



Benchmarking of Wastewater Treatment Plants The Austrian Way

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Outline

- Introduction
- Methods
- Results
- Recap & conclusions
- Future work

INTRO ➔ The Austrian Benchmarking way...

- **1999 ➔ Austrian benchmarking research project**
 - Objectives
 - develop performance indicators
 - identify the best practice
 - determine optimisation & cost reduction potentials
- **2004 ➔ implementation of an internet platform**
- **Today ➔ more than 130 participants (2,000 – 1,000,000 PE)**
 - 39 % of the Austrian design capacity (>10,000 PE)

Cooperation

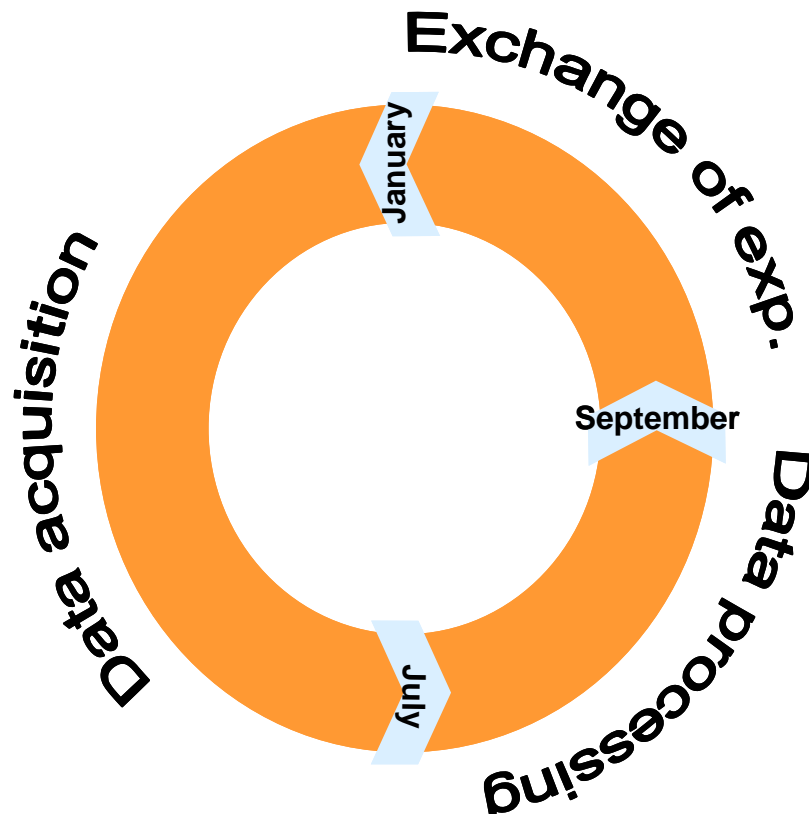
- the Austrian Water and Waste Management Association (OEWAV)
- two private companies (technical & financial)
- one university institute (Institute for Water Quality, TU Vienna)
- guarantees sound scientific, technical and economic work



M&MS → The Austrian benchmarking system

- **Benchmark plants for yearly total, capital & operating costs**
 - Compliance criteria (operating and yearly total costs)
 - Austrian emission standards
 - minimum quality of technical data
 - municipal wastewater character ($N/COD \geq 0.7$)
- **Process benchmark**
 - lowest specific operating costs for one of the defined treatment processes (criteria compliance!)
- **PIs for processes**
- **PIs for cost categories**

A benchmarking year can be subdivided into 3 steps



1. Data acquisition

- internet platform
- technical & financial data

www.abwasserbenchmarking.at

2. Data processing

- plausibility check
- calculation of PIs & BMs

3. Exchange of experience

- individual consulting
(expert @ WWTP)
- workshops (WWTPs amongst
each other and with expert)



Benchmarking Plattform
Nutzen
Ablauf
Praxisbeispiele
Kosten für Betreiber
Anmeldung zur Teilnahme
Abwicklung und Betreuung
News
Veröffentlichungen
Öffentliche Berichte
Kontakt
Diskussionsforum
Benchmarking Bereich

Public reports →
Discussion forum →
BM area →

Benchmarking Plattform

Was ist Benchmarking?

Benchmarking heißt:

- die wesentlichen eigenen Prozesse (Verfahrensabläufe) zu verstehen und mit den Prozessen anderer Unternehmen zu vergleichen,
- daraus zu lernen,
- um letztlich die eigenen Prozesse verbessern zu können und
- Maßnahmen zur Kostensenkung umzusetzen und deren Wirkung zu überprüfen.

