For our Environment

Umwelt Bundesamt

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Wastewater treatment and its potential for recycling management

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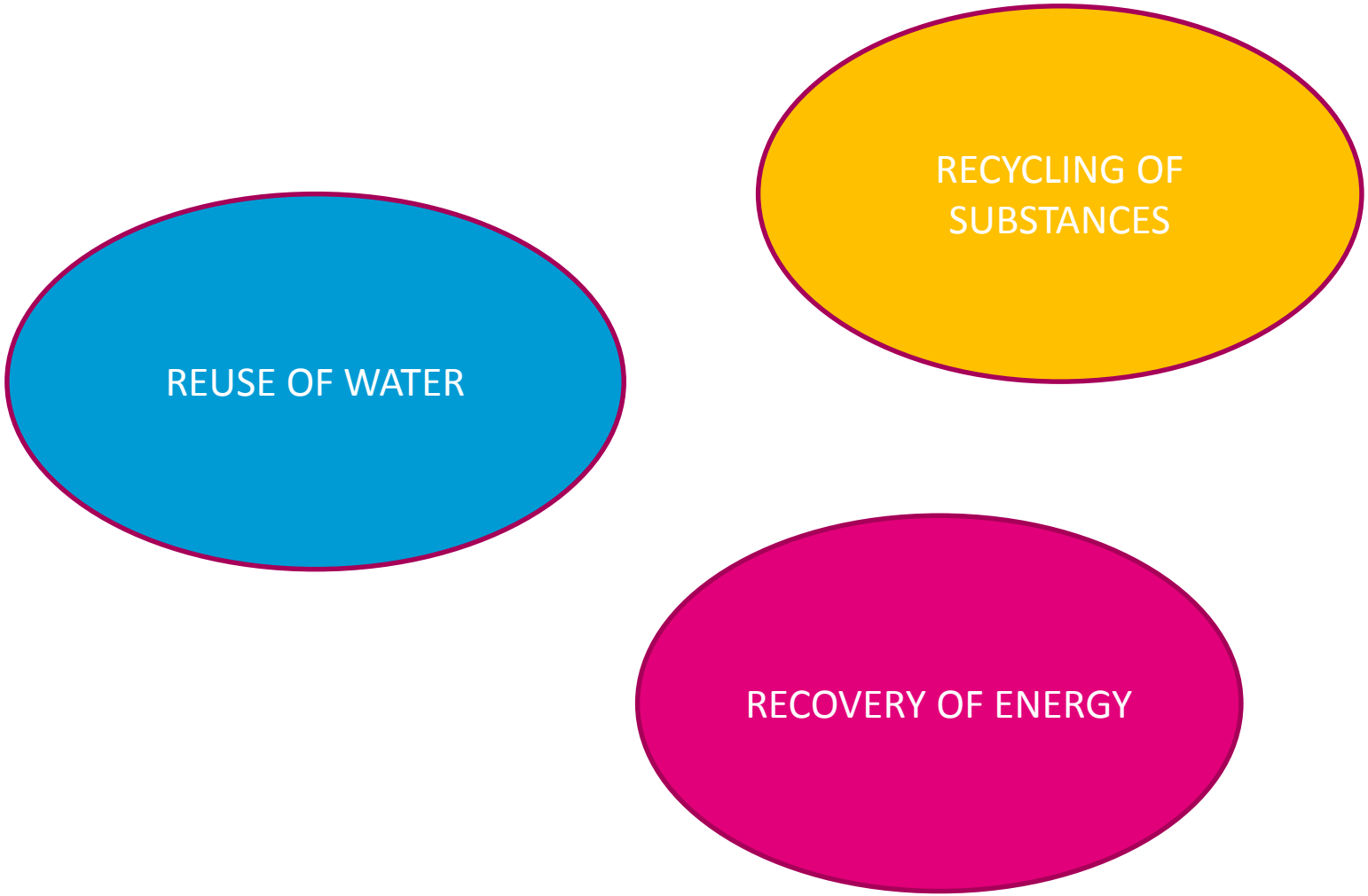
What can we get from waste water ?



