BILFINGER BERGER
Facility Services

ROEDIGER VACUUM

Closing the Demand Gap by Ressource Efficiency

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Sophisticated Systemic Approaches and Technically Feasible Solutions

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Closing the Demand Gap by Ressource Efficiency

Content

Main Business Activities

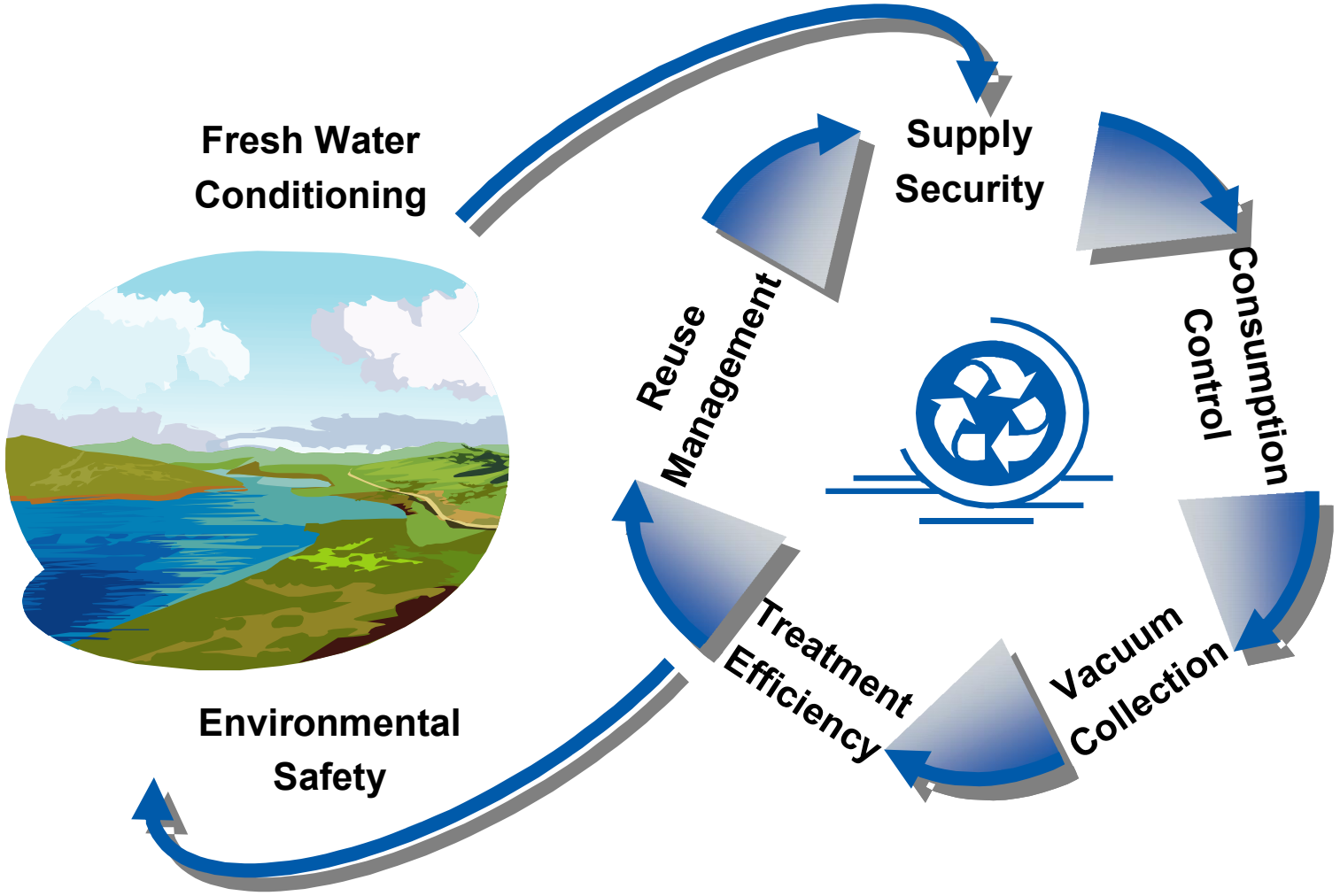
ROEDIGER

RoeVac® Vacuum Sewer Systems OUTDOOR

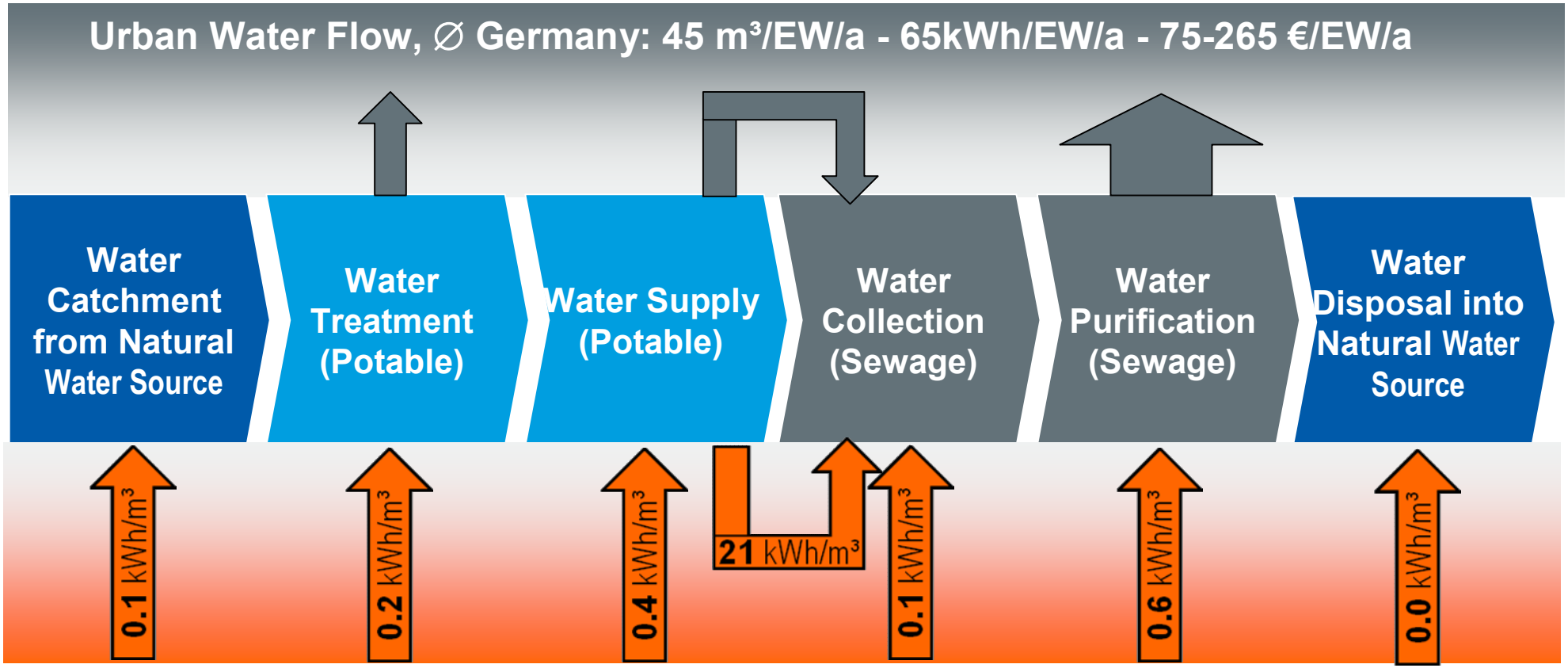
RoeVac® Vacuum Sanitation Systems INDOOR