ÖWAV-Abwasser- Benchmarking

Beim **ÖWAV-Abwasser-Benchmarking** werden auf Basis der individuellen Kosten sowie technischer Leistungsdaten von Kanalisations- und/oder Kläranlagen individuelle Kennzahlen errechnet. Diese werden anonymisiert ausgewertet, um so genannte „Benchmarks“ (Bestwerte) zu gewinnen.

Durch die Gegenüberstellung der eigenen Kennzahlen mit den ermittelten Benchmarks werden **Kostensenkungspotenziale** aufgefunden.

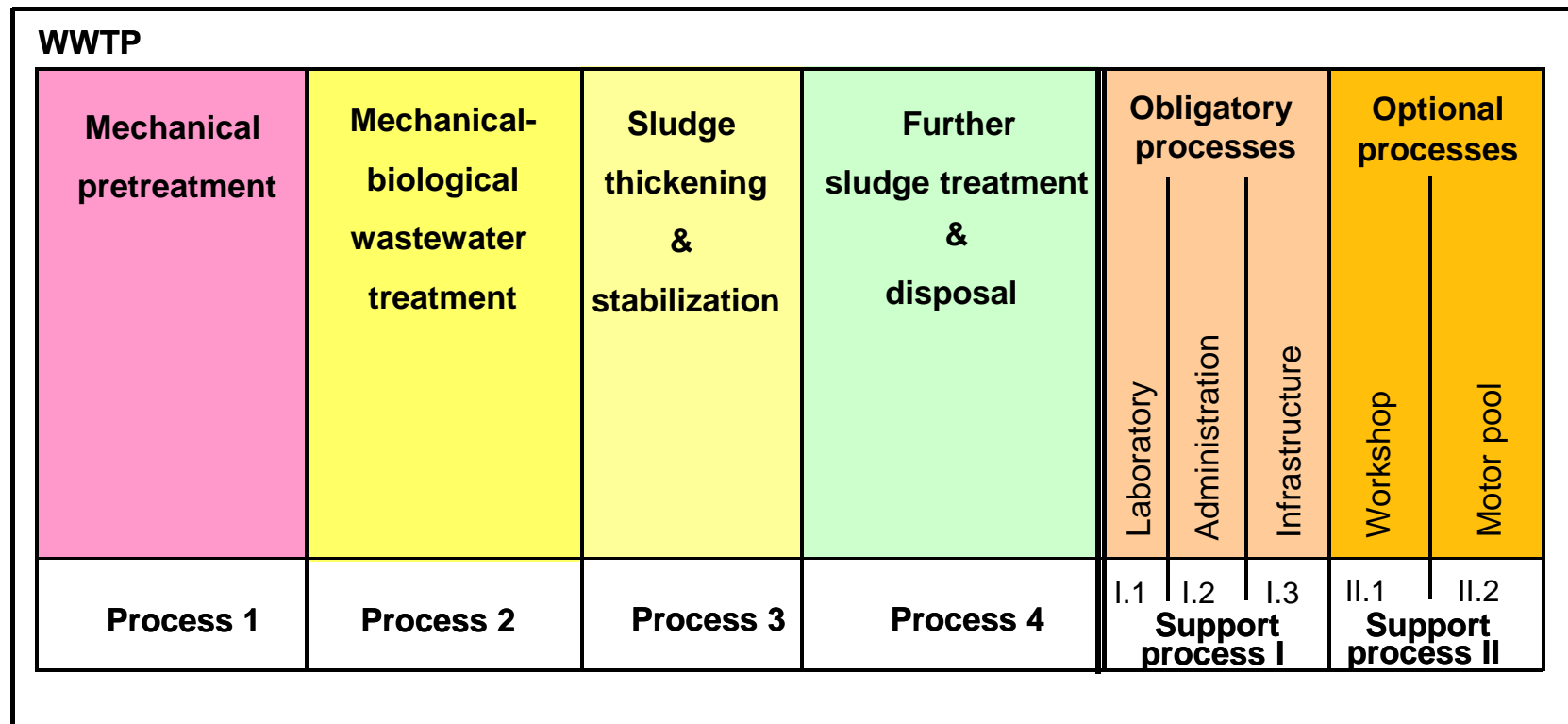
Um die Datensammlung und -auswertung sowie die Ausgabe der Ergebnisse **kosten- und zeiteffizient** abwickeln zu können, wurde eine **Internetplattform** eingerichtet.

