



**P-REX**

# Data quality and implications for P governance - from speculation to knowledge -

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PHOSPHORUS RECYCLING  
FROM PROTOTYPE TO MARKET

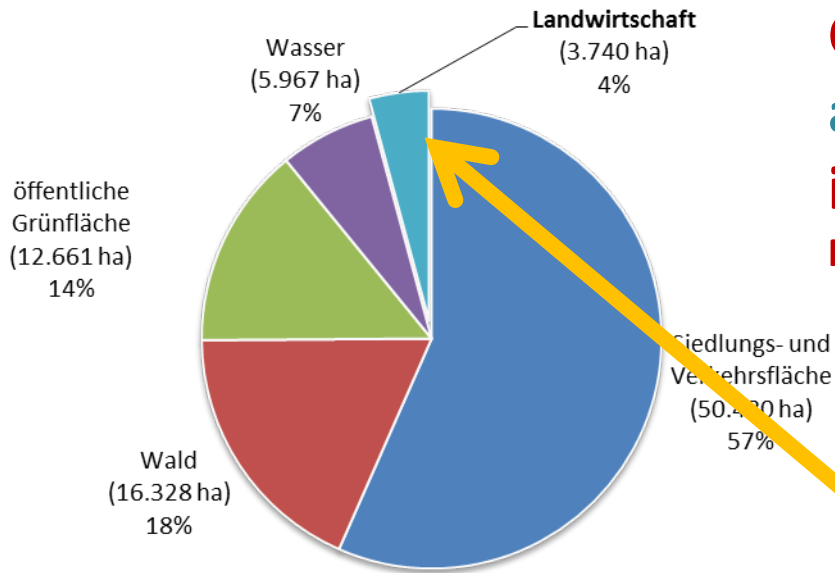


**KOMPETENZZENTRUM**  
WasserBerlin

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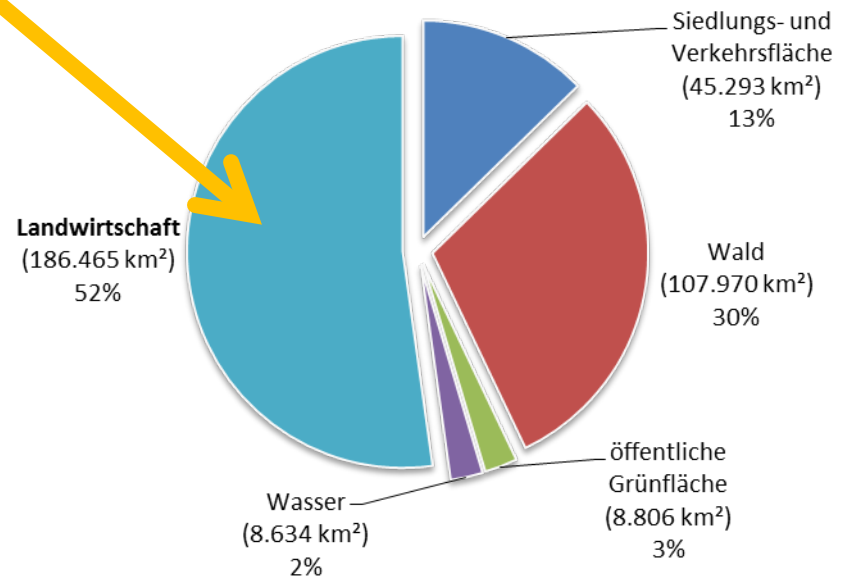
- Never blindly trust statistics you have not calculated yourself (Common saying!)
- Continental and national averages are rather useless for effective implementation of recycling strategies! -> Regional/local level is a MUST due to structural diversity!
- Normalized data / ratios can be misleading, absolute data/figures have to be preferred
- Official Statistics not necessarily reflect reality, often just estimates or assumptions -> direct contact to owners of material flows the only way for the real picture ...
- Data reliability and consistence for sludge is low (sludge only by compiling different sources) (Eurostat, national offices, direct contacts, but inhomogenous definitions, units)
- Waste monitoring focused on pollutants, not on valuable ingredients (like nutrients)
- And when „monitored“, different factors for nutrients applied (esp. for manure!!!)
- Concentrations/loads mainly limited to total content, not species
- Data quite isolated to legislative domains ... not along value chains (waste, agriculture ...)
- Imports and actual consumption (esp. human food consumption) hardly distinguished