Roediger Water Management Systems

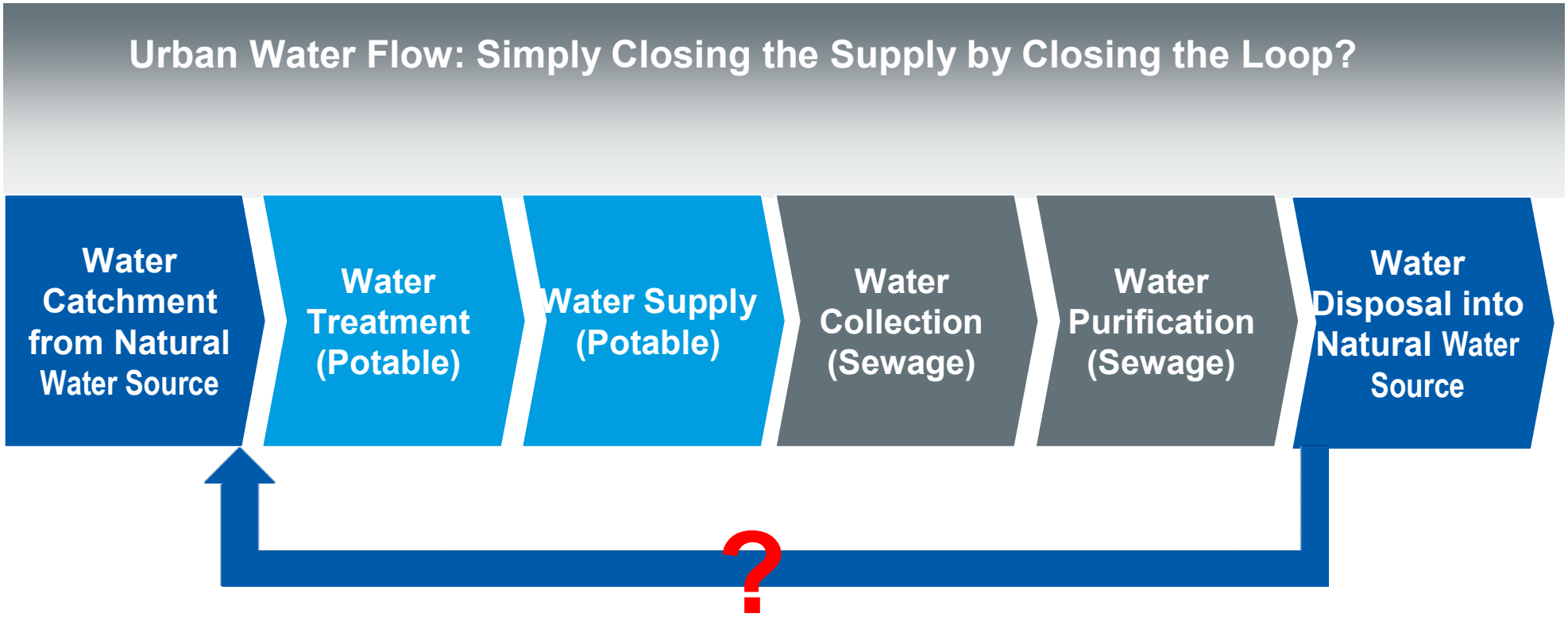
Water Management Systems – We provide Full Service Range



Key Figures - How does water relate to Energy?



