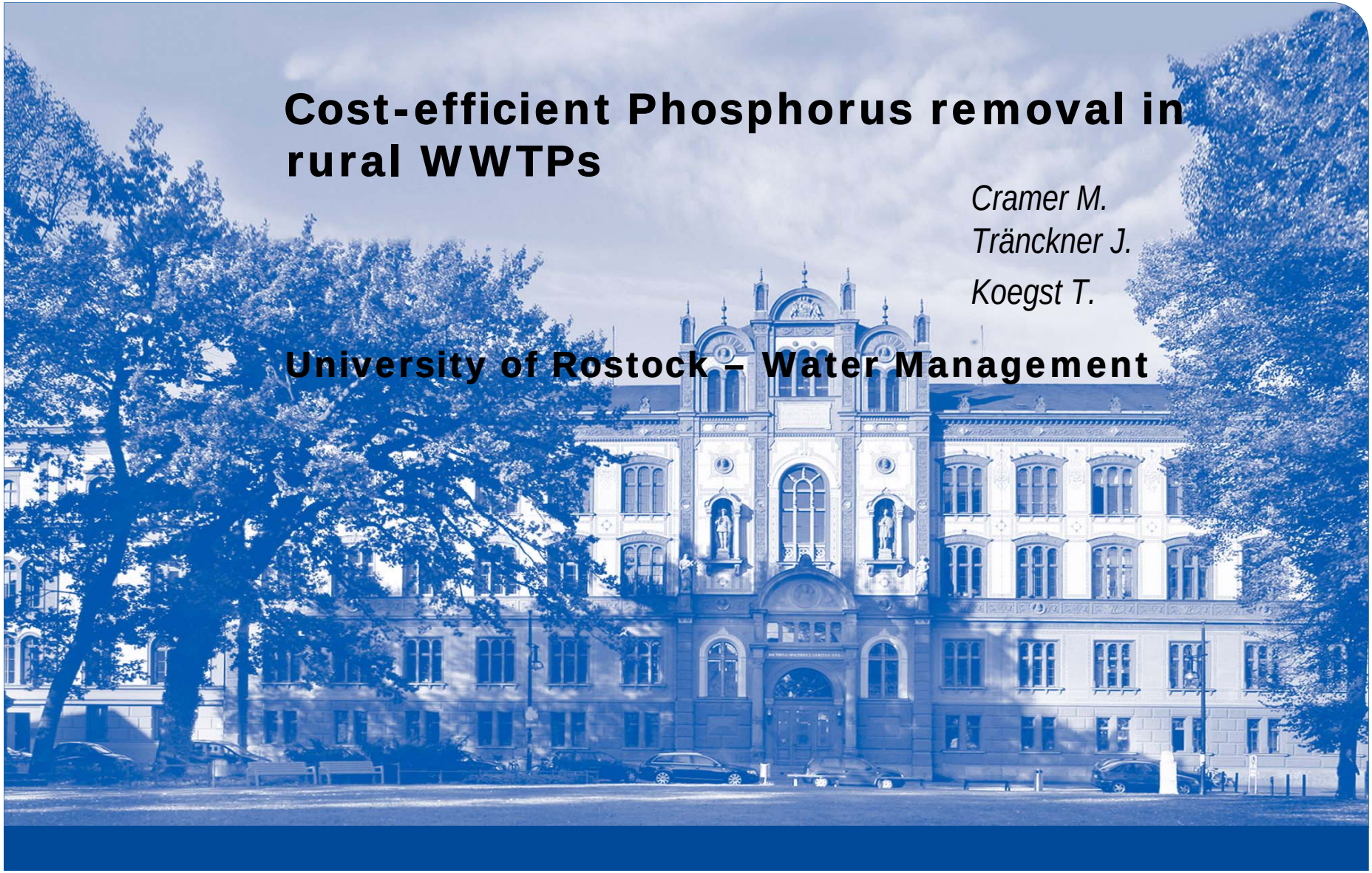
Universität Rostock

Traditio et Innovatio



Cost-efficient Phosphorus removal in rural WWTPs

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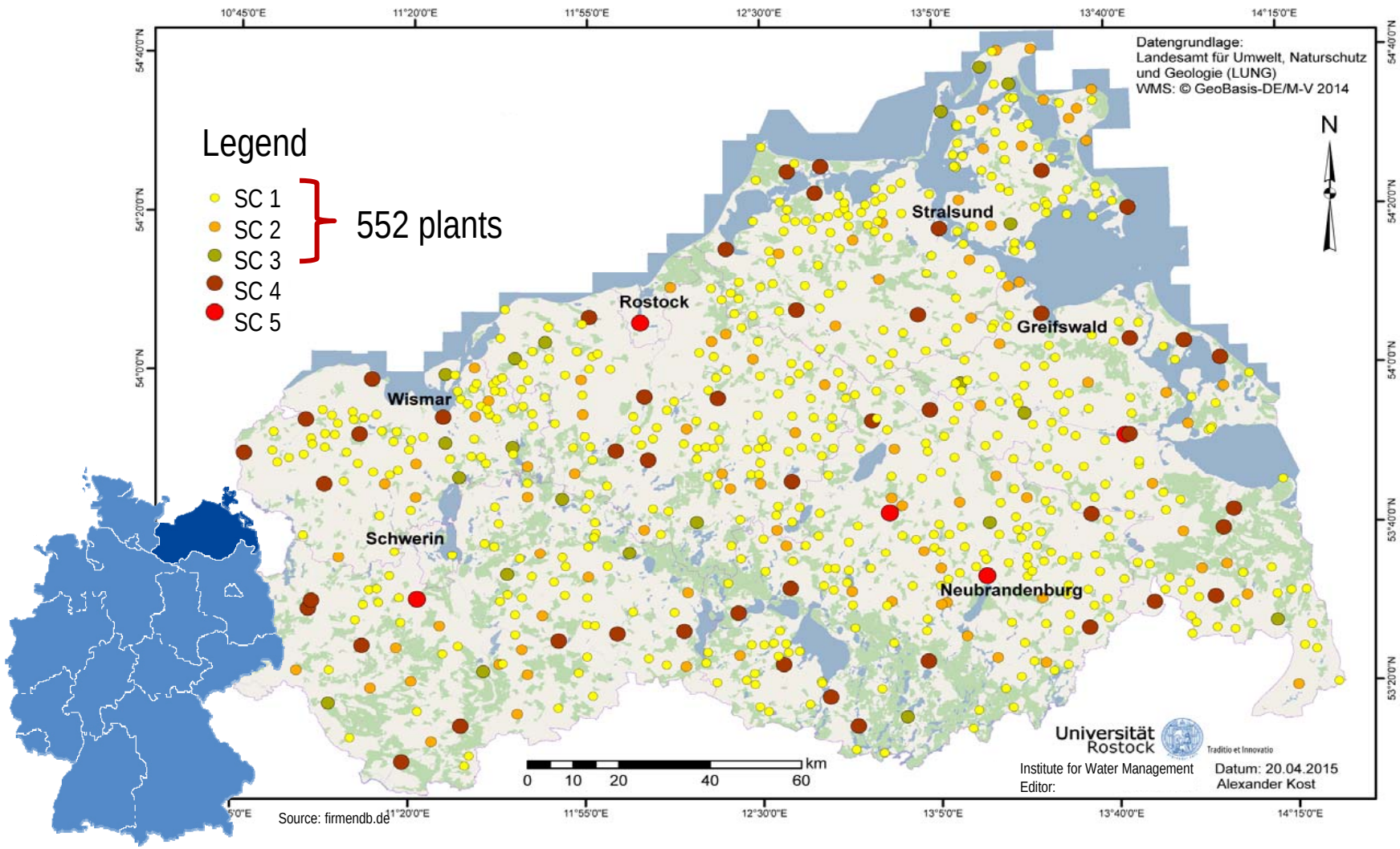
Tränckner J.
Koegst T.

University of Rostock – Water Management


Legend
SC 1
SC 2
SC 3
SC 4
SC 5
552 plants
Datengrundlage:
Landesamt für Umwelt, Naturschutz und Geologie (LUNG)
WMS: © GeoBasis-DE/M-V 2014
N
Stralsund
Rostock
Greifswald
Wismar
Schwerin
Neubrandenburg
km
0 10 20 40 60
Universität Rostock
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Institute for Water Management
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10°45'0"E
11°20'0"E
11°55'0"E
12°30'0"E
13°5'0"E
13°40'0"E
14°15'0"E
54°40'0"N
54°20'0"N
54°0'0"N
53°40'0"N
53°20'0"N

