How climate change drives the R&D strategy

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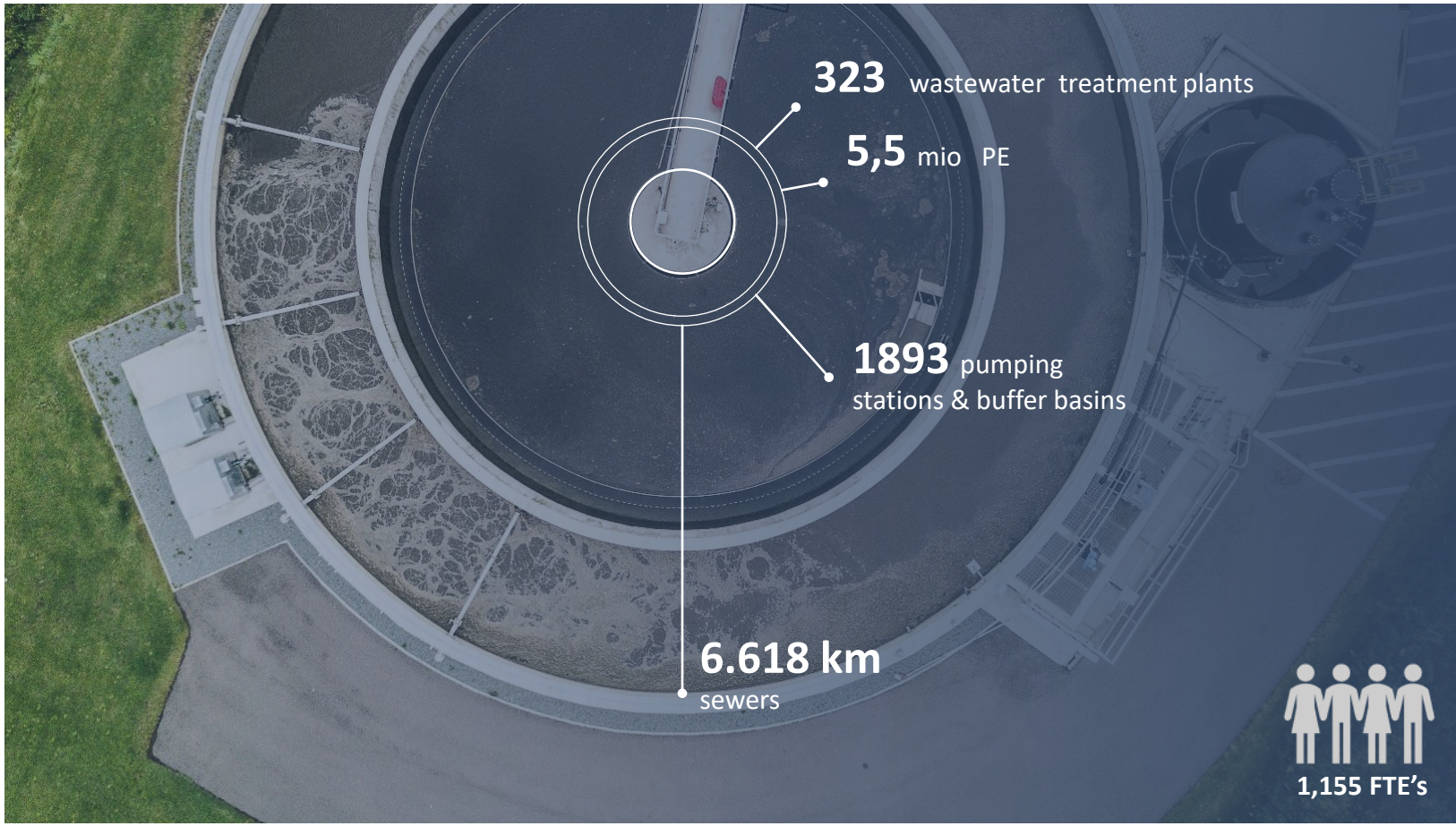
Wastewater transport, treatment and reuse

Rainwater management planning

Climate adaptation and mitigation



Key factors environmental footprint

0,7%
of all electric power consumption in Flanders

5 Mm^3 concrete
in sewage, road and WWTP infrastructure

?
Micropollutants

Wastewater transport and treatment is an energy and materials intensive industry.

What is the impact? How to reduce our footprint?

