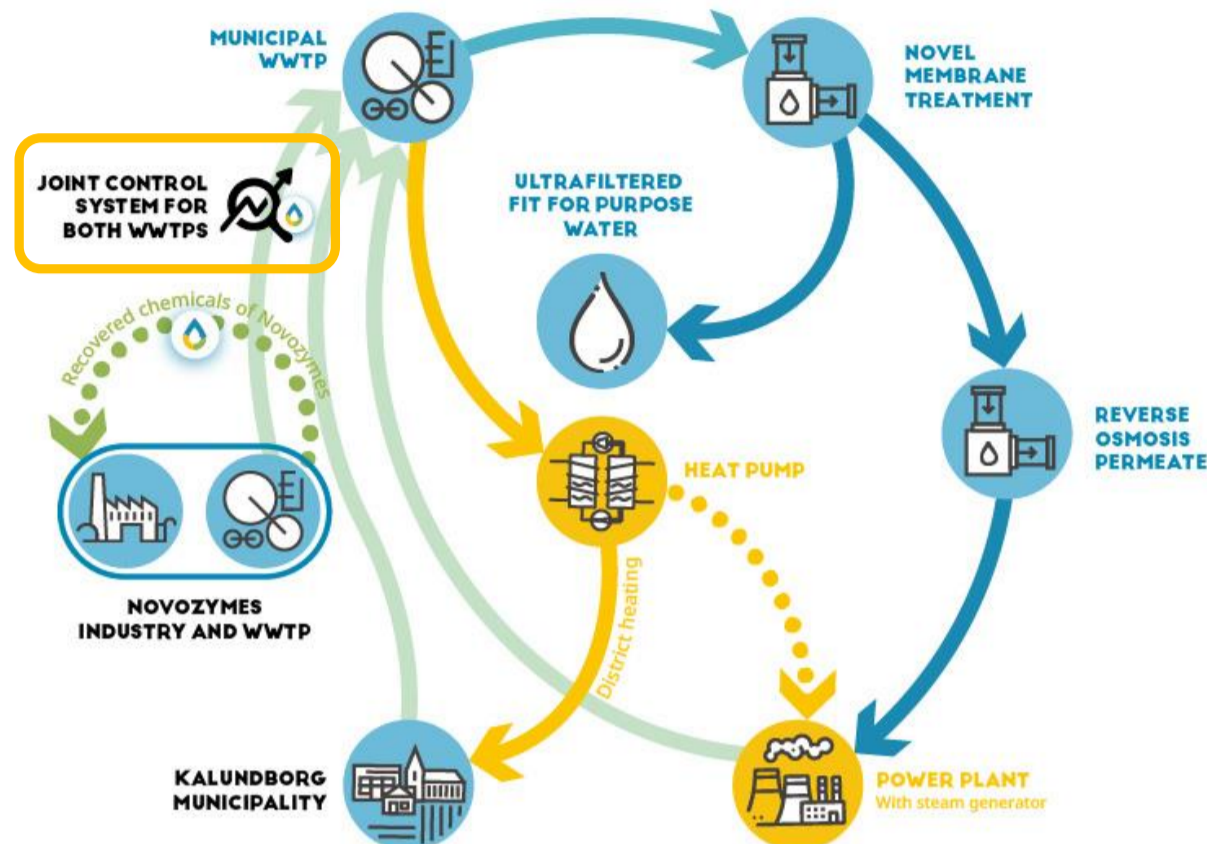


CS9 – Joint control system for two WWTPs



Objectives:

Reduce energy consumption

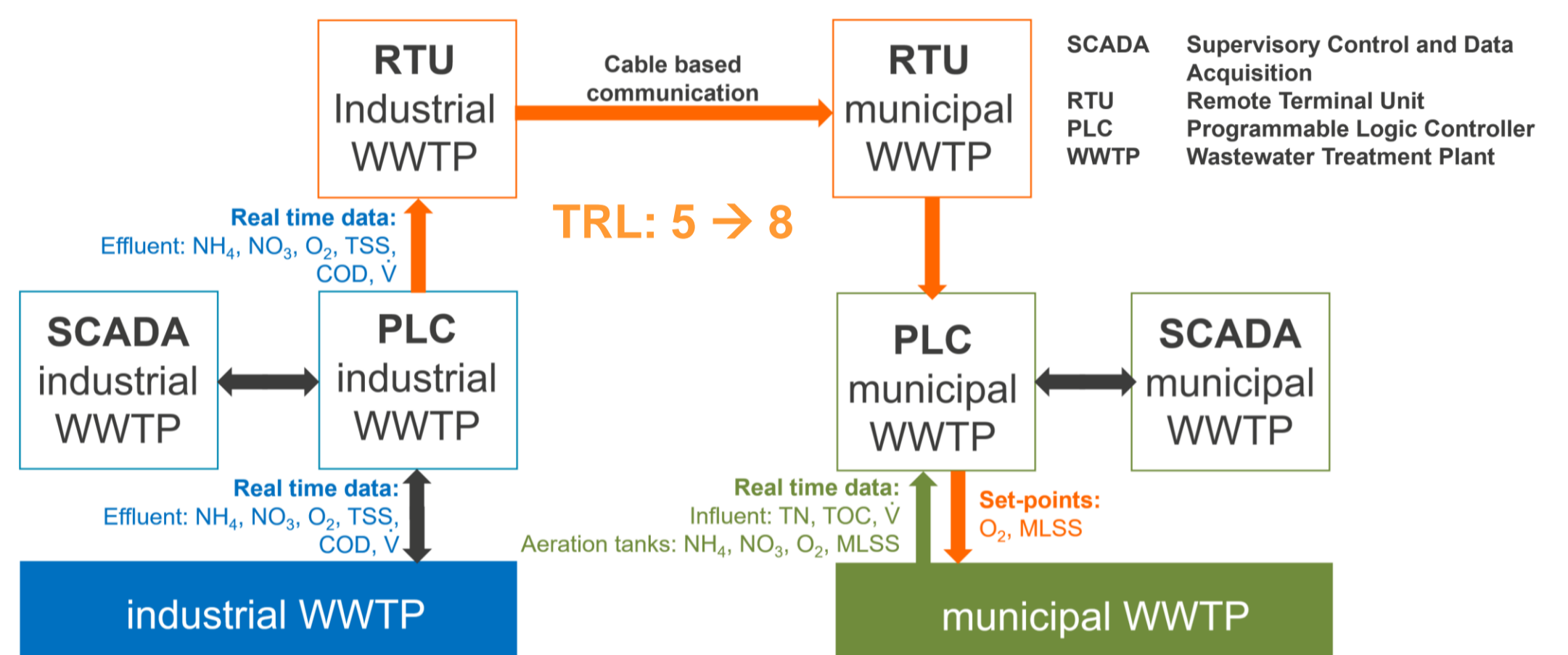
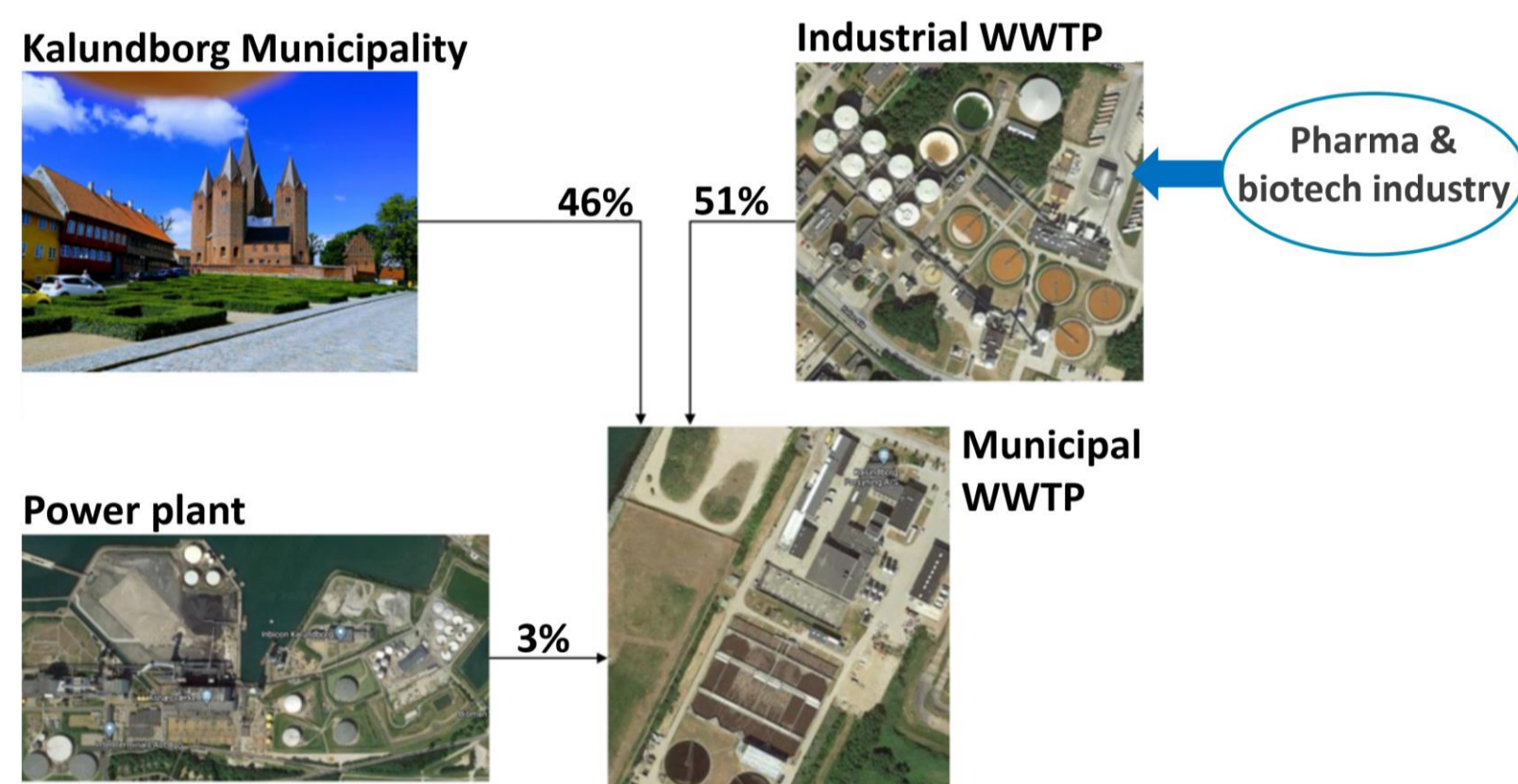
→ Model-based predictive controlled nitrogen elimination (Air supplied as low as possible via predicting NH_4 , NO_3 , TN and COD loads to the municipal WWTP)

