

Smart Vannteknologi –
Smart Water process and
infrastructure engineering
Tittel: Sivilingeniør



Institutt for bygg- og energiteknikk

Bygg

Bachelor - ingeniør
Konstruksjonsteknikk
Vann og miljø
Infrastruktur og byutvikling

Master - sivilingeniør
Konstruksjonsteknikk
Bygningsteknologi
Infrastruktur vei og bane
Vann og miljø
Geoteknikk

Energi og miljø

Bachelor - ingeniør
Energi og miljø i bygg

Master - Sivilingeniør
Energi og miljø i bygg

Smart Mobility and Urban Analytics

Master
Smart Mobility and Urban Analytics

Ph.d Ingeniørvitenskap

Instituttakta

- 2 bachelorprogram – fire spesialiseringer
- 3 masterprogram
- Forsknings- og utviklingsaktiviteter
- 840 studenter – i vekst og vil ha ca.1200 i 2024
- 50 årsverk / 70 ansatte – vil øke til ca. 100 i 2024





OSLO METROPOLITAN UNIVERSITY
STORBYUNIVERSITETET

FRA BACHELORSEREMONI 15. JUNI 2023

Smart Water Engineering Group (SWING)



Hallgrim Hjelmbrække
Former Instituttleder,
Mastermind of the
Water Eng.
Education program



Benedek Plosz
Smart Water Research
group leader,
MSc Specialisation
coordinator
Associate professor



Marit Sandvik
Project
manager



Tom Baade-
Mathiesen
Assistant
professor



Morten Borup
Associate professor
Krüger-DK



Manuel Franco-Torres
Assistant professor
Multiconsult



Maria Faragò
Assistant professor
Rambøll-DK



Mehdi Zarei
Head
engineer



Kristin Jenssen Sola
Assistant professor
Drammen Kommune

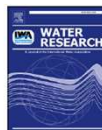


Laura Ferrando-Climent
Associate professor
IFE.NO

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Water Research

journal homepage: www.elsevier.com/locate/watres

Dynamic calibration of a new secondary settler model using *Cand. Microthrix* as a predictor of settling velocity

Yuge Qiu^a, Thomas Hug^b, Dorottya S. Wágner^c, Barth F. Smets^c, Borja Valverde-Pérez^c, Benedek G. Plósz^{a,d,*}

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^c Department of Environmental and Resource Engineering, Technical University of Denmark, Byngstorsvej, Bld. 115, Kgs. Lyngby 2800, Denmark

^d Department of Built Environment, Oslo Metropolitan University, Postboks 4 St Olavs plass, Oslo 0130, Norway



Modelling the impact of sludge settleability on aeration and N₂O emission



Yuge Qiu¹, Vince Bakos¹, Neil Stewart-Campbell¹, Benedek G. Plósz^{1,2}



¹ Department of Chemical Engineering, University of Bath, Claverton Down, Bath, UK

² Department of Built Environment, Oslo Metropolitan University, Oslo, Norway



Smart Water Process and Infrastructure Engineering

1st semester

Life Cycle Assessment for Built Environment

MABY4700 5 ECTS

Urban Pipe Systems

MABY5310 5 ECTS

Bioprocess Technology

MABY5320 5 ECTS

Research Methods and Ethics

MAEN5300 5 ECTS

2nd semester

Water Resource Recovery Technology

MABY5330 10 ECTS

Water Infrastructure, Trenches and No-Dig

MABY5340 5 ECTS

Sensor Networks and Model Based Decisions Support

MABY5350 5 ECTS

Smart Water Engineering Group (SWING)

SWING focuses on engineering research and education, promoting sustainable development of urban water infrastructure.