Planetary boundaries

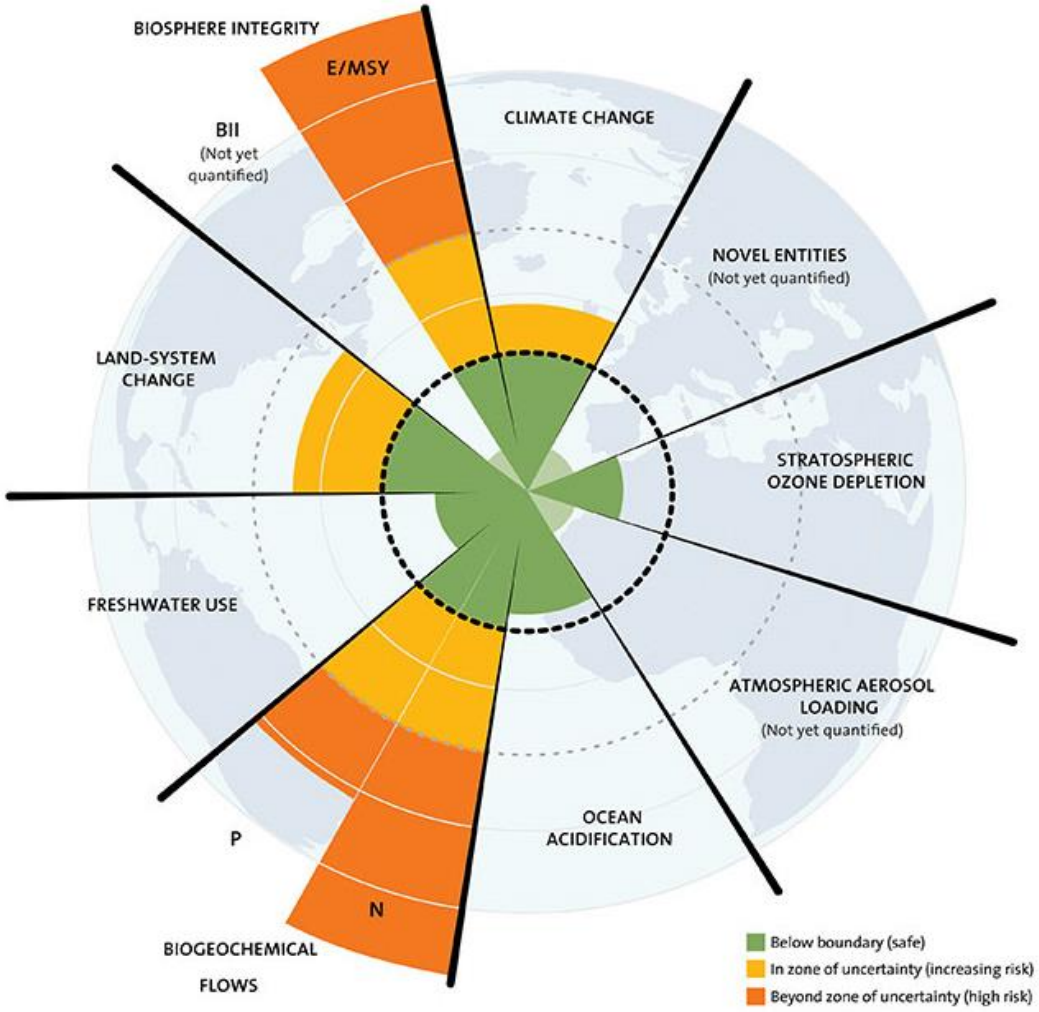


Image from J. Lokrantz/Azote based on Steffen et al. 2015 (via Stockholm Resilience Center)

Environmental footprint (LCA)

After a complete Life Cycle Assessment (LCA) of an urban catchment in Flanders (20.000 p.e.) we concluded that

- the use of chemicals
- the presence of micropollutant
- greenhouse gases emissions

are the major causes of environmental impact from wastewater management.

These factors affect directly biosphere's integrity, human health, biochemical flows (nutrients) and to a certain extent also the availability of raw materials.

Drivers of the R&D Strategy

Energy and Climate plan:

- Reduction of energy consumption of 1% per year
- Fossil free by 2030
- 40% energy renewable and from own sources by 2030. Rest will be also green.
- Every action leads to a reduction of GHG emissions.

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Drivers of the R&D Strategy

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Aquafin's vision

Clean watercourses for future generations and a living environment in harmony with water

