BORDA

University of KwaZulu-Natal
Pollution Research Group

TECHNISCHE UNIVERSITÄT DRESDEN

Monitoring Results of 108 DEWATS in Indonesia

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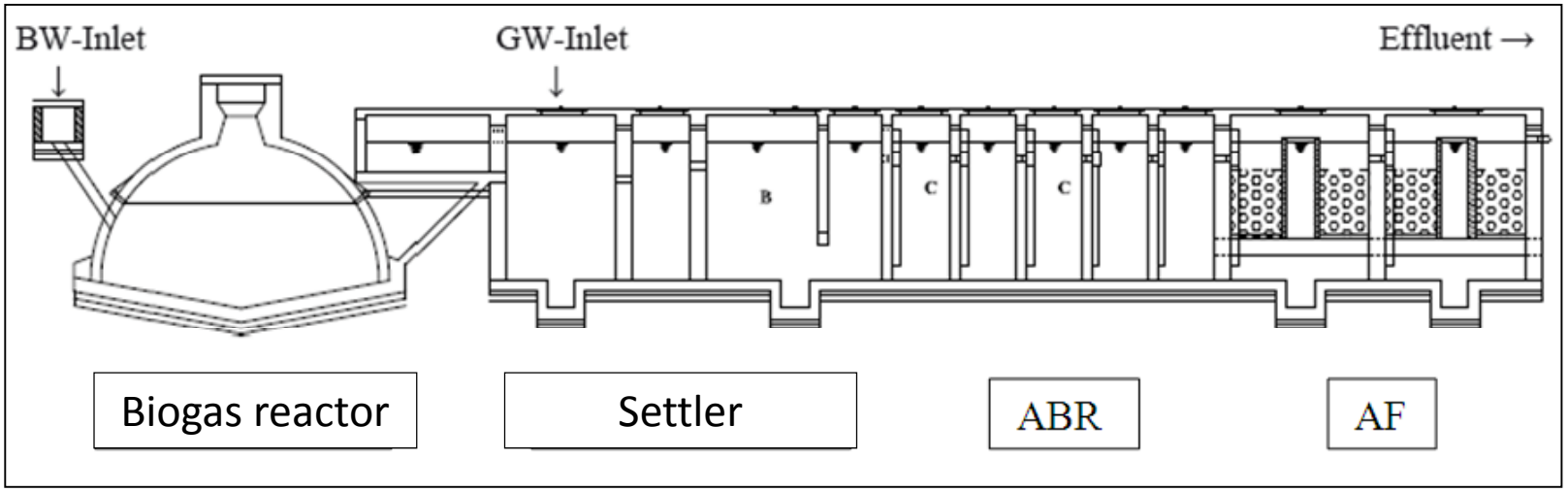
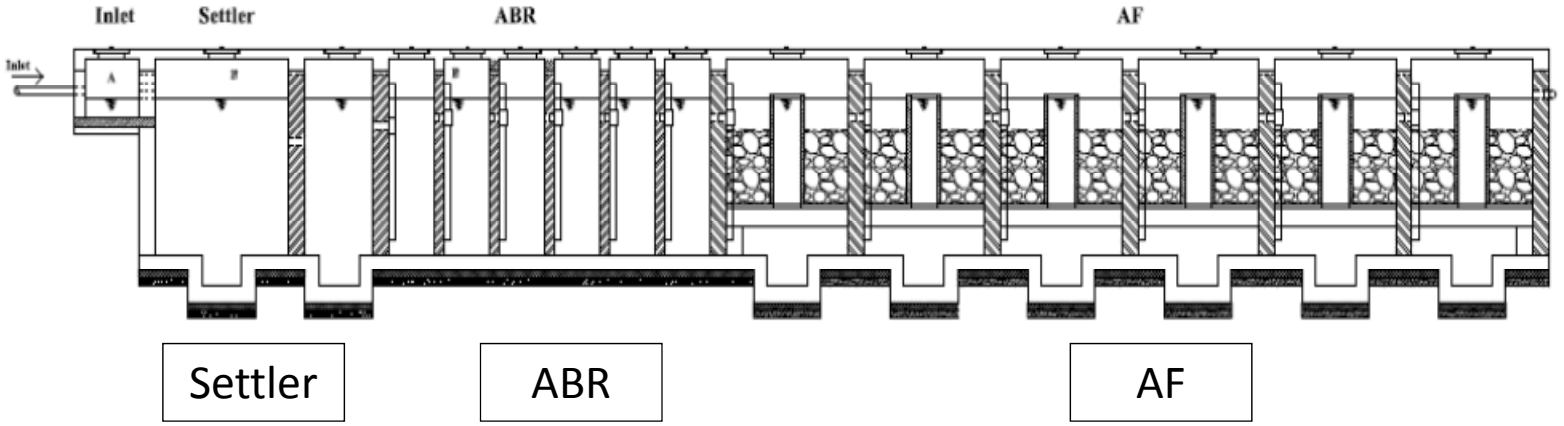
Co-authors: CA Buckley, P Krebs

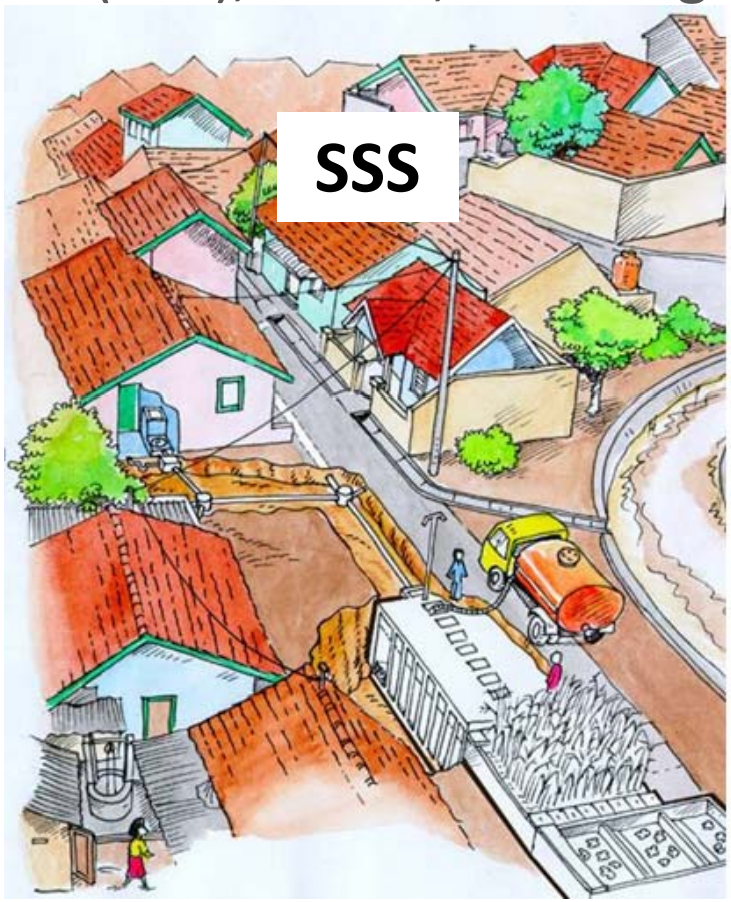
Typical BORDA DEWATS design in Indonesia





