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“SPA-DET” Approach for Quantities and Qualities (Q&Q) of Faecal Sludge

Dr. Linda Strande, Miriam Englund

AfricaSan5 FSM5

“SPA-DET” Approach for Quantities and Qualities (Q&Q) of Faecal Sludge

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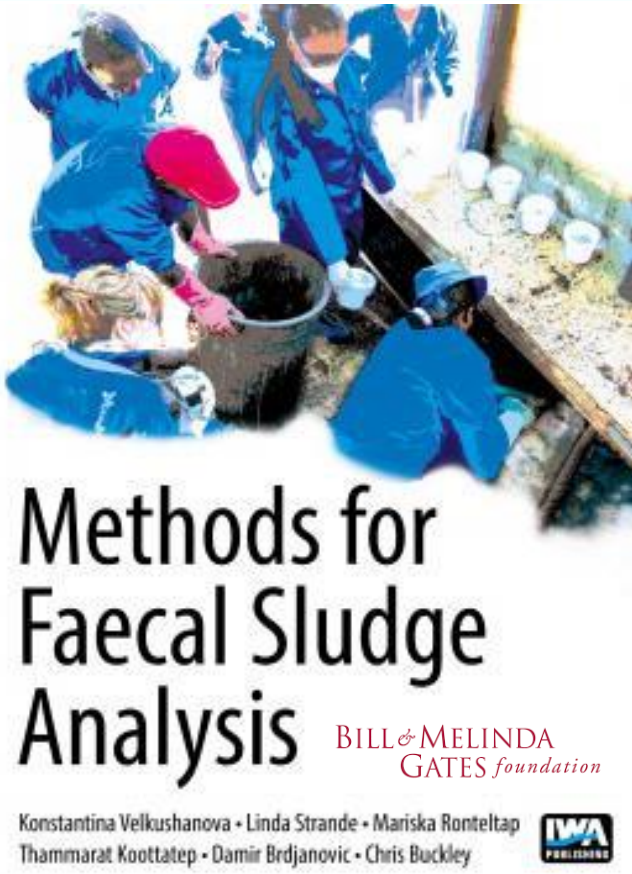
METHOD

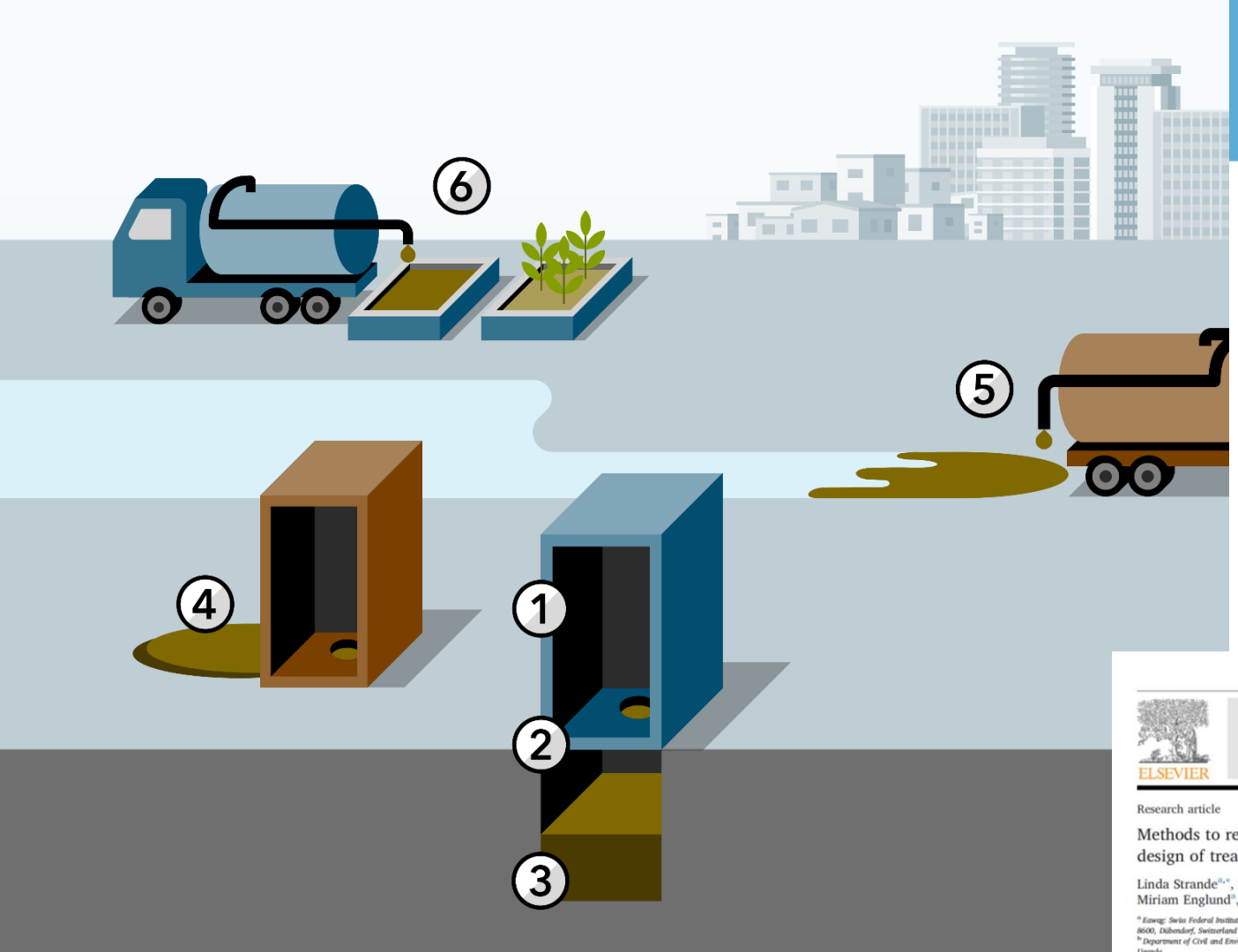
Introduce the newly developed “SPA-DET” approach to data collection and analysis

RESULTS

India, Tanzania, Uganda, Vietnam

(next year: Nepal, Zambia)