Berlin 89.176 ha



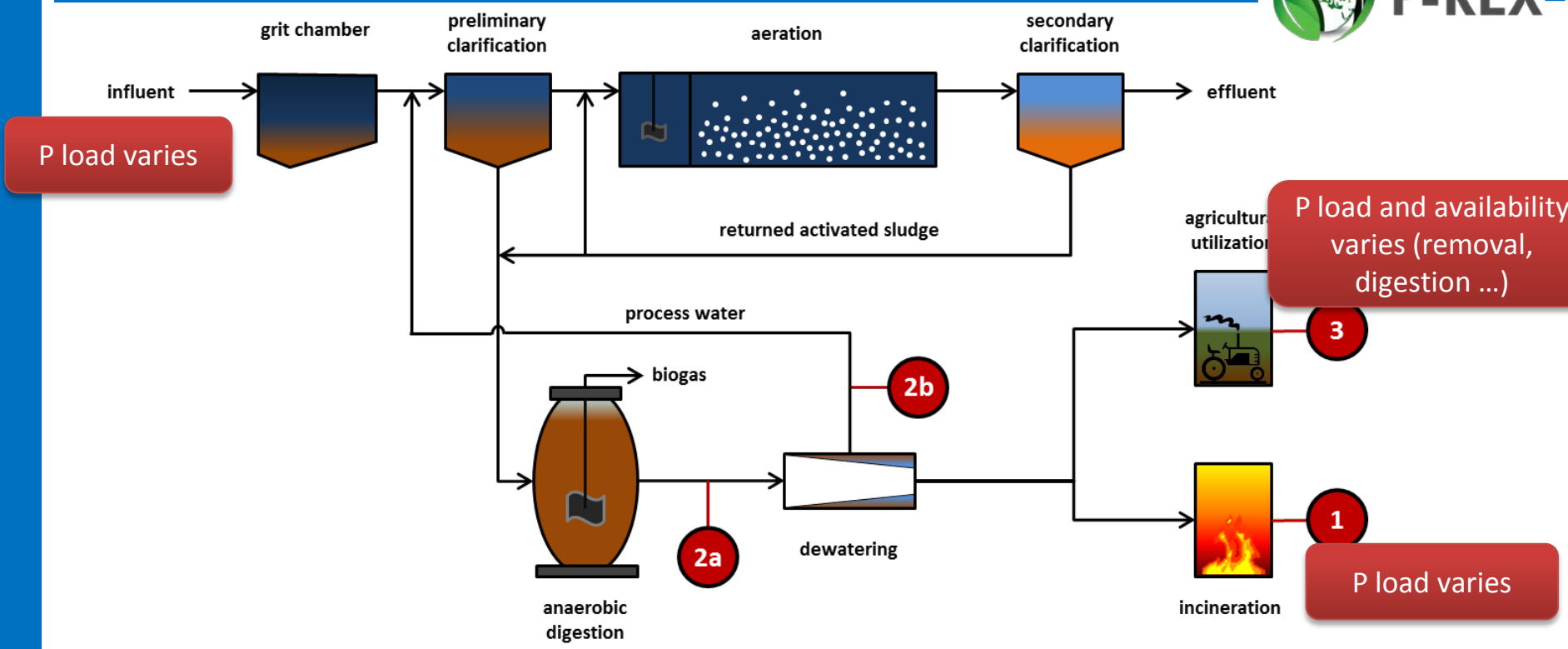
**Compared to national average, agriculture does not play an important role in Berlin!**  
**Not a relevant market for fertilizers!**

