Centralized vs. Decentralized Systems: Which is Which For You?

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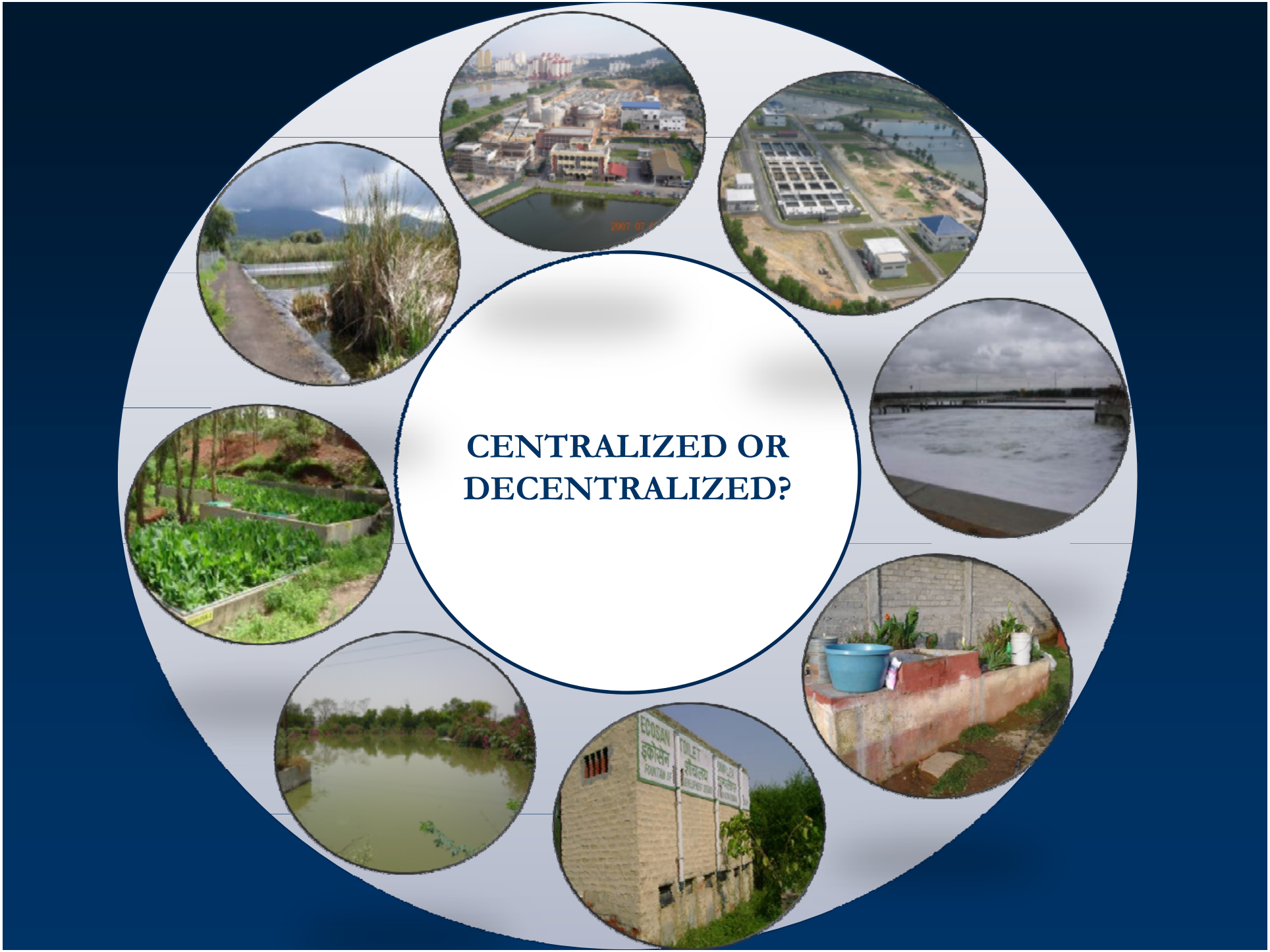