Visited communal BORDA DEWATS types

Small Sewage Systems (SSS), Community Sanitation Centres (CSC), Mixed, Boarding-Schools



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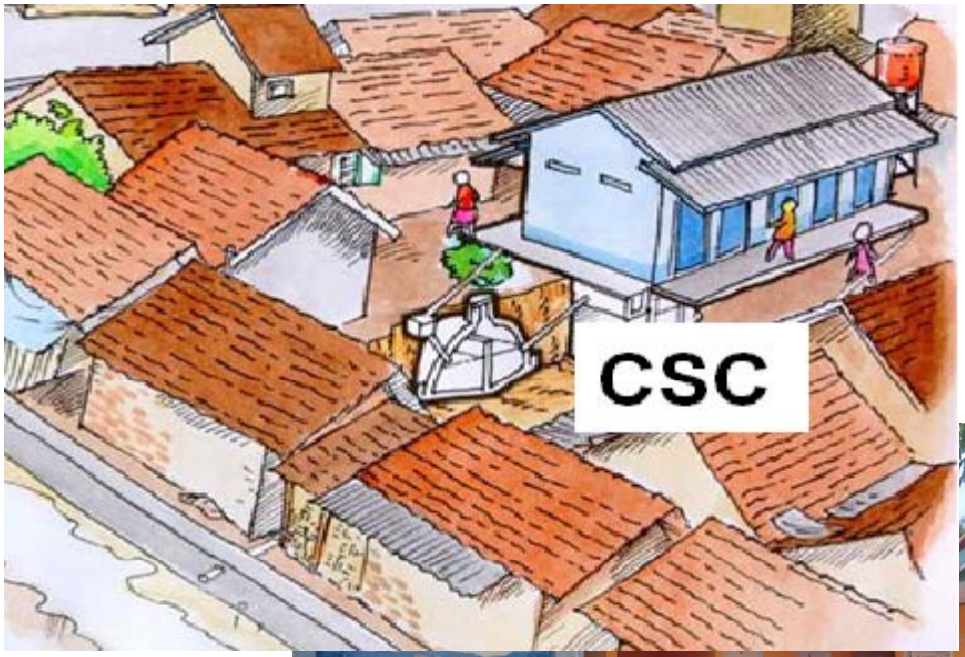

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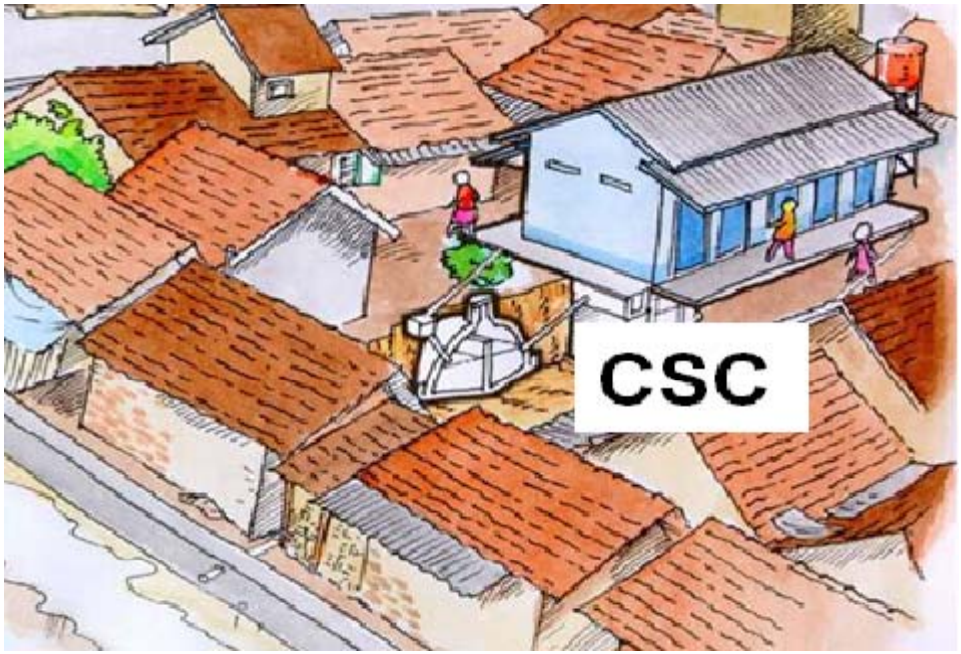

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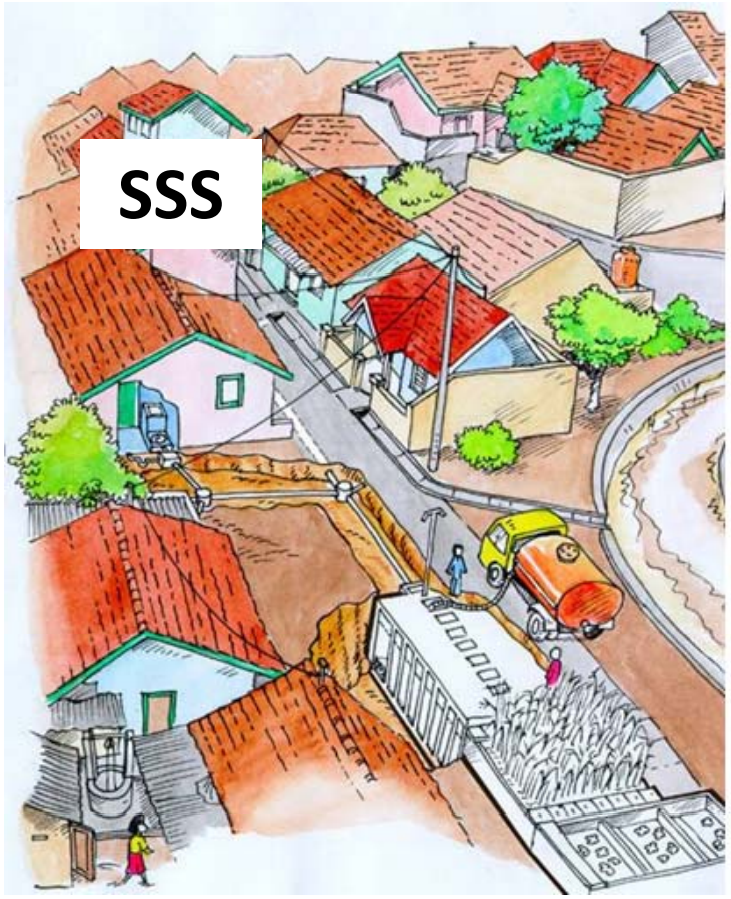