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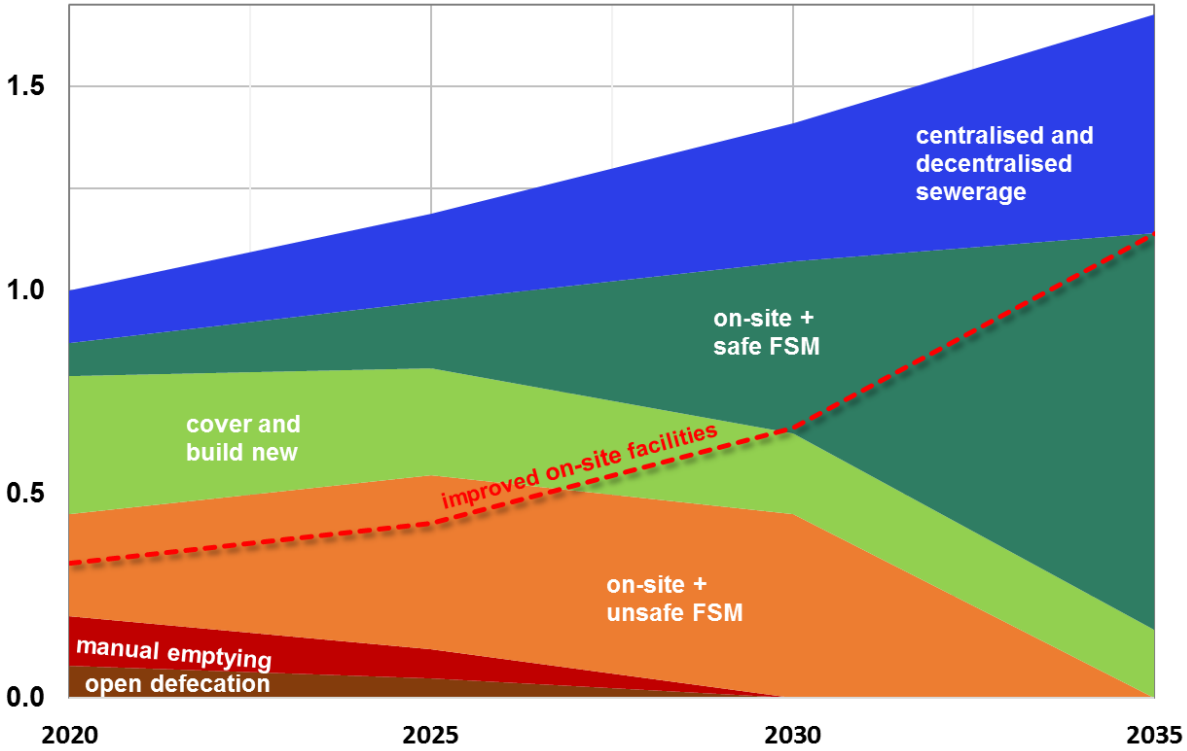
[a] Eawag: Swiss Federal Institute of Aquatic Science and Technology, Department of Sanitation, Water and Solid Waste for Development (Sandec), Überlandstrasse 133, 8600, Dübendorf, Switzerland

[b] Department of Civil and Environmental Engineering, College of Engineering, Design, Art and Technology (CEDAT), Makerere University, P.O. Box 7062, Kampala, Uganda