Reduce chemicals consumption for phosphorus elimination

→ Implementation of enhanced biological phosphorus removal

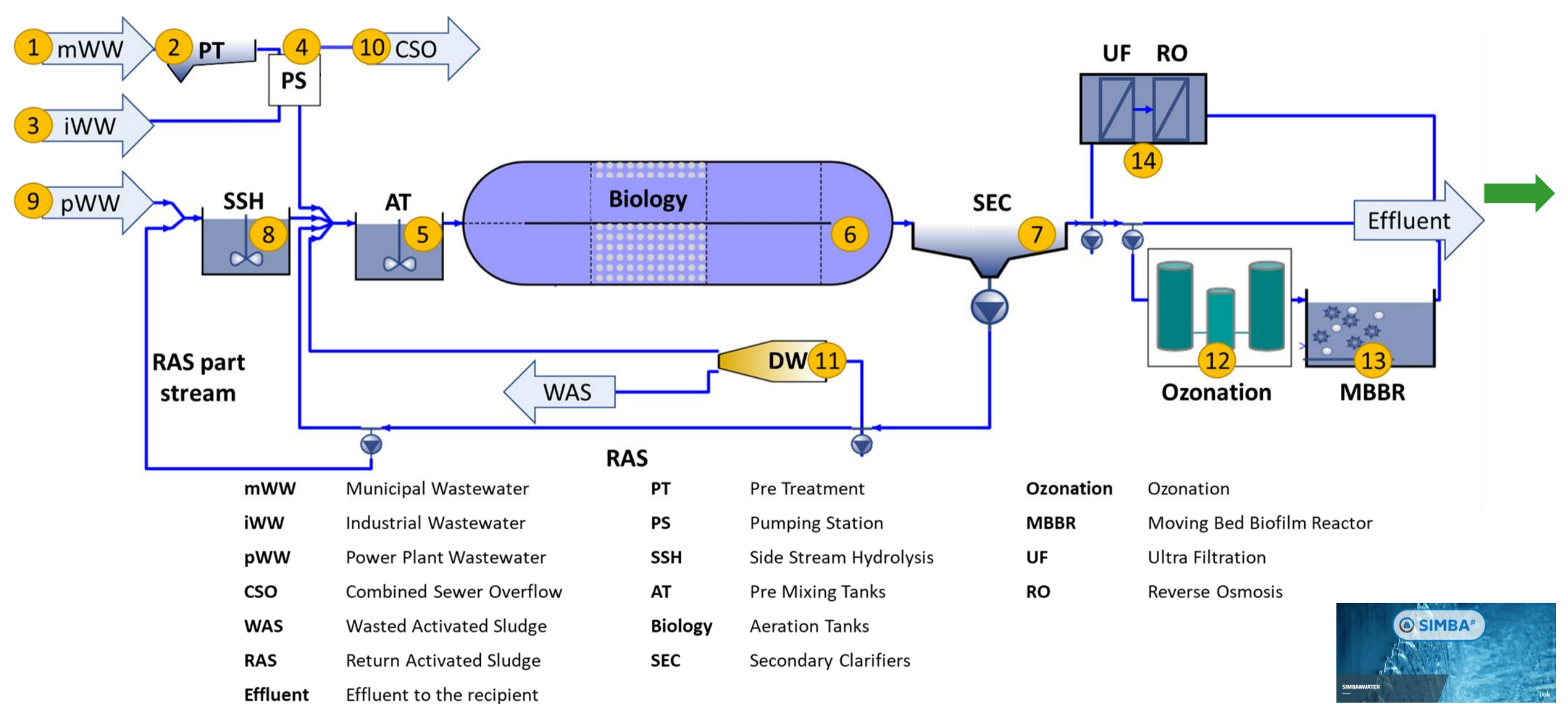
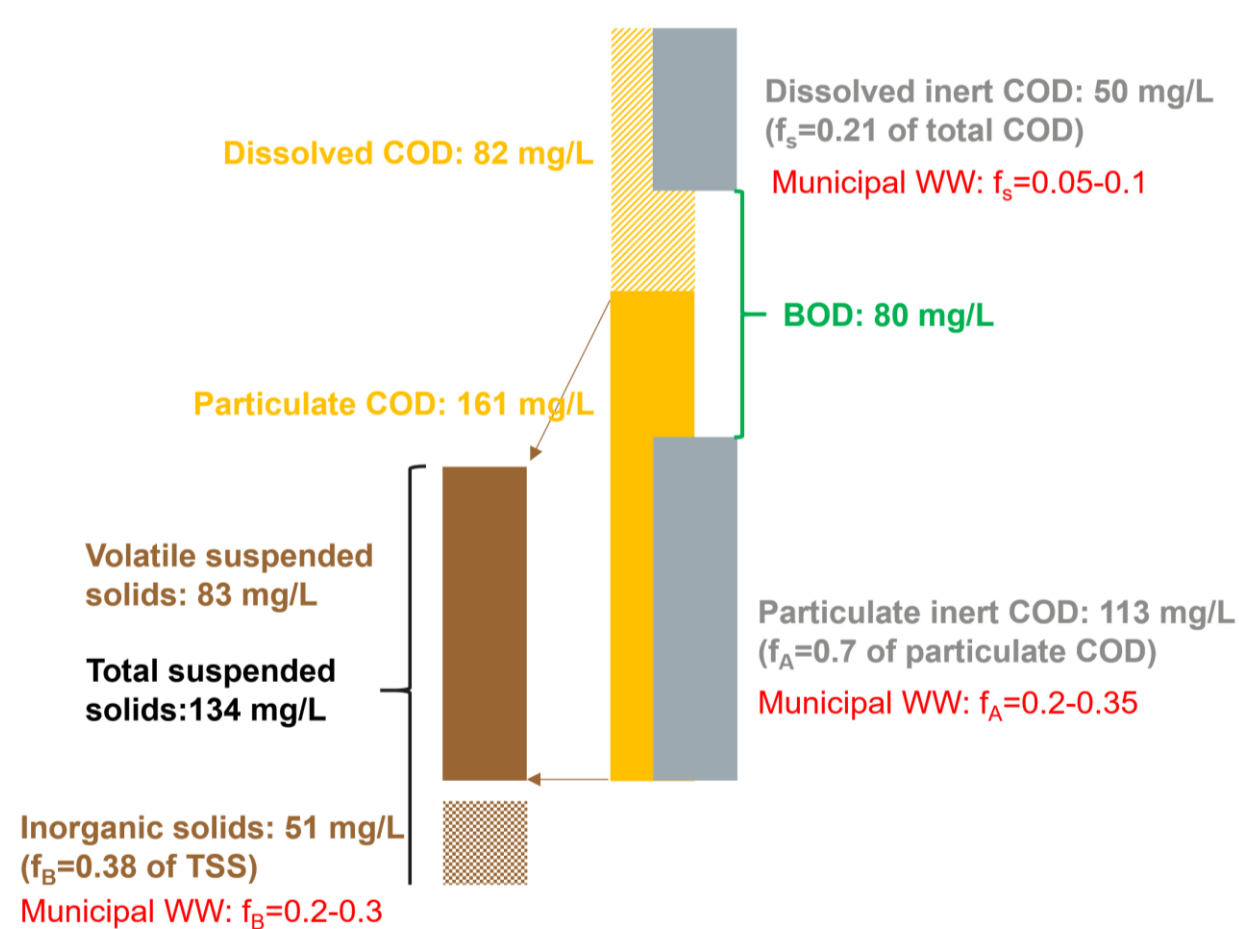
Optional: Reduce direct discharges of untreated wastewater to recipient

