



Evalueringer af fremtidens vandhåndtering

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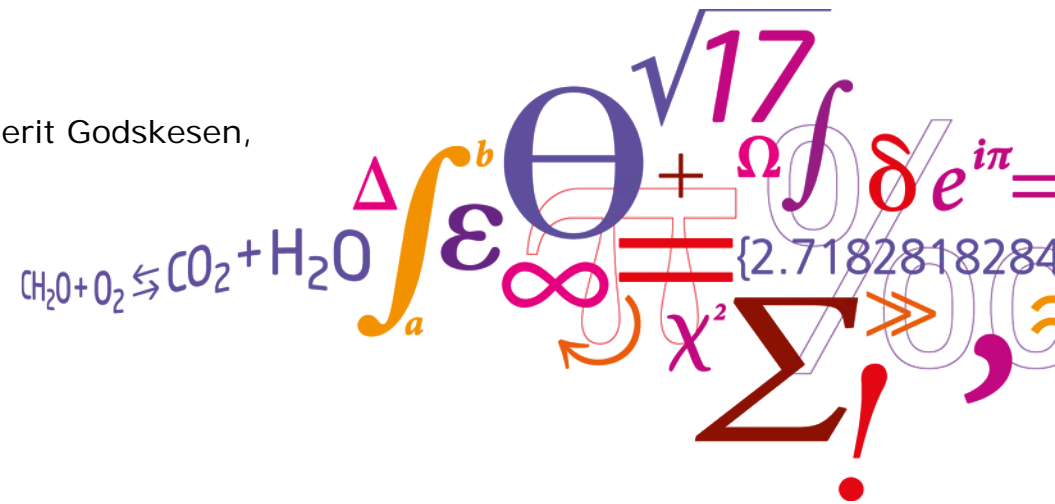
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Evalueringer af fremtidens vandhåndtering