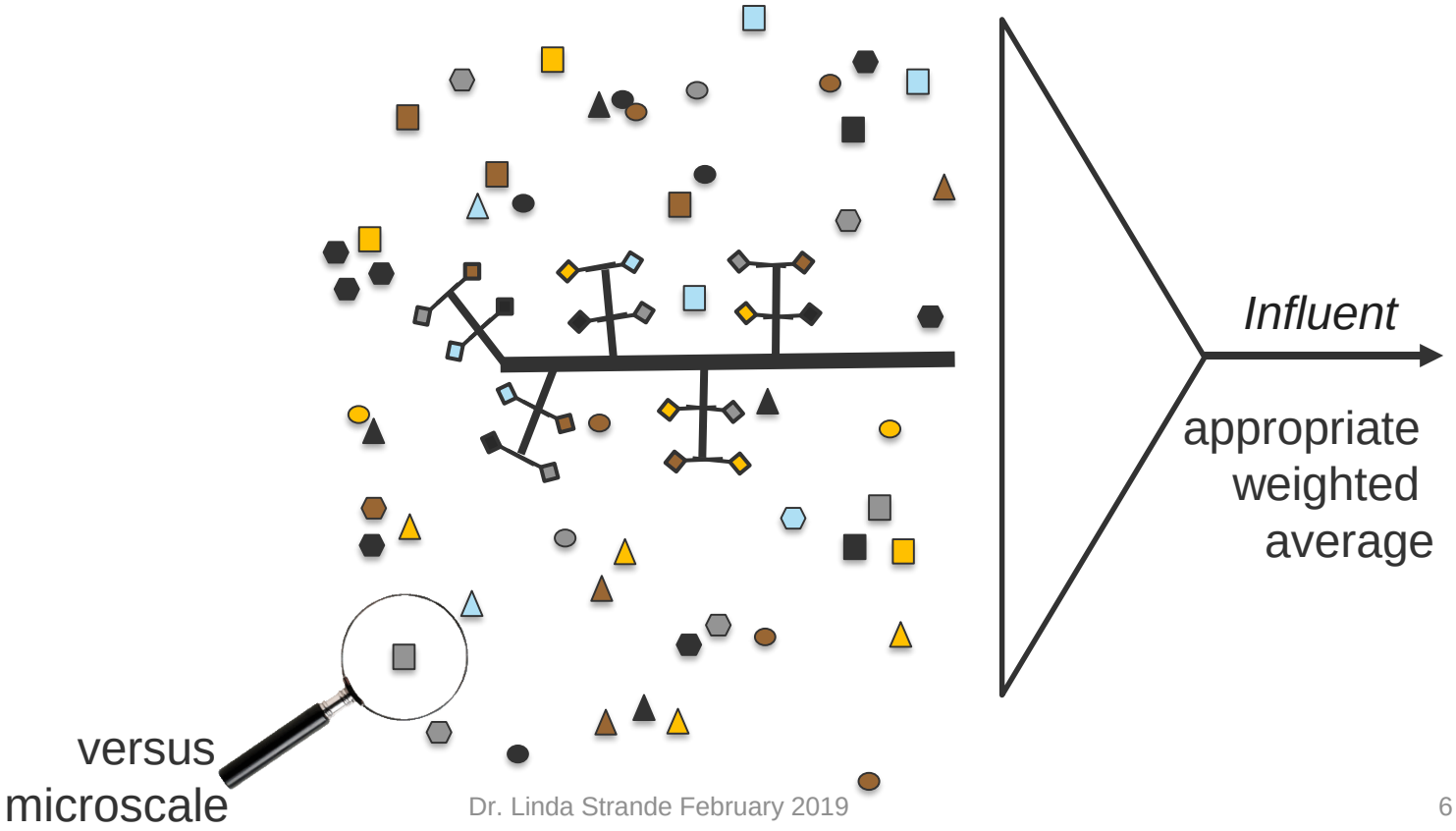
Importance of Q&Q

SanMix Time-Technology Diagram



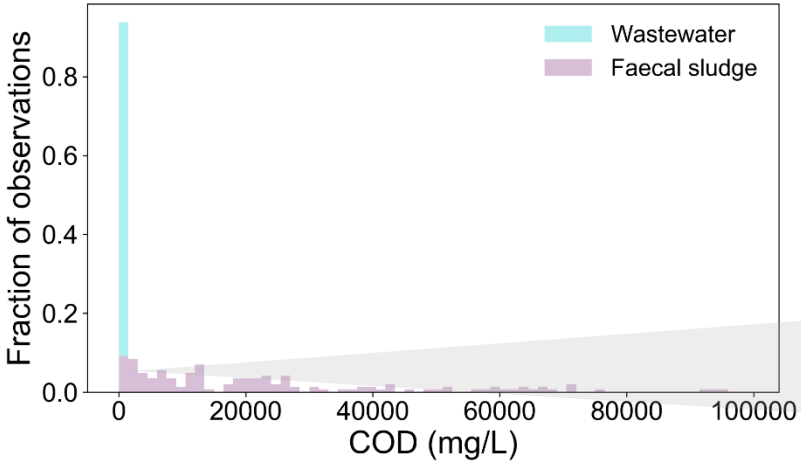
Reference:
Peter Hawkins

Predicting what is delivered to treatment?

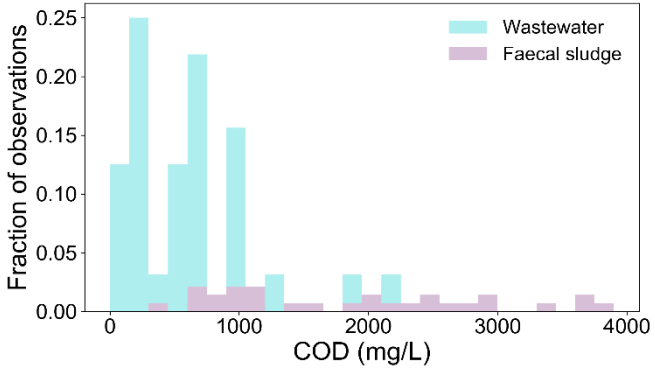


Distribution of data?

Lubigi wastewater and faecal sludge treatment plant



ave = 23,550 mg/L COD
stdev = 23,433 mg/L
-> predicts16% negative values



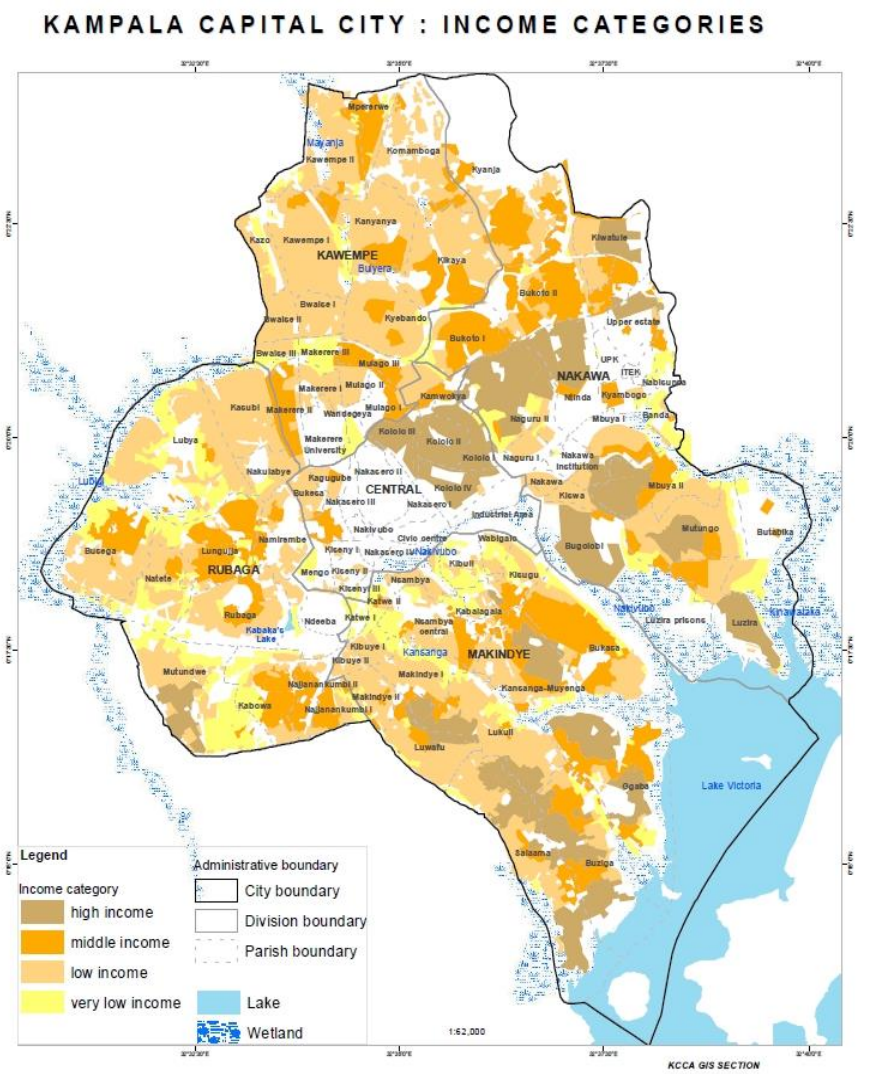
Strande, L., Englund, M., Carbajal, J.P. Quantities and Qualities (Q&Q) of Faecal Sludge for Planning and Management. Methods for Faecal Sludge Analyses, in preparation as chapter in Velkushanova, K., Strande, L., Ronteltap, M., Koottatep, T., Brdjanovic. D., Buckley, C. (book editors) Methods for Faecal Sludge Analysis, in preparation as IWA publication

What is “SPA-DET” data?

