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Emschergenossenschaft

Welcome to Bottrop

photo: EGLV/Baumers, Klaus



Tour of EmscherGenossenschaft's central sludge treatment plant and large-scale demonstration plant for phosphorus recycling in Bottrop

Agenda

1. Welcome at Bottrop
2. Introduction to EGLV & central sludge treatment plant
3. Introduction P-Recovery & Projekt AMPHORE
4. Safety Instructions wwtp
5. Group formation for plant tours
 - A – Tour WWTP and sludge treatment
 - B – Tour large-scale demonstration plant (P-Recycling)
incl. specific safety instruction



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Emschergenossenschaft's central sludge treatment plant in Bottrop

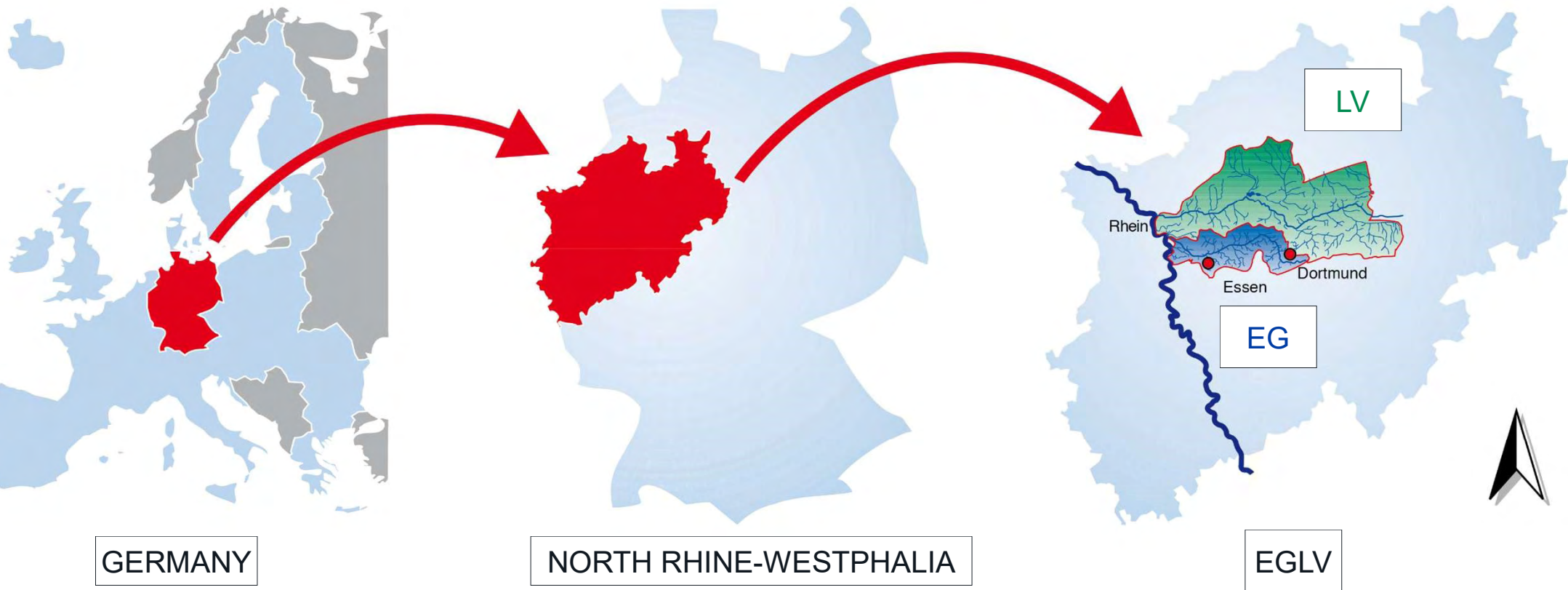
photo: EGLV/Baumers, Klaus



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Emschergenossenschaft / Lippeverband (EGLV)

