



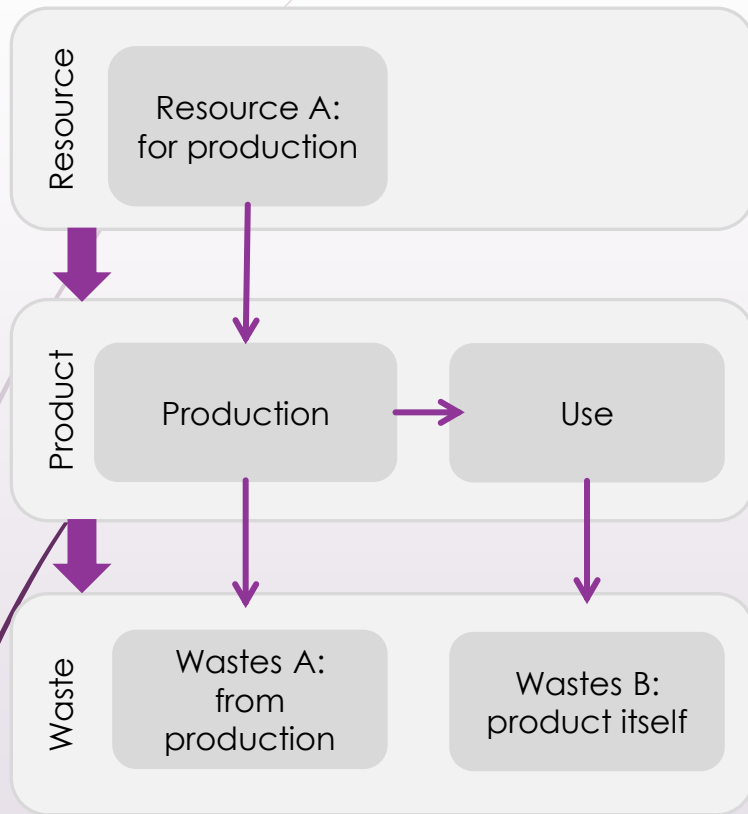
Circular urban water systems – discussion and ideas

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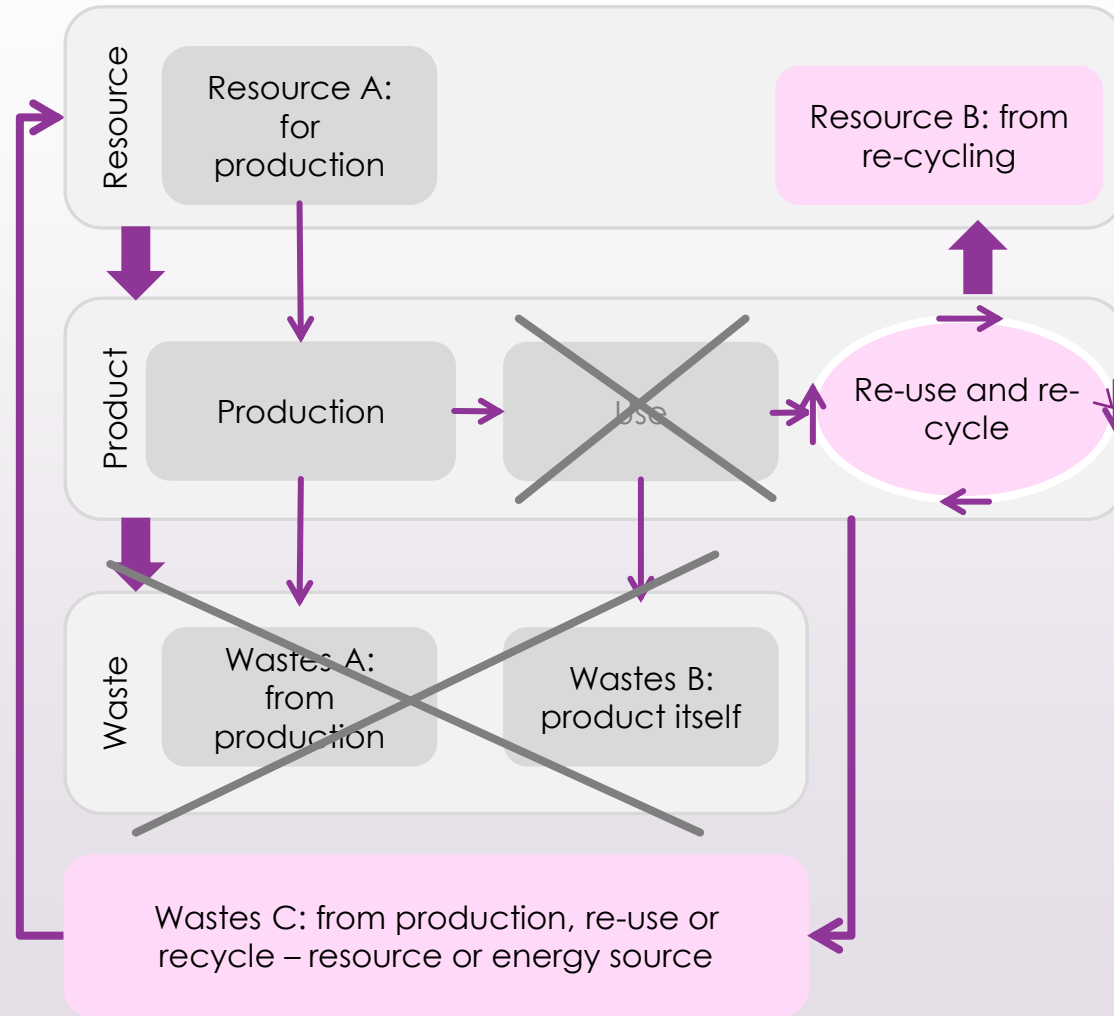
Assoc. Professor