Current impacts and (future) policy requirements

Societal position and coorporate resposibility

SUSTAINABLE DEVELOPMENT GOALS

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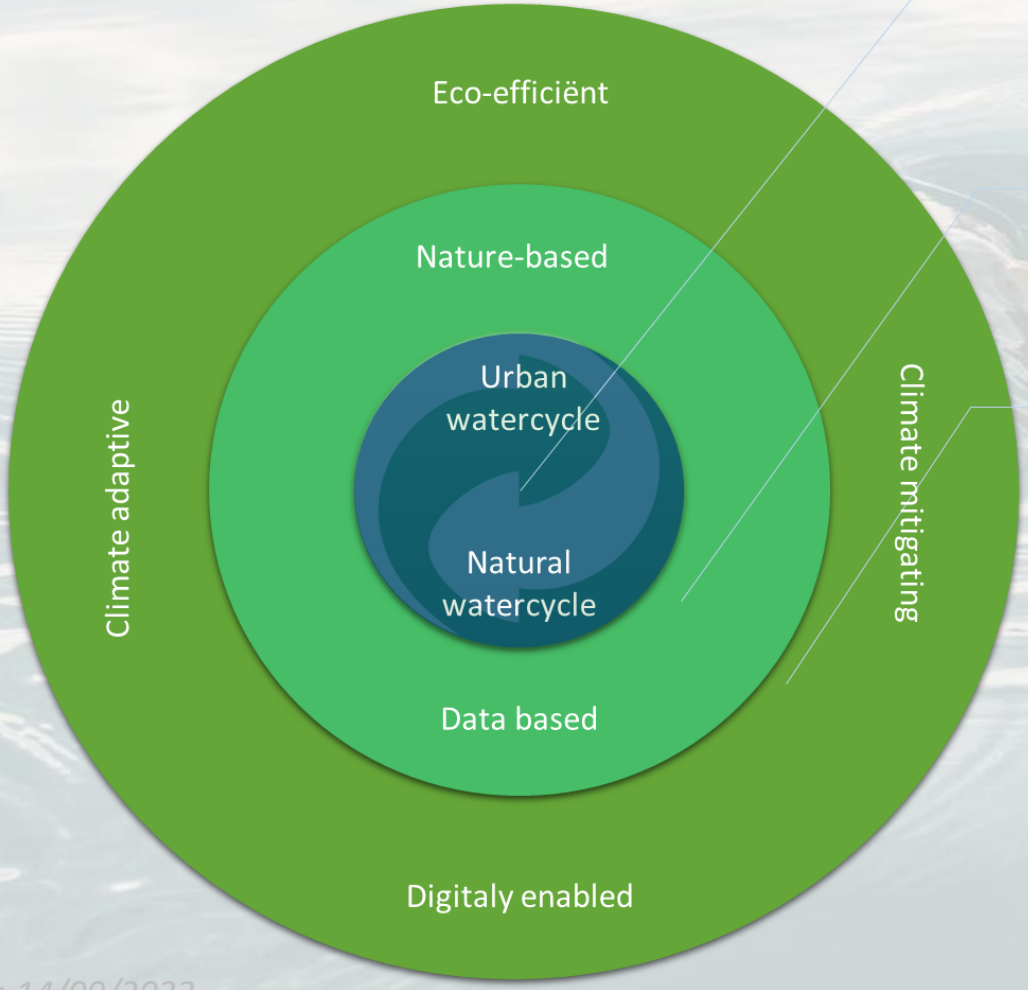
Boundary conditions R&D Strategy



Generate and integrate knowledge

Processes, tools and solutions

Technologies, scenario's and business models

Strategic tracks (2021-2030)

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Zero-waste watercycle

Robust and healthy watersystems

Enabling track

Digital water value chain

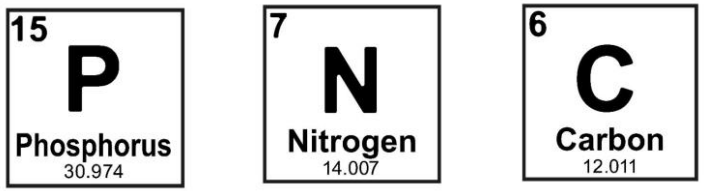
Transfer to business

Eco-efficient business models

Zero-waste watercycle

Challenges in nutrient recovery:

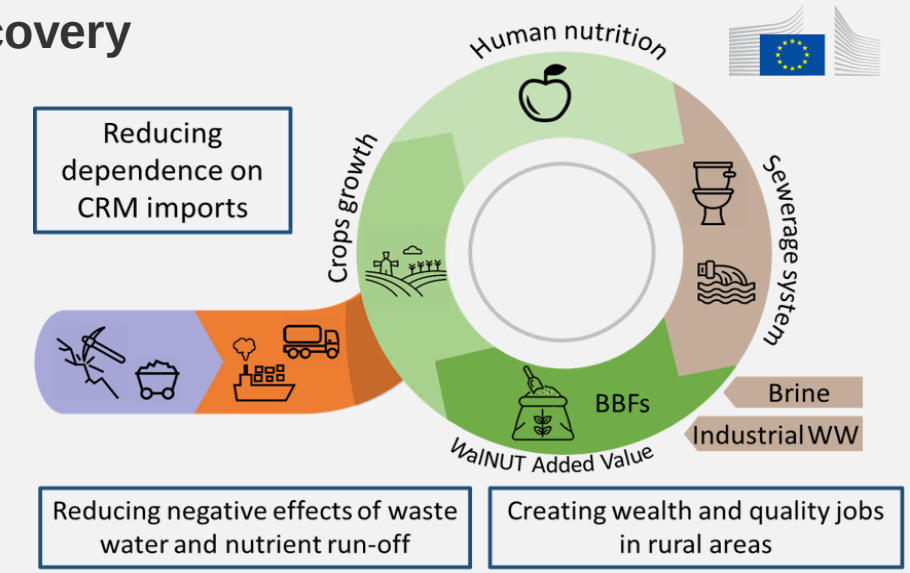
- ✓ Is it feasible? Technology and processes
- ✓ Is it desirable? environmental impact
- ✓ Is it profitable? business case



Closing wastewater cycles for nutrient recovery

WALNUT

EU project to re-design the value and supply chains of nutrients from wastewater and brine.