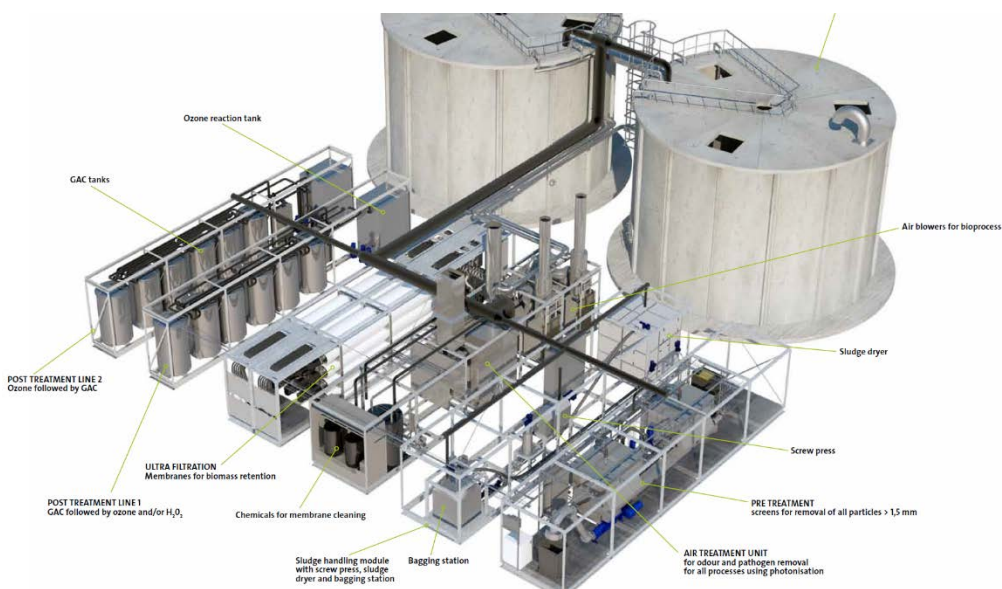
Martin Rygaard

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