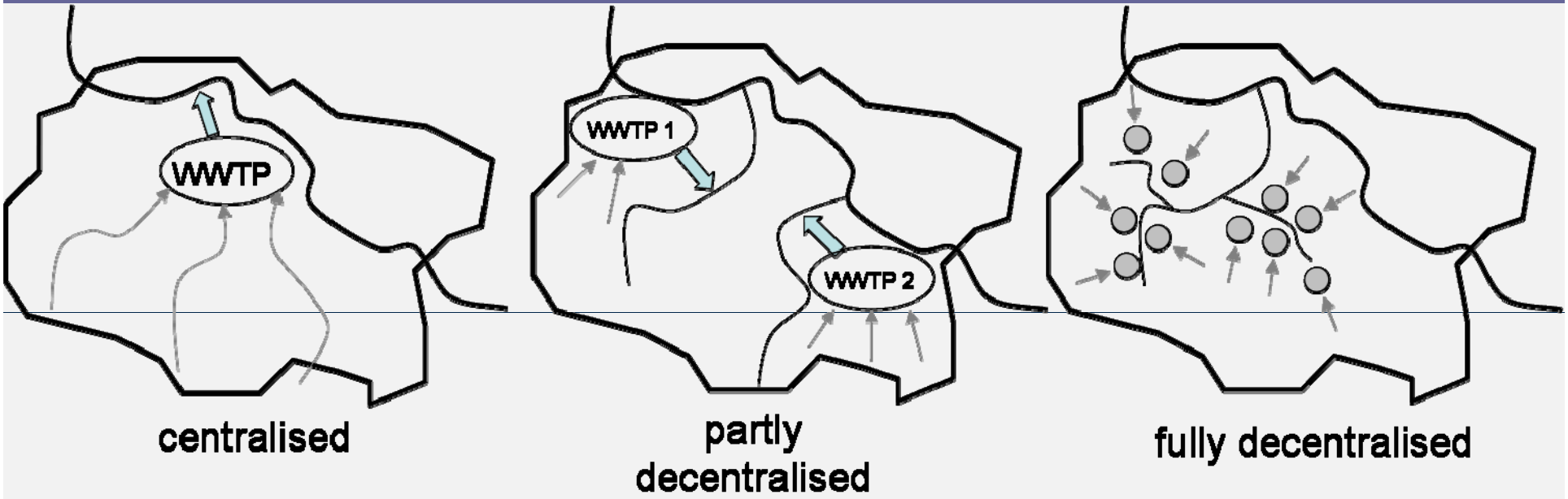
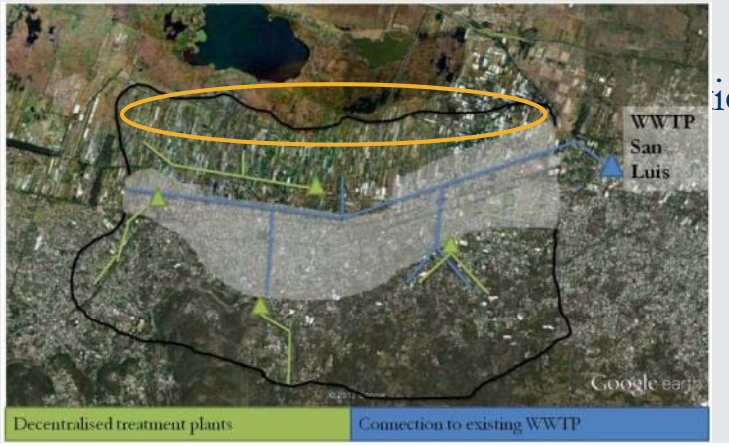
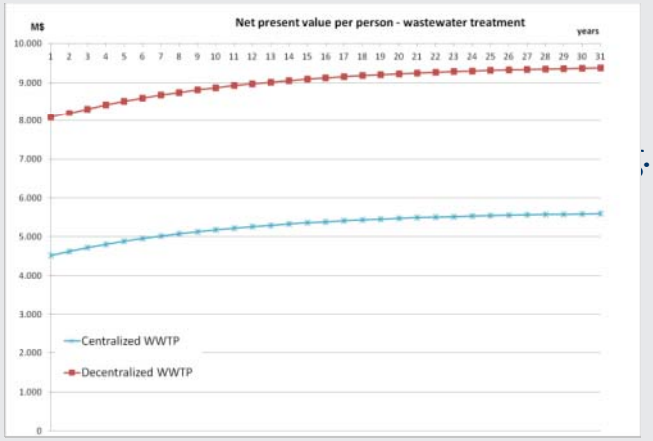