Germany 357.169 km<sup>2</sup>

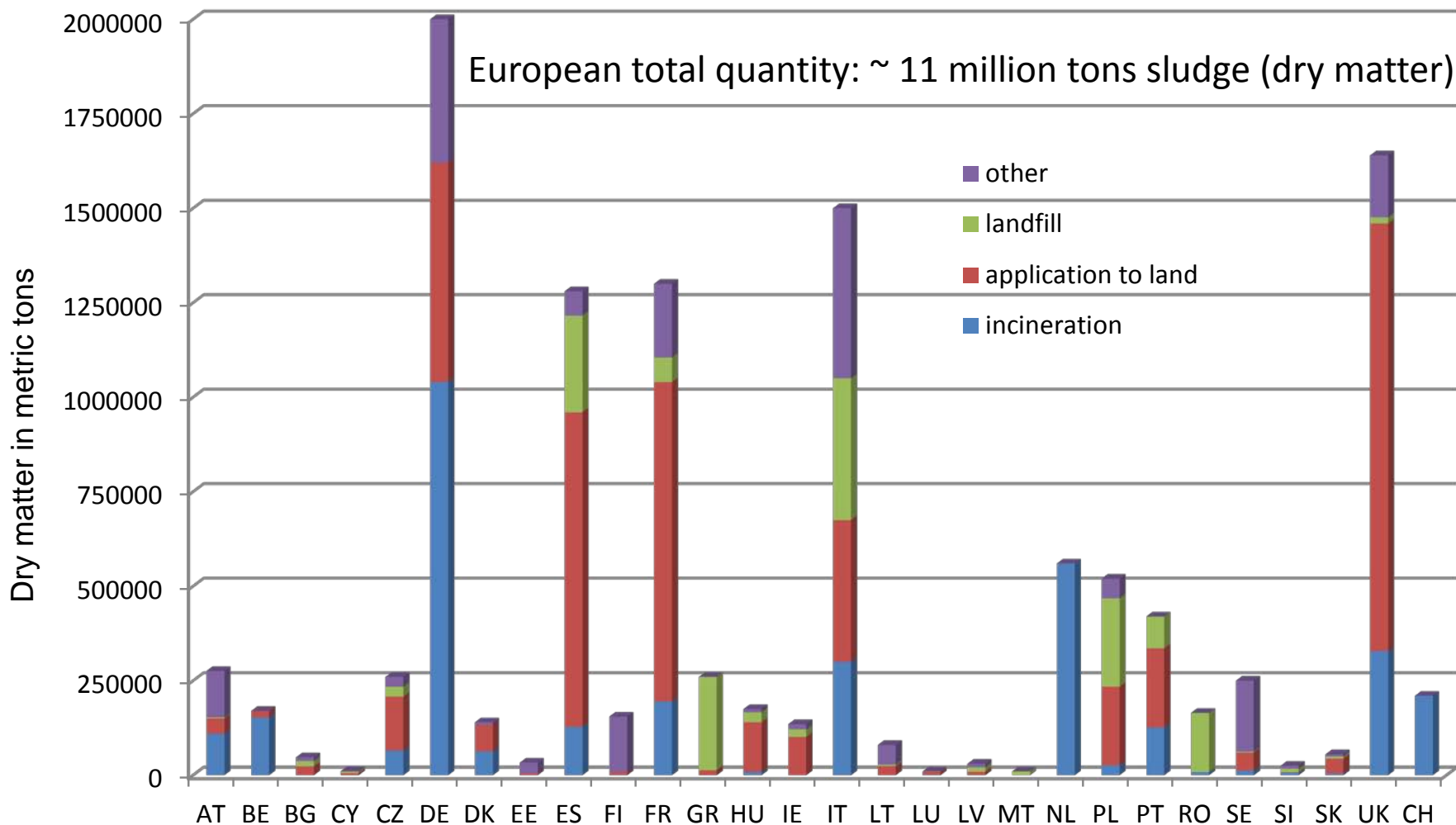


Source: DESTATIS 2013

# Limited data availability for internal mass balances



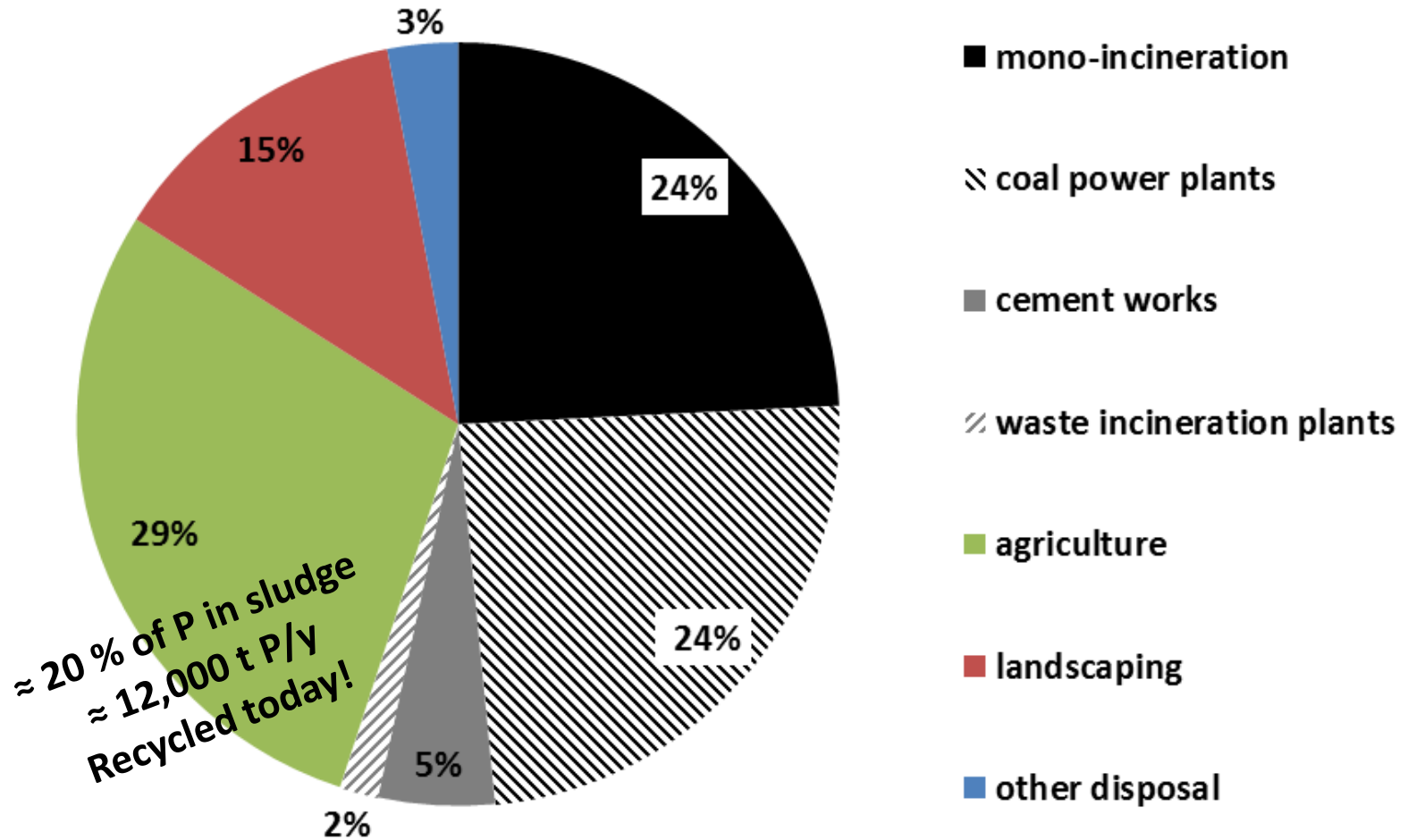
- 1 ash after incineration
- 2a undrained sludge after anaerobic digestion
- 2b sludge liquor after dewatering
- 3 direct agricultural utilisation of dewatered sludge



- Only absolute quantities reveal relevance
- Importance of harmonized definition of categories (i.e. what is OTHER???)



Total sludge quantity in Germany (2013): 1846 kt DS/y



According to Destatis 2013, Lehrmann 2011

# P potential in Berlin's wastewater stream

Total P load (influent) treated by BWB: 2.841 Mg P

from Berlin  
2.452 Mg P

86 %

14 %

from Brandenburg  
389 Mg P

6 WWTPs  
2.841 Mg P

fractions:

Human excreta	2.116 Mg P
Detergents	369 Mg P
Indirect discharge	356 Mg P

3,2 %

Loss to surface water  
90 Mg P

1,4 %

Struvite  
40 Mg P

95.4 %

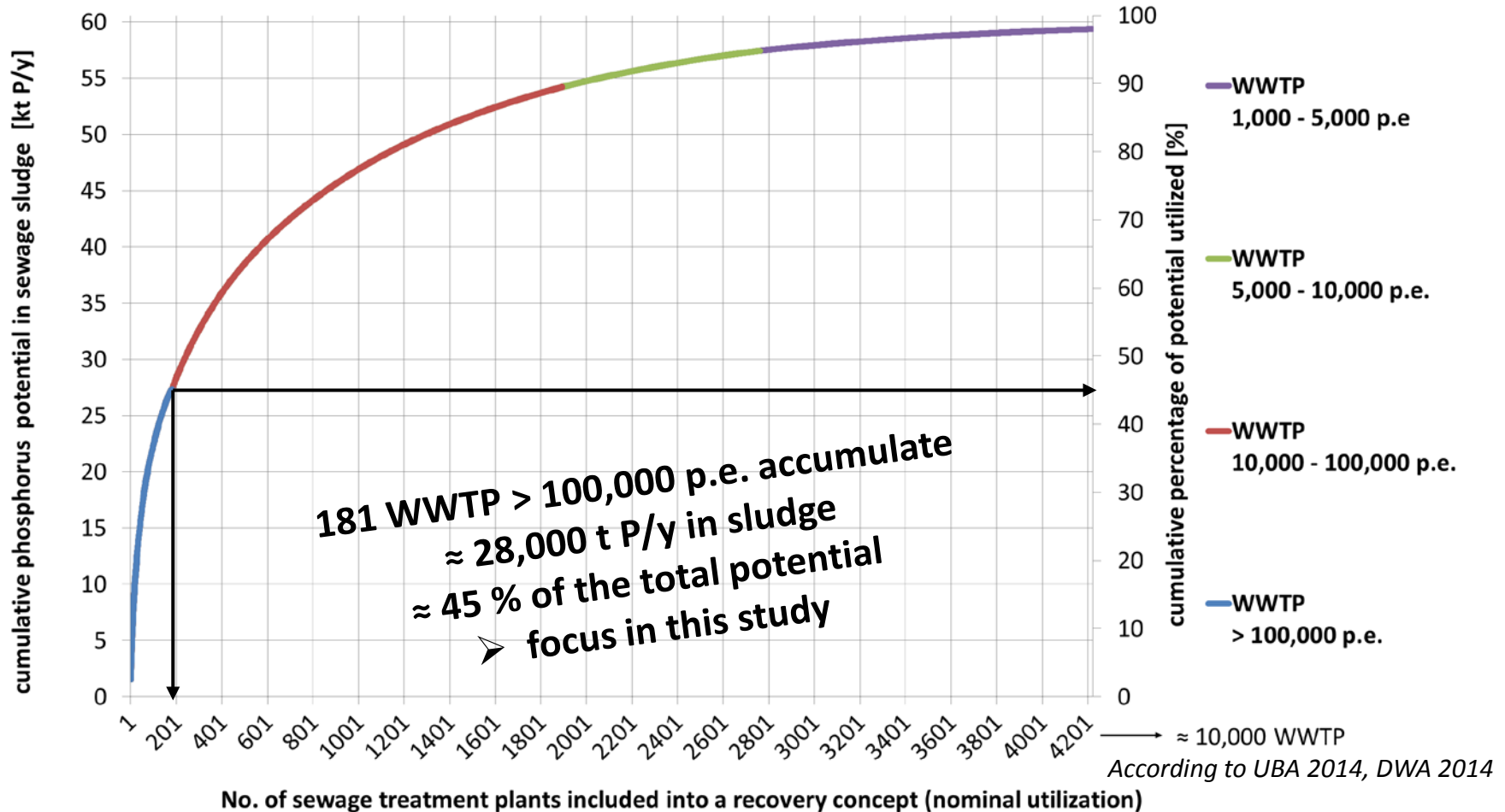
