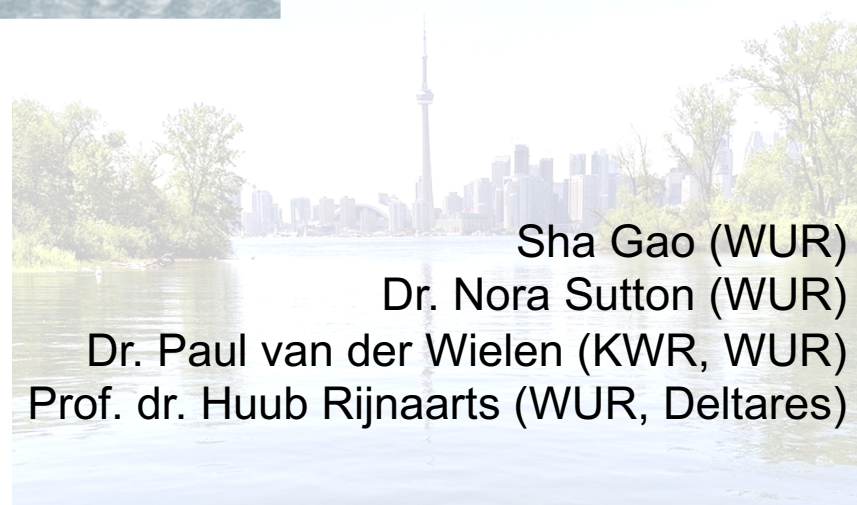




WAGENINGEN
UNIVERSITY & RESEARCH



Microbiological urban surface water quality



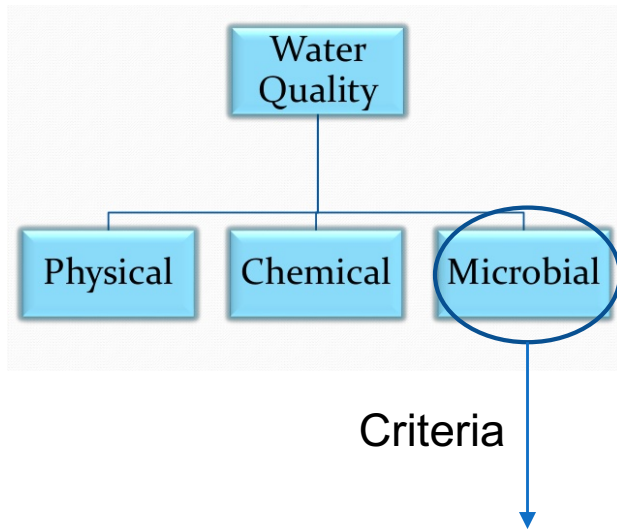
Sha Gao (WUR)

Dr. Nora Sutton (WUR)

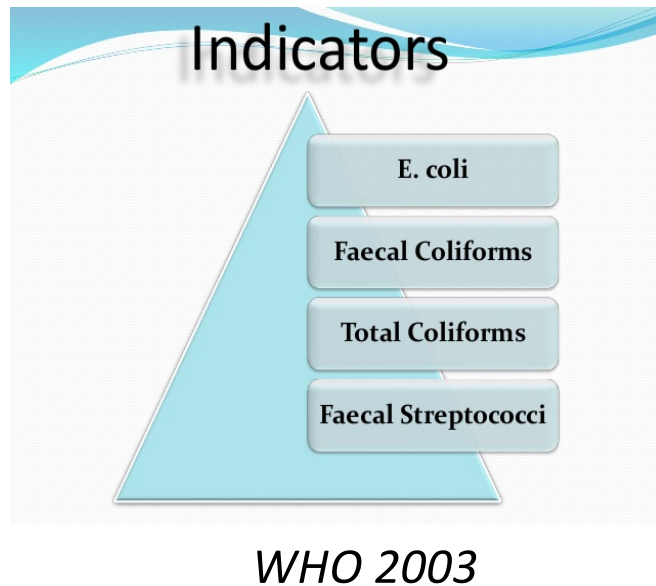
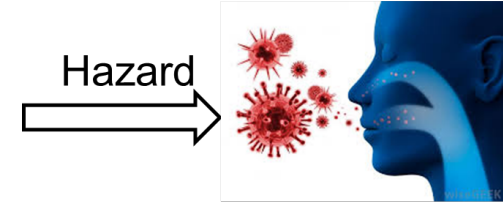
Dr. Paul van der Wielen (KWR, WUR)