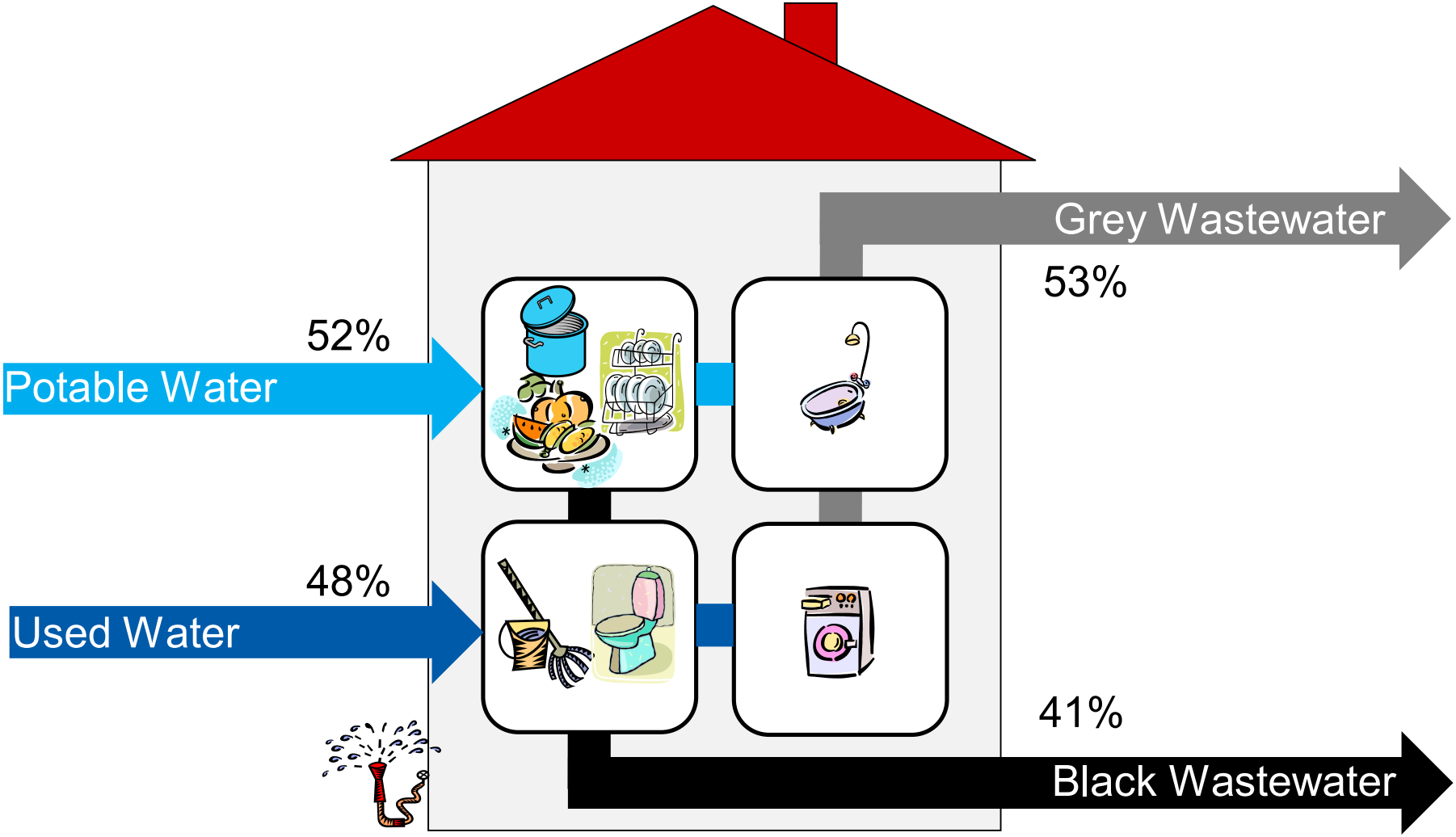
Closing the Loop – Is it Feasible or even Reasonable?



