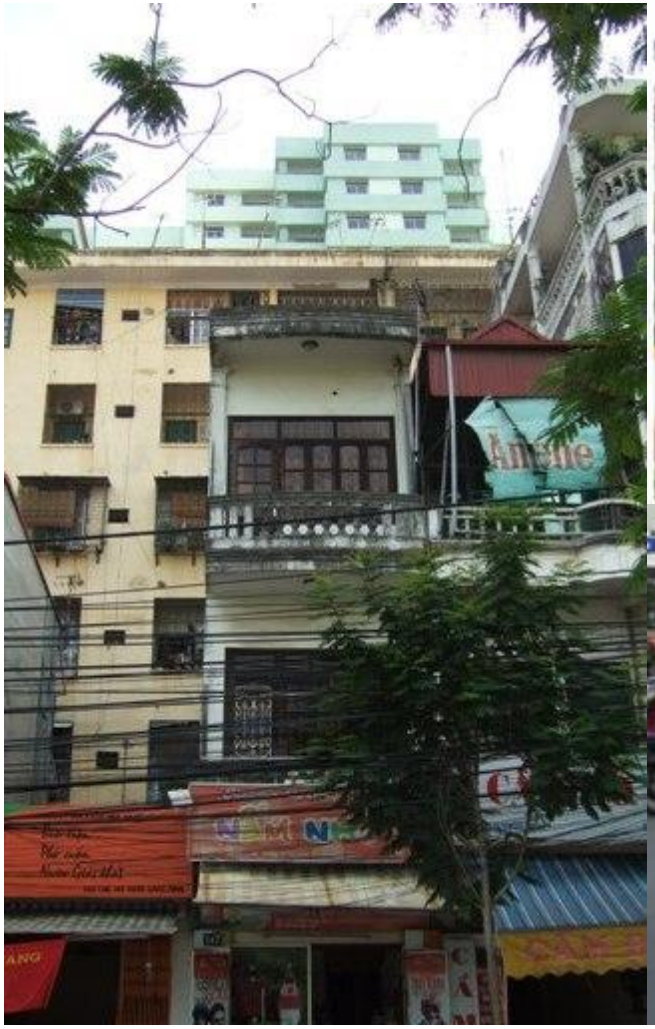
- high loads in the blackwater – concentration of organics and nutrients
- using stormwater as design-element
- nutrient recovery (P, N) possible
- micropollutants are collected more concentrated – an option for better treatment in the future
- energy self-suffiency (with added biomass) possible
- system can be integrated into existing structures

Solutions for “combined” challenges

Semizentral Hanoi, Vietnam



Hanoi, S.R. of Vietnam



Hanoi - urban space

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Rapid change – urban growth and transition

- The urban centres of **Hanoi** and **Ho Chi Minh City** as centres and **engines of rapid economic growth**
- Extreme **inner city densification**
- extension of the urban fringe with **large scale expansions** and smaller scale densification

Hanoi - urban space

Rapid change – urban growth and transition

Two characteristic kinds of urbanization in Hanoi:

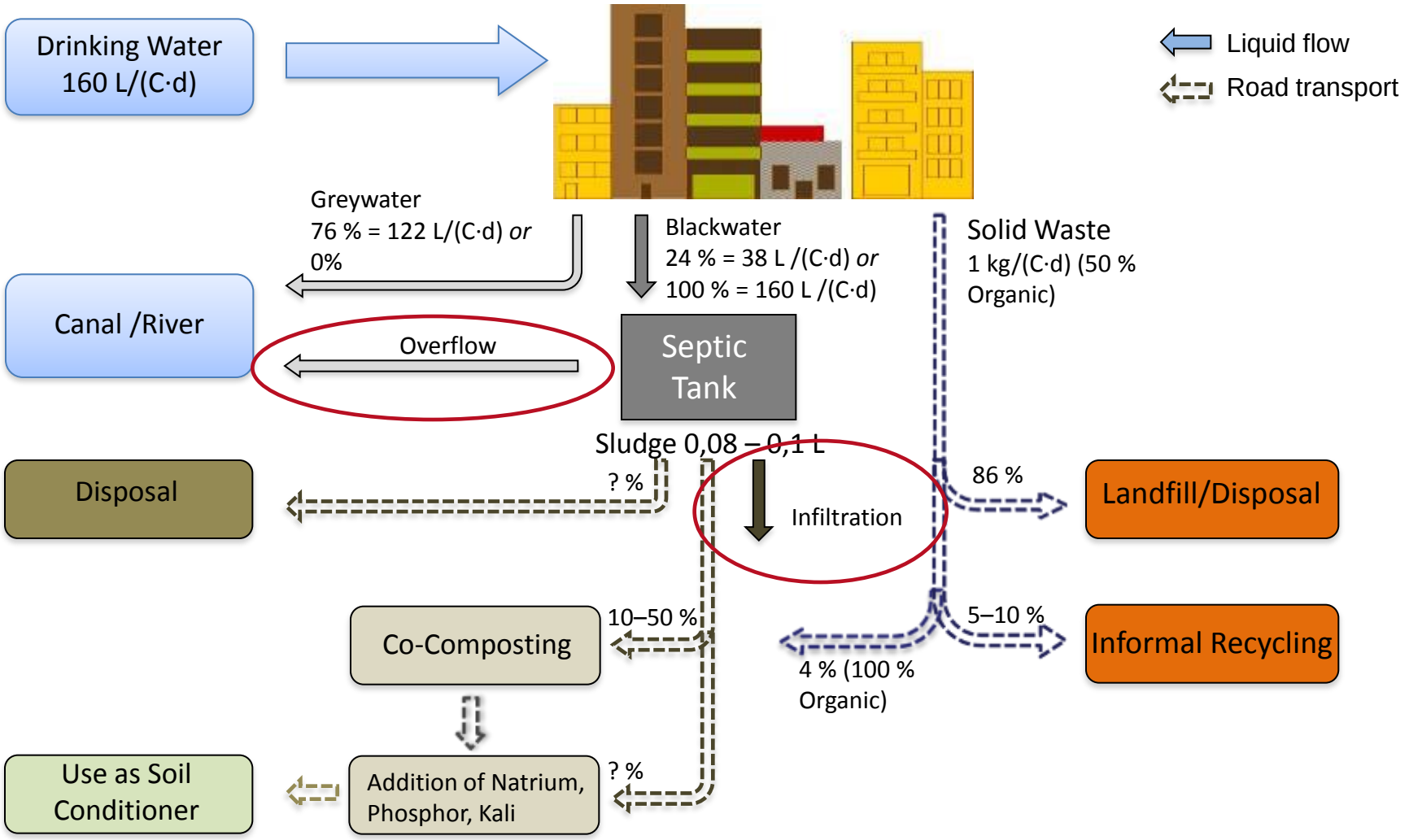
1. **New Urban Areas:** large plots are developed by one investor based on detailed urban planning

→ These areas qualify for the prior installation of networked infrastructures

2. **“urban villages”:** small-scale individual building activities lead to a dense road network and housing structures

→ Due to incremental building process, these areas are mostly supplied with decentralized technologies