Prof. dr. Huub Rijnaarts (WUR, Deltares)

Definition & criteria



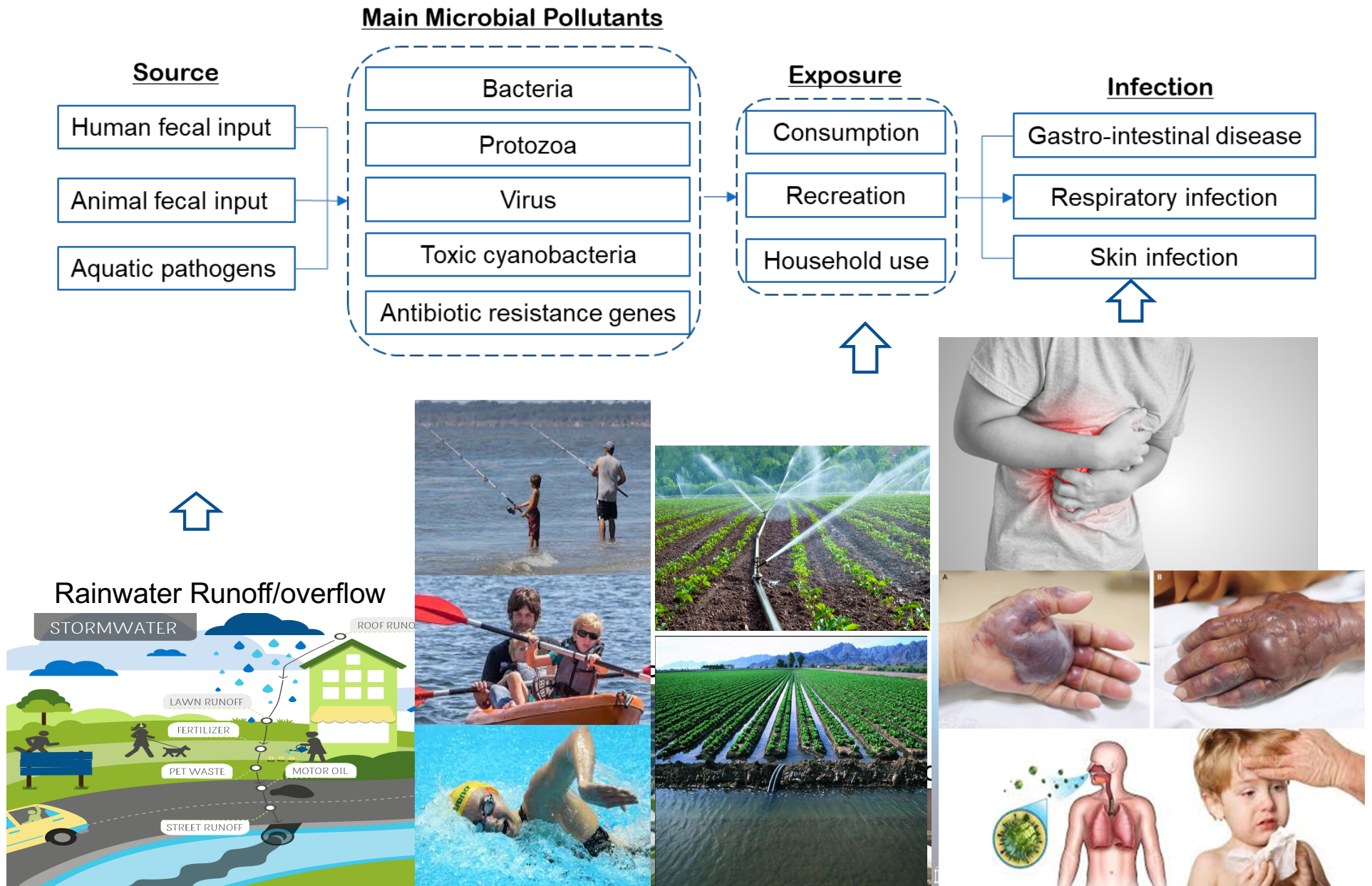
- Microbial pollutants
Pathogens (bacteria, protozoa and viruses);
Antibiotic resistance genes;
Toxic cyanobacteria.
- Urban surface water
River, canal, lake.....