The research group emphasizes:

- Climate change impact adaptation and mitigation
- Water systems modelling and analysis
- Water pollutant and resource engineering
- Trace-organic drug and antibiotic biomarkers in water systems
- Urban Water Infrastructures

See more information below under [More about the research group](#)

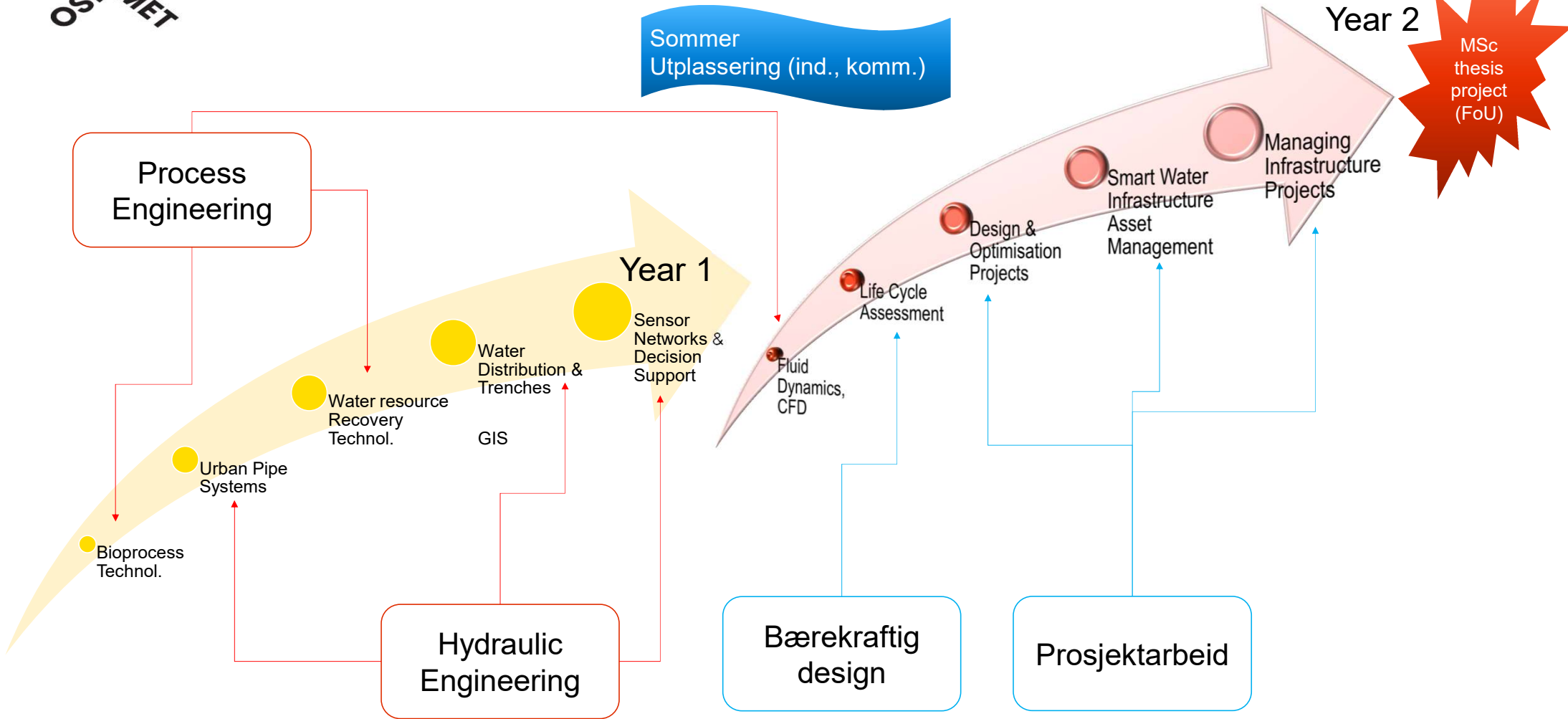
Markedsundersøkelser i Norge

- ❖ **Markedsundersøkelse** (2021-22): møter med vanneksperter fra “industry” & academia;
- ❖ MSc svarer på utfordringer som har kommet frem fra klimaendringer og mangel på ingeniører med kunnskap om vann.
 - ❖ data om vann, innhenting og kvalitet
 - ❖ prosessdesign, modellering, beslutnings støtte og kontroll.
 - ❖ tett samarbeid med partnere for å utvikle et studieprogram som komplementerer eksisterende
- ❖ Utdannede studenter vil være i stand til å utvikle **smarte & bærekraftige løsninger for å møte** klimaendringer og få god ressursutnyttelse.



Smart vannteknologi MSc

Sommer
Utplassing (ind., komm.)