Public water associations for more than a hundred years

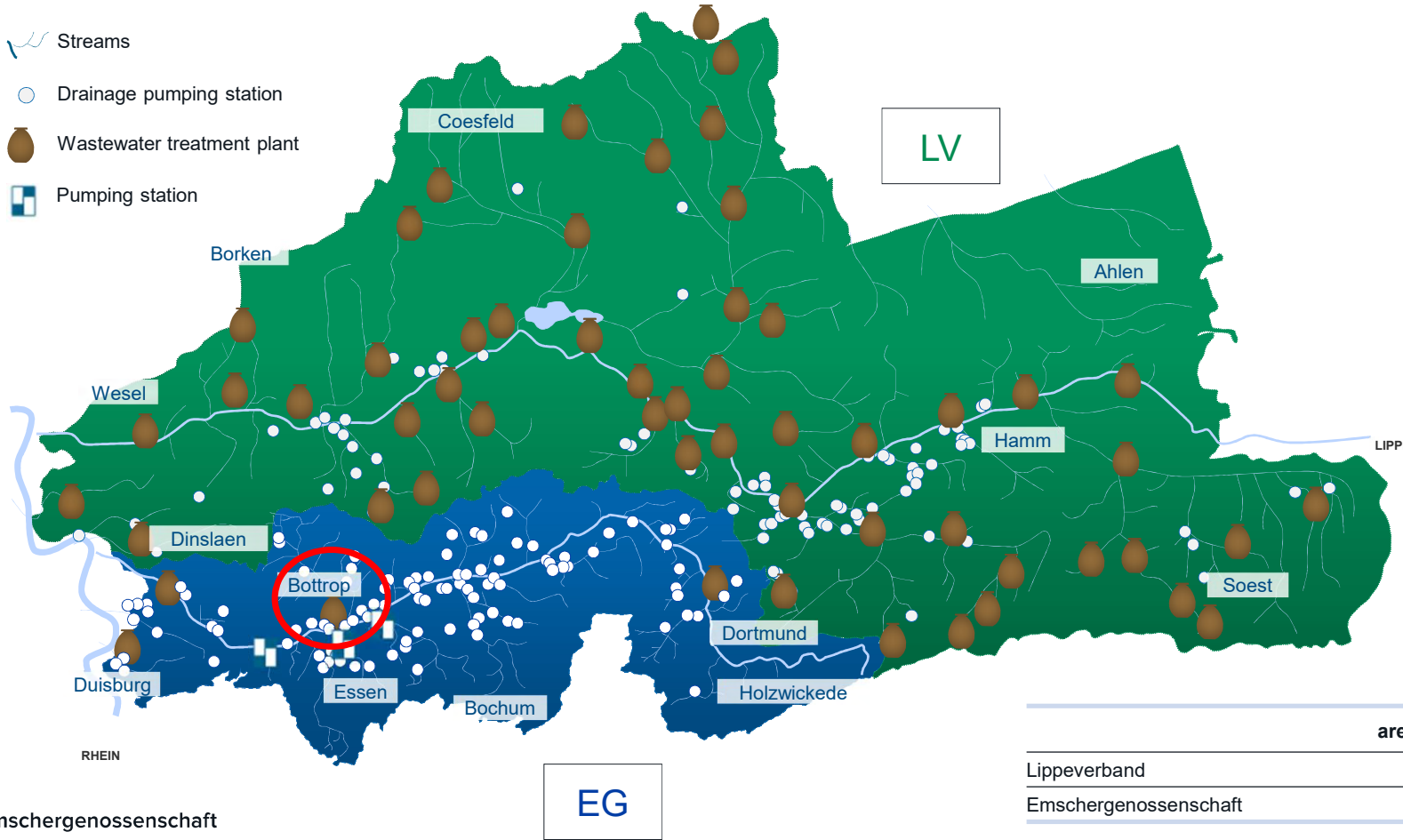


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Our catchment areas



	area (km ²)	population (Mio.)	inhabitants/km ²
Lippeverband	3.280	1,4	427
Emschergenossenschaft	865	2,2	2.546