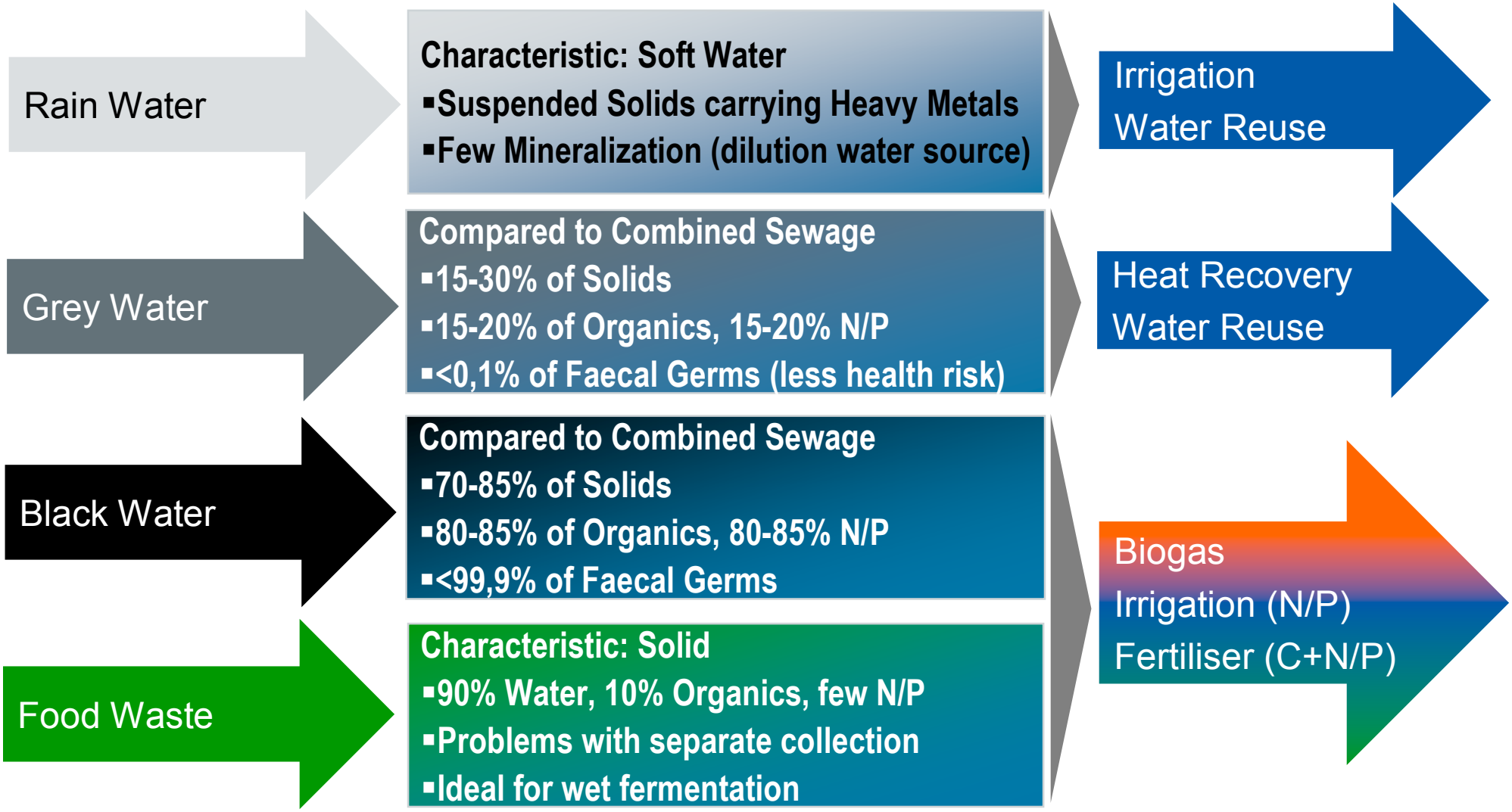
- High sanitary risk
- Acceptance problems
- Quality consciousness

- Increased treatment costs (safety, enrichment)
- No energy saving or consumption increase
- Water resource protection (water stress)