Muligheter for studenter for å jobbe i med/hos samarbeidspartnere

SEMESTER 1				SEMESTER 2				SEMESTER 3				SEMESTER 4			
Urban pipe systems 5 ECTS				Water resource recovery technology 10 ECTS				Design and optimisation projects 10 ECTS				Master thesis project 30 ECTS			
Bioprocess technology 5 ECTS				Water distribution, trenches & (NO-dig) 5 ECTS				Managing infrastructure projects 10 ECTS							
Fluid dynamics & computational methods 10 ECTS				Sensor networks & model-based decisions support 5 ECTS											
Life cycle assessment of the built Environment 5 ECTS				GIS 10 ECTS				Smart infrastructure, asset management 10 ECTS							
Research Methods & Ethics 5 ECTS								Summer jobs 0 ECTS							

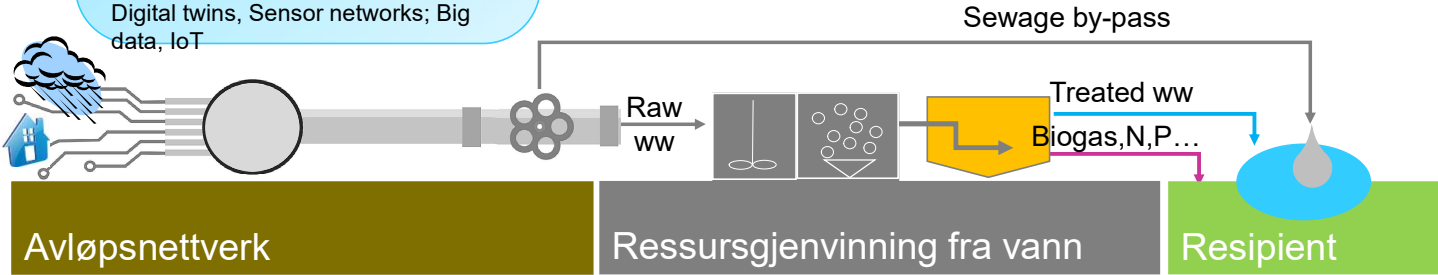
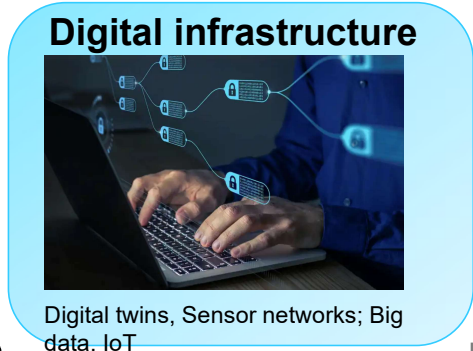
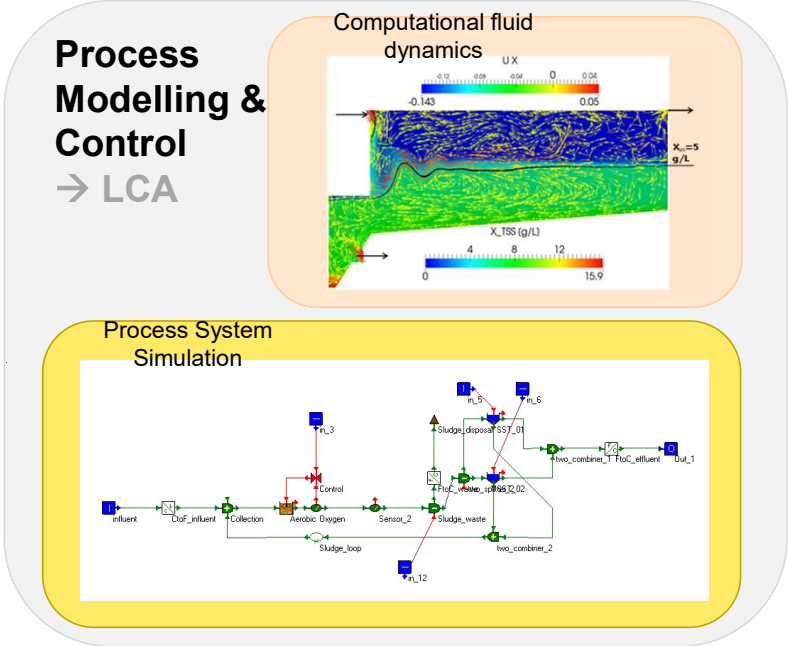
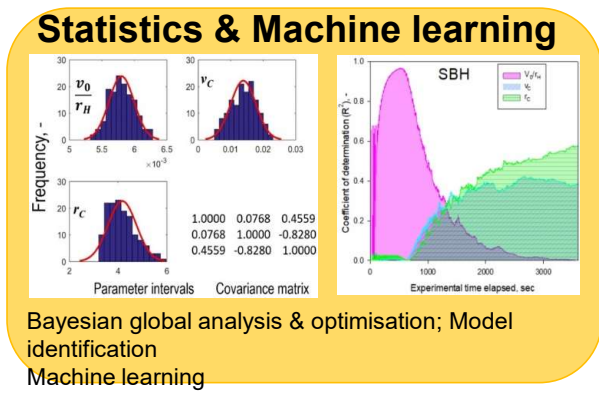
Green: MSc spesialiseringen in Smart water infrastructure engineering;