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Linear and circular economic models

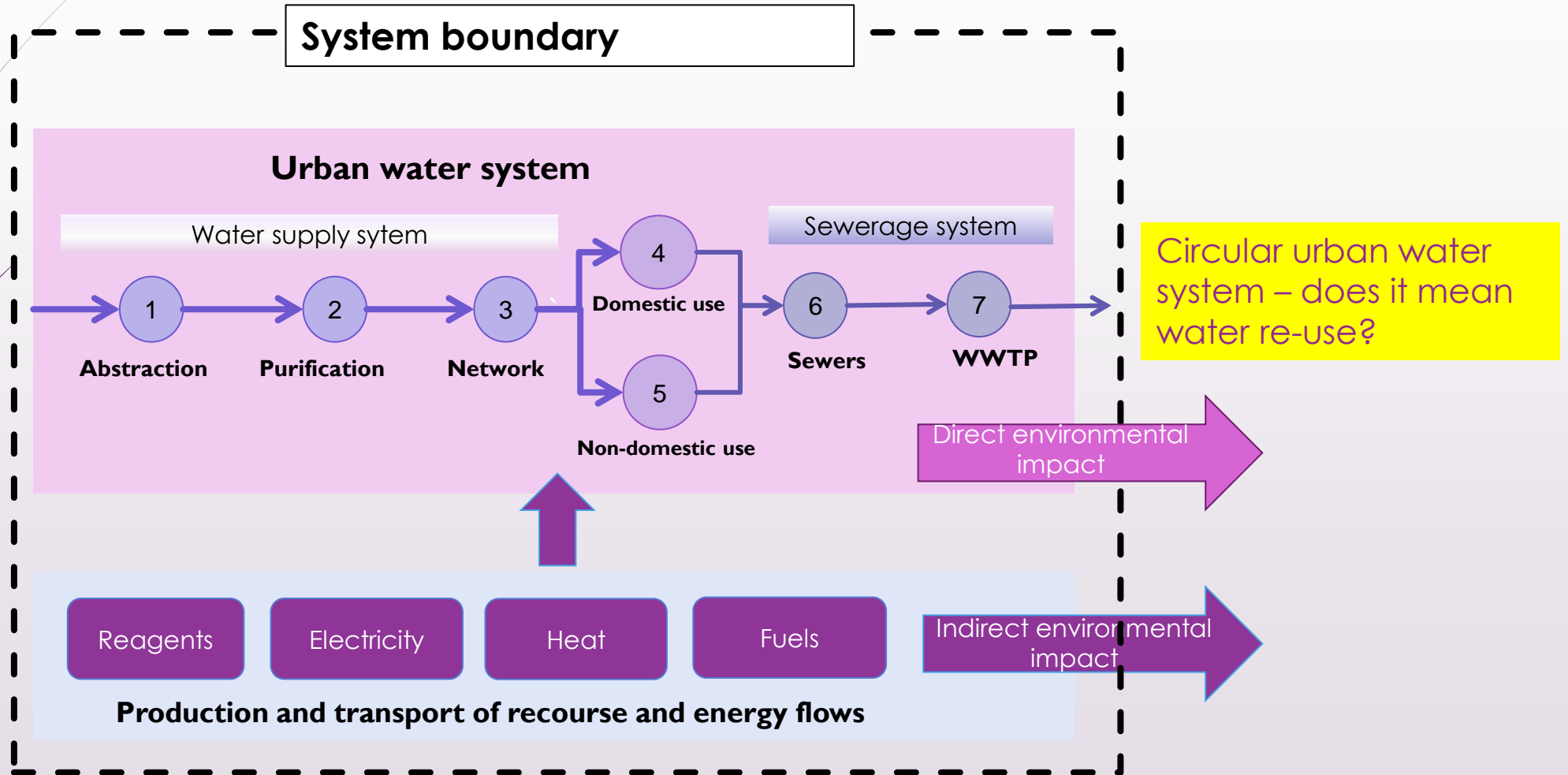


Linear model




Circular model

LCA approach





Water re-use=circular economy?

- ▶ This is simplistic and even wrong understanding of the