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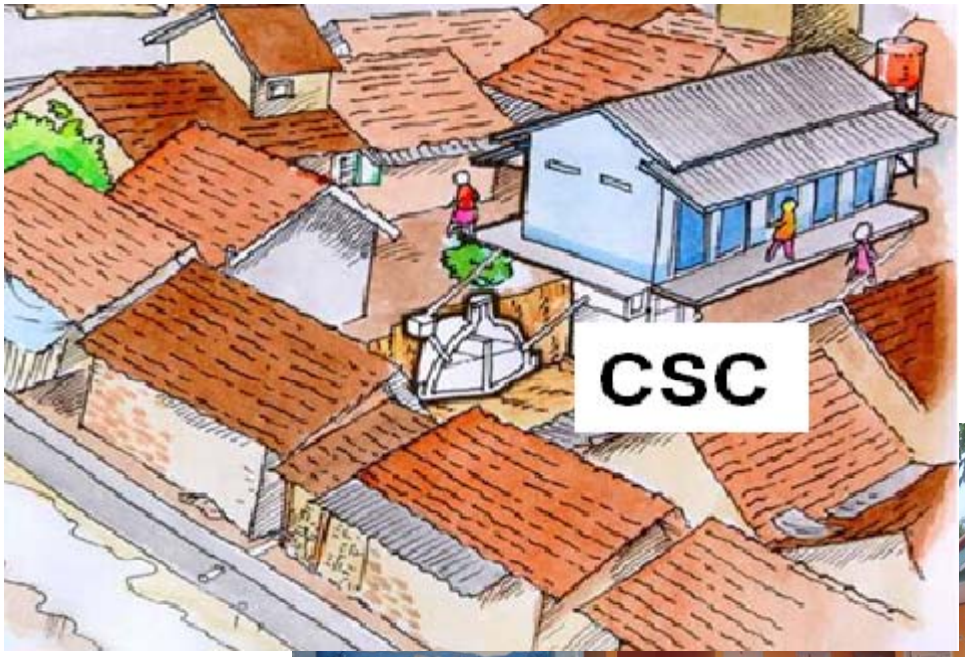


Communal BORDA DEWATS types

Small Sewage Systems (SSS), **Community Sanitation Centres (CSC)**, Mixed, Boarding-Schools

DEWATS plants are ...

... intrinsically exposed (to varying and strongly diverse operation conditions)

... quite unexplained (relatively young history of implementation, little available literature/research → design has to rely on a number of assumptions)

The survey on which this paper is based

- Conducted from Sept. - Nov. 2011
- Random selection of 323 communal plants, of which 2/3 implemented by BORDA network, 1/3 implemented through Local Government
- Information was gathered on social factors, operation and maintenance and technical observations during once-off field-visits and community meetings

→ This paper presents data of 108 of those (BORDA) plants for which effluent concentration measurements were done

Research-Questions

How tolerant is the general DEWATS treatment to external factors?

Are DEWATS effluent concentrations generally complying to national effluent standards?

What can we learn about the general relationship between loading and treatment of anaerobic BORDA DEWATS?

Investigated treatment influencing factors

Design details

- Location
- System type
- System set-up
- Inclusion of BGD in the design
- Implementation date

Feed characteristics

- Exposure to storm-water
- Rain 24 h before sampling
- Salinity of fresh-water
- General water scarcity
- Grey water exclusion in the case of CSCs

Applied O&M practices

- Existence of a CBO
- Existence of an operator
- Use of biogas
- Desludging
- Descumming
- O&M training of the operator
- O&M training of the users

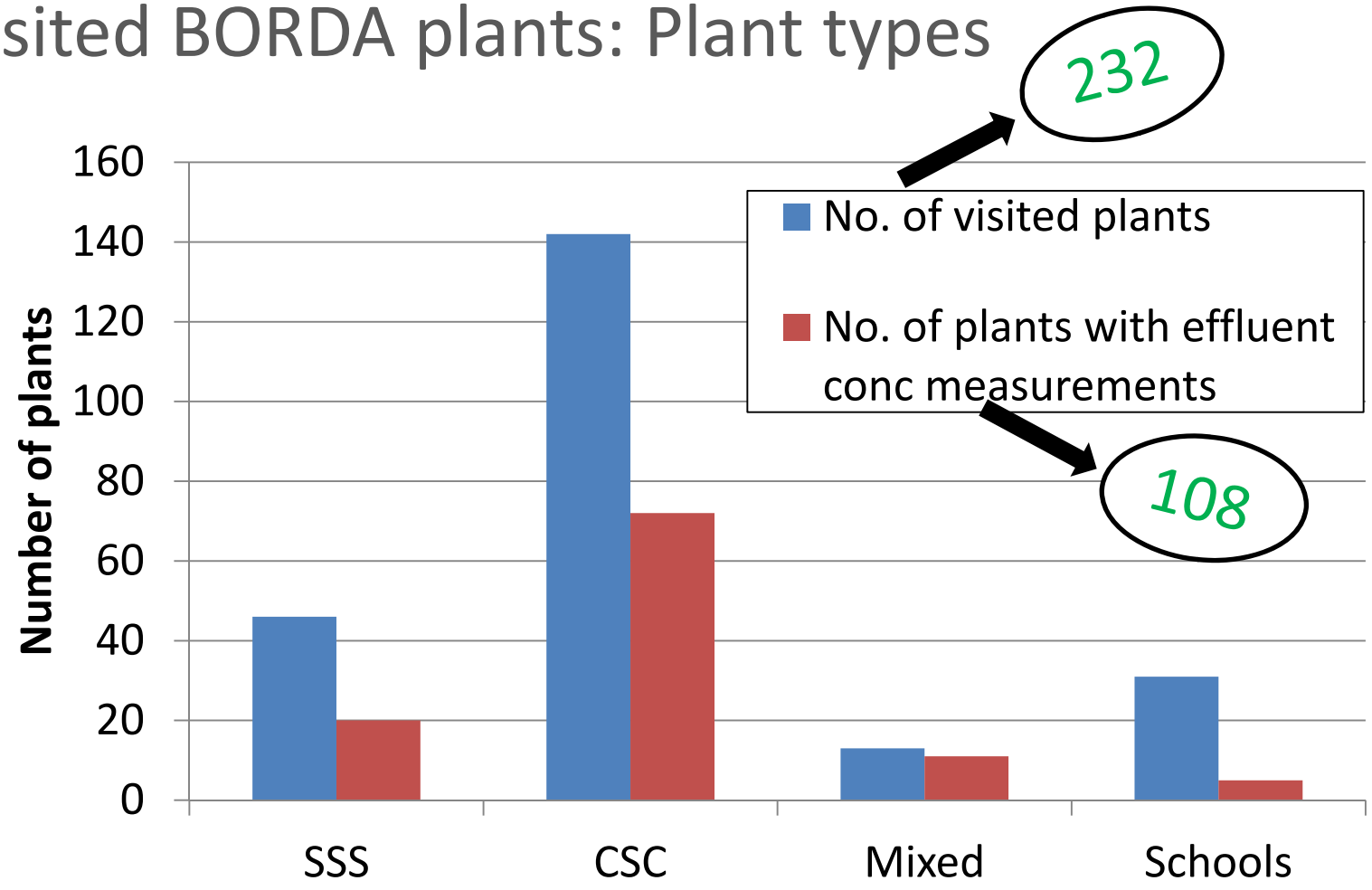
Treatment-Indicator

→ COD effluent concentrations, once off grab-sample, 15% long term variation (variation measured perviously)