Yellow: extra-curricular activity; **Blue & Orange :** courses shared with other MSc programs



Noen andre?

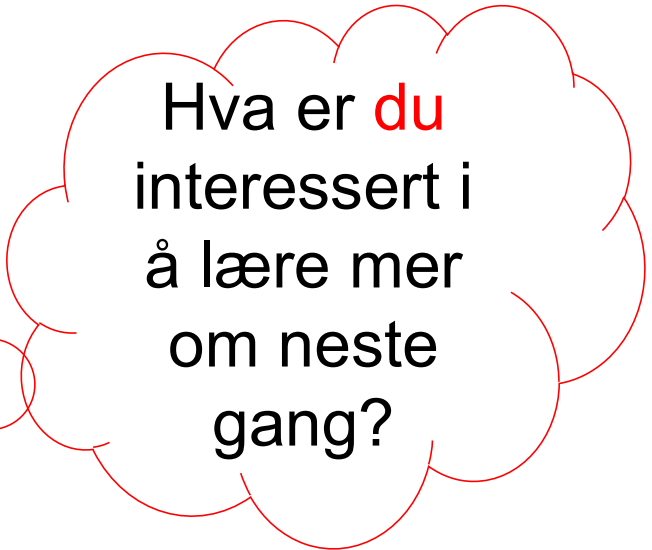
Digitale ferdigheter og utvikling av kompetanse



Videreutdanningsprogram (fra 2024) for industri/kommunale partnere

Temaområder for etterutdanningskurs

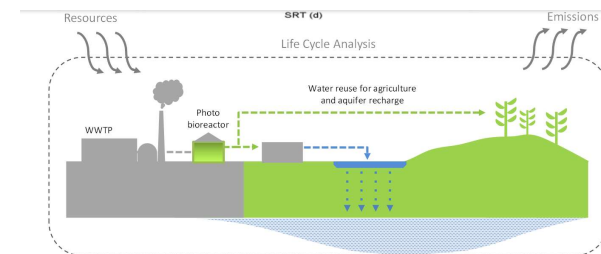
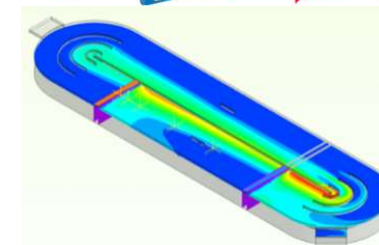
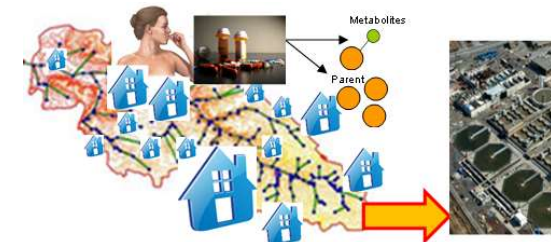
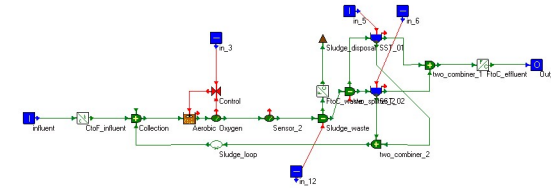
- ❖ Vannlaboratorieferdigheter
- ❖ Programvareopplæring for modellering av kloakkrør og renseanleggssystemer (SUMO, WEST+, MIKE+, Matlab, Simulink, Python, etc.)
- ❖ Design og optimalisering av kloakkrør og renseanleggssystemer
- ❖ Skreddersydde videreutdanningsprogrammer