principles of the circular economy if current practice of wastewater generation and treatment continues
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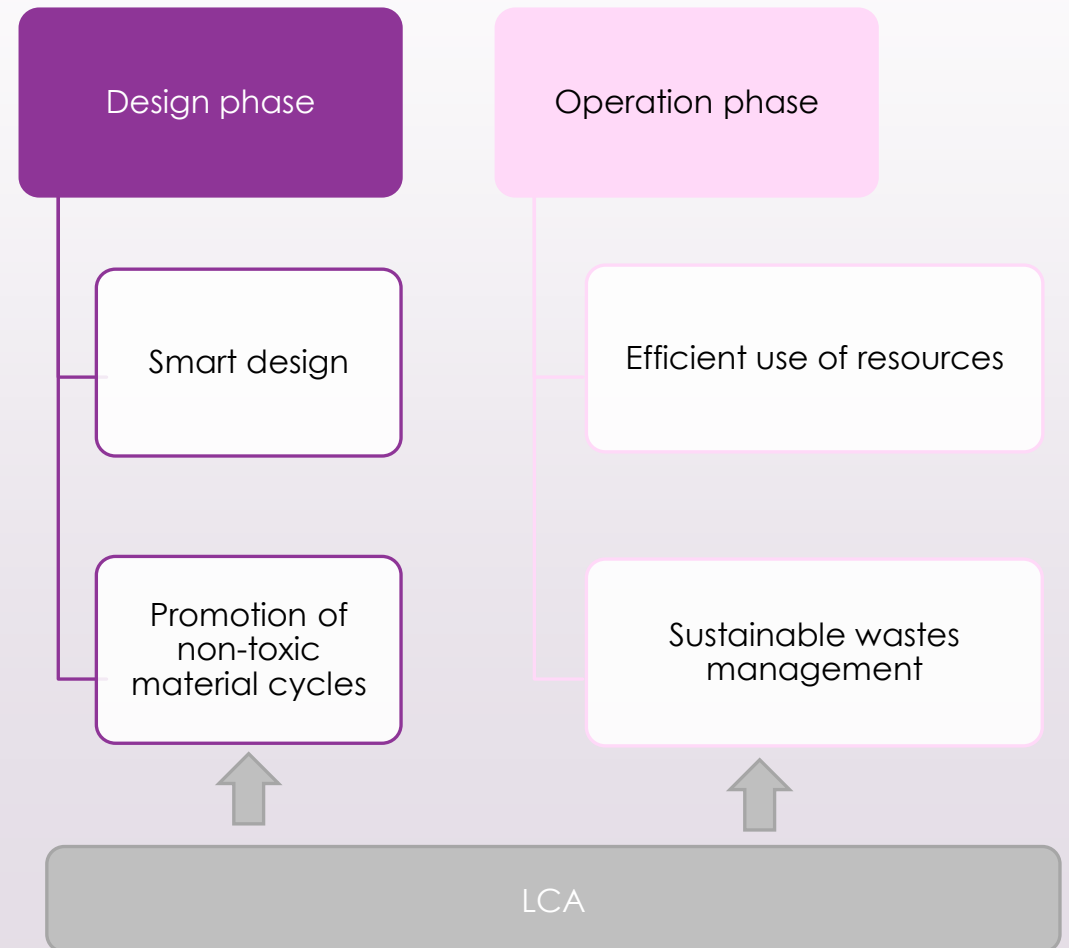
COM (2015) 614. "Closing the loop – An EU action plan for the circular economy"