Recycling of Substances

Phosphorus

Nitrogen

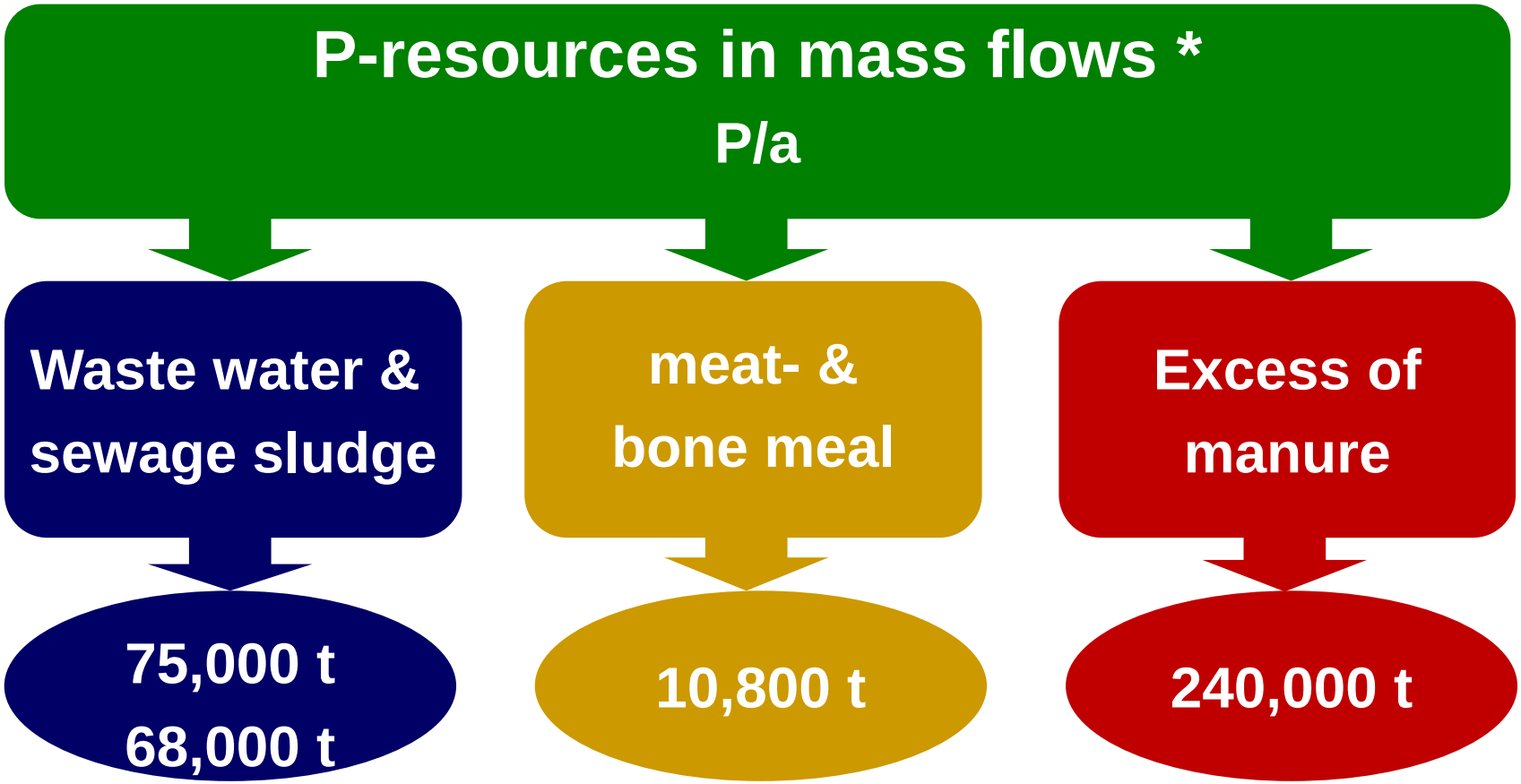
Other Substances ?