Sewage sludge  
2.711 Mg P



Kabbe, Bäger and Mancke 2014



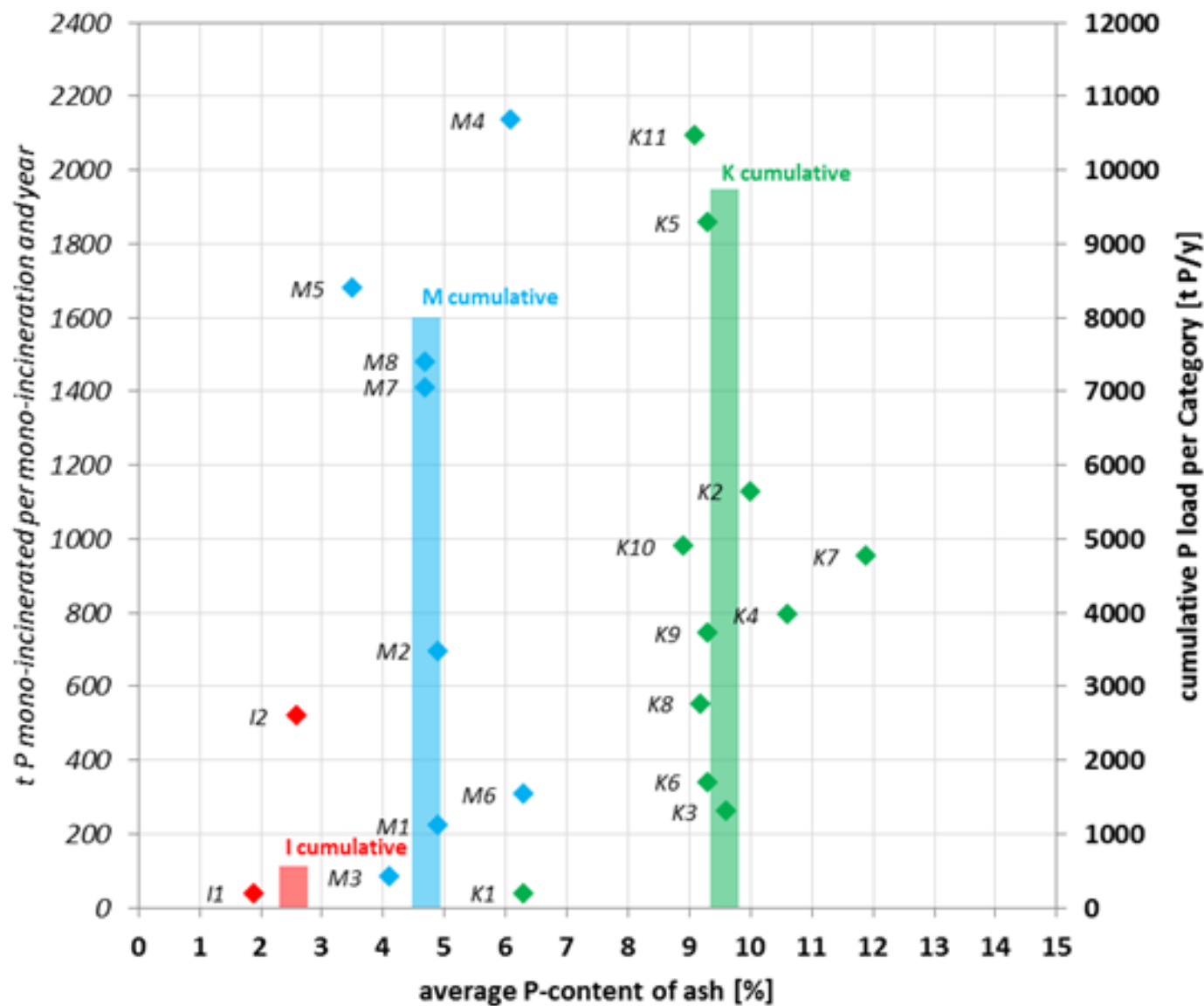
- P removal and sludge treatment depending on WWTP size (discharge limits, digestion)