Smart design

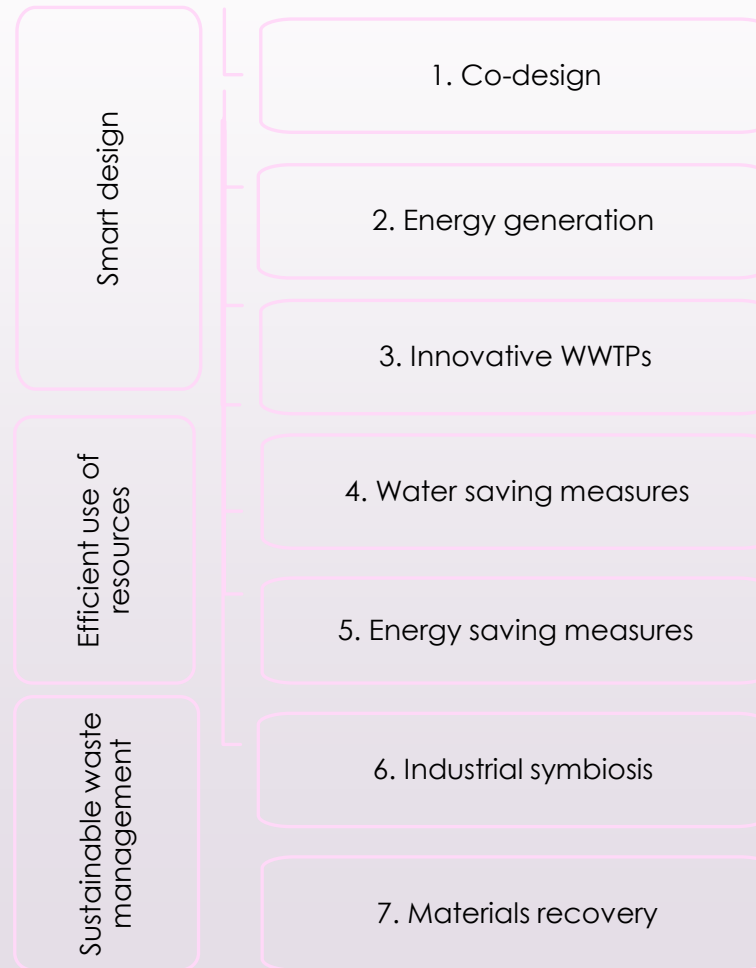
Better design can make products more durable or easier to repair, upgrade or remanufacture. It can help recyclers to disassemble products in order to recover valuable materials and components. Overall, it can help to save precious resources.