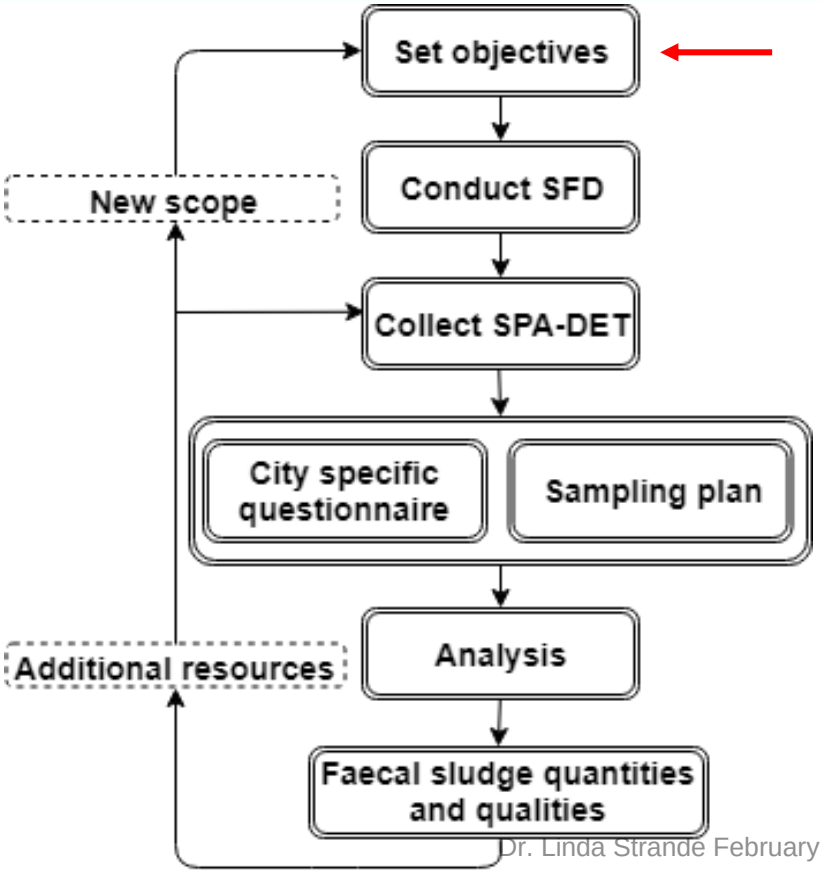
Spatially analyzable (SPA)

(DET)

- **D**emographic
  (e.g. income level,
  population density)
- **E**nvironmental
  (e.g. groundwater, elevation)
- **T**echnology
  (e.g. septic tank / pit latrine,
  emptying frequency)



“SPA-DET” approach for Quantities and Qualities (Q&Q) of Faecal Sludge



Objectives!
Affect what, how and where you sample

- Sludge accumulation rate?
- Delivered to treatment?
- Regularly scheduled emptying?
- Pumpability?

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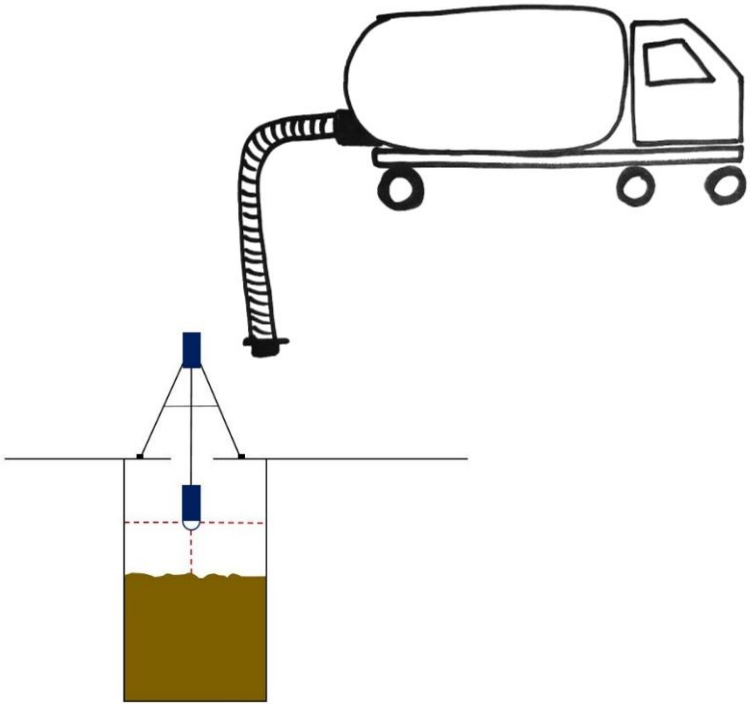
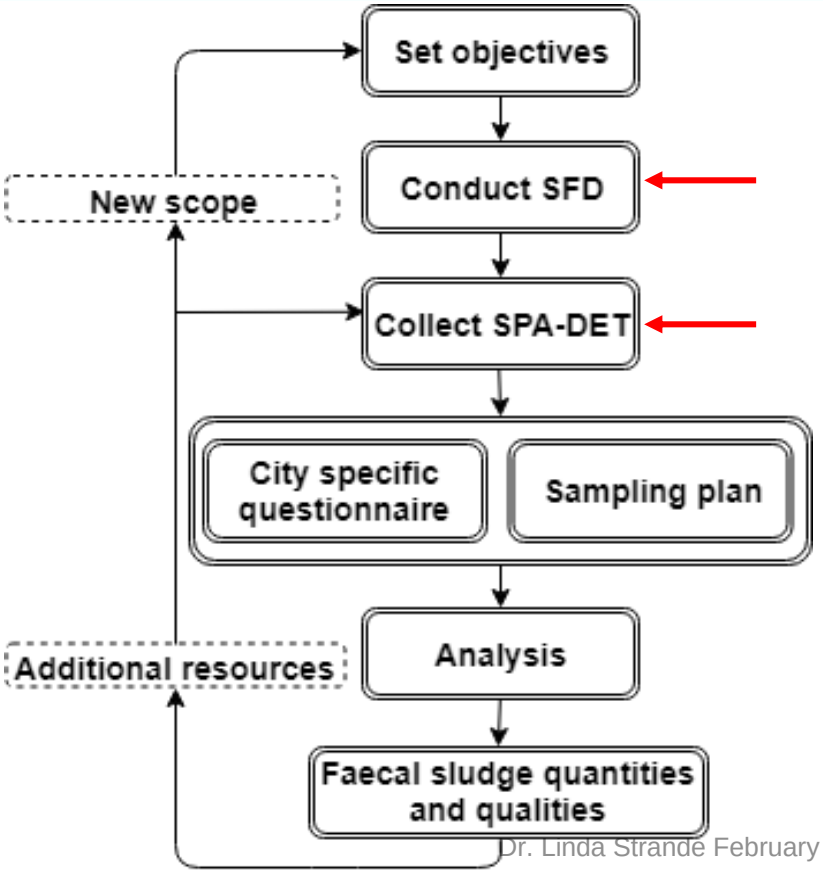
How to measure accumulation rates?