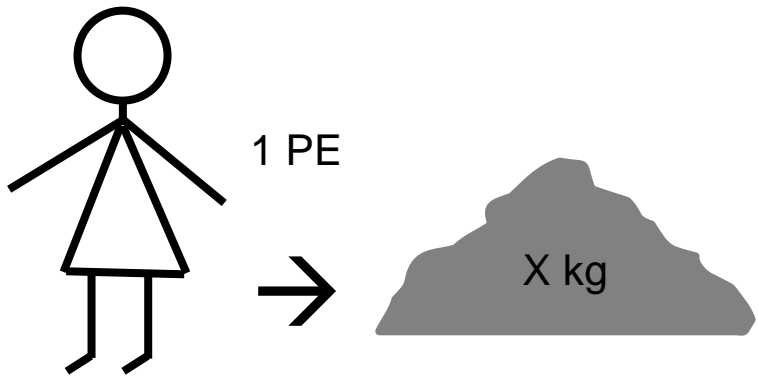
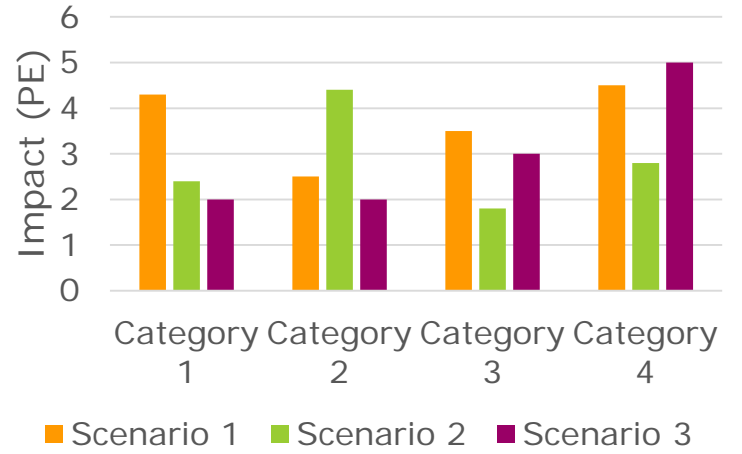
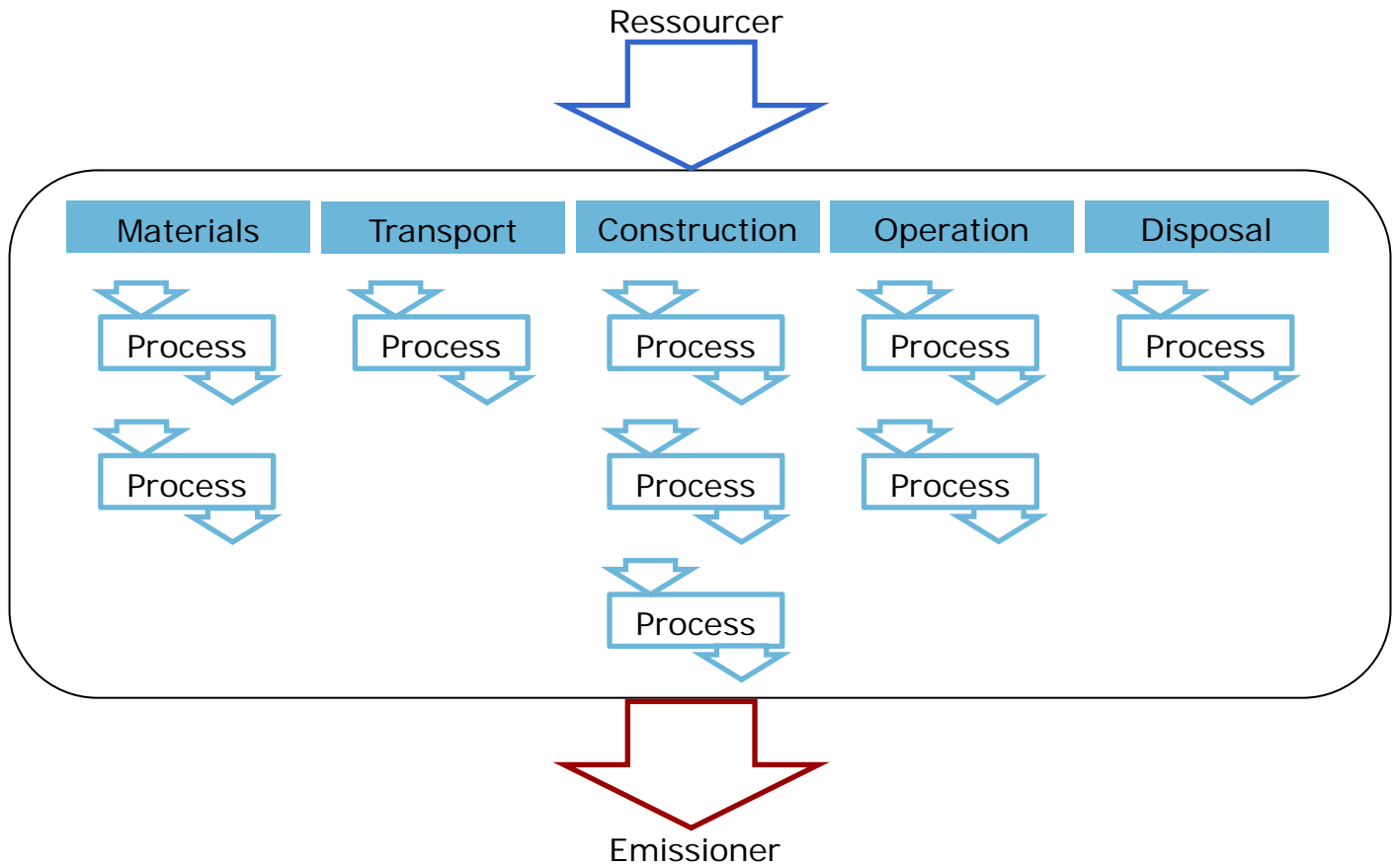