Production process

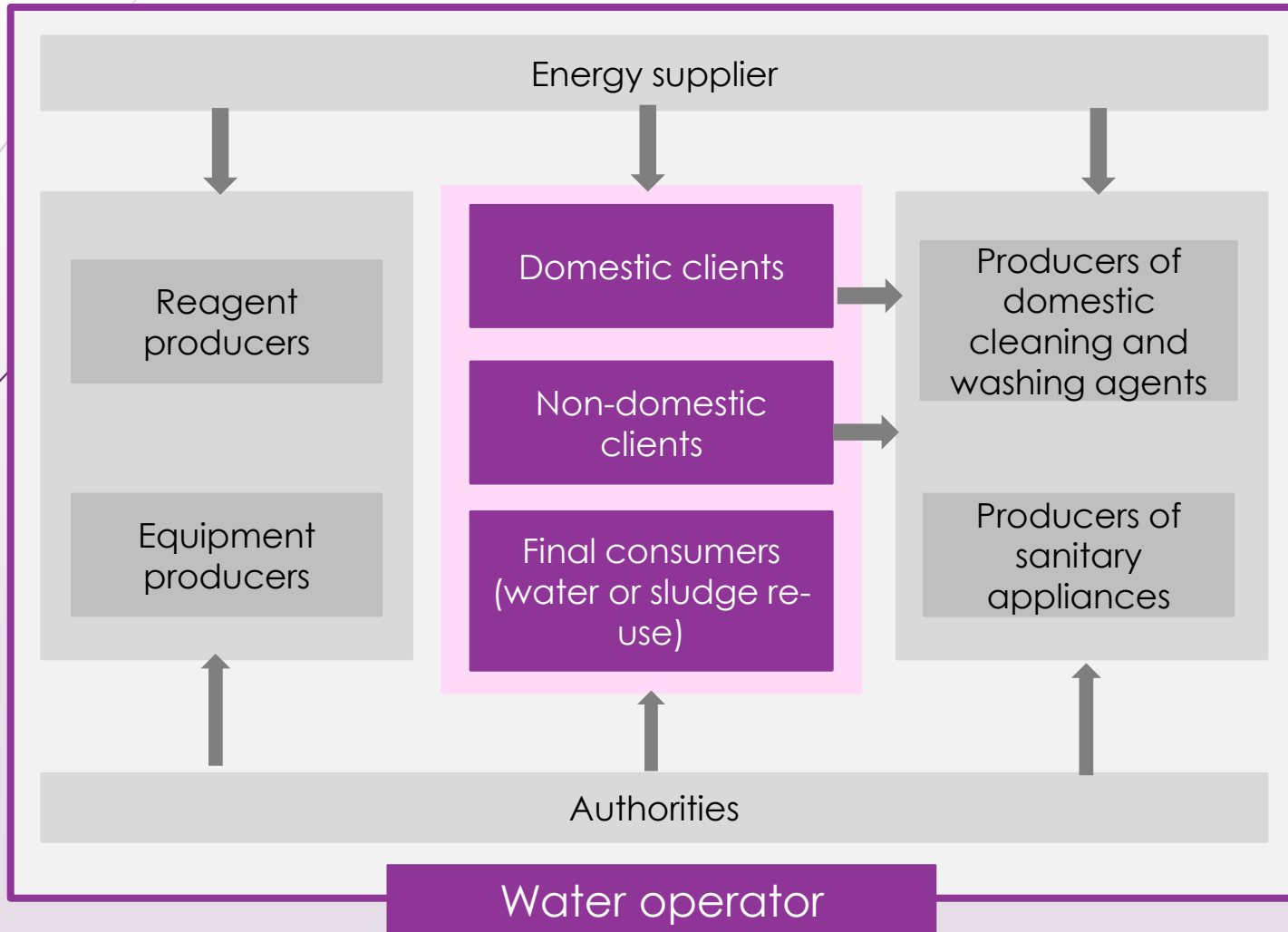
Even for products or materials designed in a smart way, inefficient use of resources in production processes can lead to lost business opportunities and significant waste generation.