Field testing the Volaser Sircilla, India



Emptying service providers Lusaka, Zambia

“SPA-DET” approach for Quantities and Qualities (Q&Q) of Faecal Sludge



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Where to get “SPA-DET” data?

Existing sources (e.g. census, call center, municipality, university, open street maps,….)
Data collection (e.g. questionnaire during emptying,…)
Future sources? (e.g. remote sensing data?)

Only 3% of Africa mapped 1:25,000

Lusaka, Zambia

Dr. Linda Strande February 2019

“SPA-DET” approach for Quantities and Qualities (Q&Q) of Faecal Sludge

Iterative based on available resources

- Start with one neighborhood, add more each replication
- Start with one category of income level, then extend to other socio-economic groups
- Student projects / research collaborations

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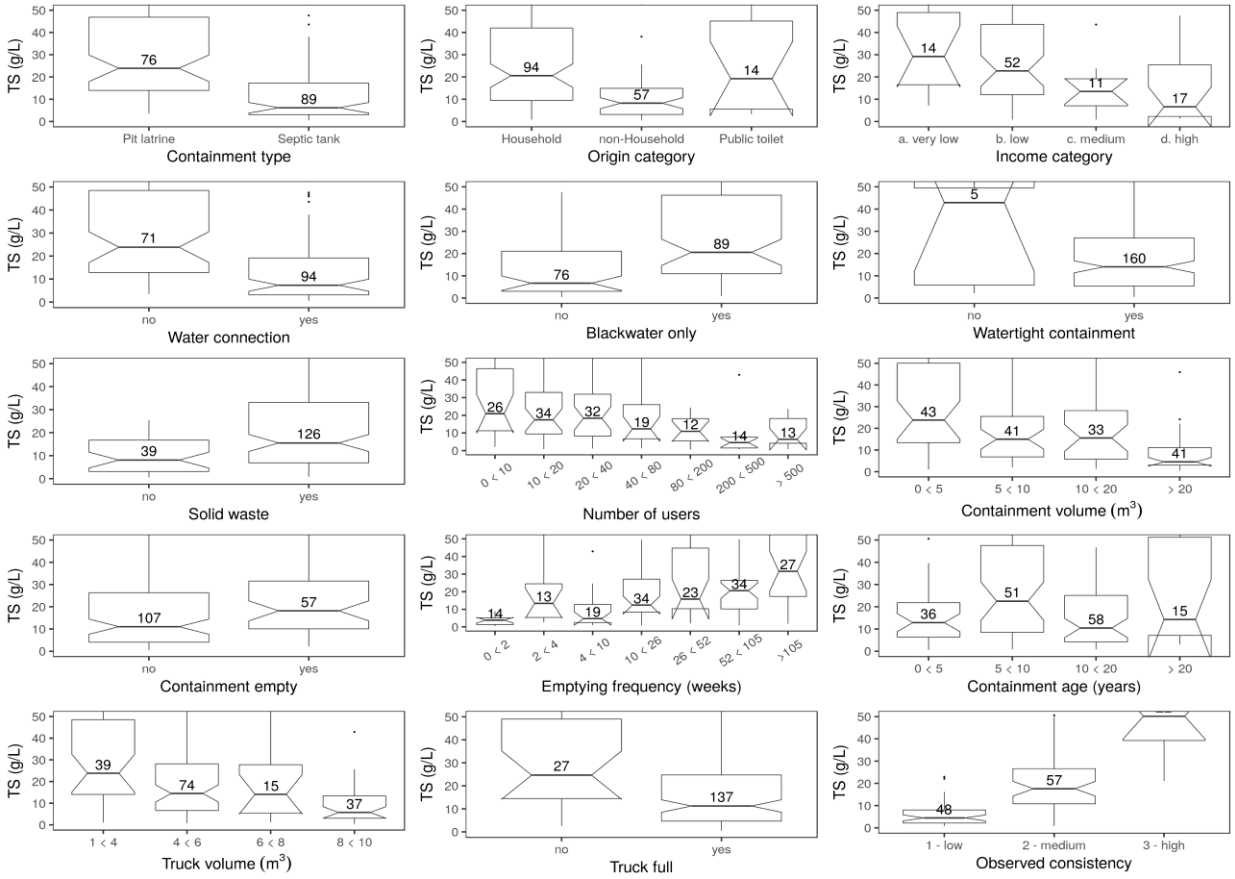
Results: Total solids Kampala, Uganda



specific for Kampala!