Angebotene Module: Kanalisation / Kläranlage

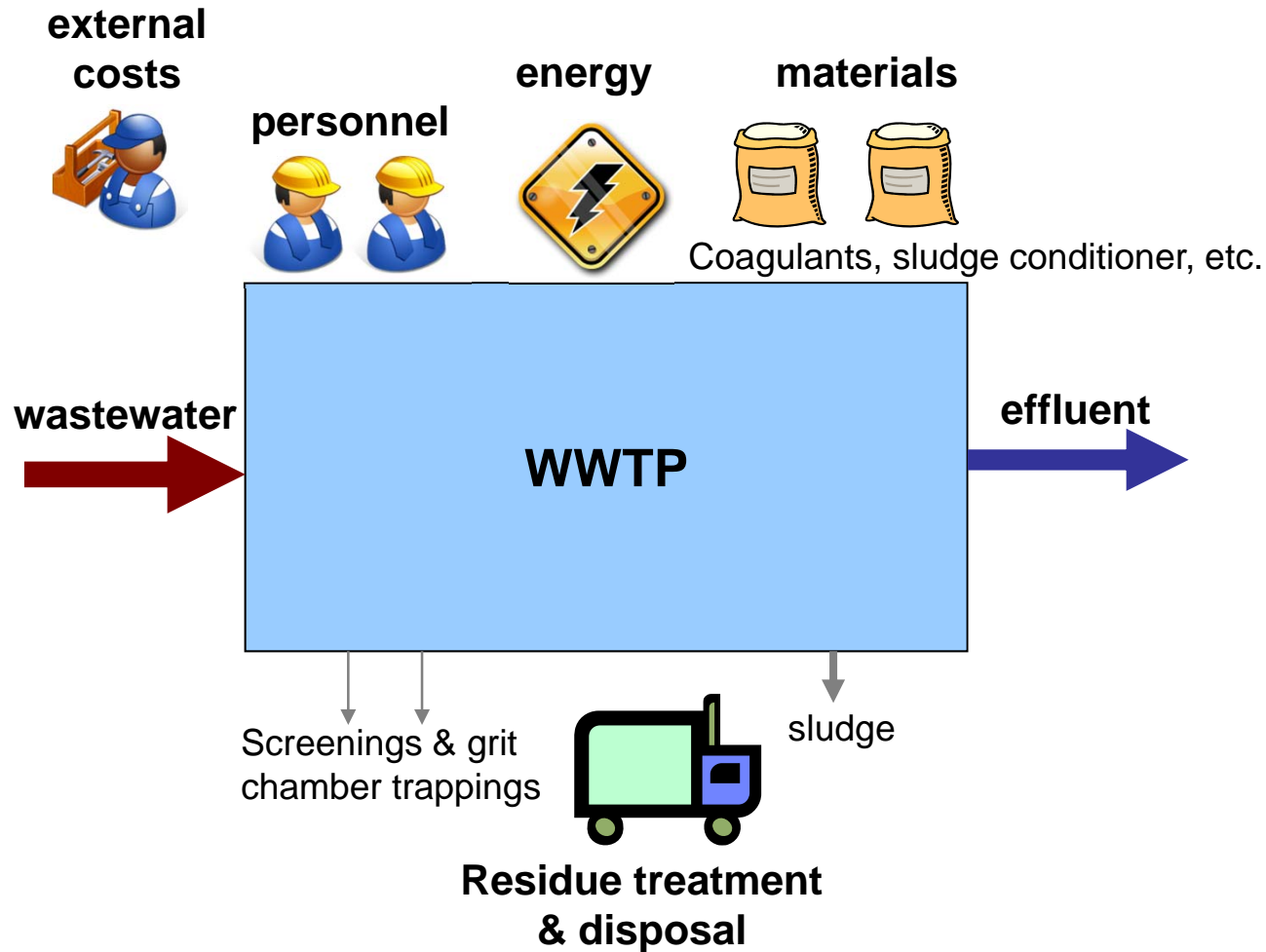
Für die Betreiber von Abwasseranlagen besteht die Möglichkeit, mit der Kläranlage und/oder der Kanalisation am ÖWAV-Abwasserbenchmarking teilzunehmen.