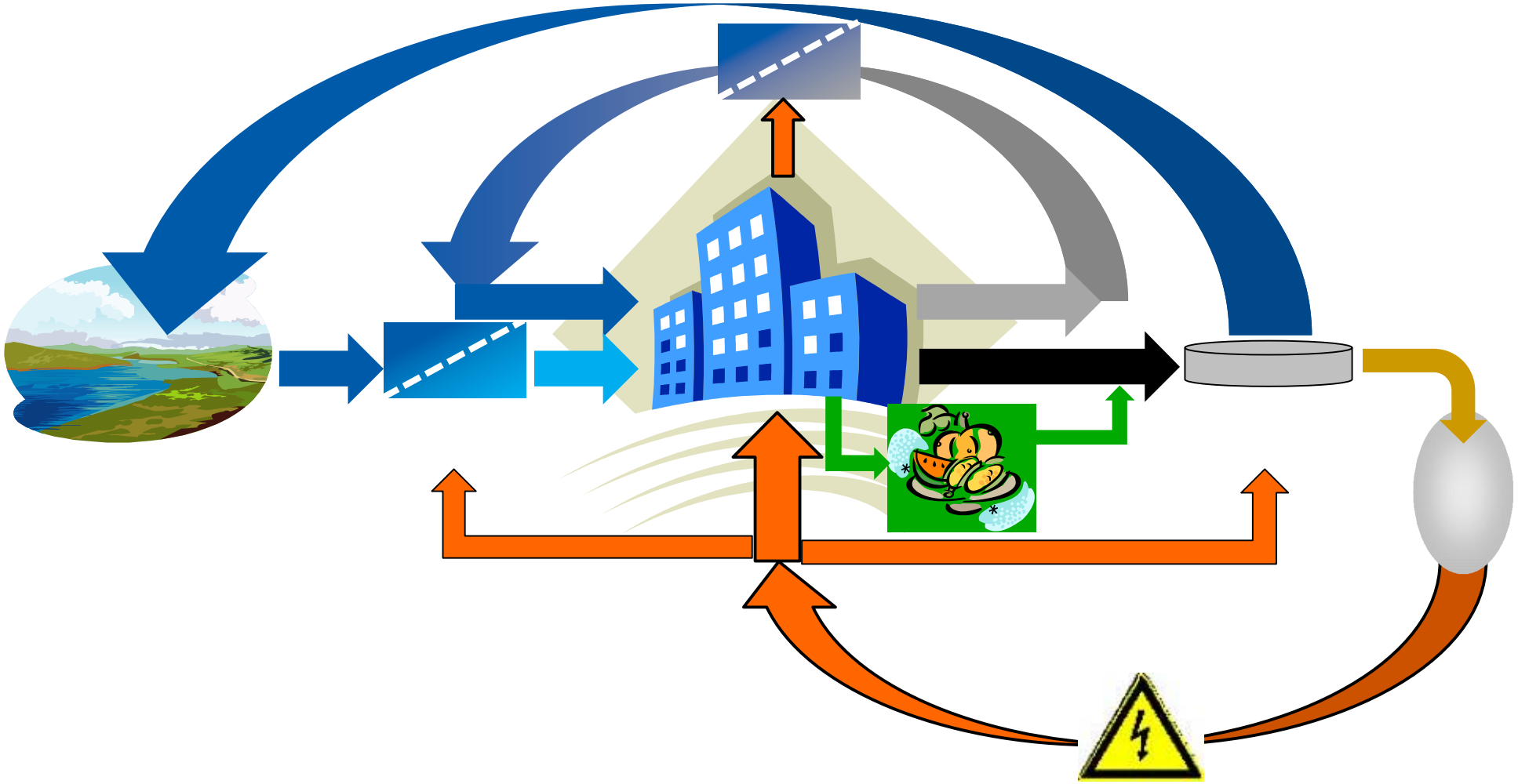
Key Figures - Distinguished Water Balance for Resource Efficient Use



Modern Flow Management as Basis of Resource Efficiency – A Rough Overview



Systemic Approach - Energy-Efficient Water Management suggested for Urban Areas



Energy-Efficient Water Management - Power Balance

Quantity	Unit	Conventional WWTP with Digestion	Combined Black Water and Bio Waste Treatment
Amount	L/PE/d	200	50
Organic Matter in Water	COD/PE/d	120	120
Organic Waste in Water	g/PE/d	0	300
Energy in generated Biogas (6 kWh/m³)	kWh/PE/a	28	81
Power from Biogas (33% efficiency)	kWh/PE/a	+9	+27
Power Consumption of Vacuum	kWh/PE/a	+0	-5
Power Consumption of Treatment	kWh/PE/a	-35	-18
Net Power Balance	kWh/PE/a	-26	+4