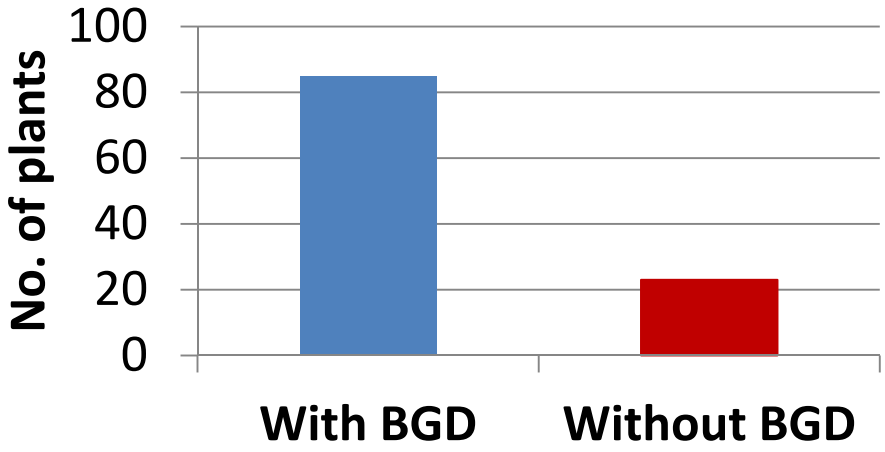
Loading-Indicator

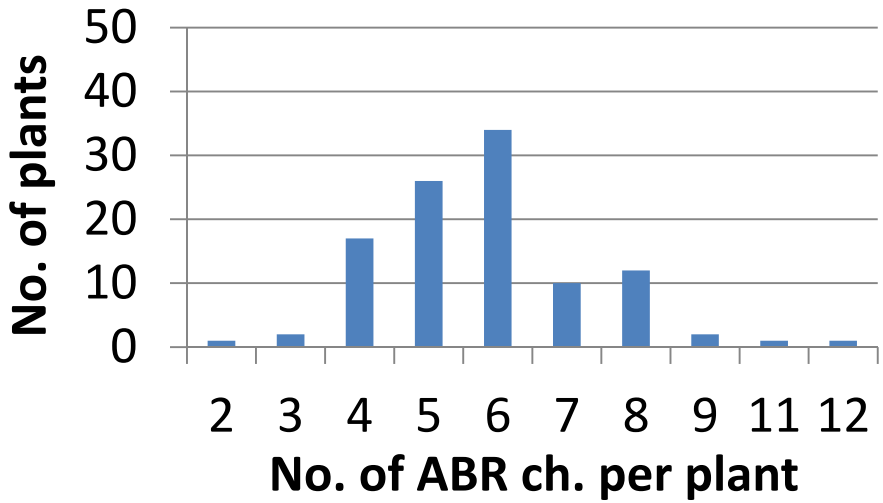
→ Number of connected people per total reactor volume (assuming that same reactor volume of different reactor types are comparable), 20% uncertainty (estimated)

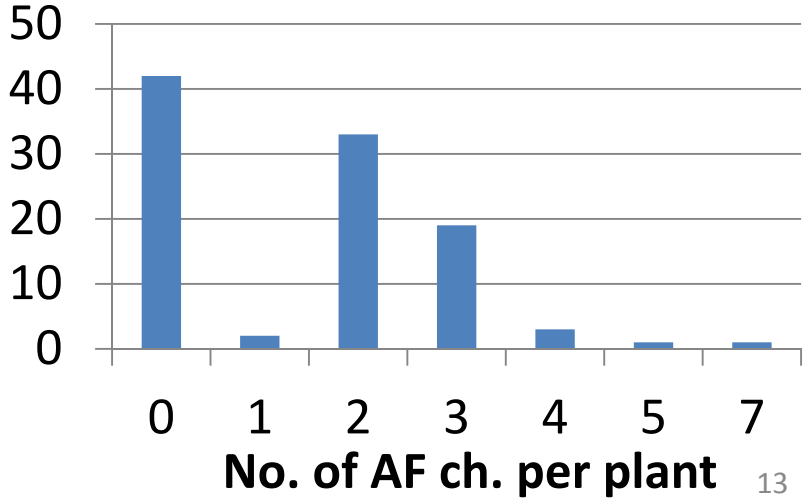
Visited BORDA plants: Plant types



Visited plants: Set-up







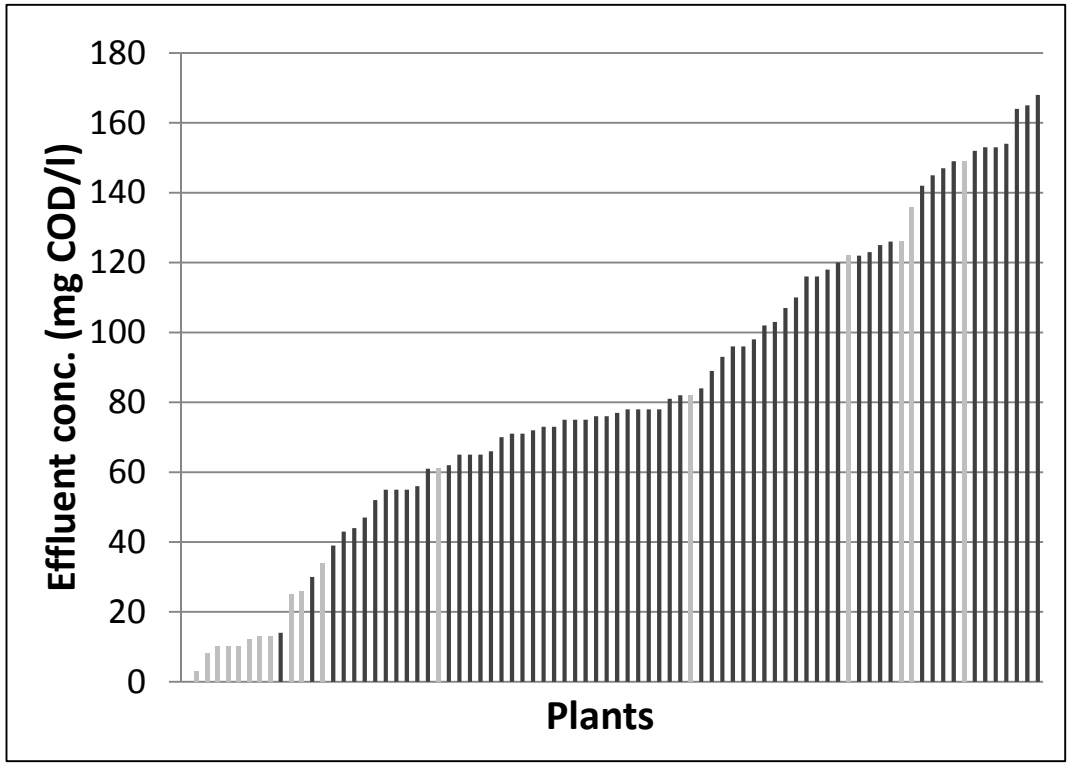
Visited plants: Locations

Most plants designed for 200 – 400 people, reactor size of 40 – 90 m³

Q1: How tolerant is the general DEWATS treatment to external factors?