Methods - process model

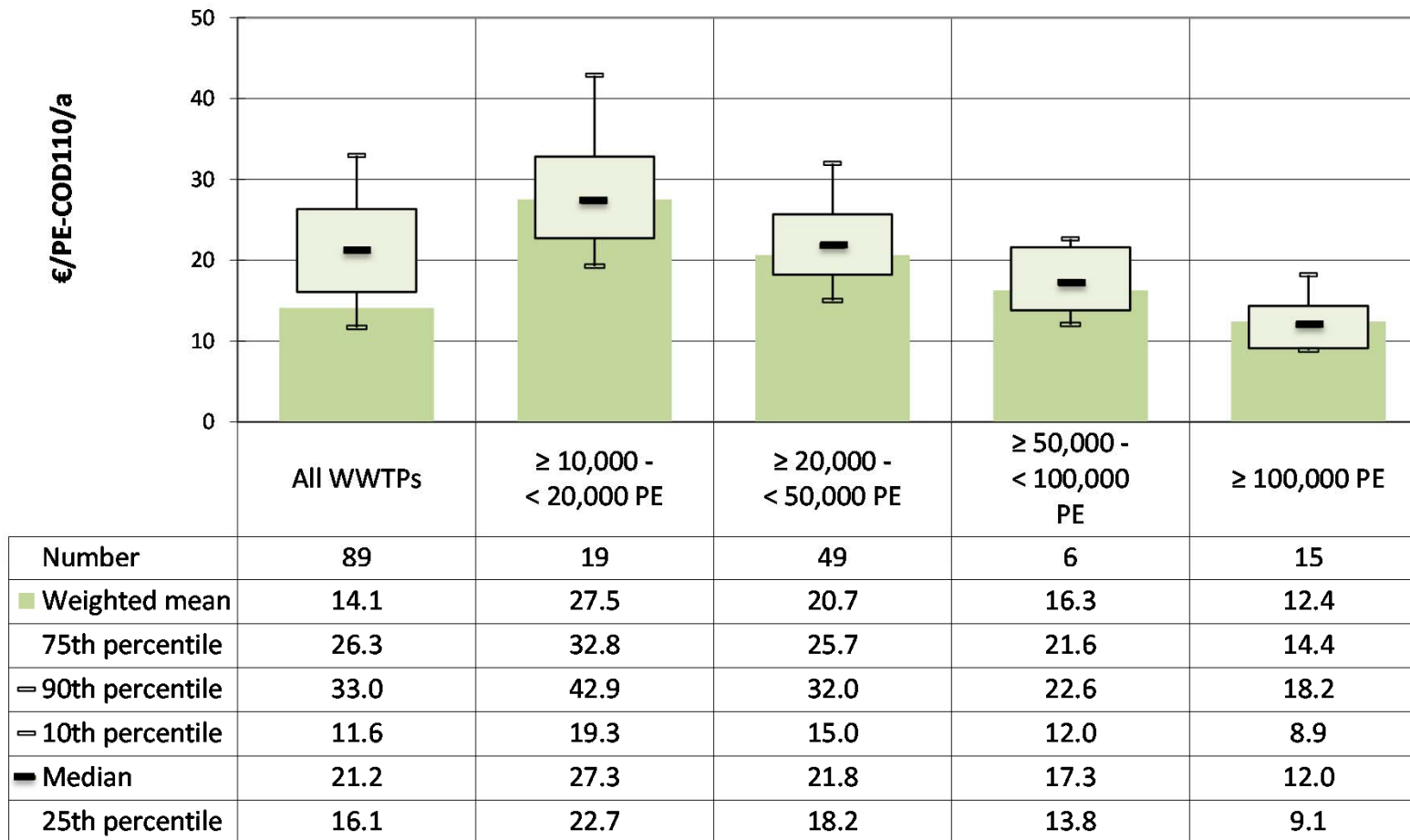
- Clearly defined processes
- Model can be adapted according to the size (PE)