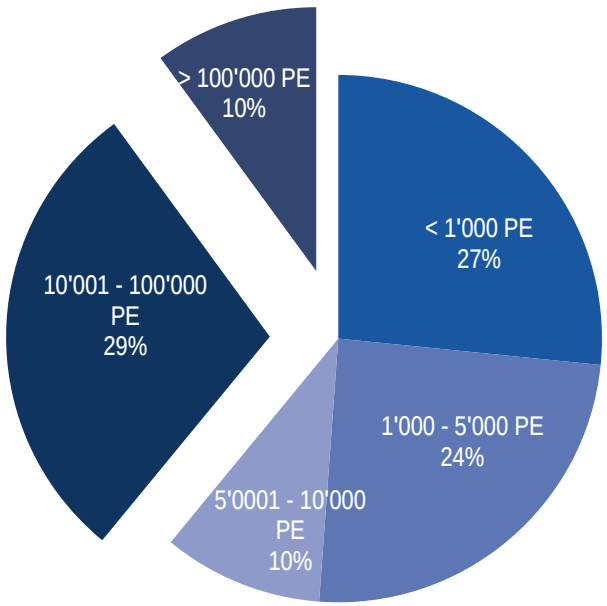
Effluent standards of communal WWTP in Germany

Size class (SC)		COD (mg/L)	BOD_5 (mg/L)	NH_4-N (mg/L)	N* (mg/L)	Total P (mg/L)
1	< 1000 PE < 60 kg BOD_5/d	150	40			
2	< 5.000 PE < 60 kg BOD_5/d	110	25			
3	< 10.000 PE < 600 kg BOD_5/d	90	20	10		
4	< 100.000 PE < 6.000 kg BOD_5/d	90	20	10	18	2
5	> 100.000 PE > 6.000 kg BOD_5/d	75	15	10	13	1

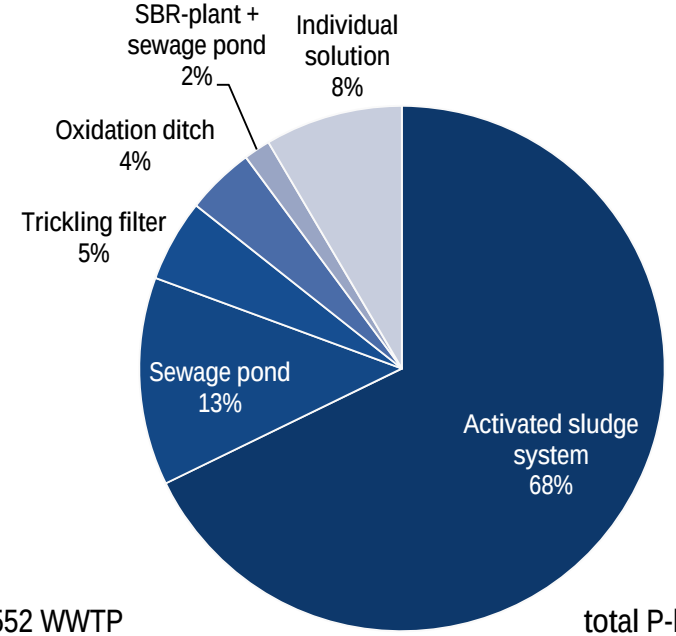
$N^* = NH_4\text{-}N + NO_3\text{-}N + NO_2\text{-}N$

Which technologies are used and how is their performance?

Percentage of P-load divided in size classes



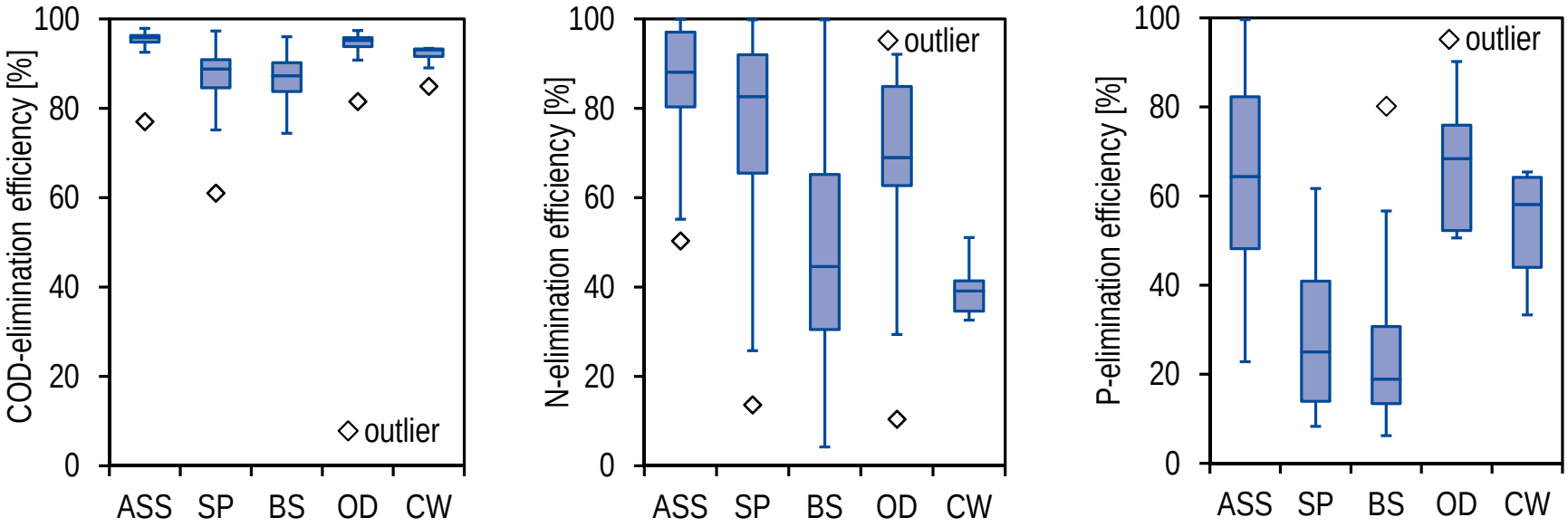
Percentage of P-load in the range of size class 1 to 3