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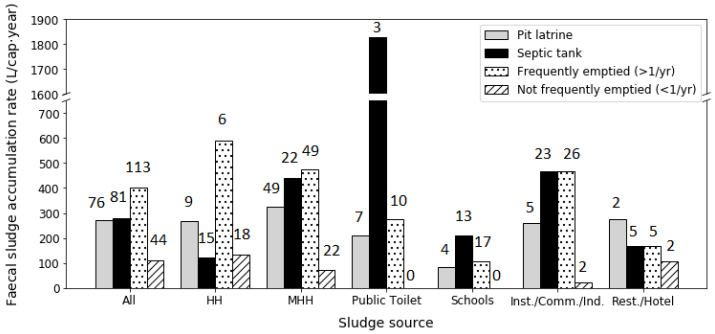
Results: accumulation rates Kampala, Uganda



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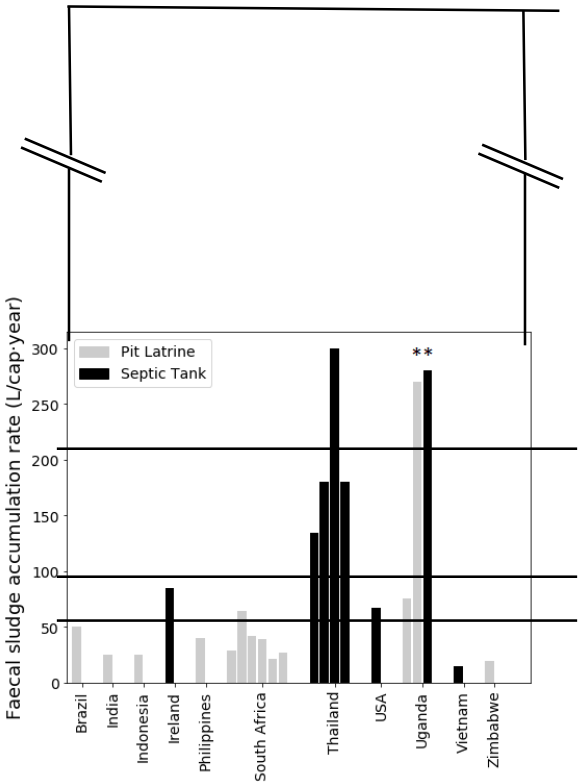
1,560 L /cap*year Abuja, Nigeria
BMGF 10 country study

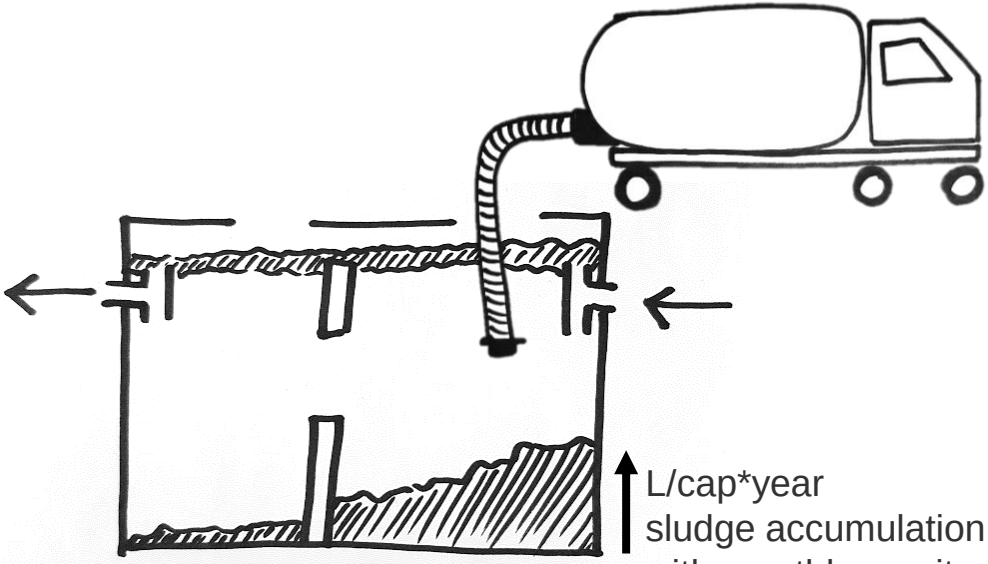


Average of 121 rates, *RTI for BMGF*

Median of 121 rates, *RTI for BMGF*

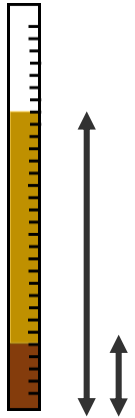
Design recommendations

Preliminary results: Sircilla, India

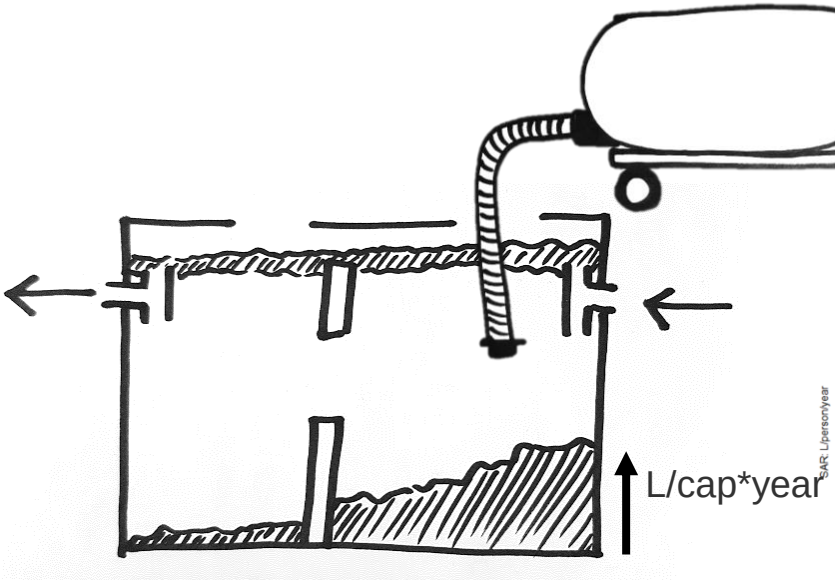


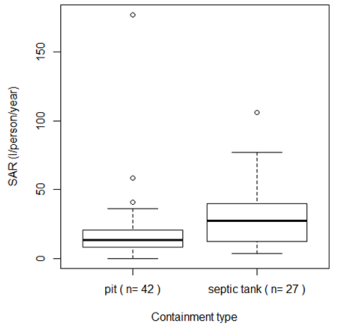
L/cap*year
sludge accumulation rate *in situ*
when tank is emptied