Zero-waste watercycle

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15
P
Phosphorus
30.974

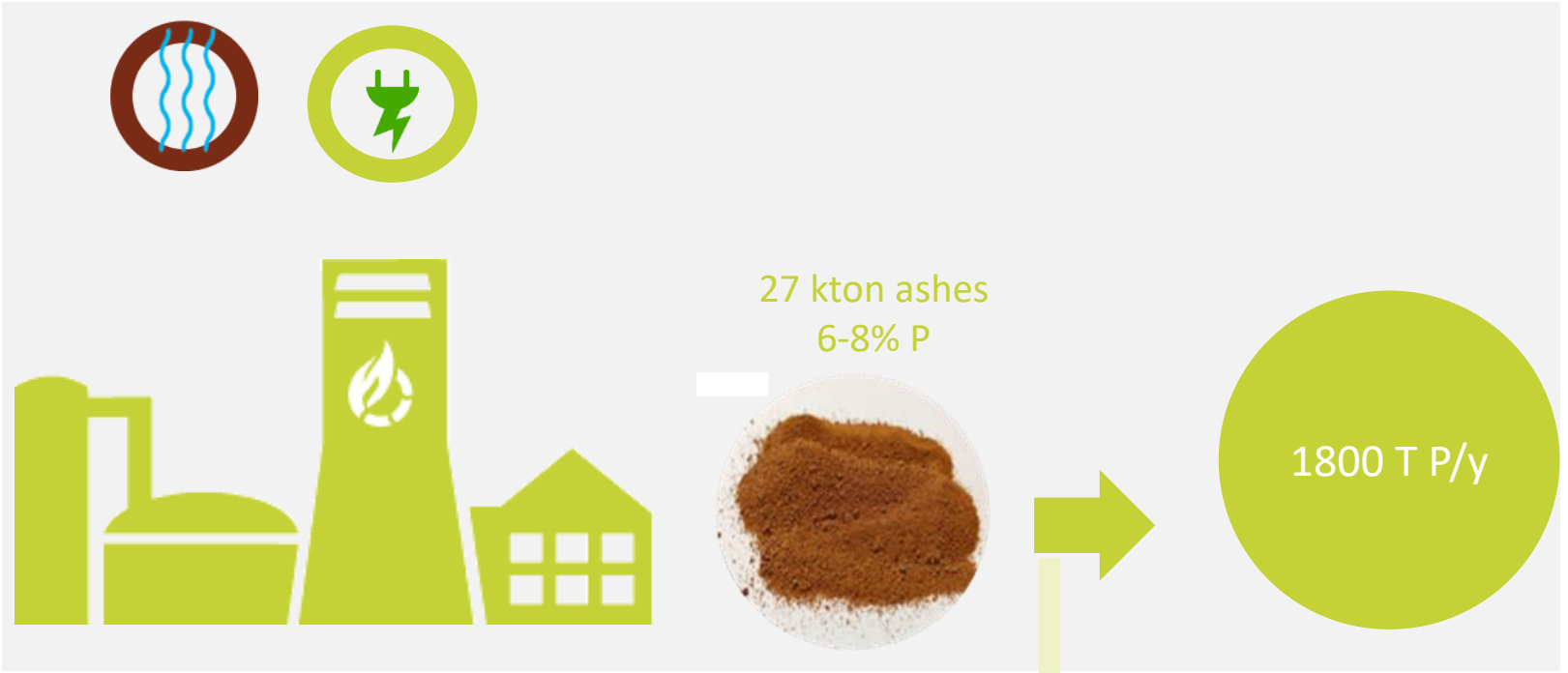
Digestate

Incineration ash

Urine

Centrate

Mono-incineration and P recovery (2026)



Zero-waste watercycle

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Opportunities for effluent (re)use:

- Providing e-flows
- Aquifer recharge
- Water supply for industrial purposes
- Water supply during dry periods for different purposes

Challenges:

- Quality standards
- Micropollutants
- Pricey infrastructure
- Legal/contractual aspects

B-WaterSmart

Stormwater for subirrigation using smart controls based on soil moisture, supply and demand.

Life ACLIMA

Assuring water Availability in Agriculture under changing CLIMAte conditions

Irrigatie 2.0: VLAKWA

Which water when and where?