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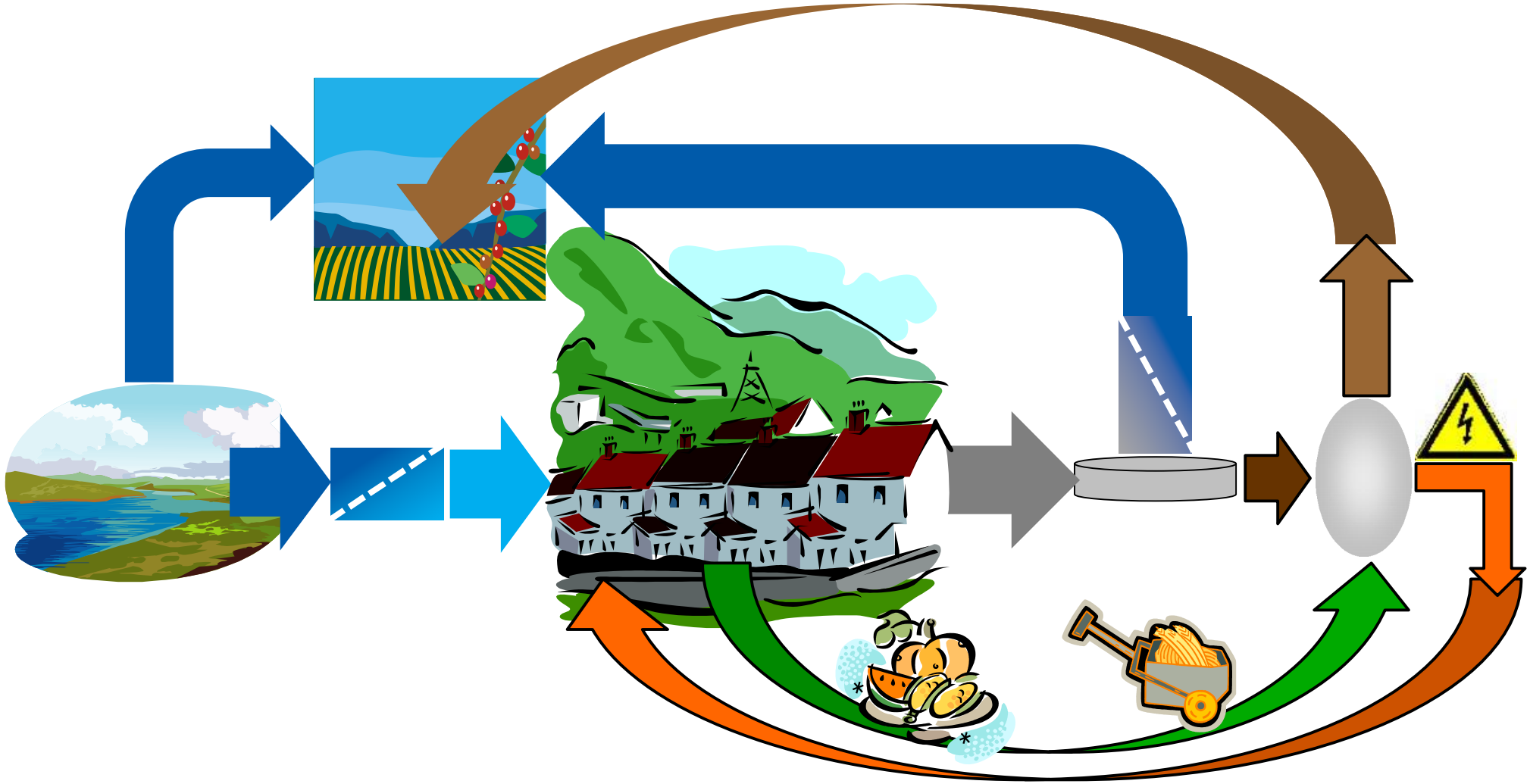
Energy-Efficient Water Management - Heat Balance