Phosphorus

Phosphorus Recovery as a Conservation of Resources:

- **P is essential for life and can not be substituted**
- **P is a limited resource**
- **90 % of known P-sources in 5 states only**
- **Germany (Europe) is totally dependent on P-import**
- **Quality is decreasing: Concentrations of contaminants such as Cadmium and Uranus are increasing**
- **P-digging is destroying the environment**

Phosphorus



* in Germany, own inquiry

Phosphorus

Special BMBF/BMUB initiative (since 2004):

Impulse of the utilization of plant nutrients from diverse mass flows

(for example waste water, sewage sludge, sewage sludge ashes, meat- and bone meal, manure)

Stimulation of innovative methods for manufacturing of fertilizers or components of fertilizers

→Research is done, knowledge required for phosphorus recycling and techniques are available in principle

→Now focus is on setting the legal and economic conditions for the production and use of recycled phosphorus now

Nitrogen

Recycling of Nitrogen:

- **N is not a limited resource**
- **Release of reactive nitrogen increased by ten times since 1913 (UBA 2011)**

→ N-Recycling from wastewater is not a priority, minimizing release of N_2O during wastewater treatment

Other Substances

Recycling from other nutrients (e.g. potassium), metals, rare earth elements…

→ no data available

→ for all recovered substances there has to be a market potentially

Water Reuse

Water Reuse is discussed and under survey for

agricultural irrigation, irrigation of urban parks etc., within industrial applications, groundwater recharge, river recharge...

Lots of research aktivities on

national level

BMBF WavE

http://www.fona.de/de/19627

and European level

Water Reuse

But, lack of a discussion on minimum quality requirements and the need to assess environmental impacts

→studies which integrate risk analysis across the various elements of water reuse schemes are urgently needed

→ modelling tools for identifying the most efficient focus for water recycling in production processes including analysis of environmental impacts (energy demand, amount of waste…) are required to make water reuse a more integrated part of the production process

→the principle of precaution (including the principle of reversibility) has to be implemented, especially when a variety of potentially hazardous substances (e.g. micro pollutants) is spread in large areas with long-term consequences for human health and soil and groundwater

→ logistical problems (resources for the infrastructure and costs) which arise to transport waste water from the places where it is produced to the (agricultural) areas, where it is needed, have to be consiedered

→reuse of waste water may not be an adequate measure for water-rich regions

Energy Production and Wastewater Treatment Plants

Renewable Energy Directive		Wastewater Treatment Plants
Heating and cooling	→	Combined heat and power (CHP - KWK)
Biofuels	→	Biogas storage
Renewable energies	→	Biogas combustion in CHPs

Wastewater treatment plants (WWTP) can contribute to the three pillars of the European renewable energy policy!