Robust and healthy watersystems

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Adaptation and resilience against extreme events:

- Pluvial flooding
- Drough and heat stress

Testing Infiltration solutions:

Robust and healthy watersystems

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Nature-based solutions and green-blue infrastructure for climate adaptation:

- Biodiversity and interaction with the environment.
- Reduction of impact of extreme events.
- Facilitates return of water to the natural system: from urban to natural watercycle.

Nature-based solutions and green-blue infrastructure for climate mitigation:

- Reducing demand, use and repair of materials with high footprint (asphalt and concrete)
- CO_2 storage.

Robust and healthy watersystems

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What about rainwater quality?

Low-tech rainwater treatment:

- Shells filter in Wetterem (BE)

- Gravel filter in rainwater buffer in Wolbenberg (BE)

Robust and healthy watersystems

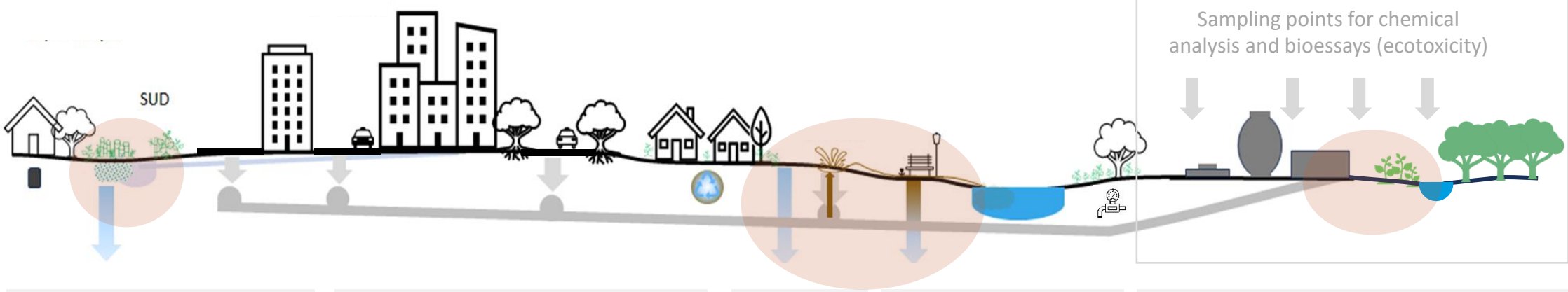
Contaminants of emerging concern: detection, monitoring and removal.