→ iWWTP = hydraulic buffer during high loading situations



Dynamic model of WWTP treats wastewater with challenging composition

Fractioning of the influent mix: municipal & industrial wastewater
→ high fraction of non-degradable organic matter



Results (post calibration): dynamic model predicts the model outputs adequately with an overall efficiency of 74%

	COD [mg/L]	TSS [mg/L]	TN [mg/L]	NHx-N [mg/L]	NOx-N [mg/L]	RAS [g/L]
Lab	67.15	10.15	6.32	0.37	1.44	22.83
Sim	69.82	4.61	5.42	0.32	1.30	21.23
Deviation	3.2%	55%	14%	13.5%	9.7%	7%

Parameter	R ²	NSE	L	a _i
COD	0.92	0.91	0.91	0.26
TSS	0.74	-0.18	0.31	0.09
TN	0.81	0.68	0.72	0.20
NHx-N	0.64	0.58	0.66	0.19
NOx-N	0.11	-1.44	0.09	0.03
RAS	0.95	0.83	0.84	0.24

E_i = 0.74
overall model efficiency

Lessons learned and what is crucial in terms of replication of the technology?

- Models are only as good as the quality of the data they rely on.
- Pre-processing and verification of data is crucial.
- Due to Covid-19, a visit of the WWTP was not possible at the beginning of the project and therefore, for the modelling process many meetings were required to verify the information, data and assumptions for the operation of the real WWTPs.
- Due to manual TSS & O₂ control on site, assumptions had to be made to model sludge and aeration control

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