CENTRALIZED OR
DECENTRALIZED?
ECOSAN
TOILET

Definitions



- largest solution: whole catchment area, smallest solution: single households, decentralized solutions inbetween
- fully centralized solutions hardly existing, large scale vs. small scale decentralized system
- physical versus operational scale

Technical and economic aspects

	ADVANTAGES	DISADVANTAGES
Technical aspects	• high treatment efficiency of conventional treatment systems (C) •small (natural) treatment systems use less energy and less energy for pumping (D)	• high energy consumption (C) • substantial pumping required (C) • larger solutions less flexible (C) • newly developed technologies may be less reliable (D) • sludge handling more difficult in many small systems (D)
	• adaptation to local conditions possible (D) • reuse of wastewater and sludge easier to manage (D) • easier to pilot new technologies (D)	
Economic aspects	 ions	

C – centralized / D - decentralized

Social, financial and institutional aspects

	ADVANTAGES	DISADVANTAGES
Social aspects	• located far away from human settlements (C)	• located near or within human settlements → odour, overflow, aesthetic issues (D) • public resistance (C,D)
Financial aspects	• smaller solutions affordable and faster to implement (D) • possibility of „staged development“ (C)	• large investment required (C) • remote areas last to be connected (C)
Institutional aspects	• small number of treatment plants easier to manage (C) • management conducted by organizations with high capacity (C)	• many small treatment plants difficult to manage (D) • remote umanned facilities prone to theft and vandalism (D)

C – centralized / D - decentralized

Case studies: failure cases of small scale decentralized solutions

- Examples of failure cases:
  - constructed wetland, Mexico, 2004, 0.1 MLD
  - waste stabilization ponds, India, 2001, 0.5 MLD
  - constructed wetland, India, 1992, 0.5 MLD
  - anaerobic digester & reed bed, Sri Lanka, 2006, 0.05 MLD
- Reasons for failure:
  - frequent change of operators, poorly trained staff
  - no arrangement for O&M
  - lack of funds for O&M
  - treatment plant located in residential area (mosquitoes, rats)

Case studies: success cases of small scale decentralized solutions

- Examples of success cases:
  - constructed wetland, Mexico, 2005, 0.3 MLD
  - solid immobilised biofilter, India, 2004, 0.04 MLD
  - baffled septic tank, anaerobic filter and planted reed bed, India, 2010, 0.05 MLD
  - duckweed pond, India, 2004, 0.5 MLD
- Reasons for success
  - well trained, continously working operator
  - contract with private company for O&M
  - community participation
  - communal use of side products (duckweed, fish, treated WW, communally used orange trees) and recovery of O&M costs with revenues
  - no energy required (gravity sewer)