Steps towards circular urban water systems



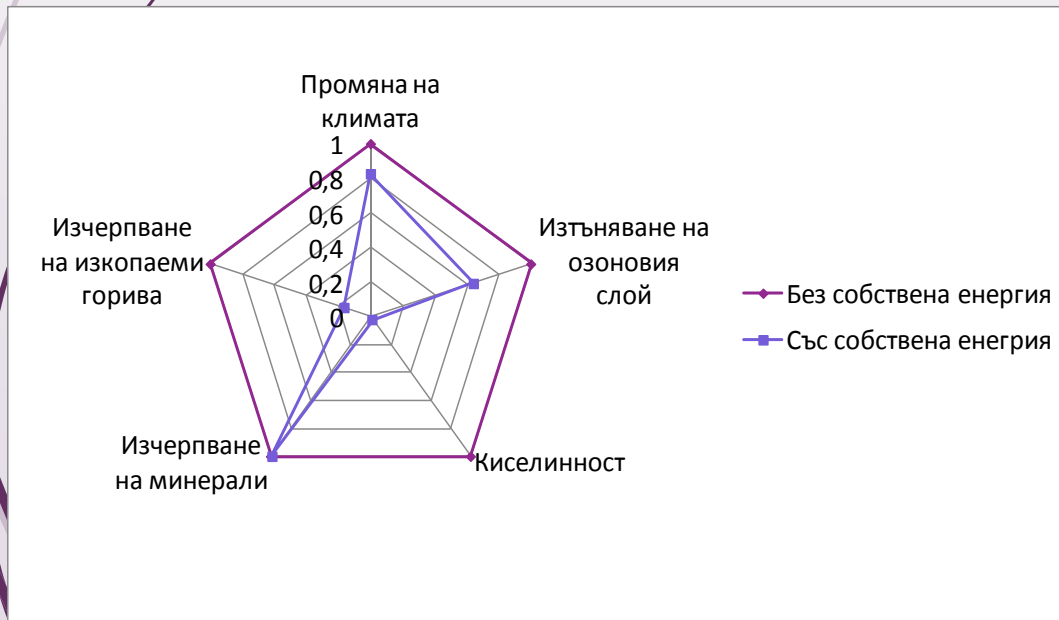
1. Co-design



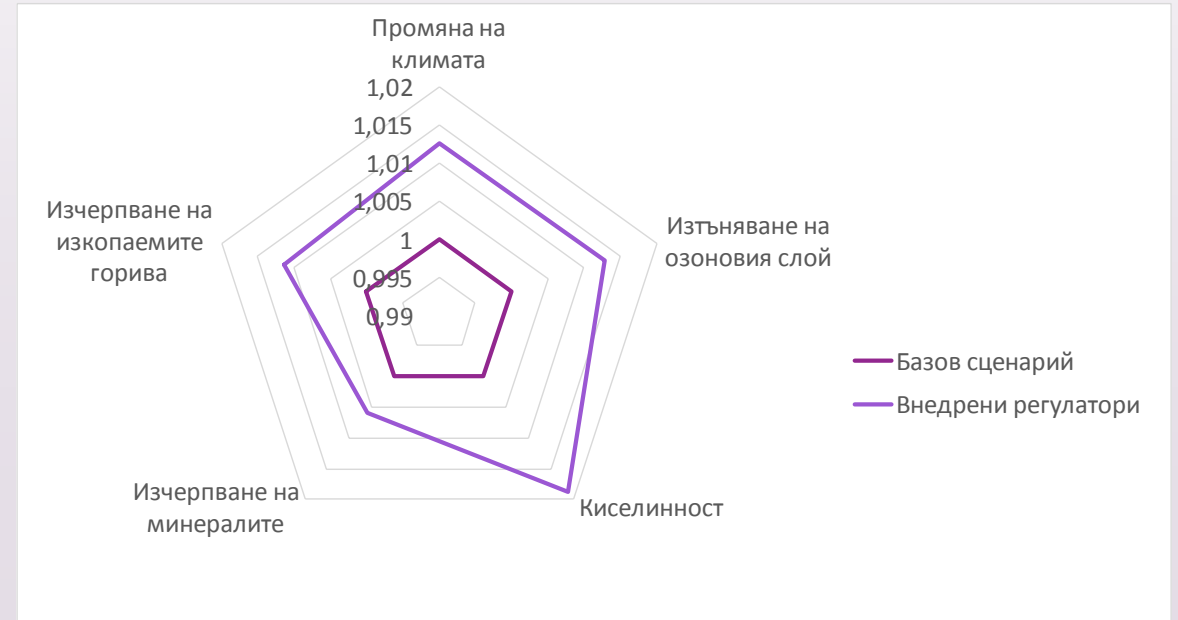
2. Energy generation

- Sludge digestion
- PRV-turbines
- Microbial fuel cells

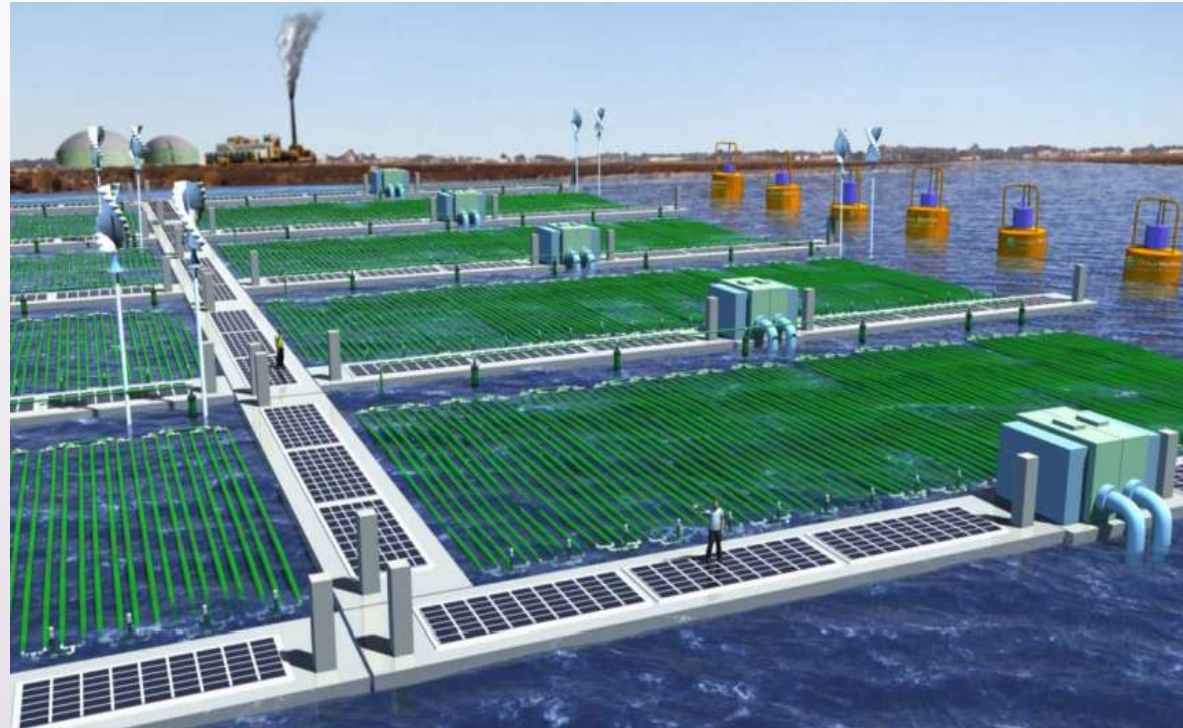
Reducing negative environmental impact when WWTP generates energy