- Rain water intrusion influenced effluent concentration

- All SSS plants and some CSC showed signs of rainwater intrusion



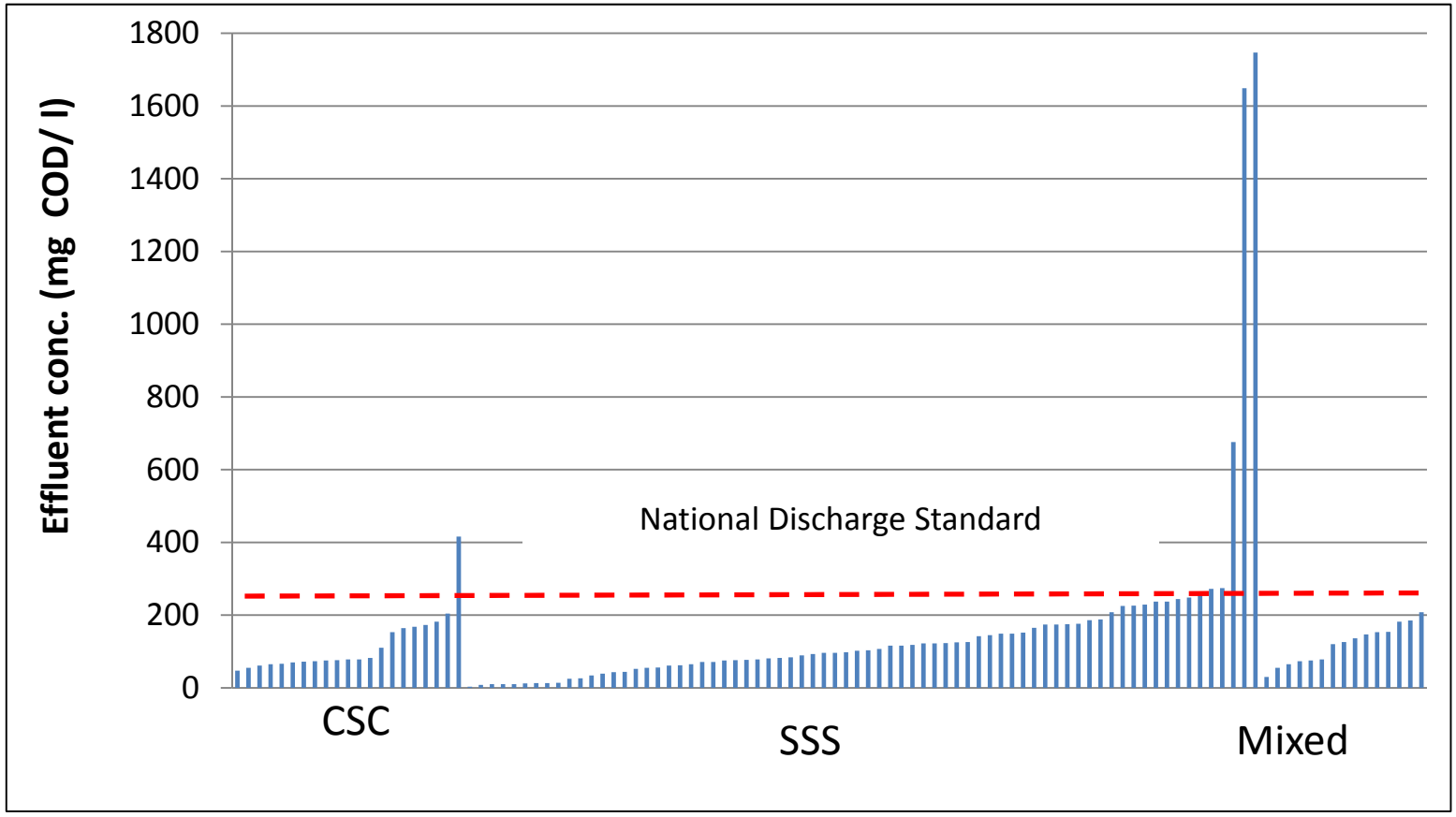
Q1: How tolerant is the general DEWATS treatment to external factors?

- Rain water intrusion influenced effluent concentration

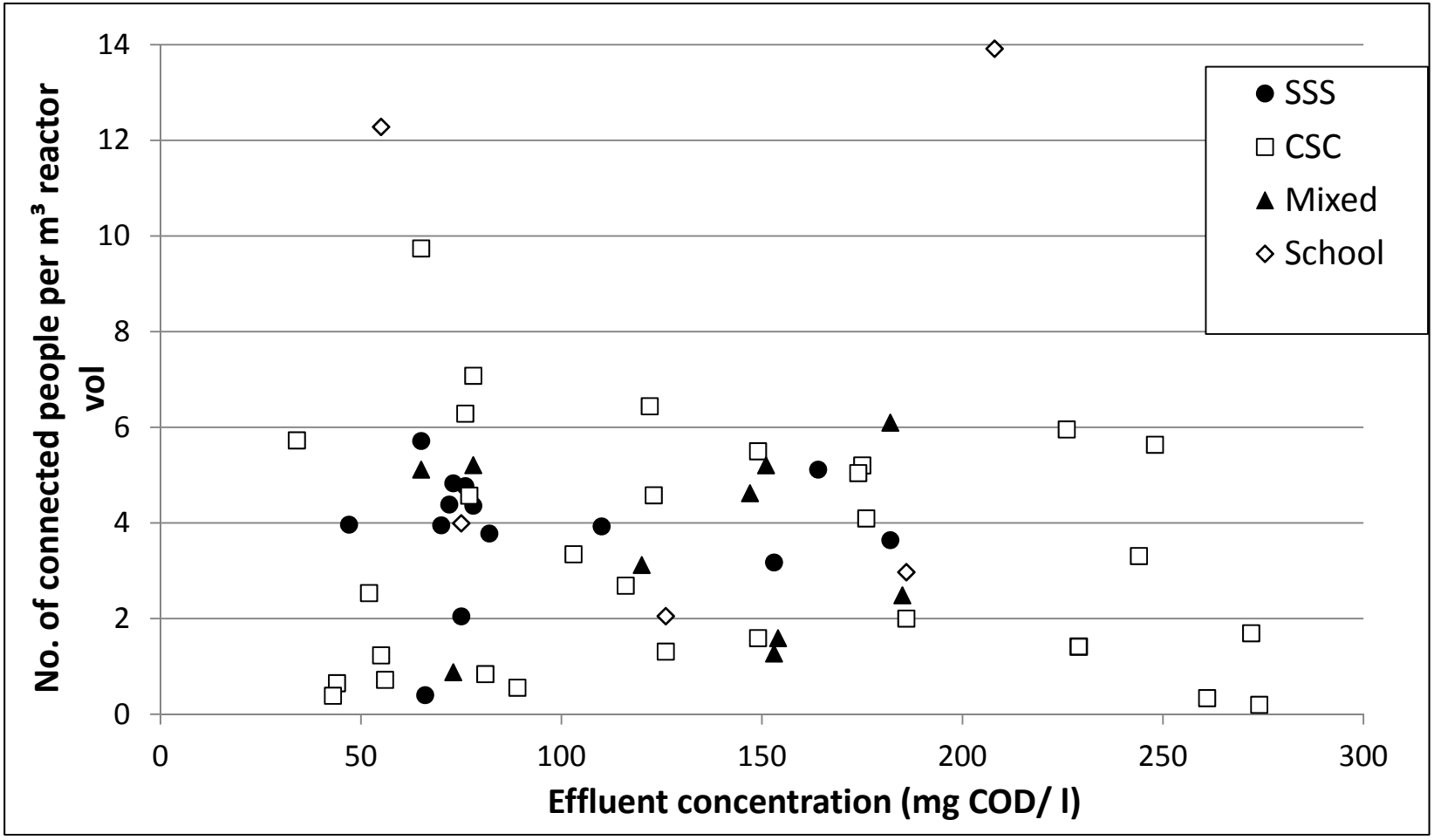
- All SSS plants and some CSC showed signs of rainwater intrusion

None of the other considered factors showed clear correlation with effluent concentrations

Q2: Are DEWATS effluent concentrations generally complying to national effluent standards?