Quantity	Unit	Conventional WWTP with Digestion	Combined Black Water and Bio Waste Treatment
Amount	L/PE/d	200	50
Organic Matter in Water	COD/PE/d	120	120
Organic Waste in Water	g/PE/d	0	100
Energy in gnerated Biogas (6 kWh/m³)	kWh/PE/a	28	81
Heat from Biogas (65% efficiency)	kWh/PE/a	+18	+53
Heat Required for Digestion	kWh/PE/a	-4.4	-5.1
Heat Required for Sludge Drying	kWh/PE/a	-53	-51
Heat Value of Dried Sludge	kWh/PE/a	+43	+55
Net Heat Balance Balance	kWh/PE/a	+4	+52

Systemic Approach - Biomass-Efficient Water Management suggested for Rural Areas



Requirement of Clustered Infrastructures for Water and Energy Reuse

Thermal use as close as possible to the hot water source, e.g. in-house

Small devices suitable for indoor installation,

↳ **Systems for local HVAC installation required**

Grey water treatment on block of buildings up to district level

Quality assurance requires professional operation and monitoring,

↳ **Minimum size in semi-central scale required**

Integrated domestic enriched wastewater, sewage sludge and bio waste treatment on district up to urban quarter or even city level

Sophisticated technique and safety features require larger units,

↳ **Semi-central up to central units of larger scale required**

Different Customer Requirements for Urban Water Management Solutions

Highly developed infrastructures

- Economy of resources included
- Contribution to renewable energy
- Reduction of costs
- Reliability and Sustainability

Less developed infrastructures

- Improve hygienic conditions
- Improve water efficiency
- Additional benefit from reuse
- Feasibility and Sustainability

customized to local conditions

Water Stress – Climate – Population Density – Existing Infrastructure
Consumer Behaviour – Consumer Acceptance – Education – Occupational Qualification
Governance - Authority Capacity – Funding Possibility – Legal Certainty

Actions required in different Sectors of Infrastructure Implementation

Sector 1: Availability of Technologies

- ✓Separated in-house water systems
- ✓Combined blackwater/food waste sewer system
- ✓Heat recovery from greywater
- ✓Intra-urban grey water management
- ✓Blackwater treatment targeting resource recovery (biogas, water, fertilizer/nutrients)

▪Sector 2: Technical Rules and Standards

- Quality of public used or service water supply
- Application of garbage grinders
- Sewer systems for combined solid/liquid transport, e.g. by vacuum sewer
- Harmonized standards for integrated solutions considering different kind of water and waste

Resource Efficiency and Sustainability in Urban Water Management

▪Sector 3: Capacity Building & Governance

- Clear orientation to resource efficiency in urban water master plans (governments, authorities)
- Adaptation of existing laws for water, sewage, waste and fertilizer to integrated solutions
- Create incentives, e.g. renewable source act
- Cost-covering water tariffs based on full-cost pricing incl. disposal fees and reuse revenues

▪Sector 4: Finance

- Long-term whole life cycle costs evaluation under consideration of system transformation
- Investment in water loss reduction
- Urban Water: Investment in infrastructure transformation with long-term approaches
- Rural Water: Micro-Finance Tools, Small CDM Project Support (<20.000 t CO2 p.a.)

Summary

Integrated solutions for water use and collection are required. Beside water resource protection by saving and reuse it combines wastewater treatment with renewable energy and resource recovery.

The target is a serious reduction of fresh water demand. Further benefits are significant green house gas reductions and utilizable recyclable materials.

It is possible to implement zero emissions strategies in urban water schemes and industrial water recycling.

We are capable to satisfy both ultimate sustainability demands and feasible sanitation solutions by adapted modular concepts and reduced sanitation costs.

We only consider reliable and efficient technologies to assure hygienic safety, proper collection and disposal and accustomed convenience.

Our solutions can very flexibly be applied to various infrastructure conditions.