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Integrated Water Management

sewage sludge incineration

solar-thermal drying
and wind power

stormwater
management

waste water treatment

pumping stations

flood protection

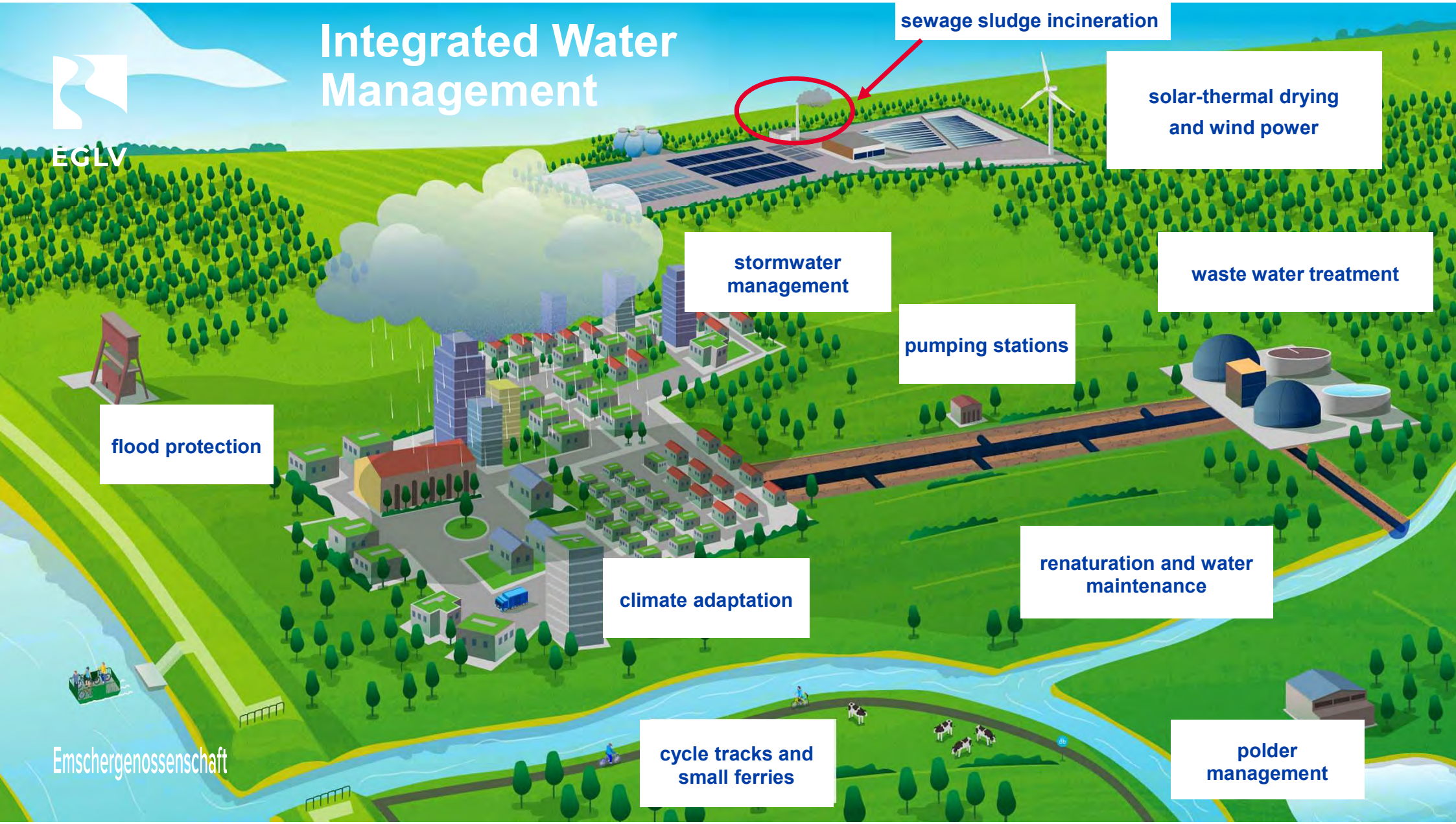
renaturation and water
maintenance

climate adaptation

cycle tracks and
small ferries

polder
management

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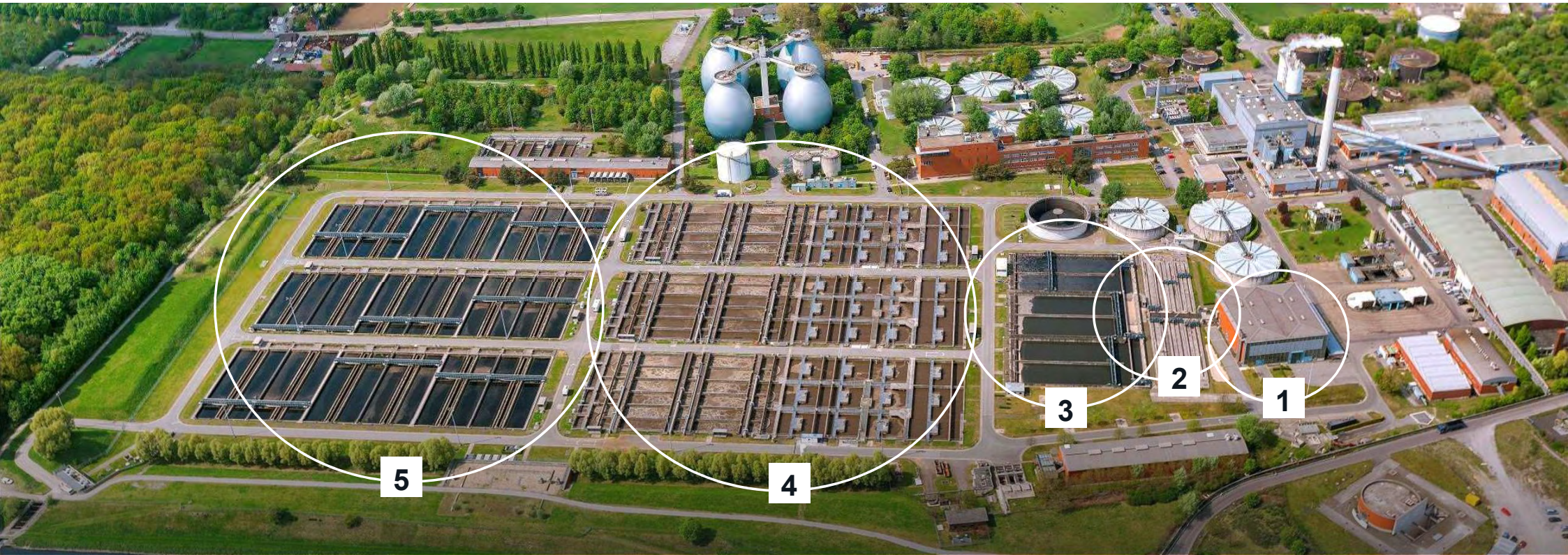




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Wastewater Treatment Plant - Bottrop

Capacity of 1,34 Mill. PE and sludge treatment for 4 Mill. PE



1. Screening 2. Grit removal 3. Primary Treatment

4. Aeration, microbes and bacteria 5. Secondary clarifiers

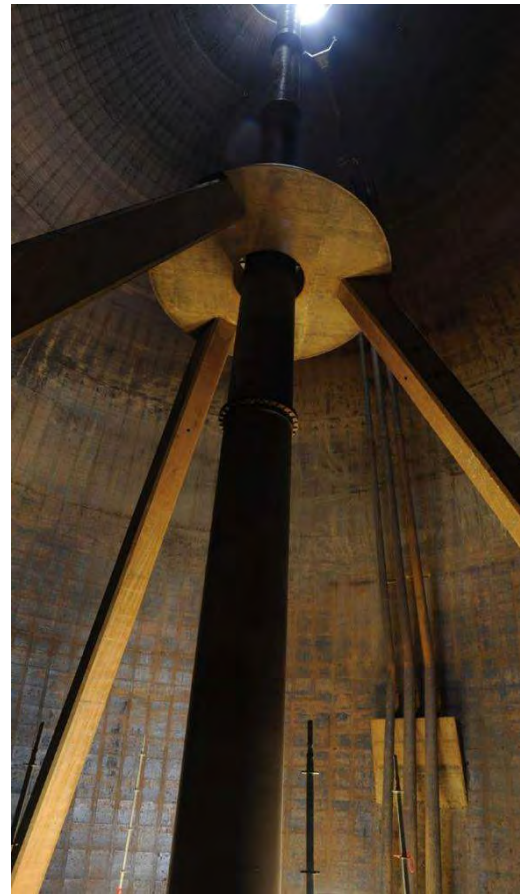
1. Screening
2. Grit removal
3. Primary treatment
4. Aeration, microbes and bacteria
5. Secondary clarifies
6. Fuel purification
7. Sewage sludge incineration