Q3: What is the general relationship between treatment and loading?



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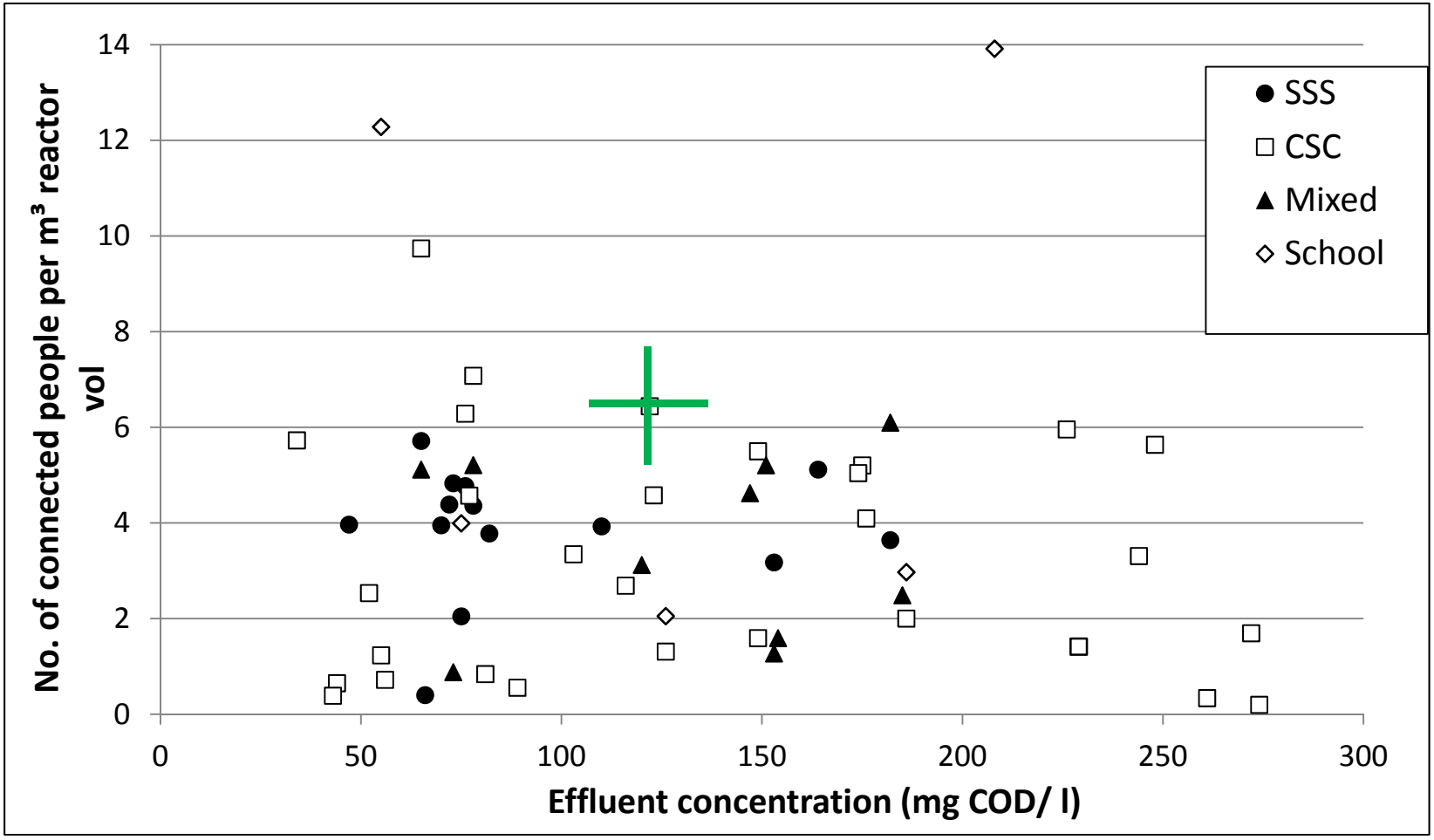

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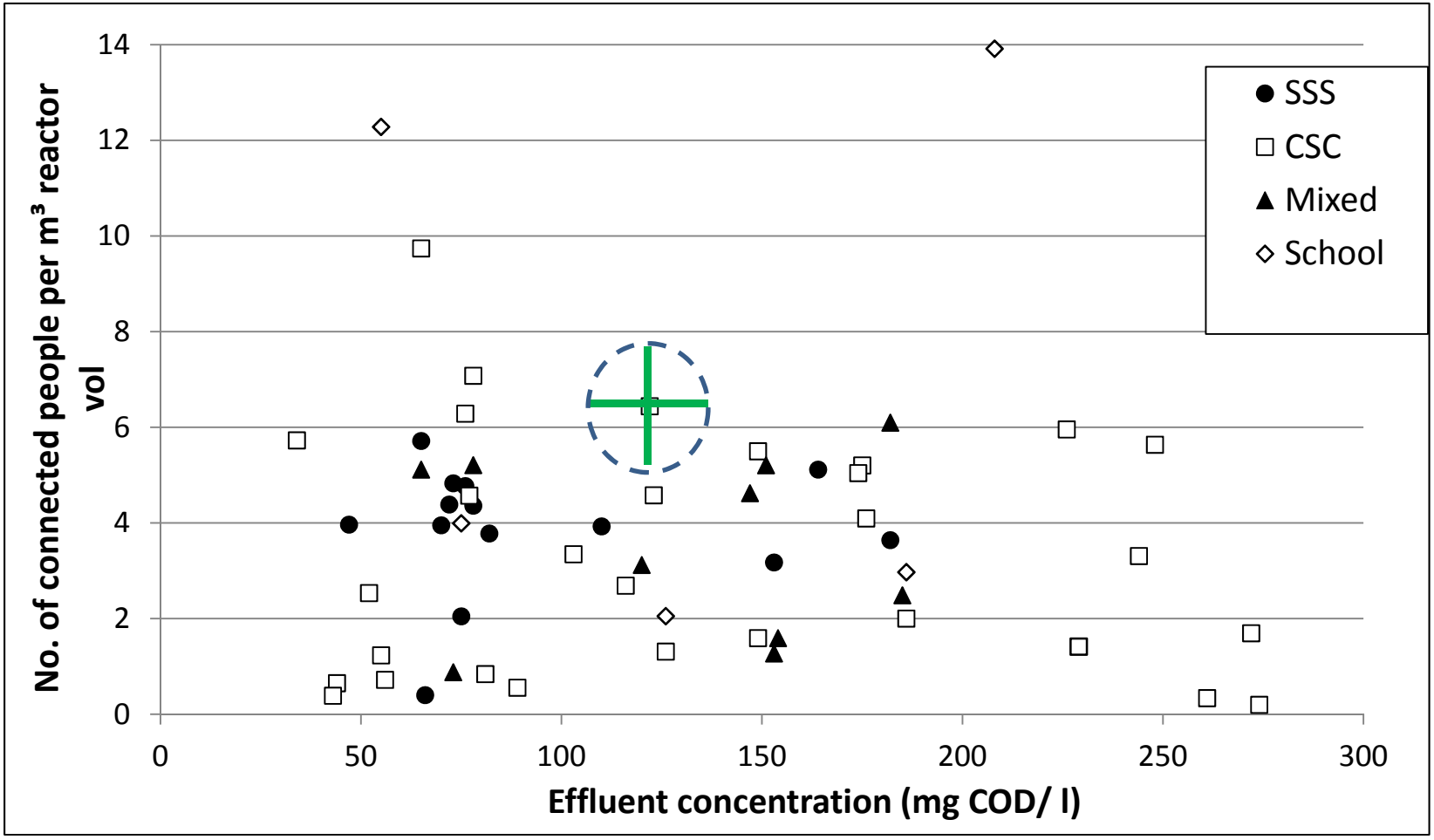