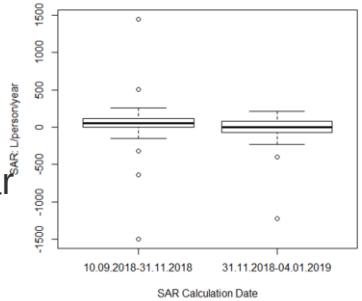
L/cap*year
sludge accumulation rate *in situ*
with monthly monitoring



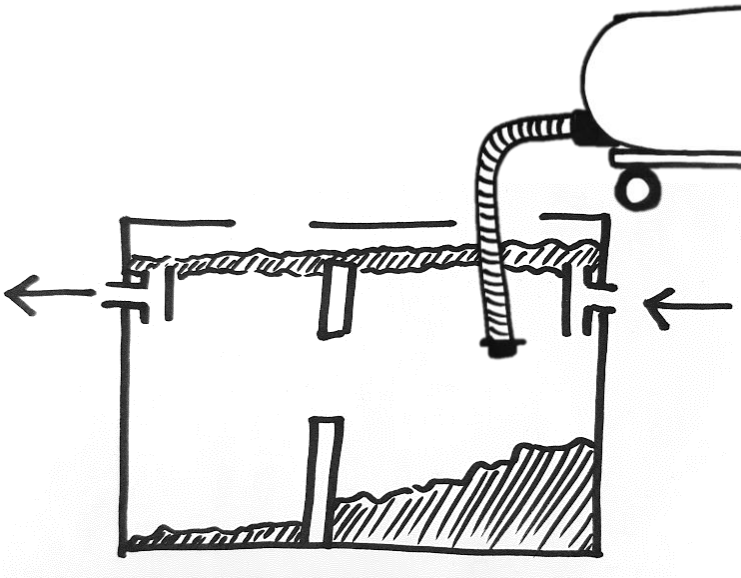
Preliminary results: Sircilla, India







Preliminary results: Sircilla, India



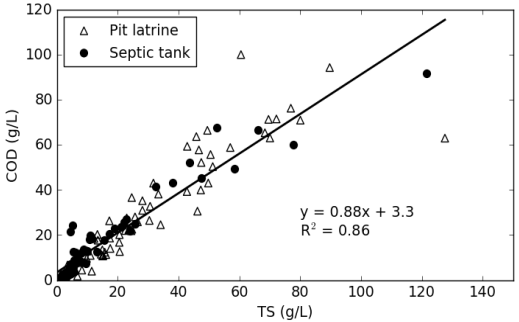
Potential predictors of characteristics?

- containment age
- containment shape / type / volume
- number of toilets
- water supply source
- “slum” / non-“slum”

Potential predictors of accumulation rates?

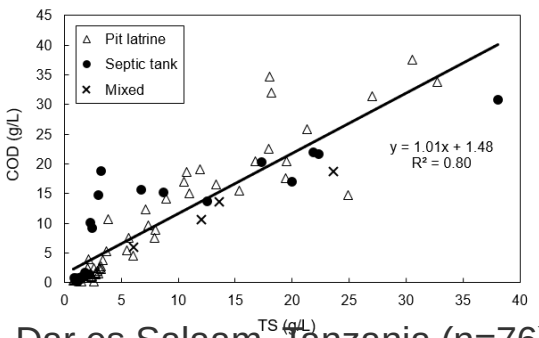
- containment age
- containment shape / type / volume
- number of toilets
- type of toilets / flush volume
- cleaning frequency
- TS / VS / COD

Results: COD:TS in 6 cities



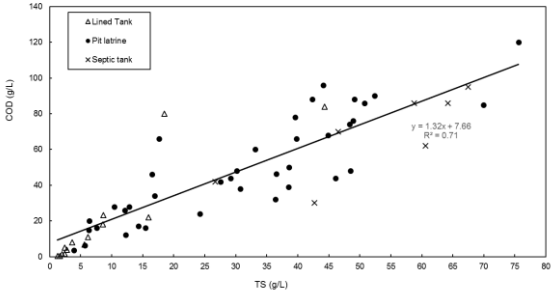
Kampala, Uganda (n=180)

Strande et al. 2018



Dar es Salaam, Tanzania (n=76)

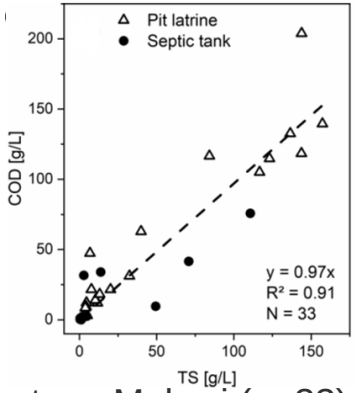
Moto, Marwa, Esanju 2017-2018, UDSM Master's Theses



Sircilla, India (n=55/180)

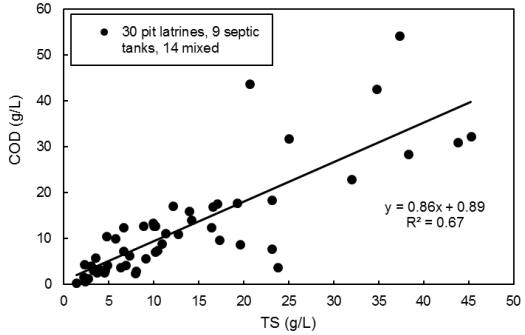
CDD – Eawag collaborat in process

Consortium for DEWATS Dissemination Society



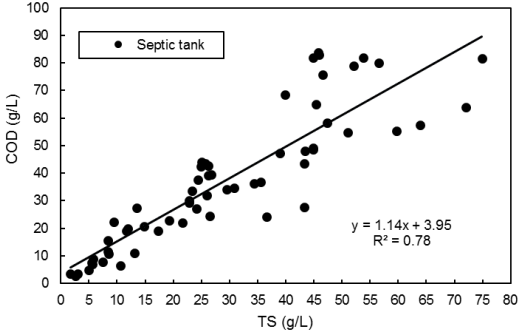
Blantyre, Malawi (n=33)