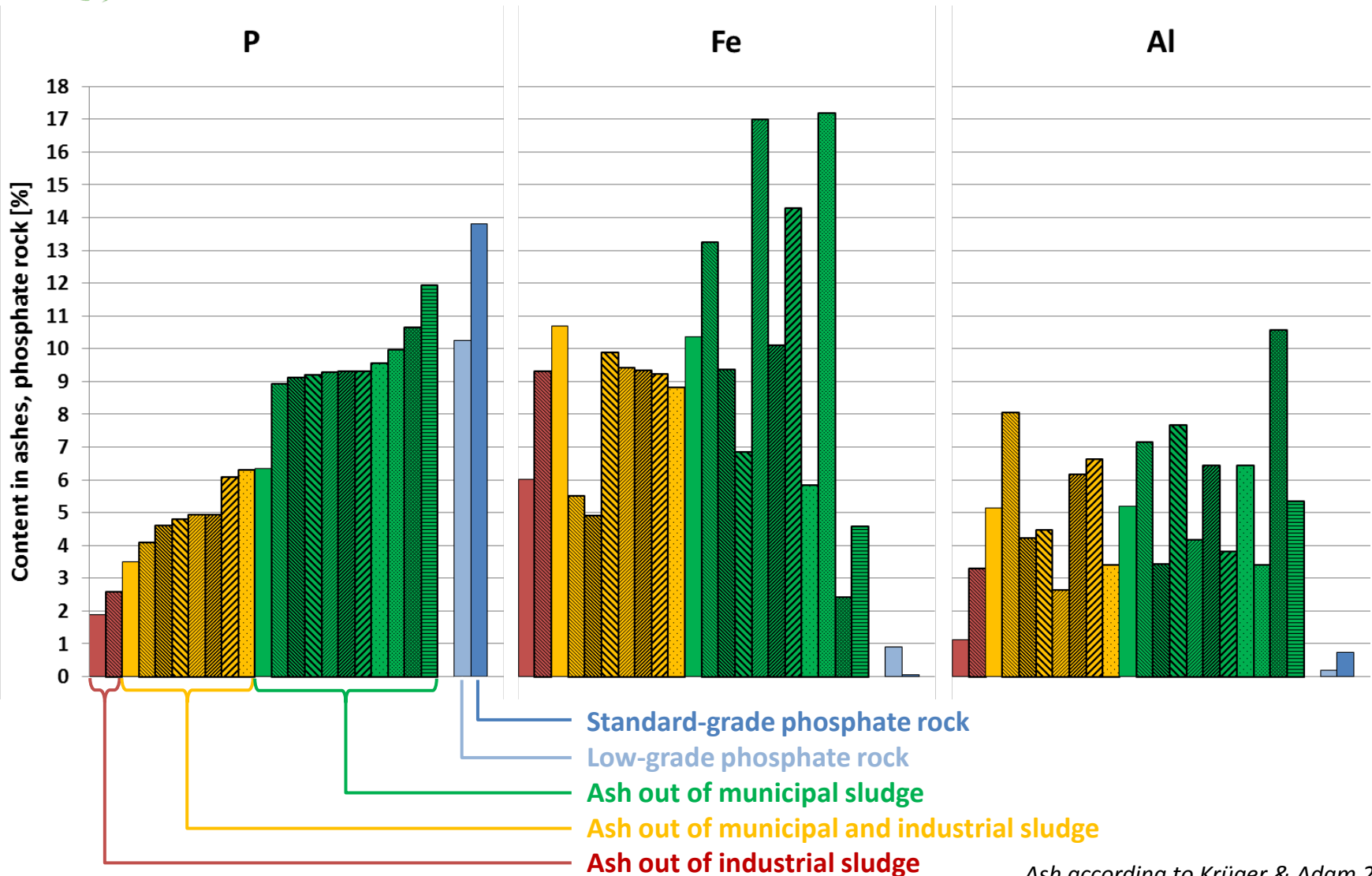
- Therefore different P conc. in sludge



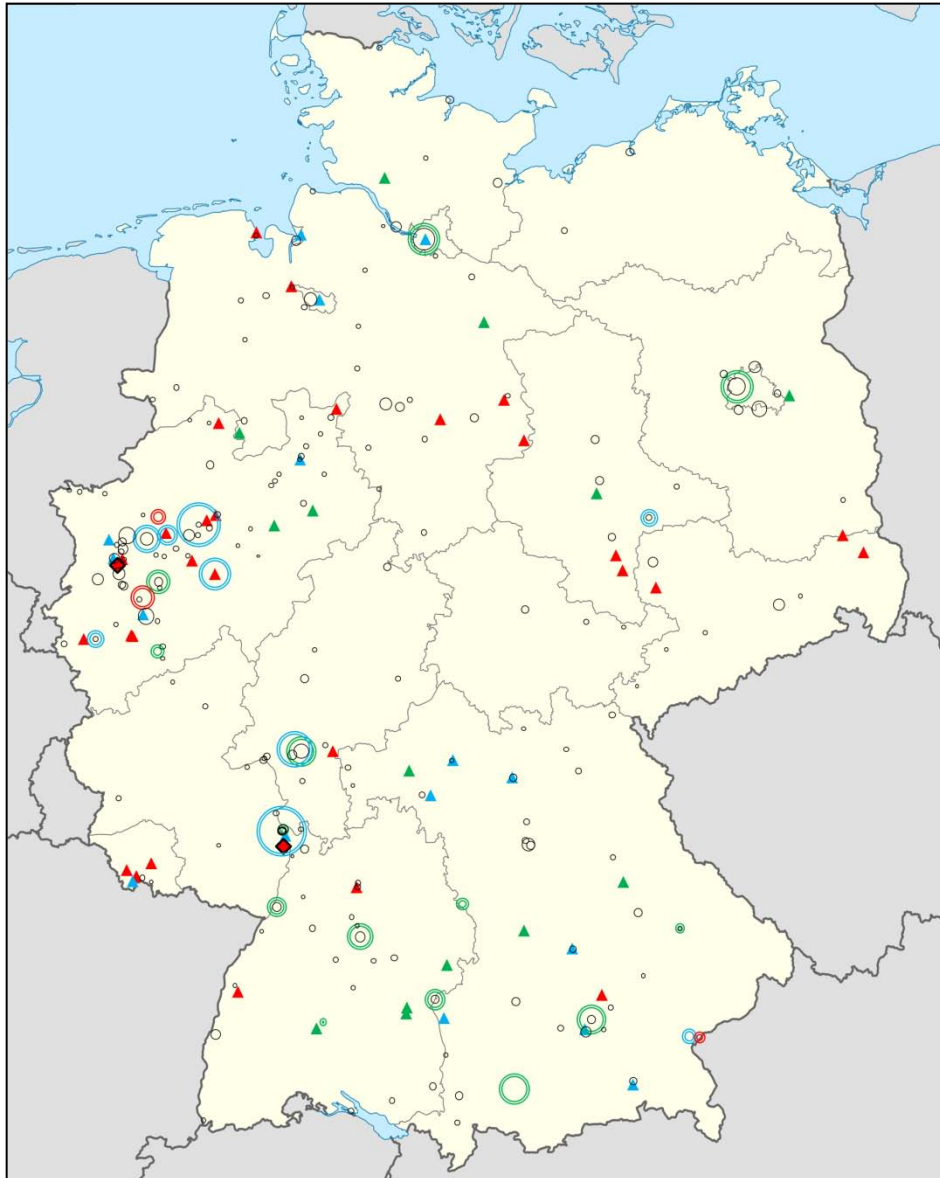
# P content in German „mono“-incineration ashes



Source: according to Krüger & Adam 2014,



Ash according to Krüger & Adam 2014,  
Phosphate rock according to EcoPhos 2015, ICL 2015



- mono-incineration (municipal sludge)
- mono-incineration (municipal/industrial sludge)
- mono-incineration (industrial sludge)

○ WWTP > 100000 p.e.

- ▲ co-inc. in coal power plants
- ▲ co-inc. in cement works
- ▲ co-inc. in municipal waste incineration plants
- ◆ phosphorus fertilizer industry

Phosphorus load of WWTP > 100000 p.e.;

Capacity of mono-incineration

- 50 t P/y;  $\approx$  1.100 t DS/y ○
- 100 t P/y;  $\approx$  2.300 t DS/y ○
- 200 t P/y;  $\approx$  4.500 t DS/y ○
- 500 t P/y;  $\approx$  11.000 t DS/y ○
- 1.000 t P/y;  $\approx$  23.000 t DS/y ○
- 2.000 t P/y;  $\approx$  45.000 t DS/y ○
- 5.000 t P/y;  $\approx$  114.000 t DS/y ○

*Mono-incineration according to Krüger & Adam 2014,  
Co-incinerations according to Jasper & Kappa 2012,  
Fertilizer Industry according to IVA 2014*

- What official stats are based on real monitoring?
- Who is cross-checking reported data? Is there any Quality Assurance???
- How can we create traceability of published data? **No trace, no trust !!!**
- Who will have to pay for reliable monitoring? (like the German ash monitoring)
- Who is responsible to define and harmonize categories/parameters?
- Who can engage higher monitoring and/or reporting frequency as needed?  
Sludge reports from MS to EUROSTAT only every 3 years!?!  
But data are there anyway for annual reporting!!!

### ***Today we just guess!***

- What you see is just your best guess what is out front. (*Ames*)

### ***Tomorrow, we have to be sure!***

Thank you ...



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**Wisdom just written on paper will once be ash;  
Only the wisdom applied will shape our future!**

*Guess who* 🤔



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