Hanoi: material flows



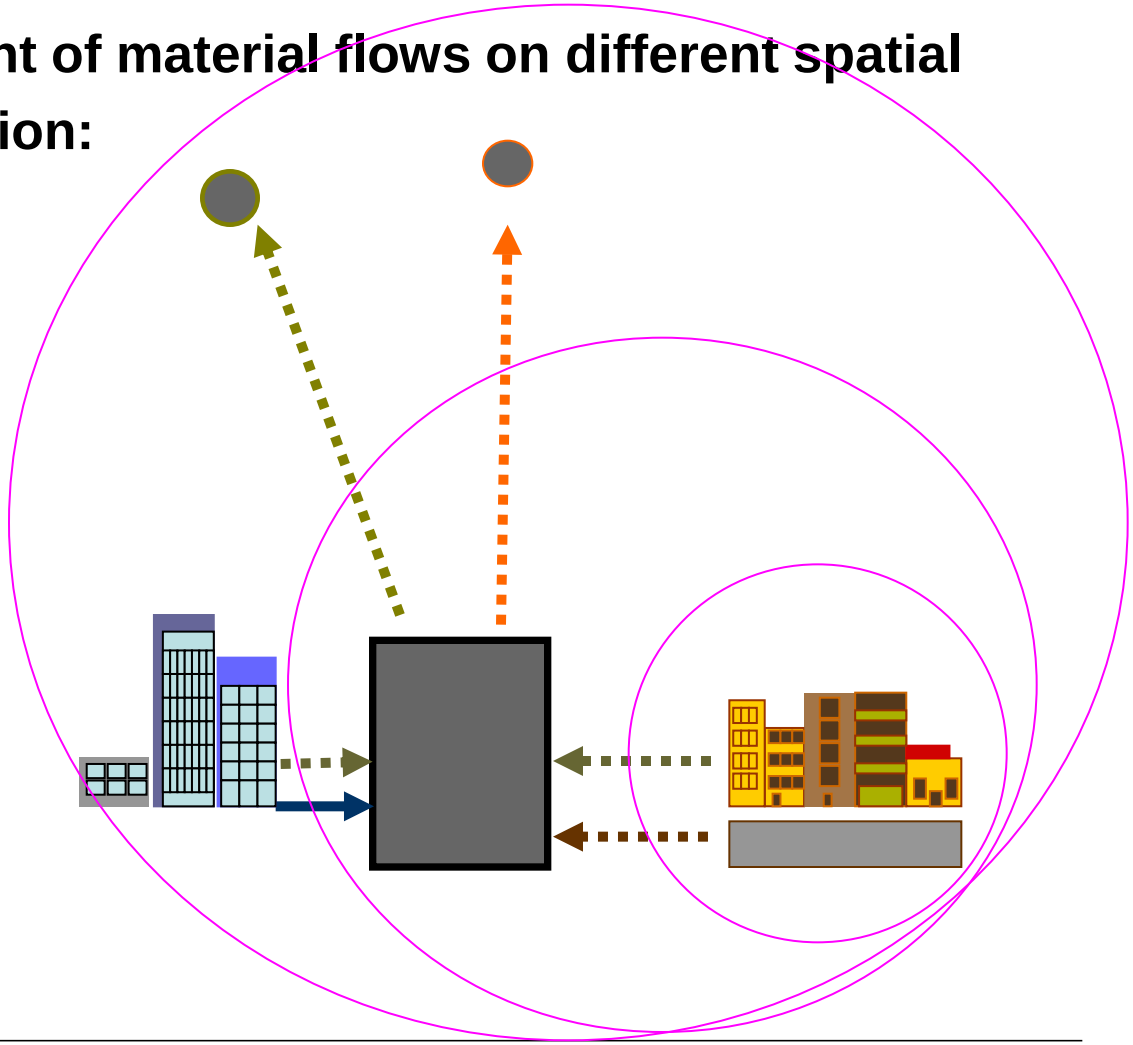
Re-direction of material flows

Semicentralized management of material flows on different spatial levels within the urban region:

- In urban villages: household-based pre-treatment in septic tanks

- ward-based co-fermentation plants

- centralized landfills for by-products
- Regional marketing of soil conditioner



Transformations-Processes

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Challenges of today

- Combined sewers for stormwater and wastewater
  - rising problems in the context of climate change
- Status/ performance of sewer systems
  - water losses
  - water intrusion
- Water & Energy
  - Much energy “in” the water is added within the households
    - How to reduce energy input?
    - How to re-use the inherent energy of the waste-warmwater?
- …

Energetic restoration-works

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Straubing, Munich (Germany)

- 4 buildings, 120 flats with old heating technology *(80,000 Liters heating oil per year)*
- realization of modern isolation *plus*
- installation of modern low-temperature heating technology,
- linked to a heat-exchange unit, using the sewer as a source for thermal energy