Wastewater Treatment Plant Bottrop in figures

- One of the largest wastewater treatment plants in Germany
- Clarification performance: 1,34 Mio. PE
- Catchment area: ca. 240 km²
- Inflow of wastewater: 4,25 m³/s to 8,5 m³/s
- Digested sludge volume: 1.500.000 m³/a
- Mechanically drained sludge Bottrop (2021): 160.000 t/a (TR ~ 24 %)
- Received sludge: ~ 50.000 t/a

Fuel Purification

Stabilizing



- Anaerobic rotting in the stabilizing towers
- Four vessels of 15.000 m³ capacity each
- Approx. 20 days at 37 °C (98,6 °F)
- > 9 Mio. m³ bio gas annually



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Technische Gesellschaft



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Solar-Thermal Drying (STD) & Mechanical Draining (MD)

Different types of sludge

STD

MD



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Solar-thermal drying (STD)

1. Mechanical draining
2. Conveyor MD to STD
3. CHP-plant
4. Foreign sludge
5. Logistic hall
6. Drying halls
7. Biofilter
8. Conveyor to incineration



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photo: EGLV/Saborowski, Jörg



STD

Facts and Figures

- Use: less coal and less CO₂
better for environment
better throughput
- Total area: ca. 60.000 m²
- Drying area: ca. 40.000 m²
- Introduced heat: ca. 145.000 MWh/a
 - Turbine condensate (55%)
 - Natural gas CHP (45%)
- Robots, that turn the sludge in different positions (electrical pigs)



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photo: EGLV/Neumann, Kirsten



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Conveyor Belt from STD to Incinerator