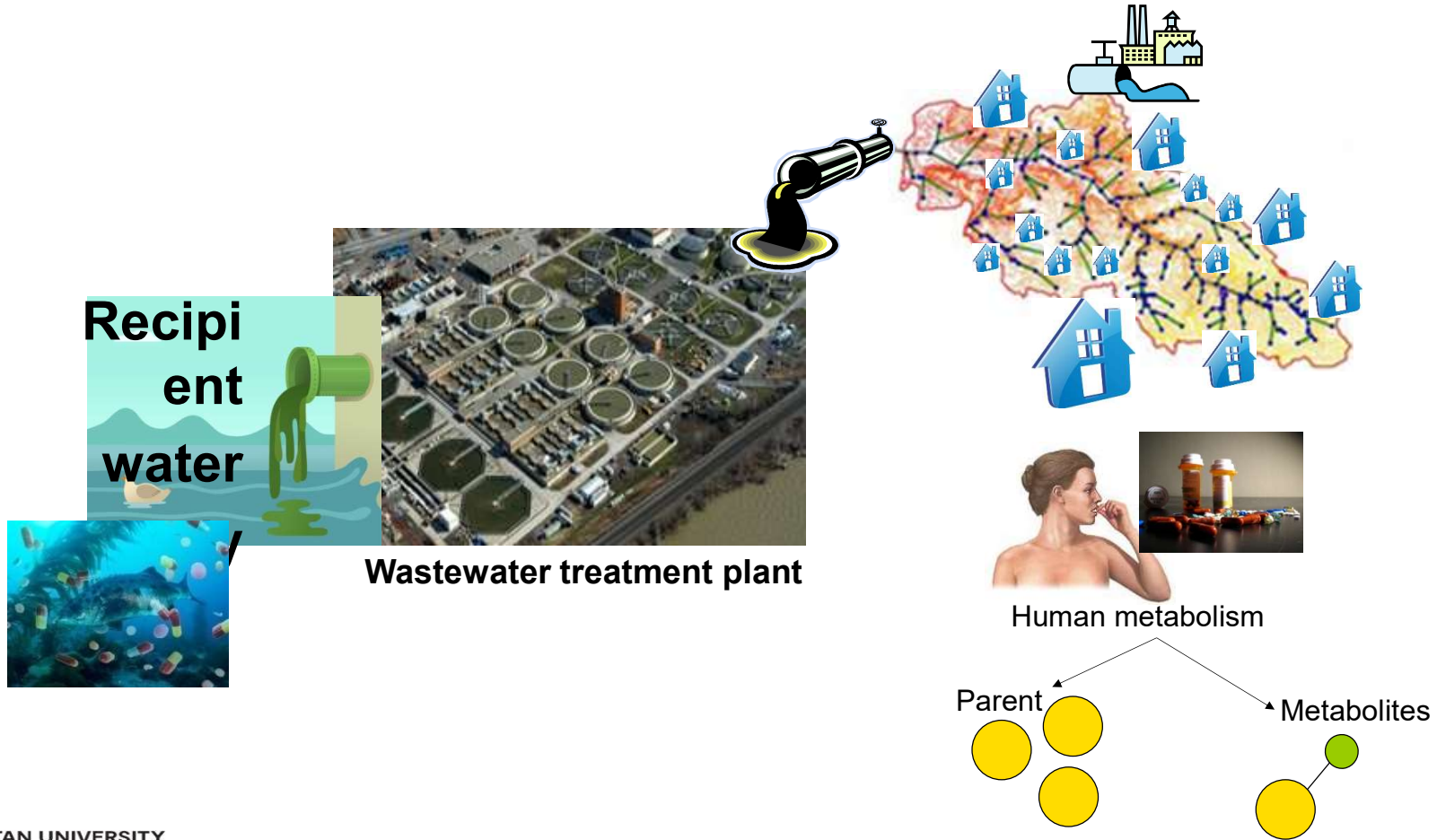
Hva er **du** interessert i å lære mer om neste gang?