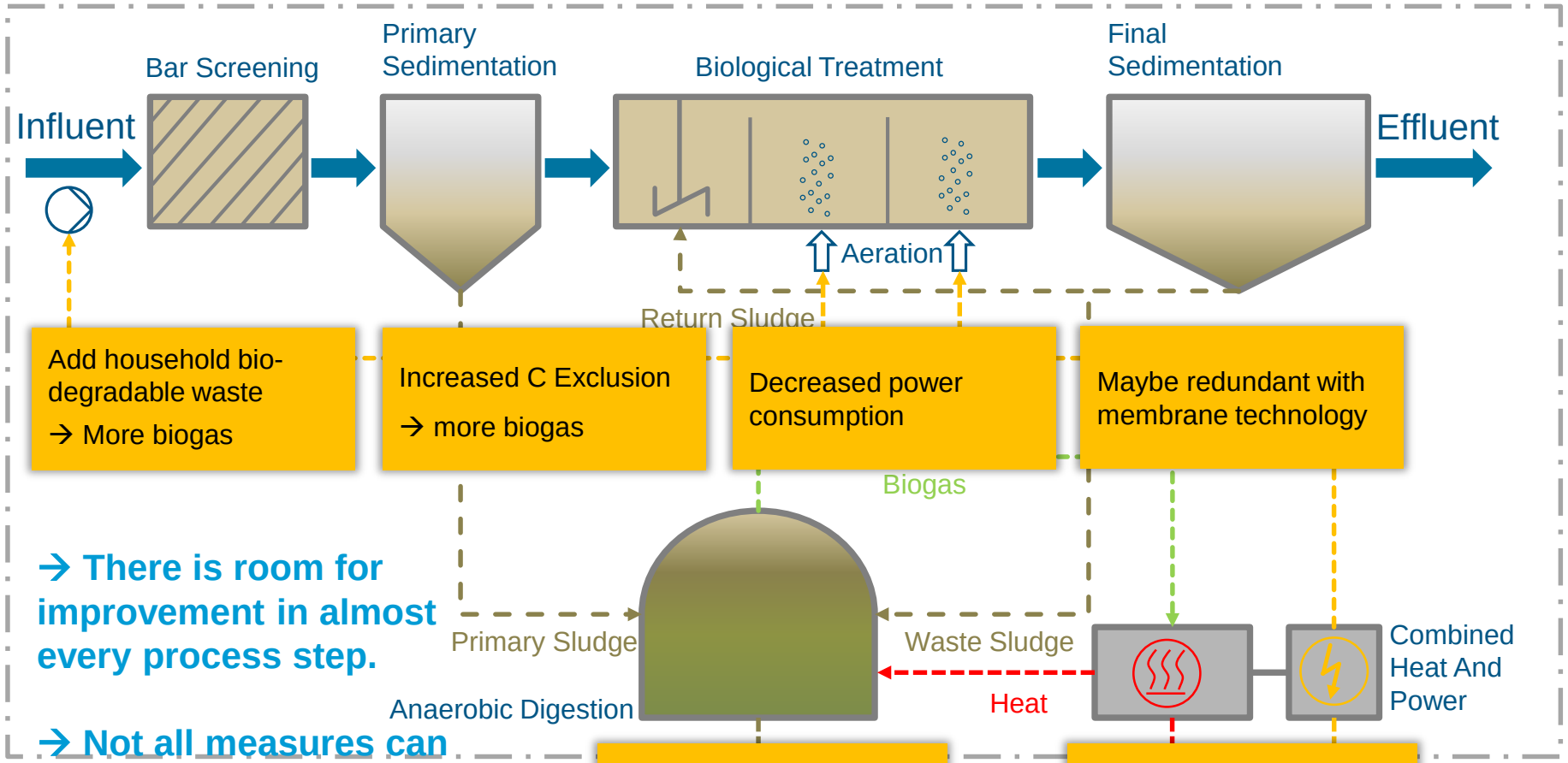
In Germany:

- WWTPs produce one third of the plant‘s total power demand and almost 100% of the required heat (power demand: 4.2 TWh/a | production: 1.35 TWh/a)
- WWTPs are responsible for 10-30% of the municipal power demand

Increasing the energy recovery from wastewater yields positive effects on various levels!

Possible Energy Related Improvements on the WWTP

Typical Flow Scheme of the Most Common German WWTP



→ There is room for improvement in almost every process step.

→ Not all measures can be included in existing plants - generates new possibilities for energy efficient WWT systems

Foster Energy Related Investment in Wastewater Treatment Sector

National Level

Exit from nuclear and fossil-fuel energy in Germany in 2000
→ Contribution of WWTPs:

BMBF project ERWAS
https://bmbf.nawam-erwas.de/
- 12 projects, 27 Mio. €

UIP (Environmental Innovation Program) Projects of the UBA
http://www.umweltinnovationsprogramm.de/foerderschwerpunkte/energieeffiziente-abwasseranlagen
- focuses on projects that are well suited for demonstration purposes and hence for replication
- 11 projects towards an optimization of the WWTP‘s energy consumption
- Various strategies: decreased power consumption, increased C-exclusion, additional C sources, ORC technique…

Foster Energy Related Investment in Wastewater Treatment Sector

Municipal level

Examples:

WWTP Hamburg

- Use of a new aerator lead to a power consumption decrease of 20%
- Additional C sources (co-substrates like glycerin) for biogas generation, construction of 2 windmills, photovoltaic modules
- „energy positive“ since 2011

WWTP Bremen

- Increased efficiency of the CHP plant, additional power generation of 12%

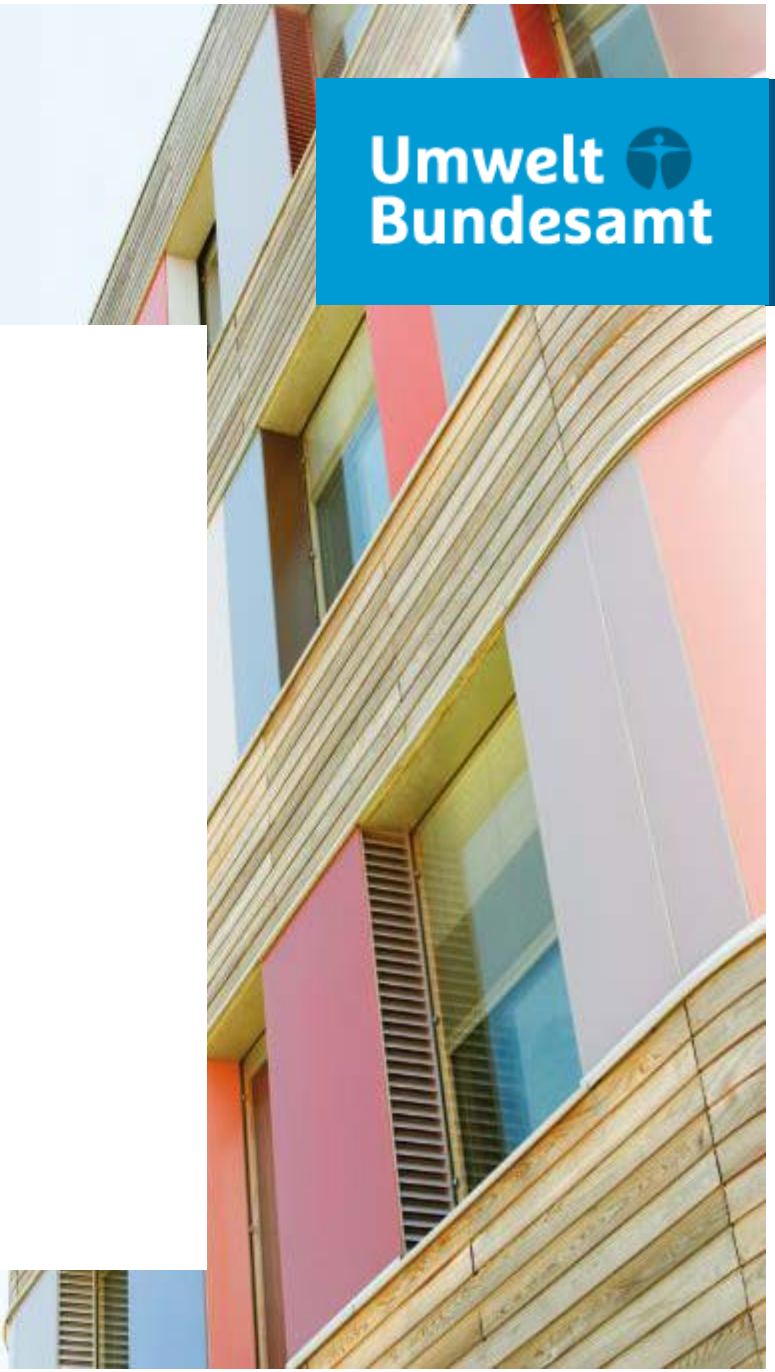
Conclusion

Priority task of wastewater treatment plants - the treatment of wastewater for environmental and health protection - will remain

→ but change from a sectoral focus to an integrative focus - coupling wastewater treatment with other sectors like energy system and supply of raw material

→ improve image of waste water treatment

(e.g. USA: Wastewater Treatment Plant → Resource Recovery Centre)



Thank you for your attention.

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