Operating costs & their origin → cost categories



RESULTS - Operating costs & WWTP size nexus



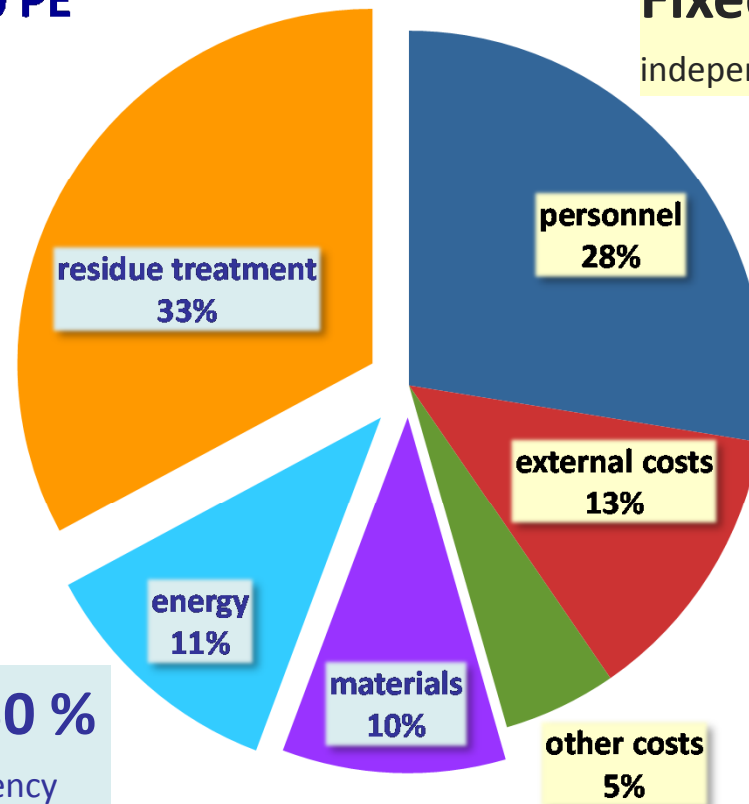
RESULTS

Operating costs attributed to cost categories

84 WWTPs \geq 10,000 PE

Fixed costs \sim 50 %

independent of utilisation efficiency



Variable Costs \sim 50 %

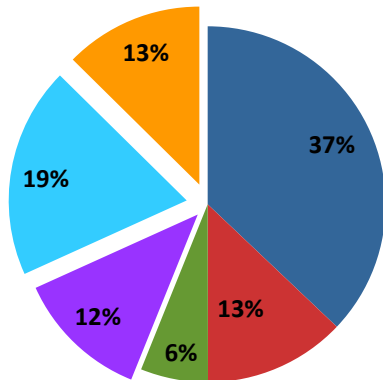
depending on utilisation efficiency



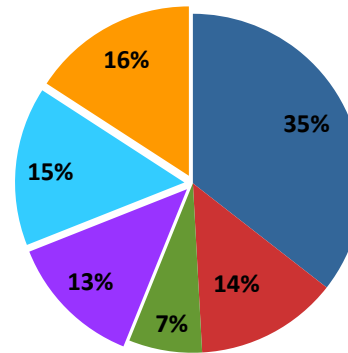
RESULTS

Share of cost categories depending on WWTP size

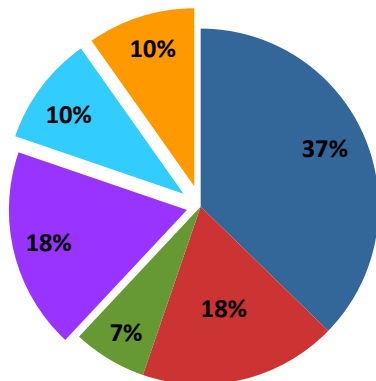
14 WWTPs 10,000 - 20,000 PE



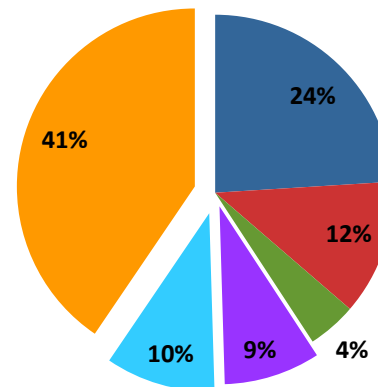
47 WWTPs 20,000 - 50,000 PE



8 WWTPs 50,000 - 100,000 PE



15 WWTPs ≥ 100,000 PE



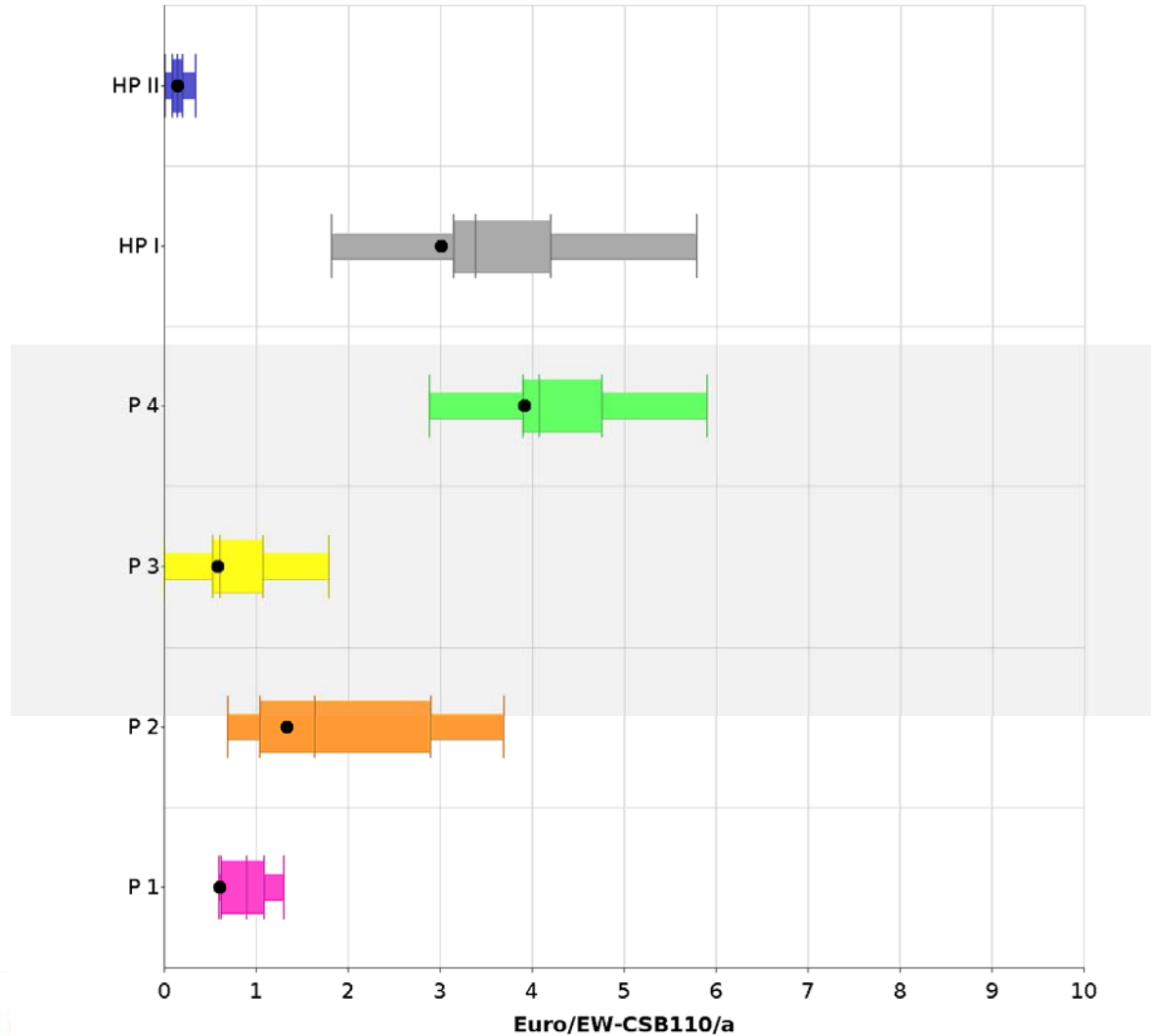
FIXED COSTS

- personnel
- external costs
- other costs

VARIABLE COSTS

- materials
- energy
- residue treatment

RESULTS - Operating costs attributed to processes



P...Process
HP...Support Process

WWTPs > 100,000 PE
Data base: 2011



The Austrian Way... ➔ Recap & Conclusion

- **The Austrian benchmarking provides an excellent data set**
 - representing ~40 % of Austrian WWTP capacity
 - subjected to rigorous quality control
 - comply with EU-criteria for sensitive areas
- **The lowest specific operating costs coincide with excellent treatment efficiency, lowest energy consumption and the best operators**
- ☞ **Continuous exchange of knowledge & experience between experts and operators and amongst WWTPs ➔ inherent for maximising cost efficiency**
 - education and continuous training of all persons involved
 - universities and professional associations as driving forces for continuous development of improved technology and management

Recap & Conclusions

- **Specific costs strongly depend on size & \emptyset capacity utilisation**
 - ☞ $\sim 60\%$ fixed vs. $\sim 40\%$ variable operating costs ($< 100,000$ PE)
- **Operating costs decrease with increasing plant size**
 - ☞ high impact of lower specific personnel costs of large WWTPs
- **Material, external and other costs \Rightarrow low size-dependency**
- **Current technology allows energy self-sufficient operation for WWTPs $> 50,000$ PE**
 - ☞ BUT energy is not a dominant cost category
- **Especially for small WWTPs \Rightarrow low impact of energy minimisation on operating costs**



Benchmarking of Wastewater Treatment Plants – The Austrian Way

FUTURE WORK



On the way...