n = 552 WWTP

total P-load= 62.58 t

Which technologies are used and how is their performance?



ASS – Activated Sludge System
SP – Sewage Pond
BS – Biofilm System
OD – Oxidation Ditch
CW – Constructed Wetlands

Key questions

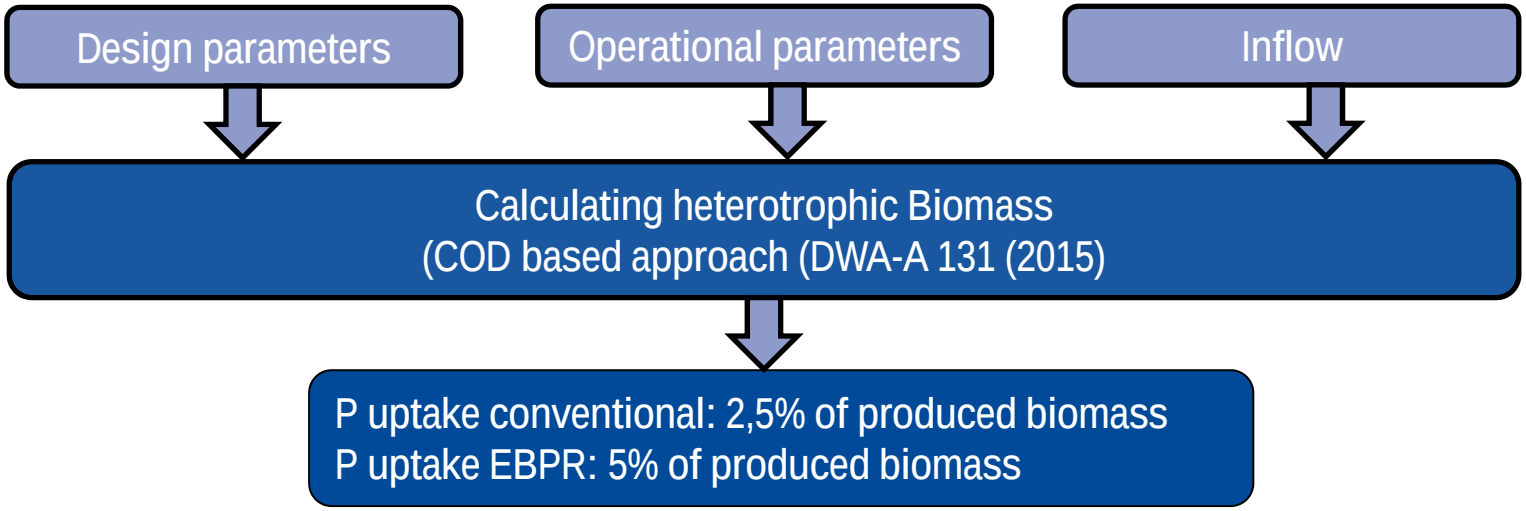
1. potential P-removal efficiency of a specific plant?

2. Operational reasons for plants with low efficiency?

3. Plants without significant potential of improvement?
   → alternative solutions?

Model for activated sludge systems

- Applicable for standard activated sludge plants, SBR systems and oxidation ditches
- General approach: P removal without precipitation only by biomass growth
  → maximation of biomass yield
  → increase of P incorporation into biomass
  (Enhanced biological P-removal)



How is the removal efficiency influenced by the SRT?