Nye krav til udledning, fx hospitaler



Treatment steps Barriers	Windhoek, Namibia	Orange County, USA	Newater, Singapore	Biobooster, Herlev Hosp.
Conventional WWTP	X	X	X	X
O ₃ -oxidation	X			X
Flocculation	X			
Activated org. carbon	X			X
Microfiltration		X	X	
Ultrafiltration	X			X
Reverse osmosis		X	X	
UV		X	X	X
Chlorination	X	X	X	
Infiltration to groundwater		X		
Conventional DWTP		X	X	
No. of barriers	6	7	6	5
Drinking water quality	Yes	Yes	Yes	(Yes)

Livscyklusvurdering

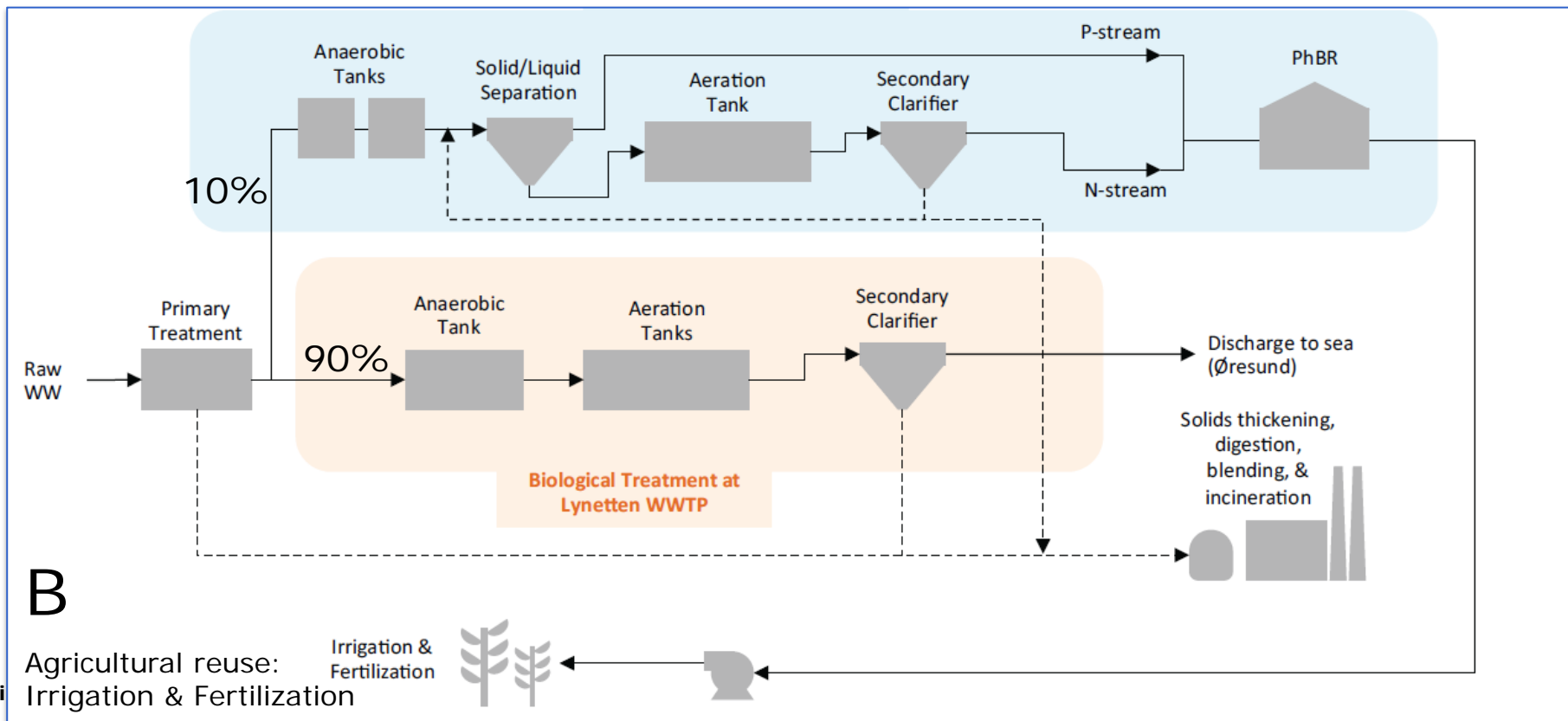
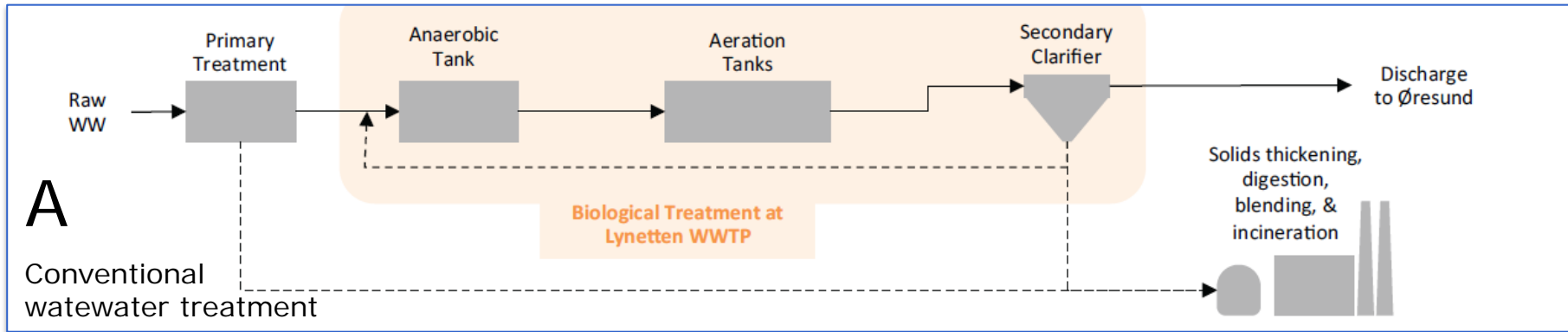