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- installation of modern low-temperature heating technology, linked to a heat-exchange unit, using the sewer as a source for thermal energy

➔ 75% of the needed energy for heating in these 4 buildings can be covered from wastewater resp. the inherent heat

Innovations – active on the market

- using „waste“ showerwater pre-heat shower water

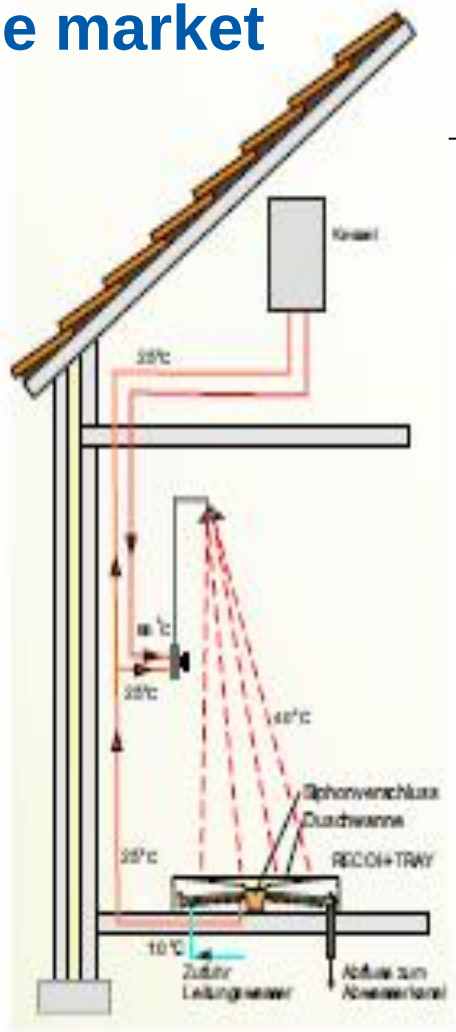
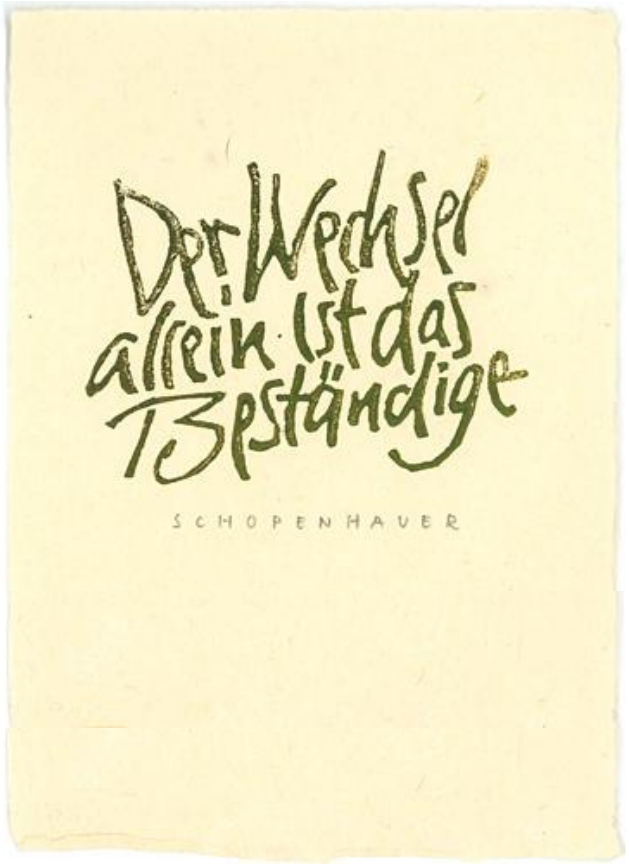


Abbildung 9: Wärmerückgewinnung aus Duschwasser – Systemskizze (links); Wärmetauschermodul (rechts) [Bilder: Fa. Hei-Tech Energiesysteme]

Coping with change - vacancies



Nothing is steady – but Change.

[Arthur Schopenhauer, German Philosopher, 19th century]