- **Benchmarking curves**

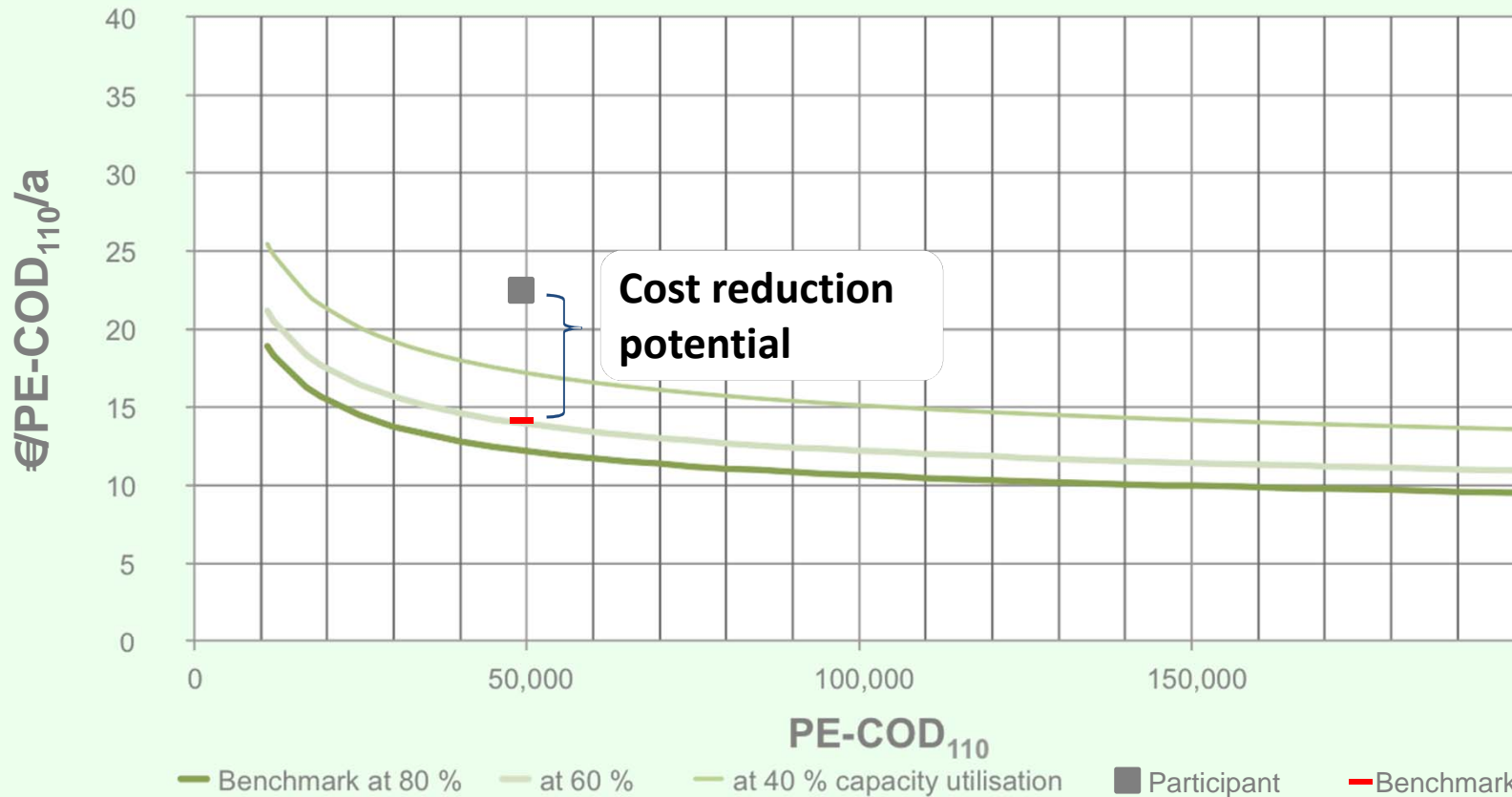
- ➔ generated from the comprehensive data pool of the last 10 yrs.
- ➔ for total operating costs & cost categories
- ➔ cost reduction potential as an output