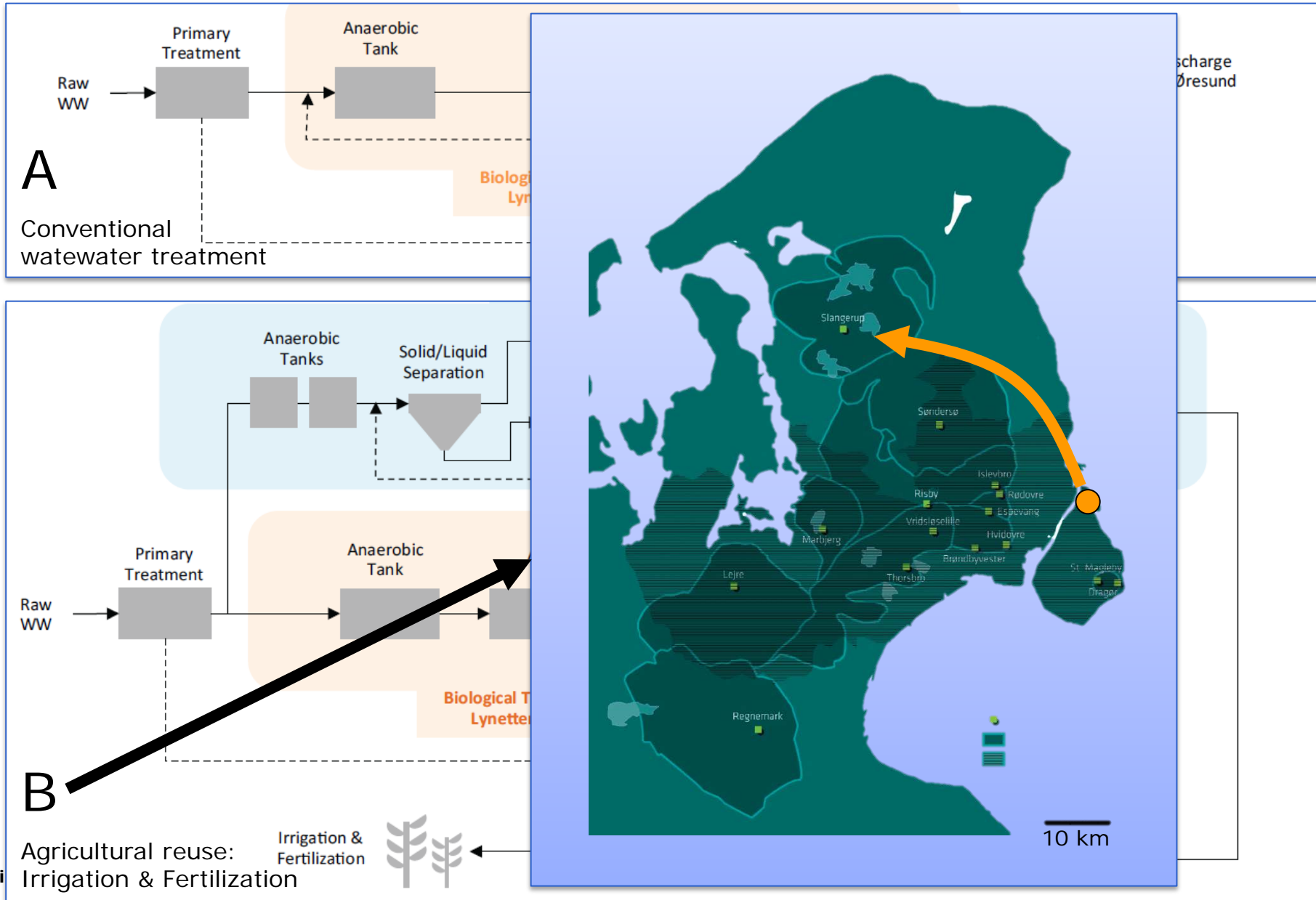
Værdiskabelse – Value Added

$$VA (kr/\text{år}) = \sum_{i=1}^n (Q_{ind} \cdot EP_{ind} - (Q_{ud} \cdot EP_{ud} + \text{ÅAO}))$$