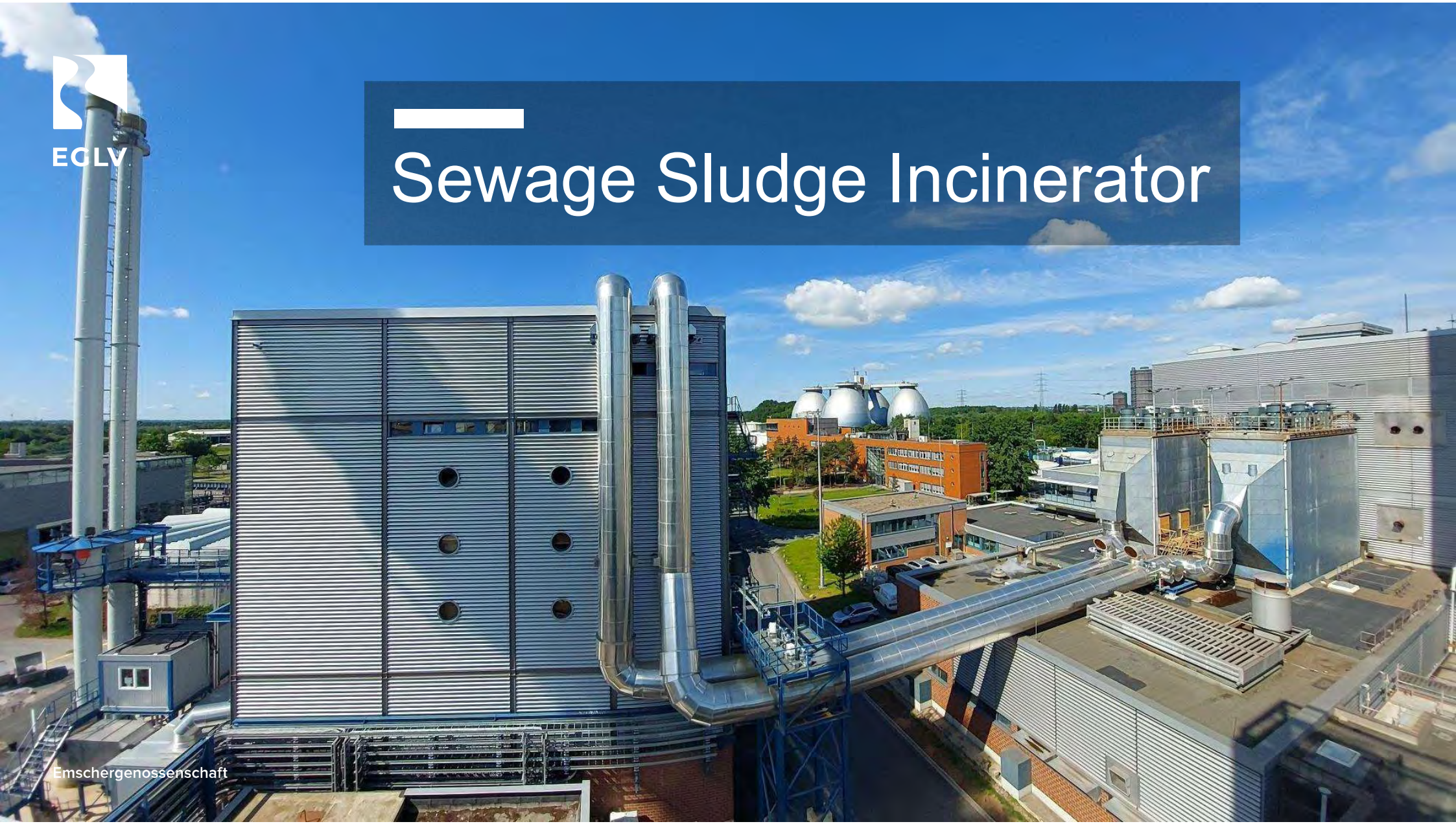




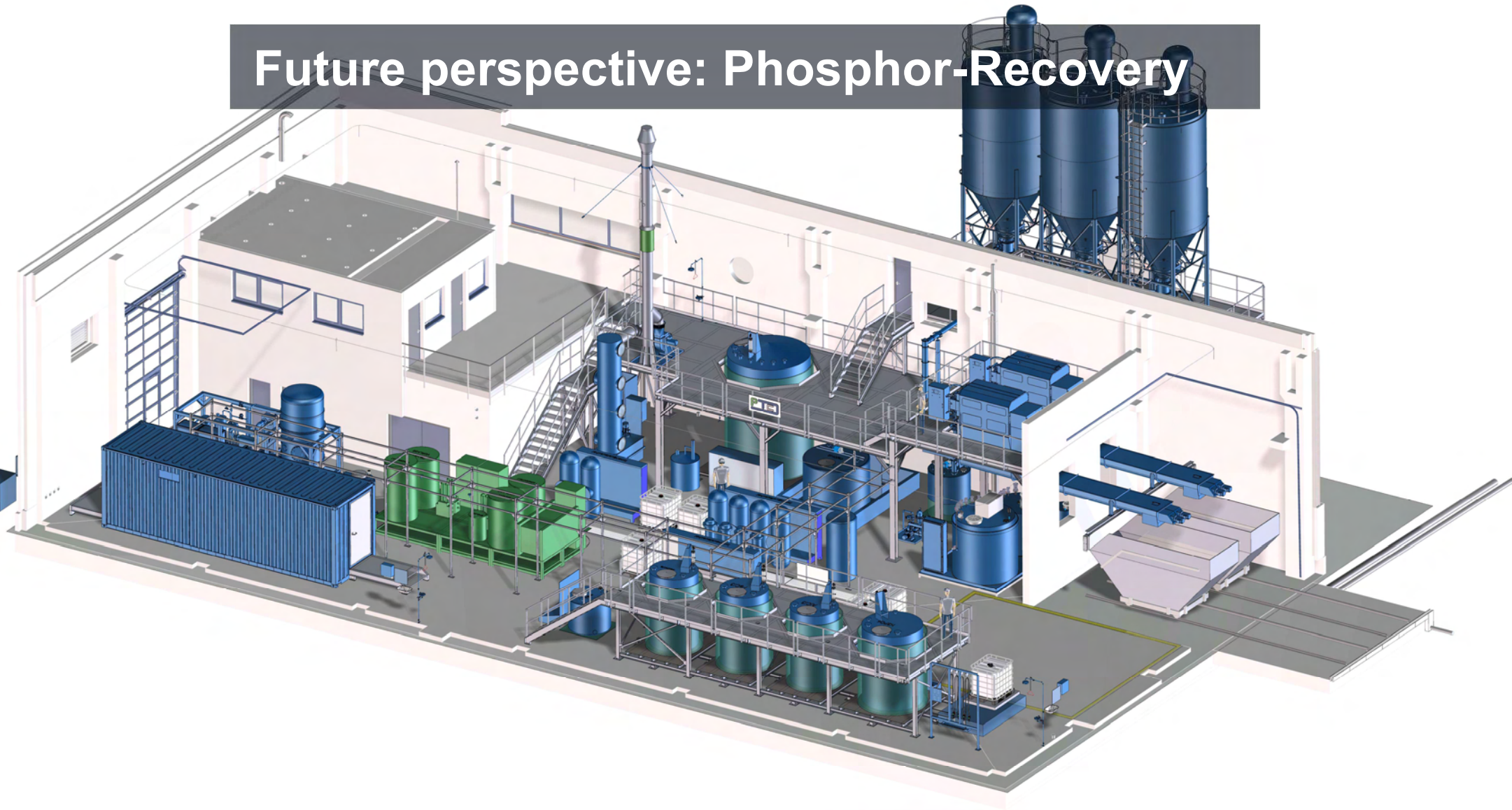
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Sewage Sludge Incinerator

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Future perspective: Phosphor-Recovery





Regional sewage sludge and ash management enabling phosphorus recycling for a densely populated area