Eco-efficiency improvement of Sofia urban water system after installing PRV (turbine) – network and water purification plant



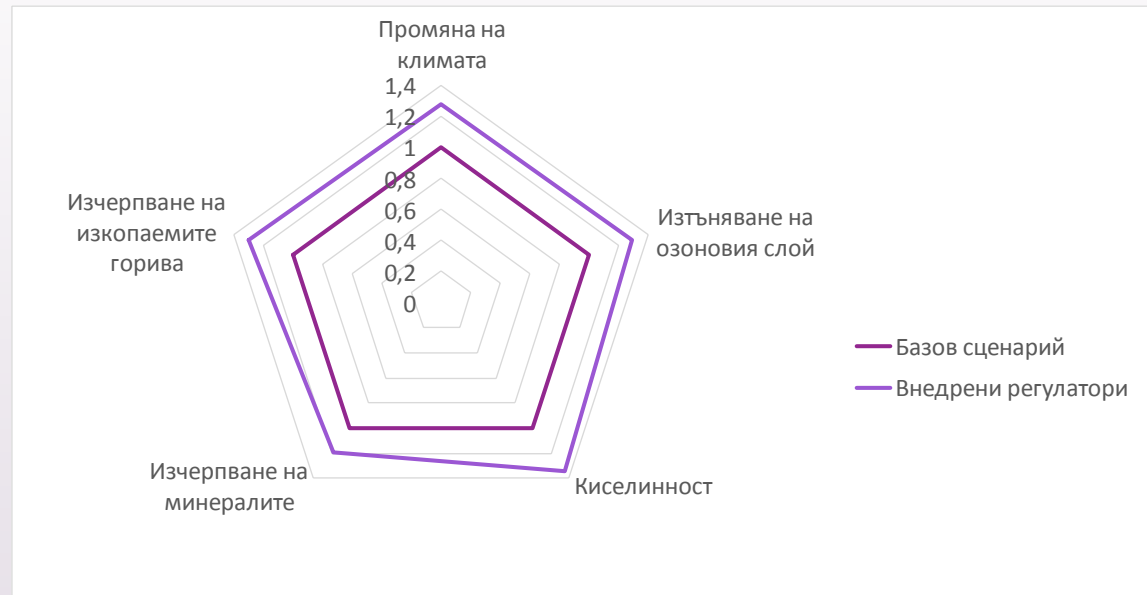
3. Innovative WWTPs



Computer simulations of algae WWTP

Trent, J. (2012). Offshore membrane enclosures for growing algae (OMEGA): A Feasibility study for wastewater to biofuels, NASA Ames Research Center