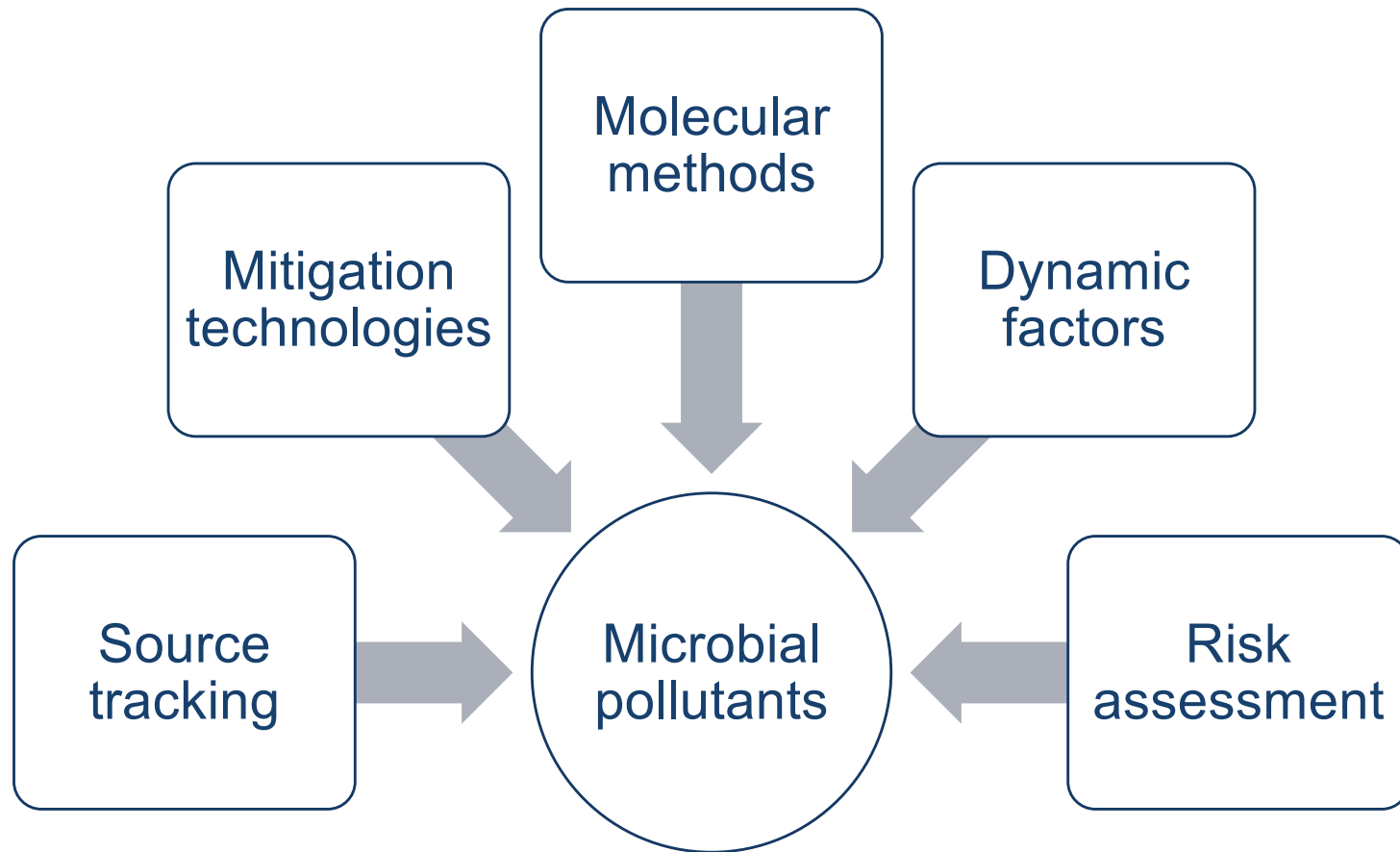
- Bathing water
- Fecal pollution



Microbiological urban surface water quality



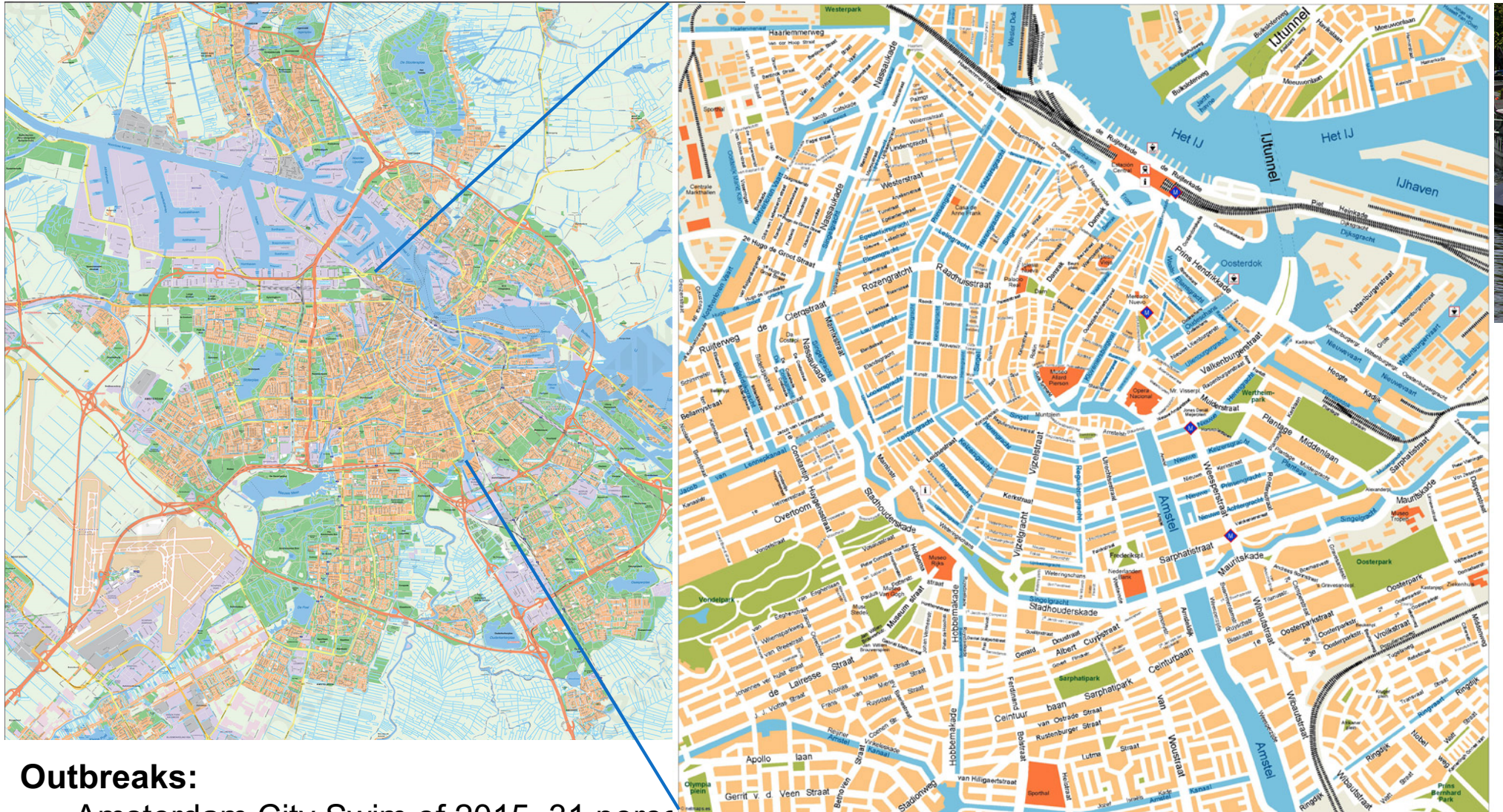
Related current research



- Researchers have proved that indicators can not represent real microbiological water quality.
- Use this toolbox to new functions in Amsterdam and Toronto urban surface water.