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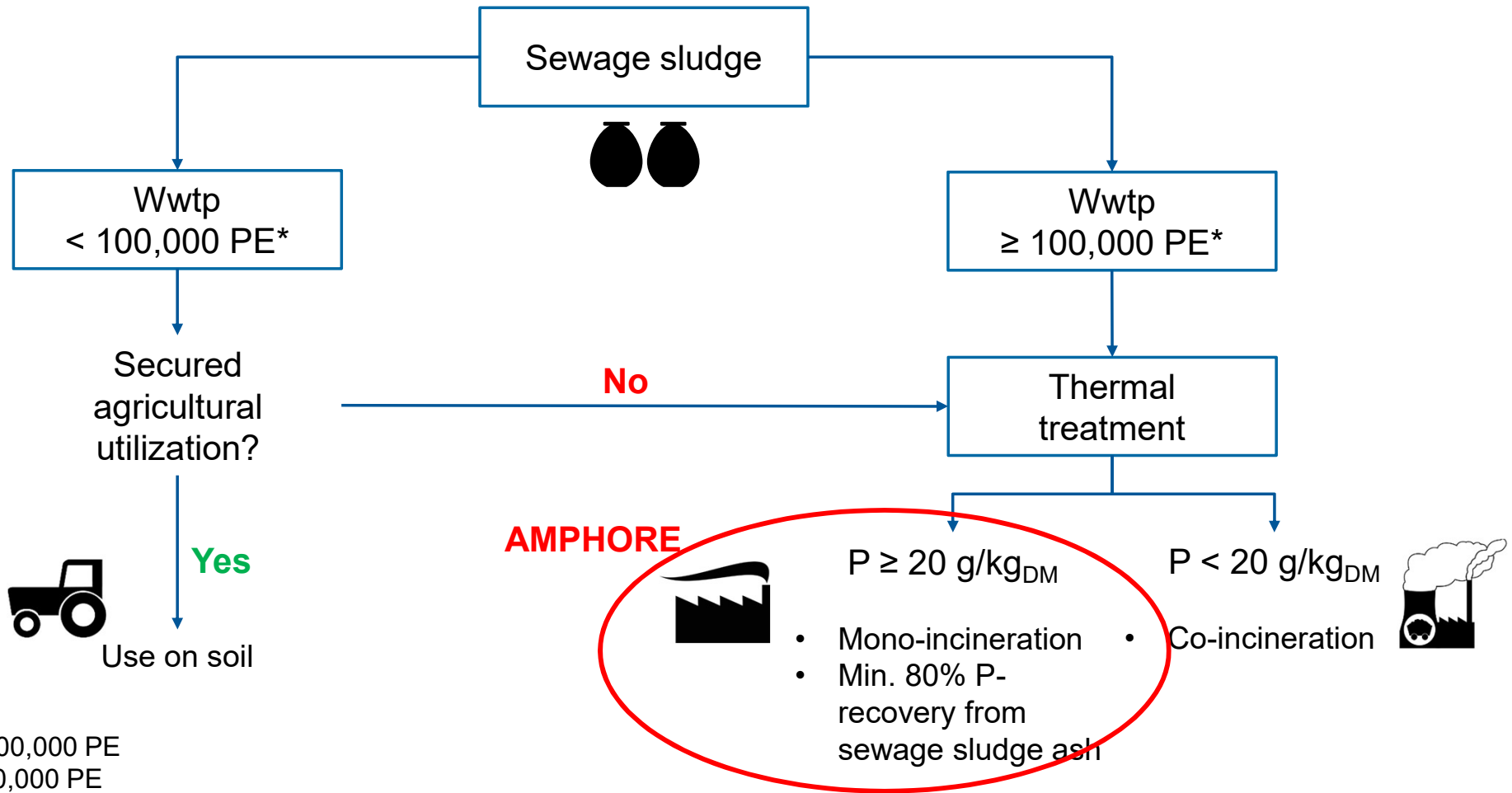


Agenda

- 1) Why phosphorus recovery
- 2) Project AMPHORE
- 3) Demonstration plant in Bottrop

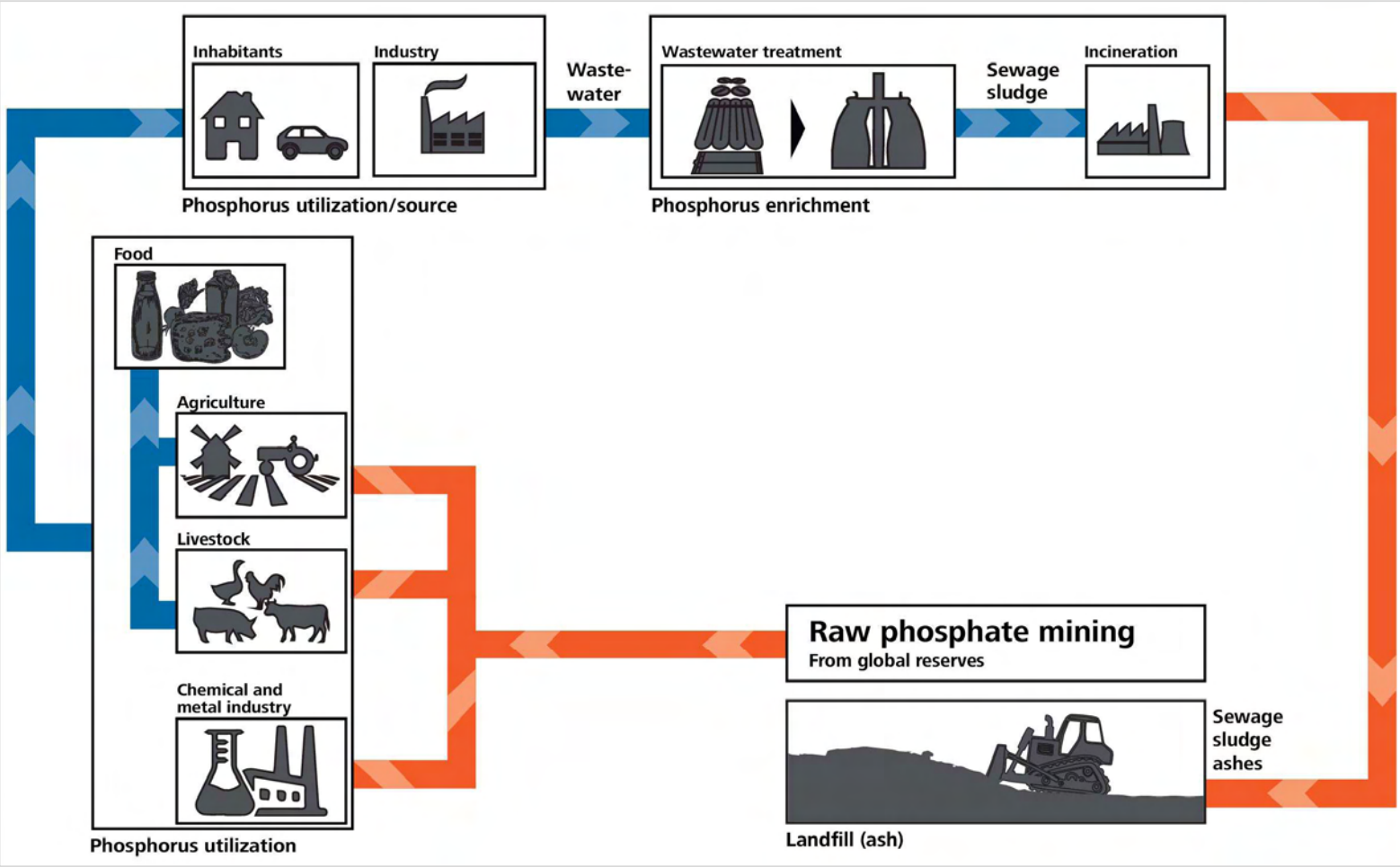


German Sewage Sludge Ordinance (AbfKlärV 2017)