Stop UP

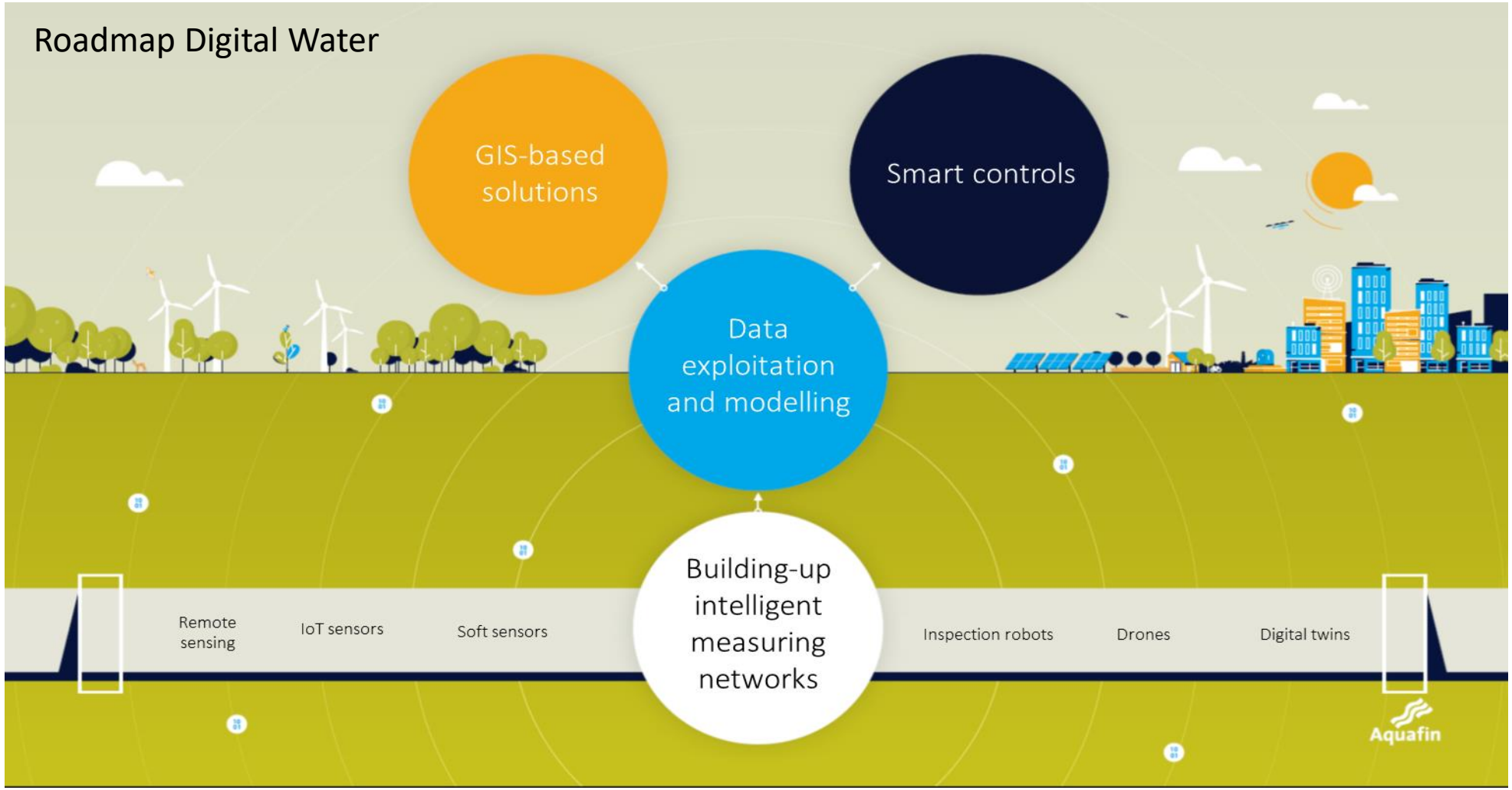
RWTH AACHEN UNIVERSITY

Protecting the aquatic environment from urban runoff pollution. Pollution pathways measures at source, retention and treatment. Advanced monitoring concepts and innovative technologies for pollution prevention.

AQUAFIN's first pilot tertiair treatment installation and monitoring program WWTP Aartselaar (BE)



Digitaal Water value chain



Digitaal Water value chain

Building- up versatile, integrated and intelligent measuring systems: creating an IoT network of sensors measuring real-time water quality from different types of water.

Digitaal Water value chain

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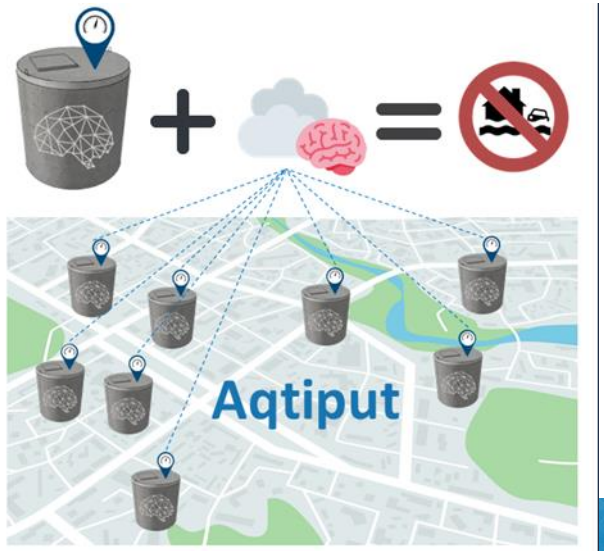
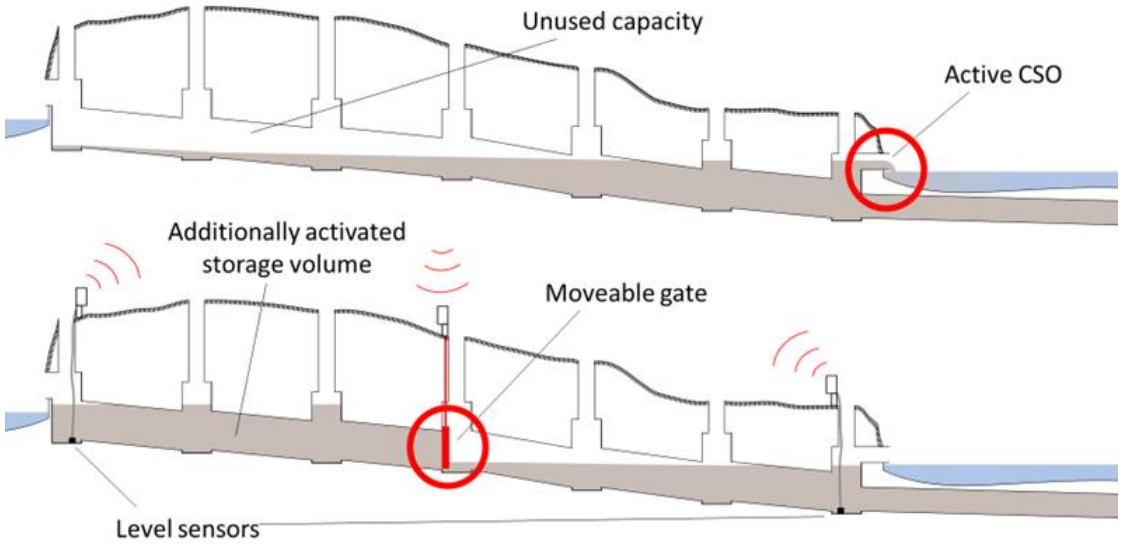
Smart controls for climate adaptation:

- Maximize buffering and reuse of rainwater
- Optimize drainage during peak events
- Reduce combined sewer overflows



Real-time control system (RTC)



COCKLE
Calculator of Overflow Concentration-Known Load Emissions

Ecoefficient business models

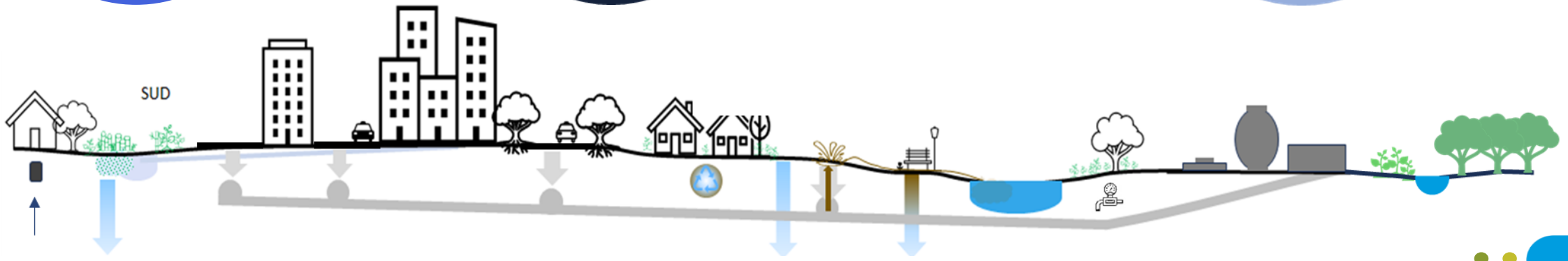
How to reduce emissions and help mitigating climate change?

Identification of hotspots GHG Emissions (LCA-Based):

20%
from untreated water and septic tanks

60%
from sewage and road infrastructure

15%
From WWTP Processes and sludge

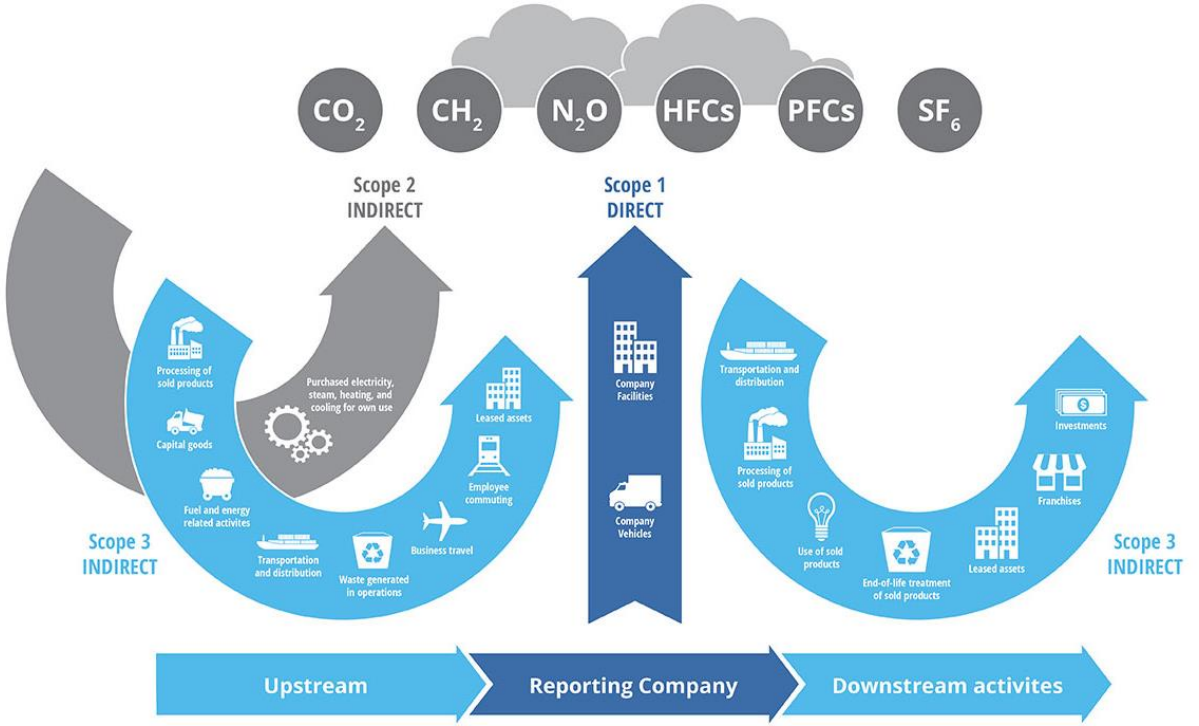


Ecoefficient business models

How to reduce emissions and help mitigating climate change?