= virksomhedskapital + lønninger + investeringer

Fra renseanlæg til ressourceanlæg: TRENS

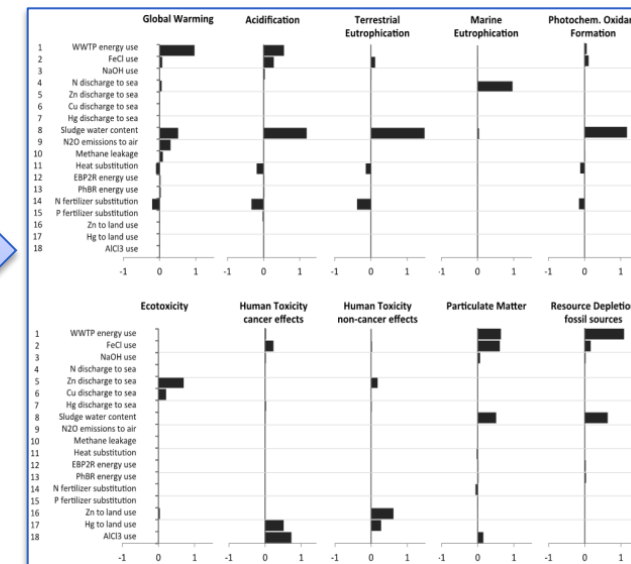
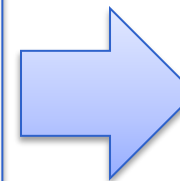




Væsentligste beskeder til TRENS-udviklerne

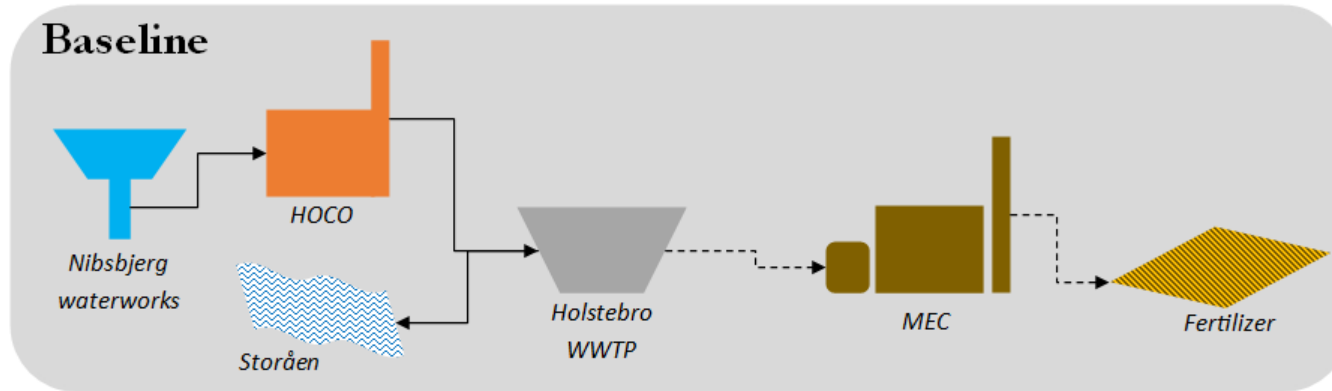
- TRENS kan medføre ca 10-15% reduktion af miljøpåvirkningen i forhold til konventionel spildevandsbehandling
- Reduktionen næringsstofbelastning er meget afhængig af kontrolleret frigivelse af kvælstof fra algerne
- Tungmetallernes skæbne i TRENS er ukendt men vigtig for den samlede miljøpåvirkning
- Produktionen af lattergas N_2O i fotobioreaktoren bør undersøges nærmere
- Materialevalg bør overvejes nu