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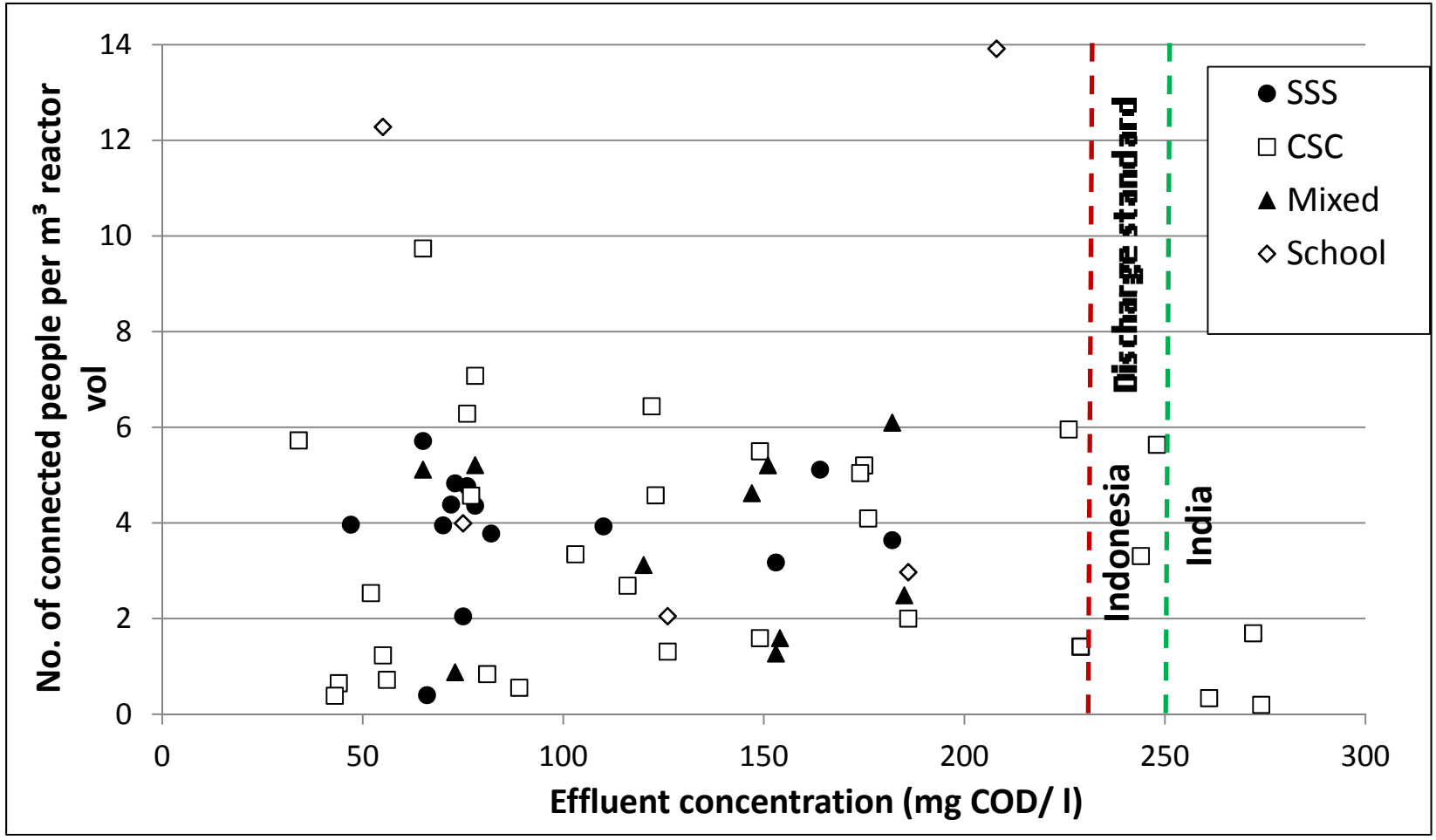