Own GHG inventarisation:

- Methods and campaings for direct measurements of GHG emissions at WWTP's and septic tanks
- Developing Data-based modelling tools for emission prediction
- Developing own accounting tool in accordance wiht GHG Protocol and standards



Ecoefficient business models

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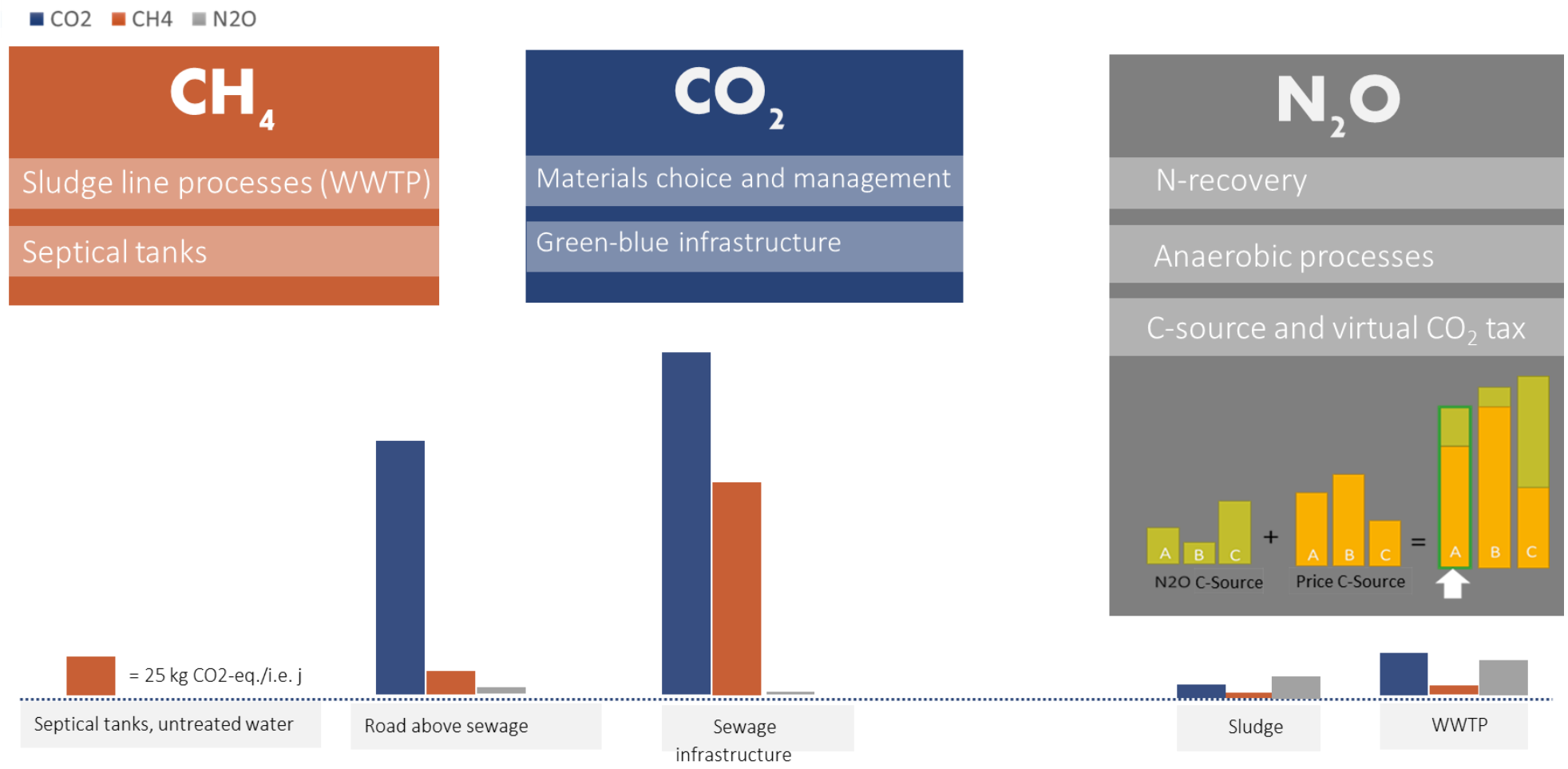
Mitigation paths: emissions



Ecoefficient business models

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Mitigation paths: energy efficiency

- Local smart energy grids: Application of AI for optimising production, consumption and storage of energy.
- Alternative energy storage: Batteries, salts, H_2, NH_4
- Innovative process optimisation, for example, data-driven automation aeration to reduce consumption.

The way forward: society 5.0

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Water
solutions
with a
Flemish twist.