Processes	Parameters	Description
WWTP Operation	1 WWTP energy use	Energy use in WWTP in kWh/m ³ influent
Discharge to sea	2 FeCl ₂ use	Iron (III) chloride production, for WWTP operation
Sludge Incineration	3 NaOH use	Sodium hypochlorite production, for WWTP operation
Emissions to air	4 N discharge to sea	Amount of nitrate-nitrogen discharged from WWTP effluent
Biogas collection	5 Zn discharge to sea	Amount of zinc discharged from WWTP effluent
Biogas combustion	6 Cu discharge to sea	Amount of copper discharged from WWTP effluent
TRENS (EBP2R + PBR)	7 Hg discharge to sea	Amount of mercury discharged from WWTP effluent
Fertilizer substitution	8 Sludge water content	Water content in dewatered sludge sent to incineration
Use-on-land	9 N ₂ O emissions to air	Emission of N ₂ O from nitrification/denitrification process
Pre-inf treatment	10 Methane leakage	Leakage of methane from biogas collection system
	11 Heat substitution	Export to district heating from biogas combustion process
	12 EBP2R energy use	Energy use in EBP2R
	13 PhBR energy use	Energy use in PBR
	14 N fertilizer substitution	Nitrogen substitution percentage of organic fertilizer
	15 P fertilizer substitution	Phosphorus substitution percentage of organic fertilizer
	16 Zn to land use	Amount of zinc going to agricultural soil
	17 Hg to land use	Amount of mercury going to agricultural soil
	18 AlCl ₃ use	Flocculant production, for pre-treatment before aquifer recharge