Case studies: failure cases of large scale decentralized solutions

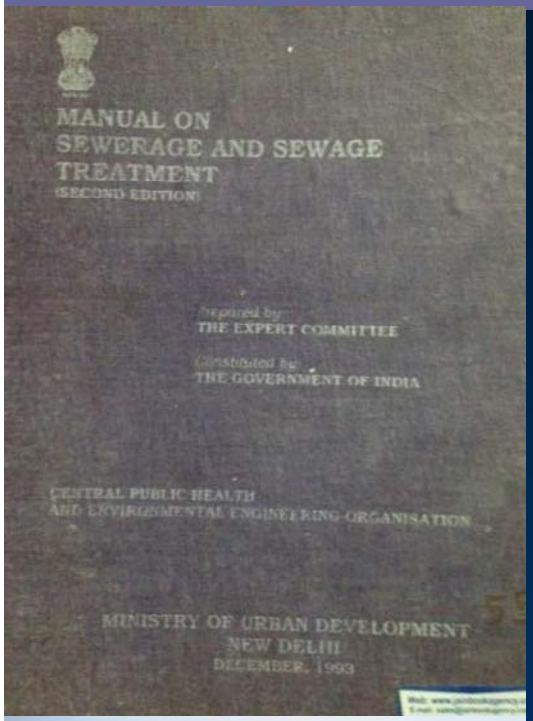
- Examples of failure cases:
  - waste stabilization ponds, India, 2001, 10 MLD
  - activated sludge process, Indonesia, 2004, 8 MLD
  - activated sludge process, Nepal, 2001, 17.3 MLD
- Reasons for failure:
  - no revenues from customers / high costs for operation
  - not sufficient knowledge of operators
  - not full use of capacity as not enough houses connected to sewer system
  - treated effluent not reused by farmers (e.g high salt content from industry)
  - responsibility (eg. sewer and WWTP) shared between too many institutions

Case studies: success cases of large scale decentralized solutions

- Examples of success cases:
  - Waste stabilization ponds, India, 2001, 14.5 MLD
  - Waste stabilization ponds, Indonesia, 2004, 10 MLD
  - Biofiltration and ASP, China, 2006, 300 MLD
  - Tertiary treatment plant, India, 2012, 40 MLD
- Reasons for success :
  - PPP facilitates outcome-based monitoring
  - wastewater bill combined with water bill (30% of tariff)
  - lab within WWTP premises and competent staff for monitoring
  - economic benefit: reuse of treated by nearby industry, farmers or hotels