4. and 5. Water and energy saving measures



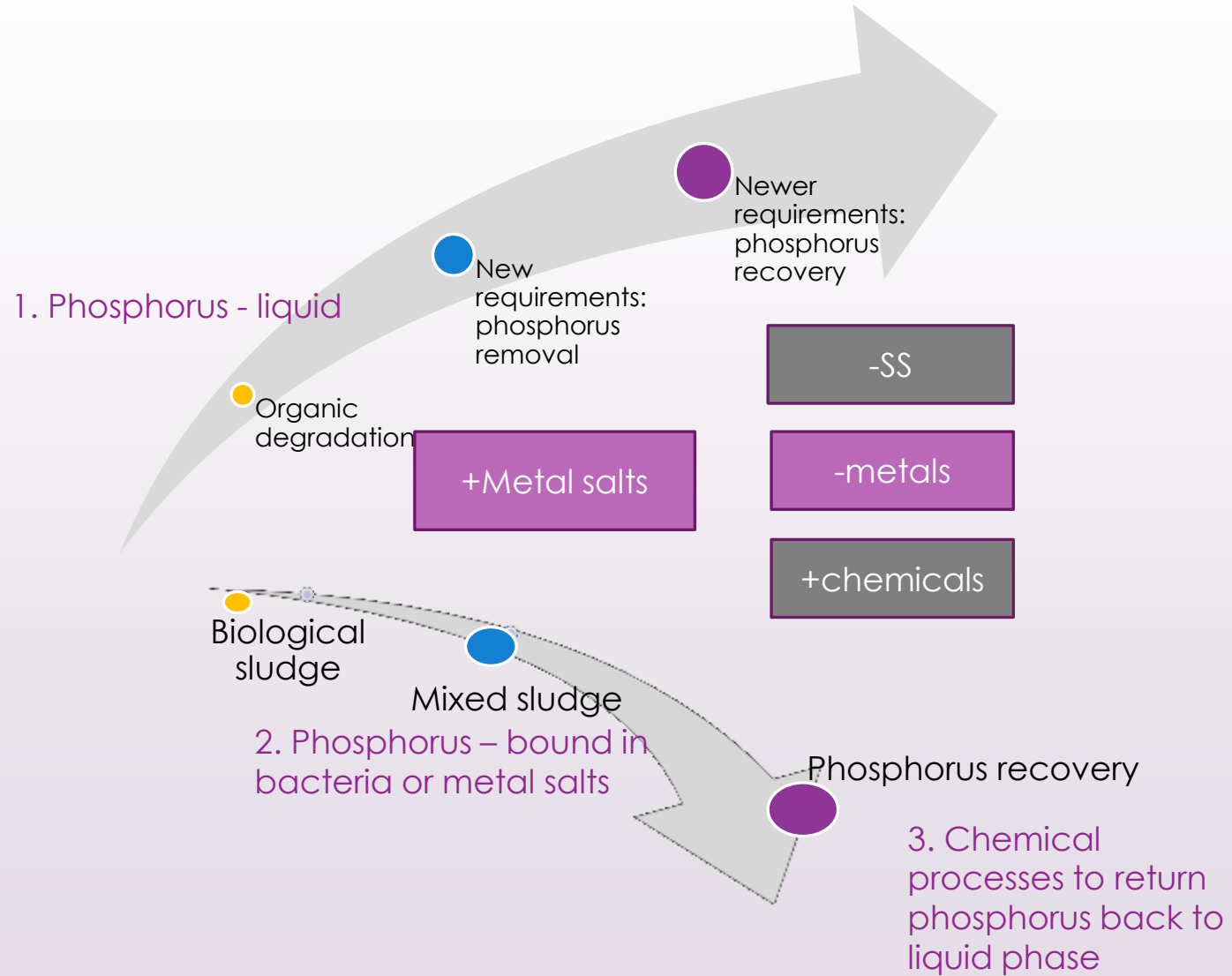
Improved eco-efficiency (Sofia urban water system) after installation of water and energy saving appliances



6. Industrial symbiosis

- ▶ Sludge – cement
 - ▶ Sludge – heat producing plants
- 

7. Recovery





Creativity is needed