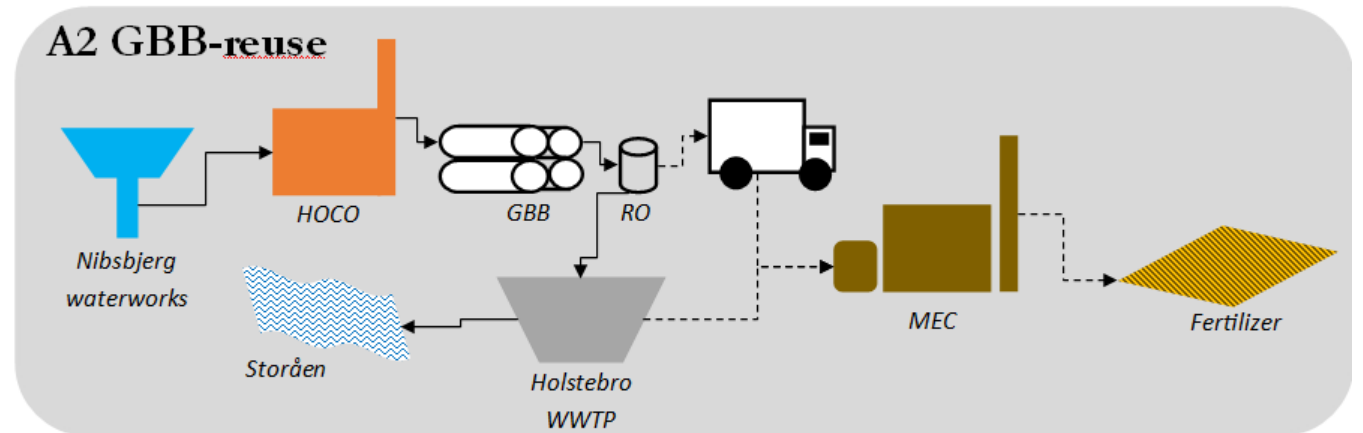


Lokal vandgenindvinding på mejeri

BAU

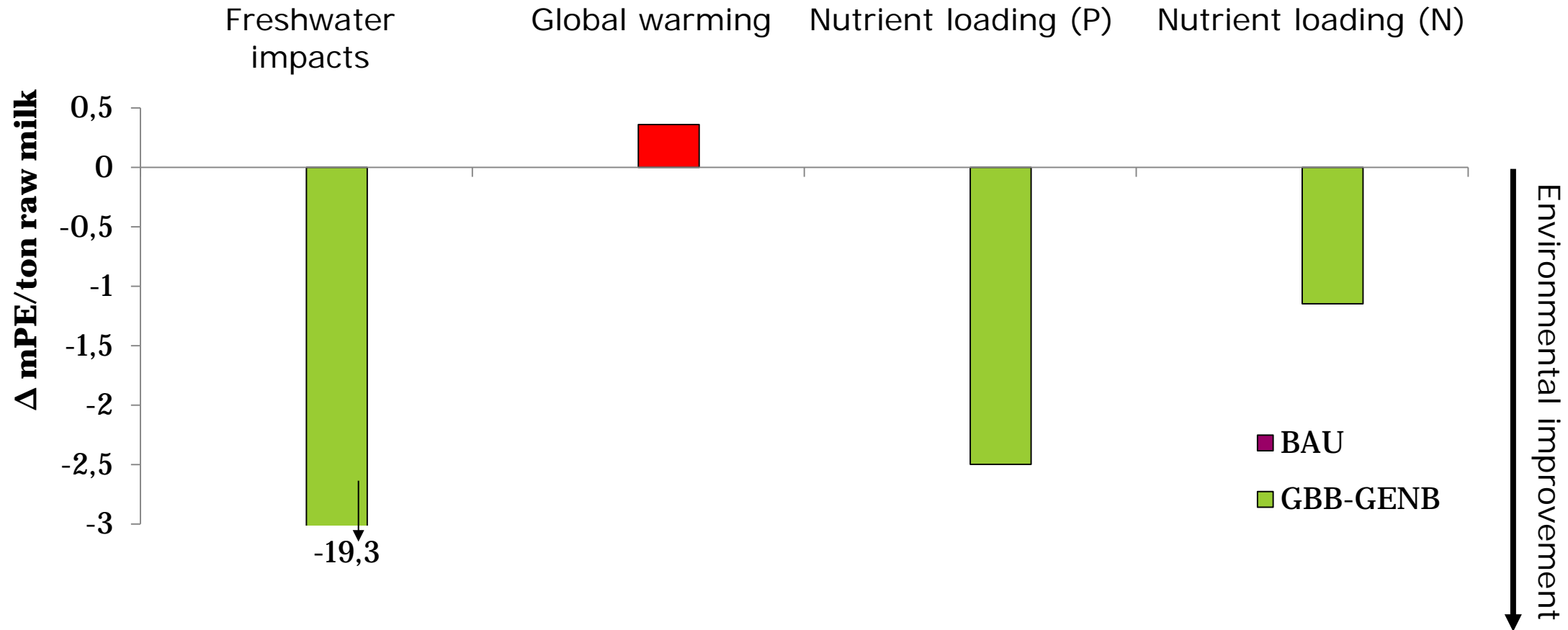


GBB-Genb










Livscyklusvurdering af lokal vandgenindvinding på mejeri



Værdiskabelse – Mejeri vs system

Værdiskabelse [DKK/ton råmælk]

	Vand-forsyning	Mejeri	Renseanlæg	Biogasanlæg	Total
Forskel BAU og GBB-GENB	-4.25	12,17	-13,85	-0,46	-6,38
					



Tag med

1. Flere drivkræfter skubber på udviklingen af byens vandsystemer
2. Større aktører vil påvirke af op- og nedstrøms forsyninger
3. Vi udvikler værktøjer, der kan beregne effekterne for hele systemet

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