- **Advantage of**

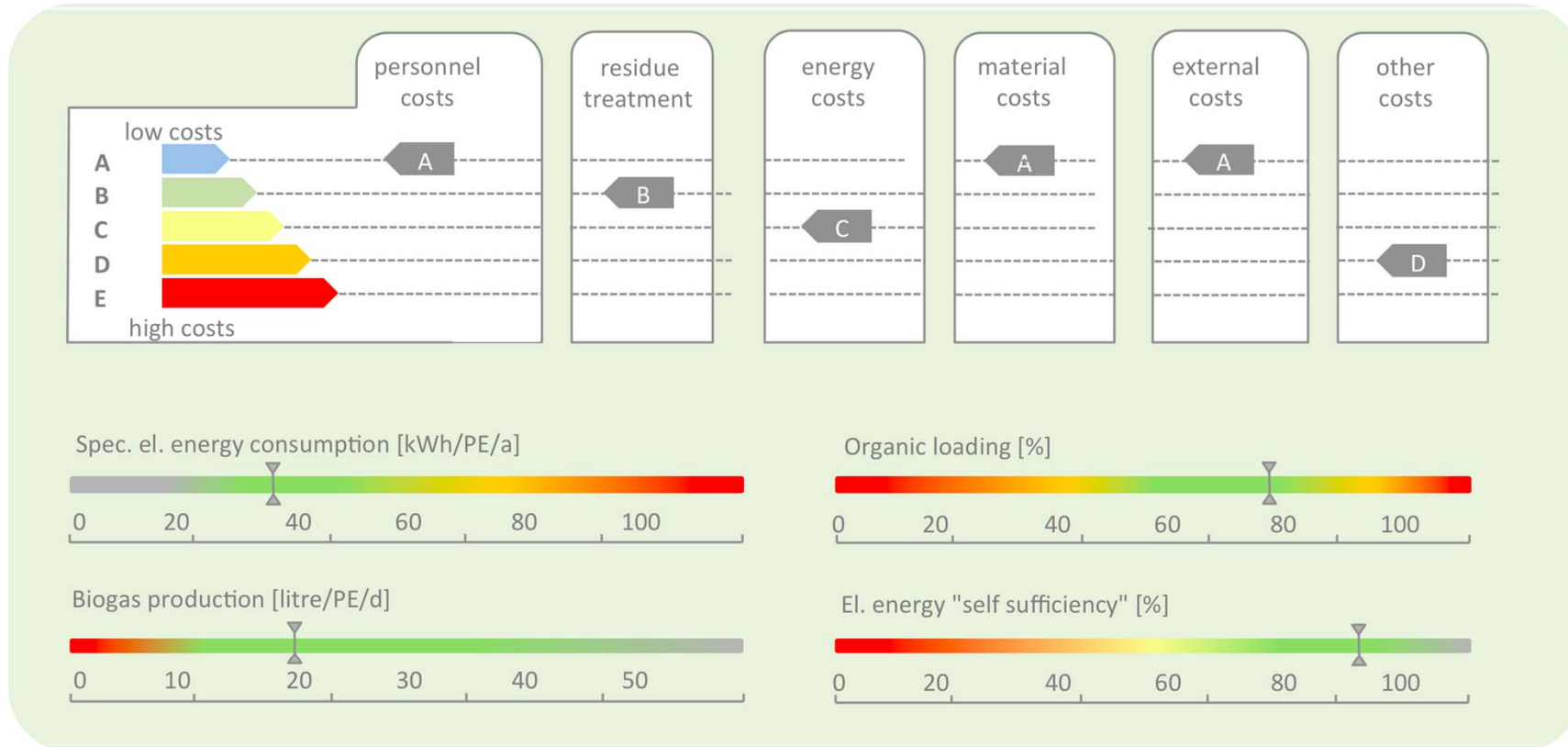
- ➔ being independent of the PIs calculated for the participants of the ongoing benchmarking year
- ➔ larger data set for comparison

Benchmarking curve

total specific operating costs



Quick-check for operating costs



Take home messages

- Benchmarking is an excellent management tool
- Strength of the Austrian Way ➔ one single benchmarking “project” ➔ organised by the OEWAU
- The human factor (education, training & networking) & the capacity utilisation (ratio between design and actual pollution load) ➔ decisive factors for minimum specific operating costs



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