Freihardt 2018, ETH Master's Thesis



Ougadougou, Burkina Faso (n=53)

Bassan et al. 2013



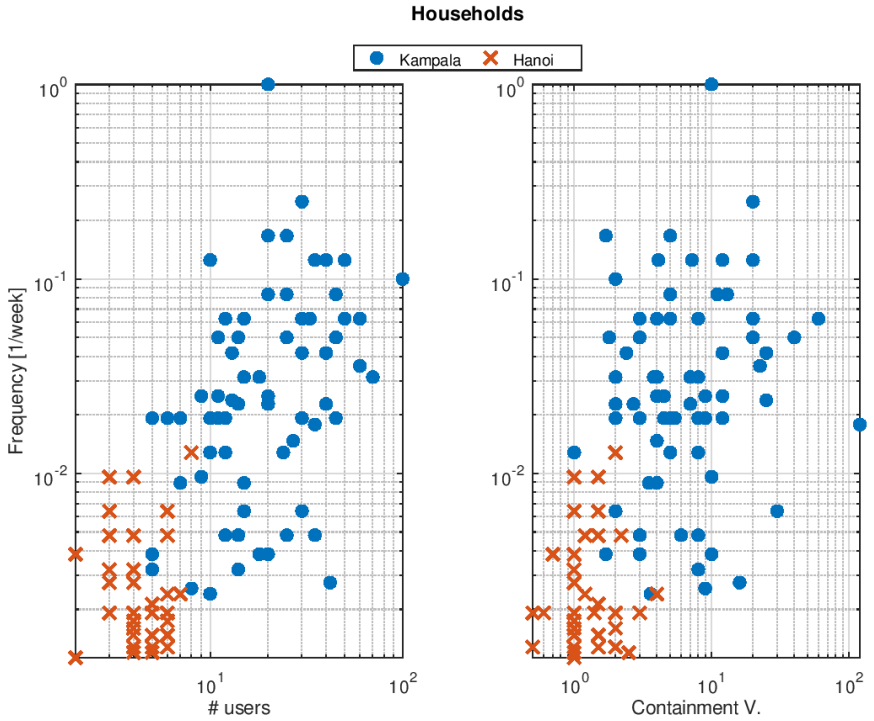
Hanoi, Vietnam (n=60)

Englund et al. Submitted

Results: emptying frequency Hanoi and Kampala

The power of modeling

- simple predictive models for management
- build mechanistic models to understand and direct our research
- GIS models based on SPA-DET for city planning, www.citysanitationplanning.org



Englund, M., Carbajal, JP, Ferré, A, Hoa, AVi, Nguyen, VA, Bassan, M, Strande, L. (submitted) Modelling quantities and qualities (Q&Q) of faecal sludge in Hanoi and Kampala for improved management solutions

“SPA-DET” approach for Quantities and Qualities (Q&Q) of Faecal Sludge

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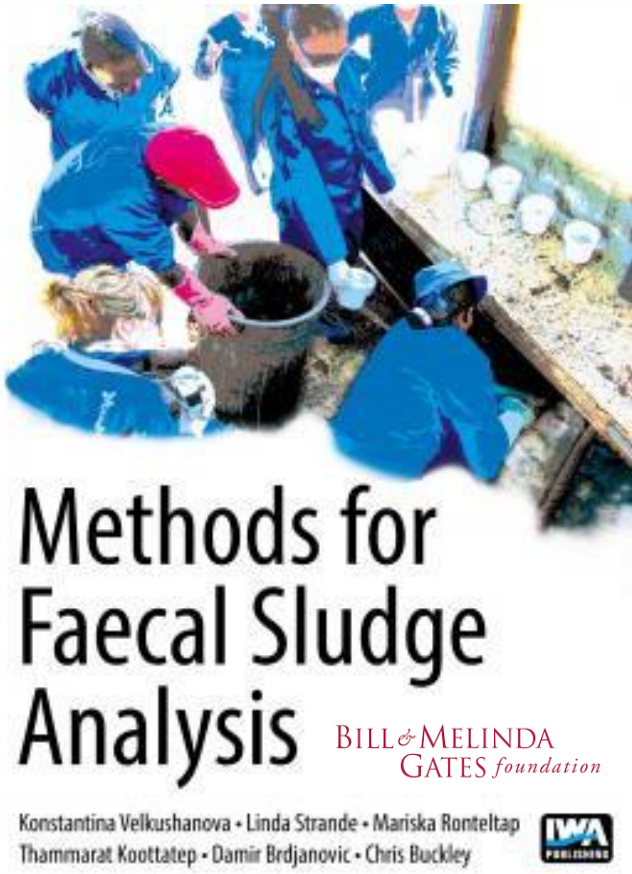
CONCLUSIONS

using statistical relationships can *improve usefulness* and *reduce costs* of collecting data

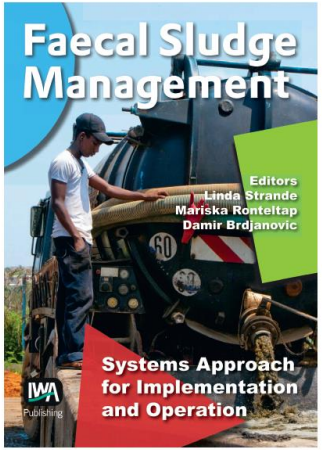
data collected in this fashion, can *improve estimates of Q&Q*, and predictive models for *improved management solutions*

with more data we could develop mechanistic relationships to help lead to *universal understandings* of FSM



Website: www.sandec.ch/fsm_tools

MEWS team: **M**anagement of **E**xcreta, **W**astewater and **S**ludge



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Schweizerische Eidgenossenschaft
Confédération suisse
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Confederación Suiza