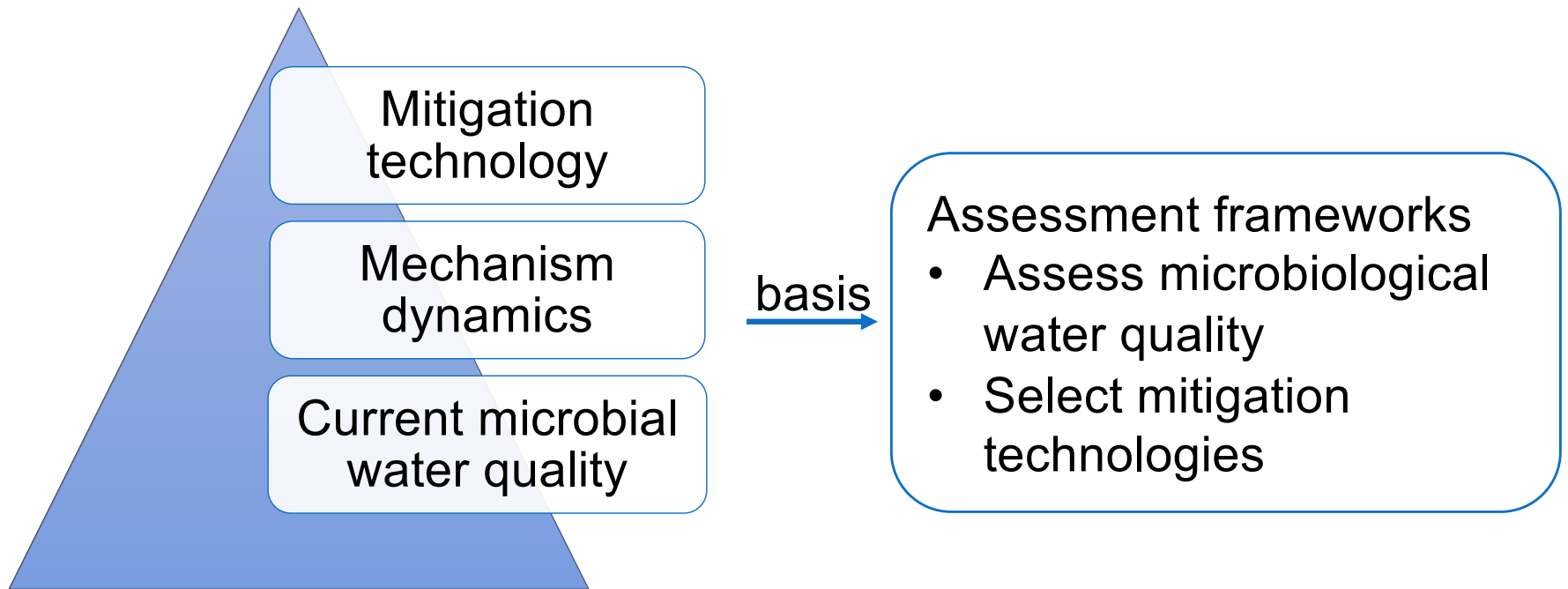
Urban surface water functions- Amsterdam



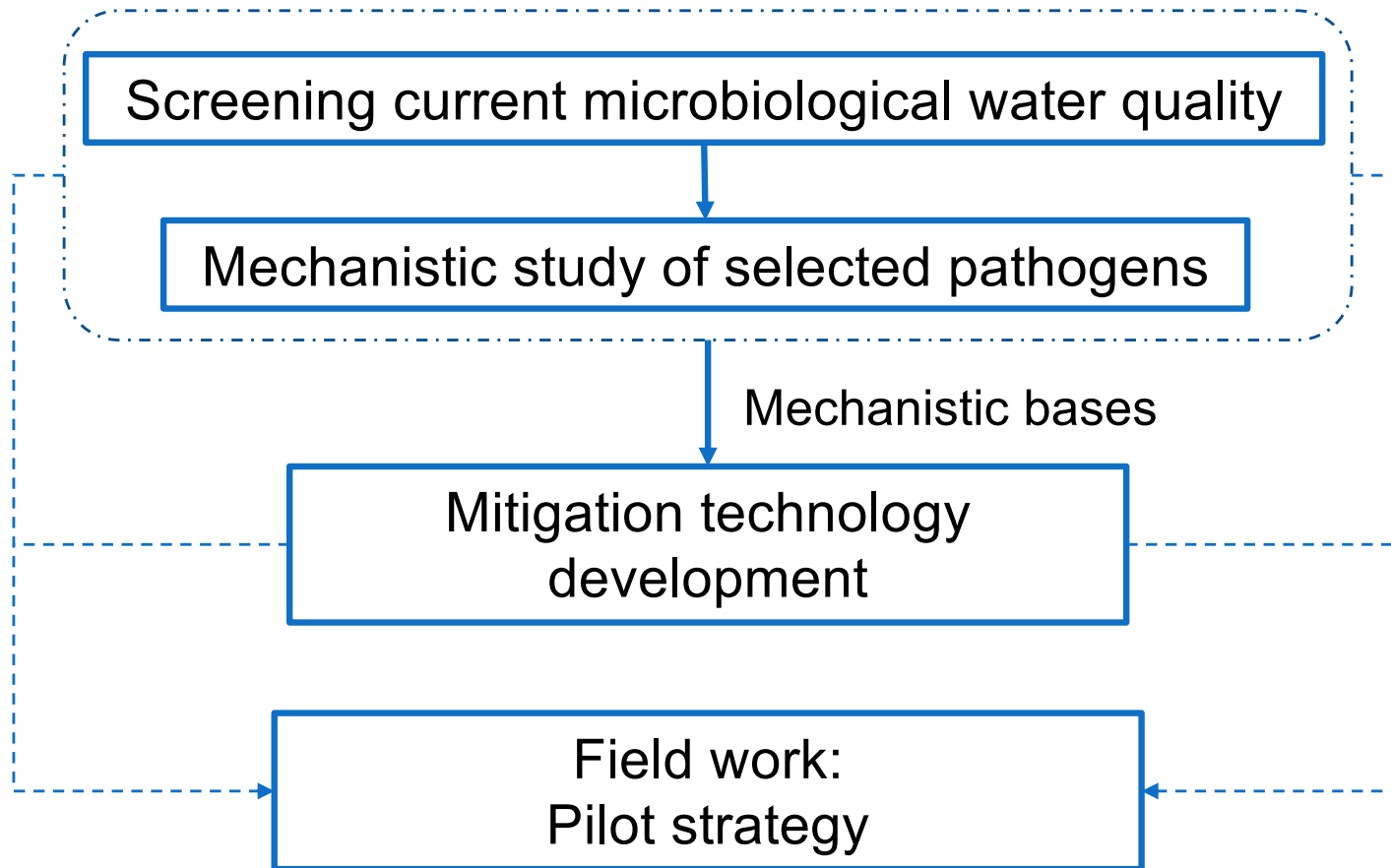
Outbreaks:

- Amsterdam City Swim of 2015, 31 percent of the swimmers got gastroenterical health complaints (*GGD Amsterdam, 2016*);
- In 2015, a triathlon event in the inner city waters of Utrecht led to an outbreak of acute gastroenteritis with 73 cases (*Parkkali S, et al., 2015*).

Objectives



Research approach



Screening current microbiological water quality

Water chemical,
hydrological data



Campylobacter jejuni



Microbial
pollutants

Monitoring Water Quality

Sampling



Temporal
monitoring

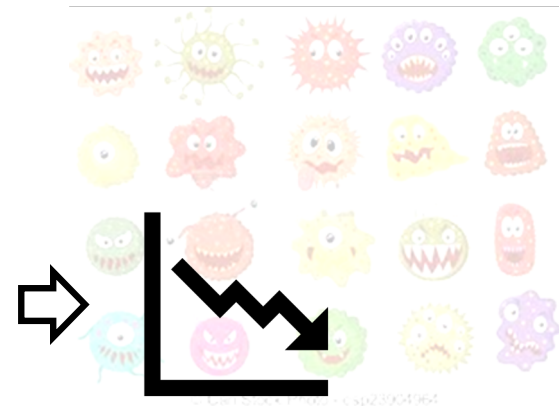
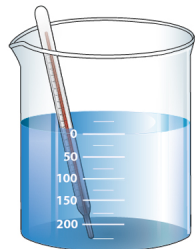


Mechanistic study of selected pathogens

- **Lab experiments under highly controlled indoor pools**
- Several typical pathogens
- Mechanism factors (Temperature, Salinity, UV exposure, etc.)
- Pathogen growth (biofilm growth, substrate availability, decay)



A **mechanistic understanding** of the **fate of pathogens** for predicting the behavior of pathogens in urban surface water and for developing technologies to improve water quality.



Mitigation technology development

- **Nature-based mitigation techniques**
- Optimize photodegradation (UV)
- Utilize retention systems to mitigate point-source releases (wetland)
- Aim at substrate and particle removal



Westergasfabriek Park Amsterdam



Pilot strategy

- A monitoring scheme and mitigation technology focuses on assessment of the most vulnerable spatial and temporal points

Screening current microbiological water quality



Mechanistic study of selected pathogens

- Lab experiments under highly controlled indoor pools
- Several typical pathogens
- Mechanism factors (Temperature, Salinity, UV exposure, etc.)
- Pathogen growth (biofilm growth, substrate availability, decay)

⇒ A mechanistic understanding of the fate of pathogens for predicting the behavior of pathogens in urban surface water and for developing technologies to improve water quality.



Mitigation technology development

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- Utilize retention systems to mitigate point-source releases (wetland)
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⇒ Vulnerable points & important pathogens

⇒ Pathogens' mechanism behavior

⇒ Mitigation technology

Focused monitoring scheme

Piloting monitoring scheme & mitigation technology

Thank you!



Micropollutant & Pathogen Group

More information/collaboration: sha.gao@wur.nl