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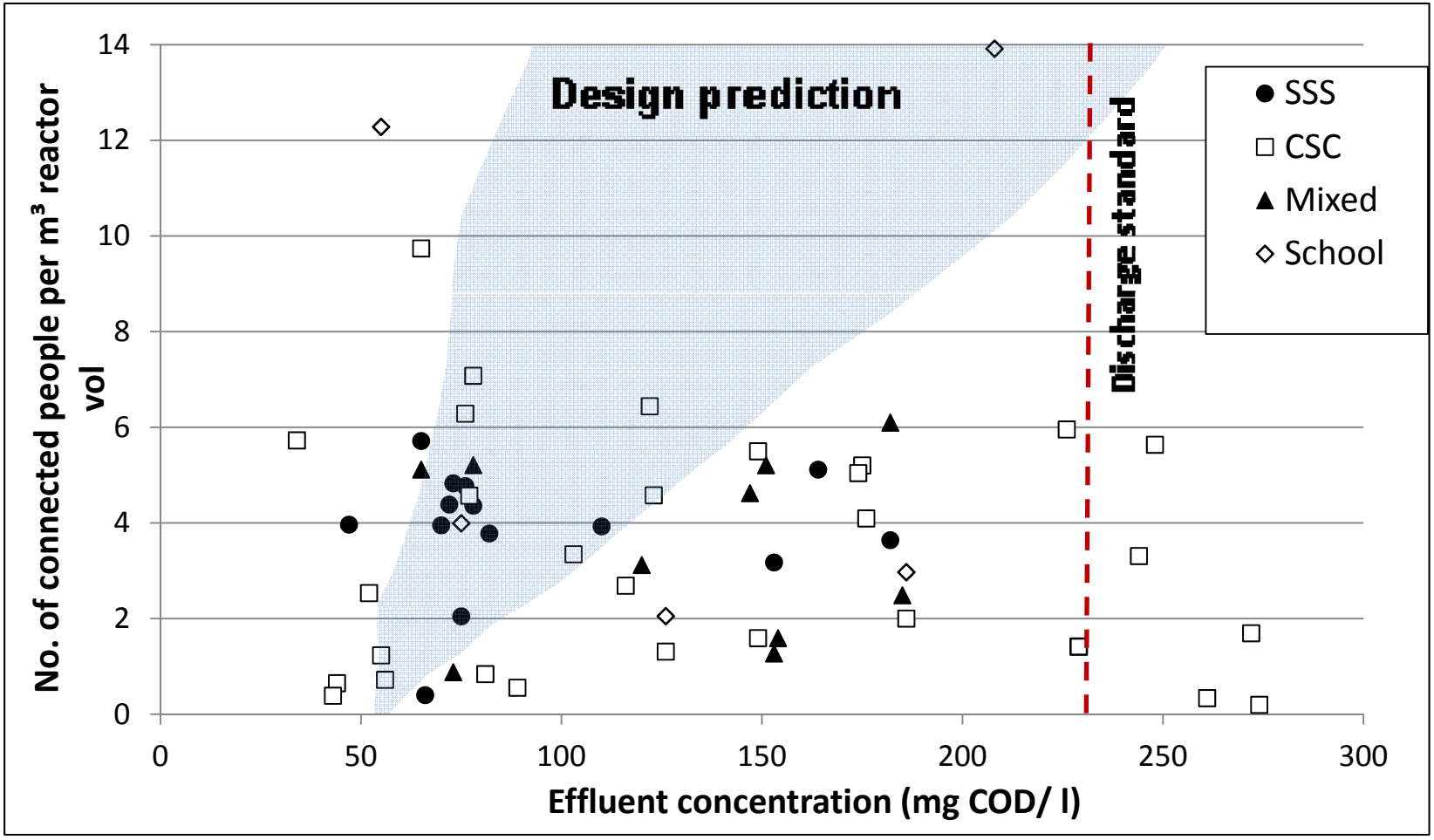

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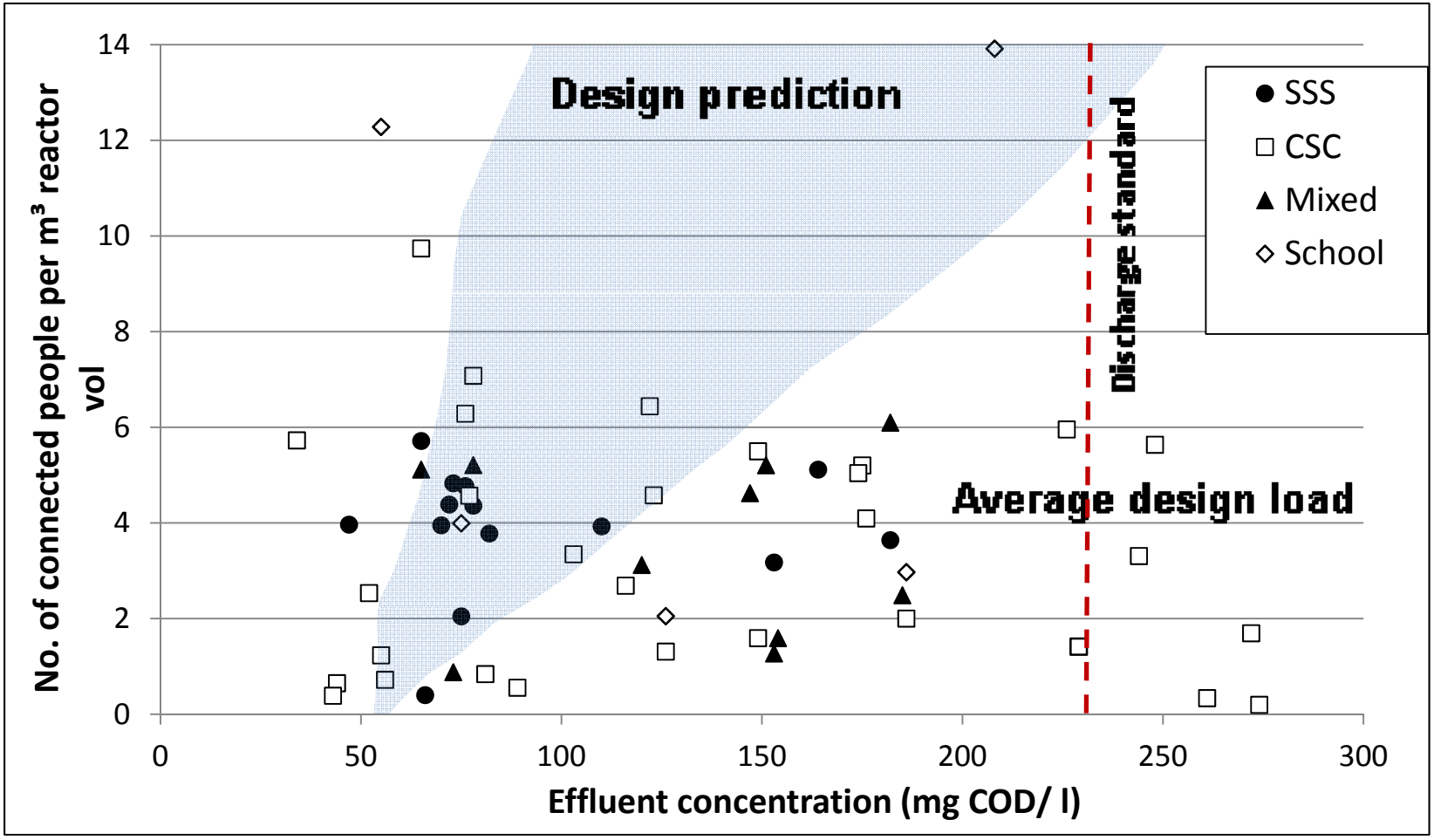

Interpretation of results

Conclusions being based on plant-data of varying reactor configuration, each exposed to a unique combination of treatment influencing circumstances.

→ Statistically meaningful conclusions on factors influencing the system efficiency can therefore not be drawn, however the data enables a number of important observations:

- All DEWATS system types including CSC are exposed to storm-water

- The data-set showed no clear correlation between effluent concentrations and any of the other 17 potentially influencing factors tested as part of this study

- Opposed to design predictions, the data suggests that reduced plant loading does not guarantee reduction of effluent concentrations

•High loaded plants on the other hand perform surprisingly well, number is too small in order to yet draw further conclusions

• 89% of the visited plants comply with Indonesian national discharge standards

→ Generally speaking, the data confirms that DEWATS are robust enough to perform reasonably well under the multitude of varying and fluctuating conditions under which they perform

Acknowledgements

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THANK YOU!