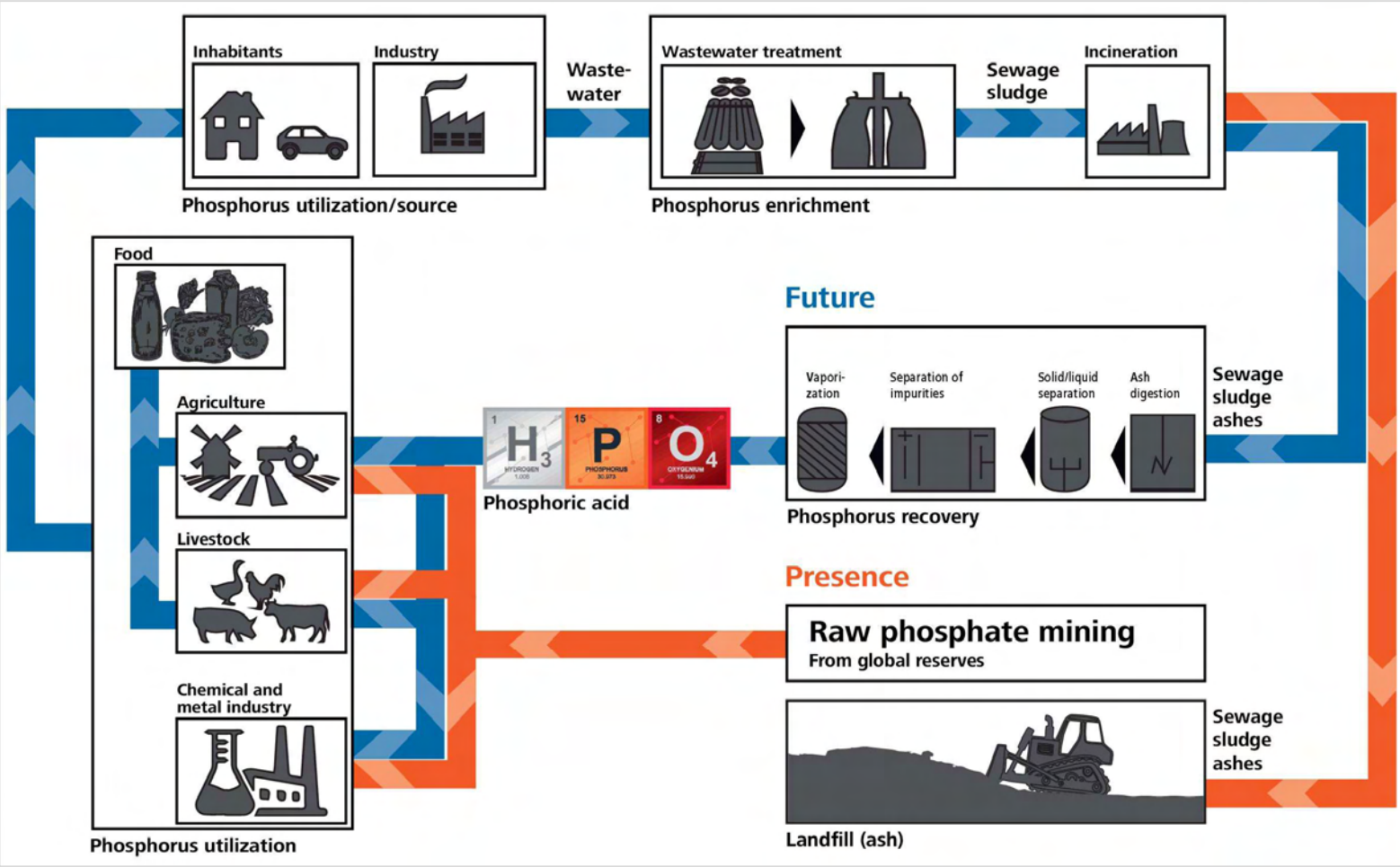


* 1. Jan. 2029: 100,000 PE
1. Jan. 2032: 50,000 PE

Current path of phosphorus



Future path of phosphorus



AMPHORE I

Project consortium



Coordination:



Project partners:

Project advisory board:

Ministerium für Umwelt,
Naturschutz und Verkehr
des Landes Nordrhein-Westfalen



PHOSREC
Phosphor-Recycling GmbH



Associated partners:



AMPHORE II

Project goals

Project duration

- July 2020 – June 2025
- Extension until June 2026

Funding by BMBF

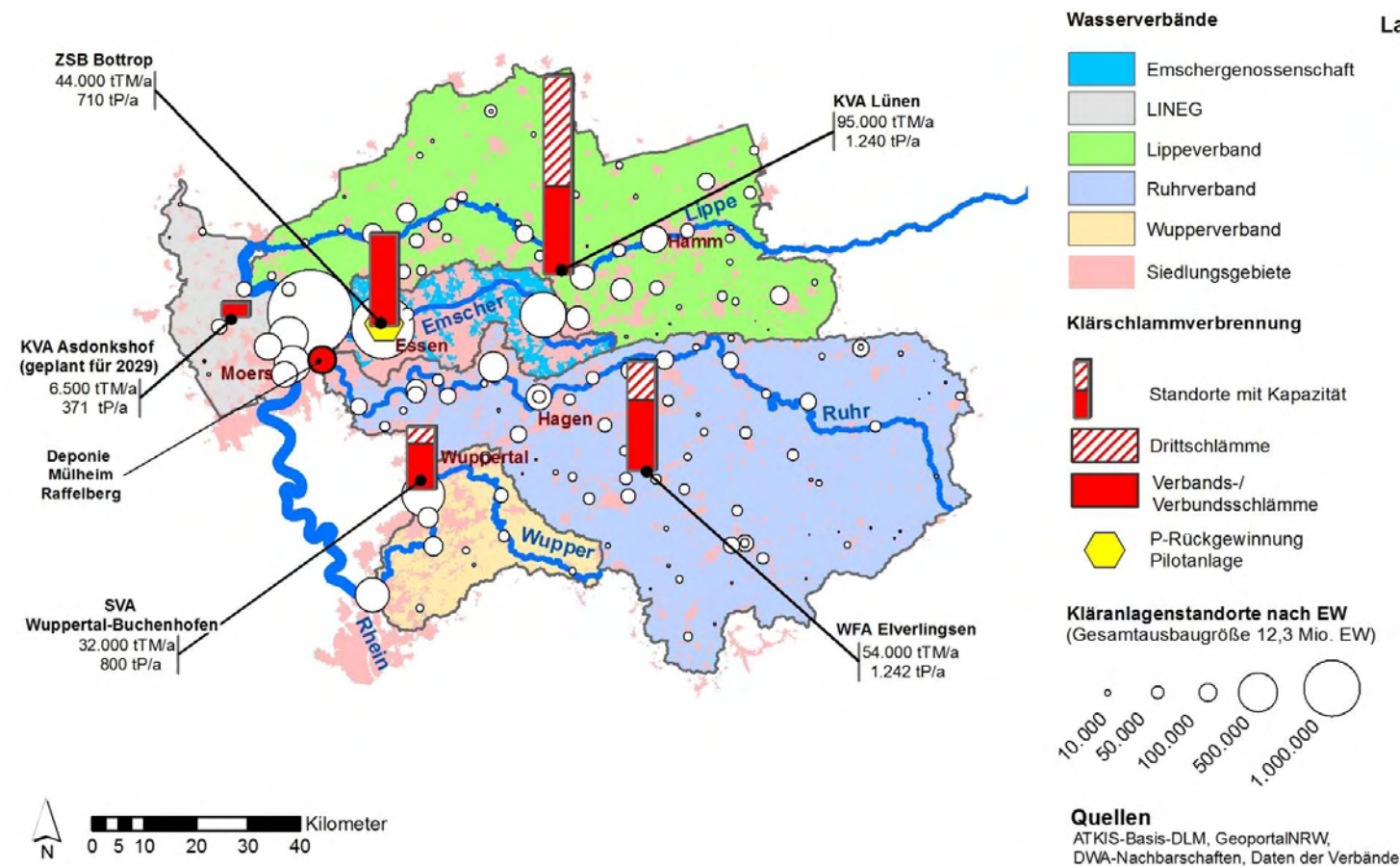
- Expenses: approx. 10.9 Mio. €
- Funding: approx. 8.8 Mio. €

Goals:

- **Large scale research plant** of a wet-chemical phosphorus recovery process
- Clarify scientific questions, especially with regards to influencing factors and interrelationships between the **ash quality, expense for the phosphorus recovery and product quality**
- Develop exemplary solutions for complex **legal, organizational, logistic and economical challenges** and determine indicative process parameters
- **Close collaboration of the participating water boards** to make use of scale effects and synergies
- Investigation of regional pathways for the utilization of the **phosphoric acid product** in application orientated qualities and field studies for the handling of **by-products and residuals**

AMPHORE III

Project area



Lage



- Total area of 10,323 km² with 12.3 Mio. inhabitants
- 139 sewage treatment plants and five sewage sludge incinerations plants
- Approx. 242,000 t_{dm}/a of sewage sludge with a potential of 4,700 t/a phosphorus
- Recovery of phosphoric acid from approx. 120,000 t/a sewage sludge ashes (~19,700 t H₃PO₄ (75%))

Demonstration plant in Bottrop Implementation

- Demonstration plant based on the PARFORCE technology® with an annual capacity of 1,000 t sewage sludge ashes
- Start of assembly in June 2023 and start of commissioning in spring of 2024; ongoing warm commissioning
- Two years of demonstration
 - Total of 18 campaigns lasting 14 days each
 - Use of different ashes of the five water boards
 - Throughput of approx. 40 t ash each campaign (approx. 120 kg/h)
- Samples of products go to associated partners for further research
 - Quality and properties of the (by-)products
 - Use of the recovered phosphoric acid in existing technological production processes
- Impressions of the construction:

<https://www.phosrec.de>

AMPHORE Introduction - plant tour PhosRec



Pictures of the launch in May 2nd 2024 (©Kirsten Neumann/PHosRec)



Thank you!

www.ruhrverband.de/wissen/projekt-amphore

www.phosrec.de

GEFÖRDERT VOM



Bundesministerium
für Bildung
und Forschung



Tour of wwtp Bottrop

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