Enabling conditions

Enabling conditions: policies and incentives I

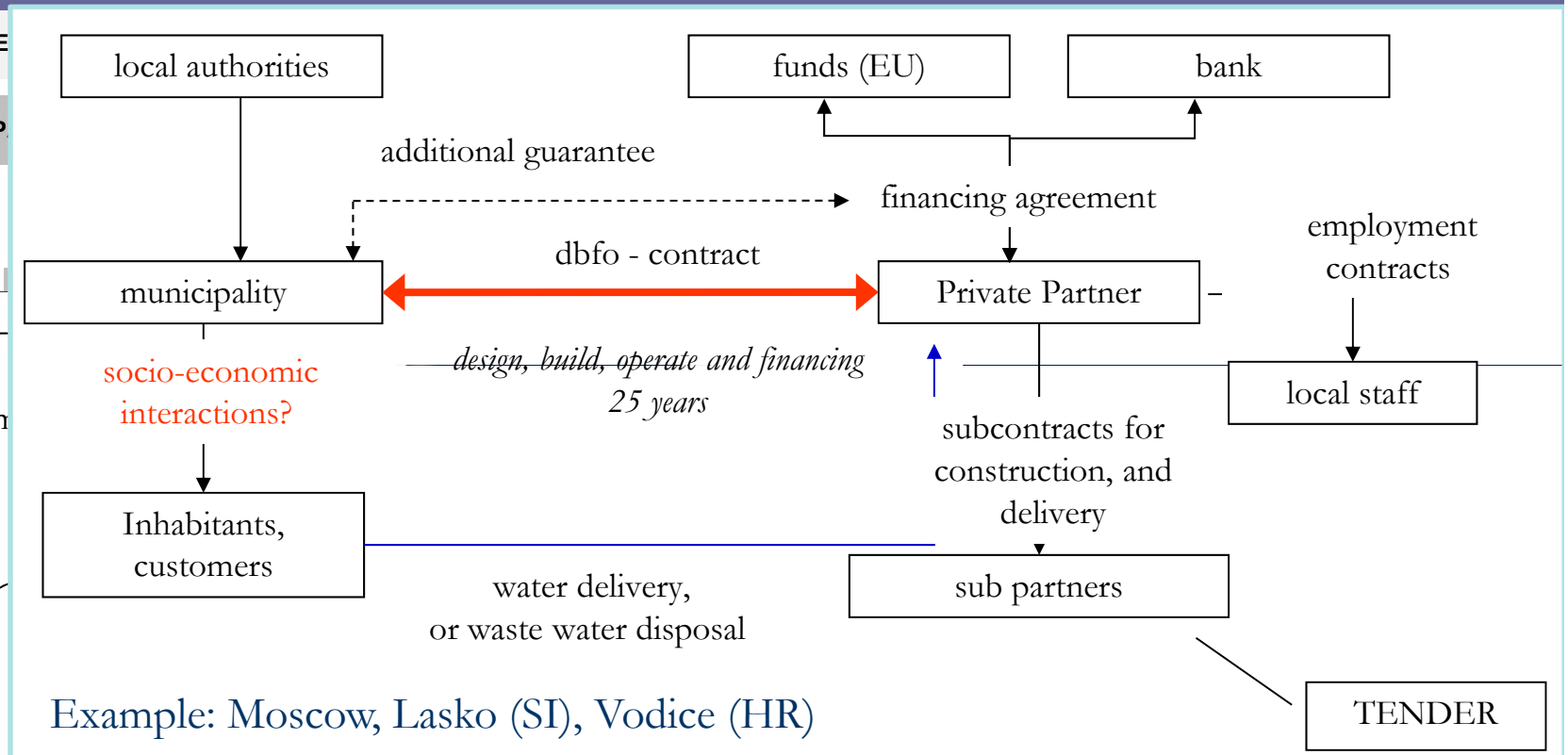


- small scale solutions:
  - laws and regulations need to be reviewed with respect to their compliance to the needs of decentralised technologies
  - Open software for decision support?
    - UNESCO Hydro Open Software Initiative (www.hope-initiative.net)
  - provisions need to be made to ensure continuity in the local knowledge required for O&M → support of community based organizations
- large scale solutions:
  - cost sharing incentive for centralised systems
  - land availability in densely populated urban areas limitation for large scale WWTP → consideration in urban development and land use plans

Enabling conditions: policies and incentives II

- all types of decentralised solutions
  - policies should make follow up and monitoring mandatory also years after implementation
  - definition of roles and responsibilities of institutions with respect to financing, implementing and monitoring/control of infrastructure as well as for cost recovery is required
  - BAT concept
  - incentives to implement treatment systems with e.g. lower energy requirements, lower space requirements, potential for reuse of side products:
    - direct benefits: e.g. higher percentage of funding
    - indirect benefits: e.g. lower proporty tax

Funding and PPP



Innovative recovery of O&M costs: Case study India (baffled septic tank, anaerobic filter and planted reed bed, India), peri-urban slum community, 0.05 MLD, 2010

- implemented in cooperation with tourism project („Mughal Heritage Trail“)
- revenues from tourism project used to pay tour guides and operators of WWTP

Conclusions

- Which scale is optimal needs to be identified in a detailed assessment considering a variety of aspects (in particular non-technical aspects such as environmental, financial, social and institutional ones)
- recyling, reuse and energy recovery should be integral to all scales
- in general, a lack of data on actual performance of decentralised plants is observed: need for better documentation and evaluation of existing decentralized plants
  - EC FP7 and GOI/DST funded project "Supporting consolidation, replication and up-scaling of sustainable wastewater treatment and reuse technologies for India" will document and evaluate existing technologies in India

THANK YOU!