FoU aktiviteter

- ❖ **Mikroforurensingskontroll** antibiotics, genetic materials
- ❖ **Luftning og N₂O klimagassutslipp** CFD, 1-D modellering, smart design, operation and control
- ❖ **Klima resilient design, drift & control** pipe- and reactor-systems
- ❖ **Smart vannsensorsnetverksinfrastruktur** urban flooding, pipe- & reactor systems
- ❖ **Vannressursteknikk** urban-rural resource cycling
- ❖ **Avløpsepidemiologi** COVID, illicit drugs and antibiotic resistance
- ❖ **Compact trenches** and collaboration with other infrastructure departments



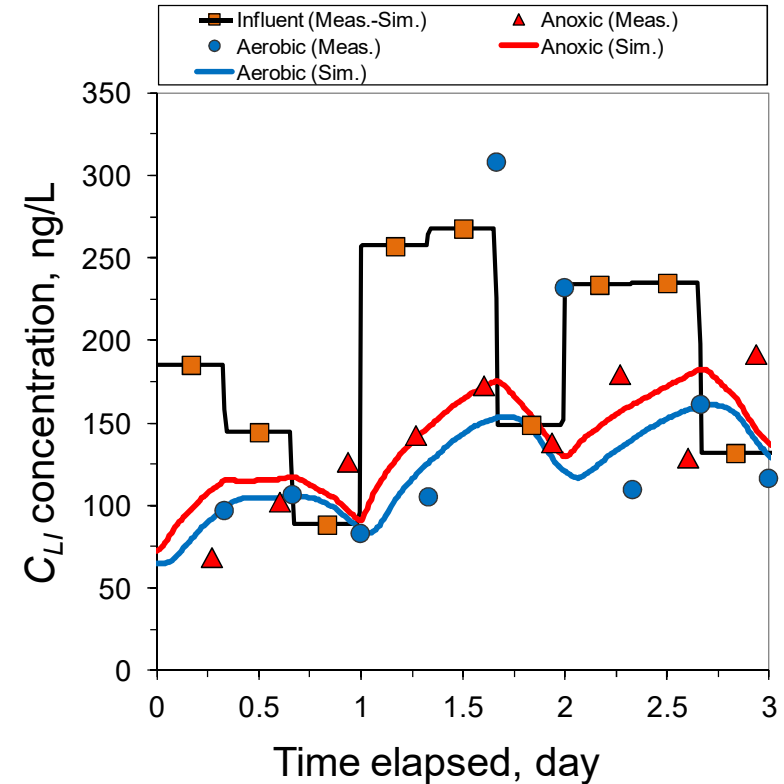
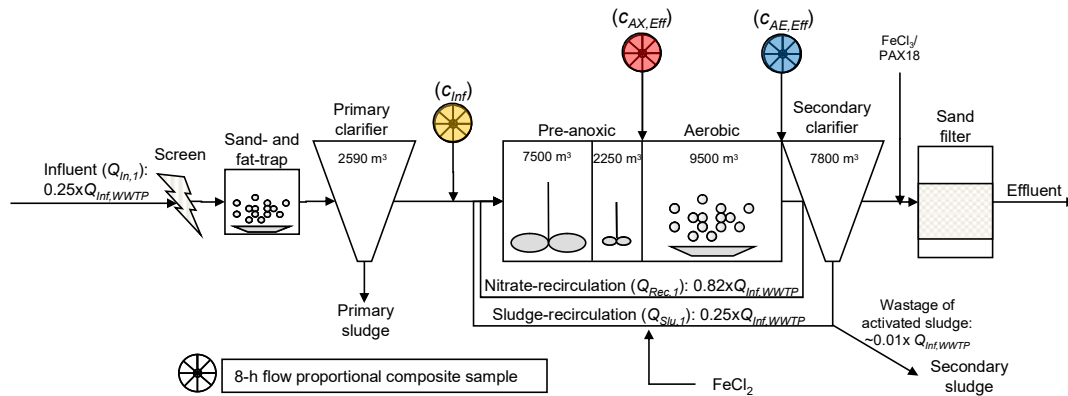
Mikroforurensninger i kloakkoppsamlings- og rensesystemer



ASM-X modellering – diclofenac i Bekkelaget rensesanlegg, Oslo

Evaluation/validation

● Full-scale simulations

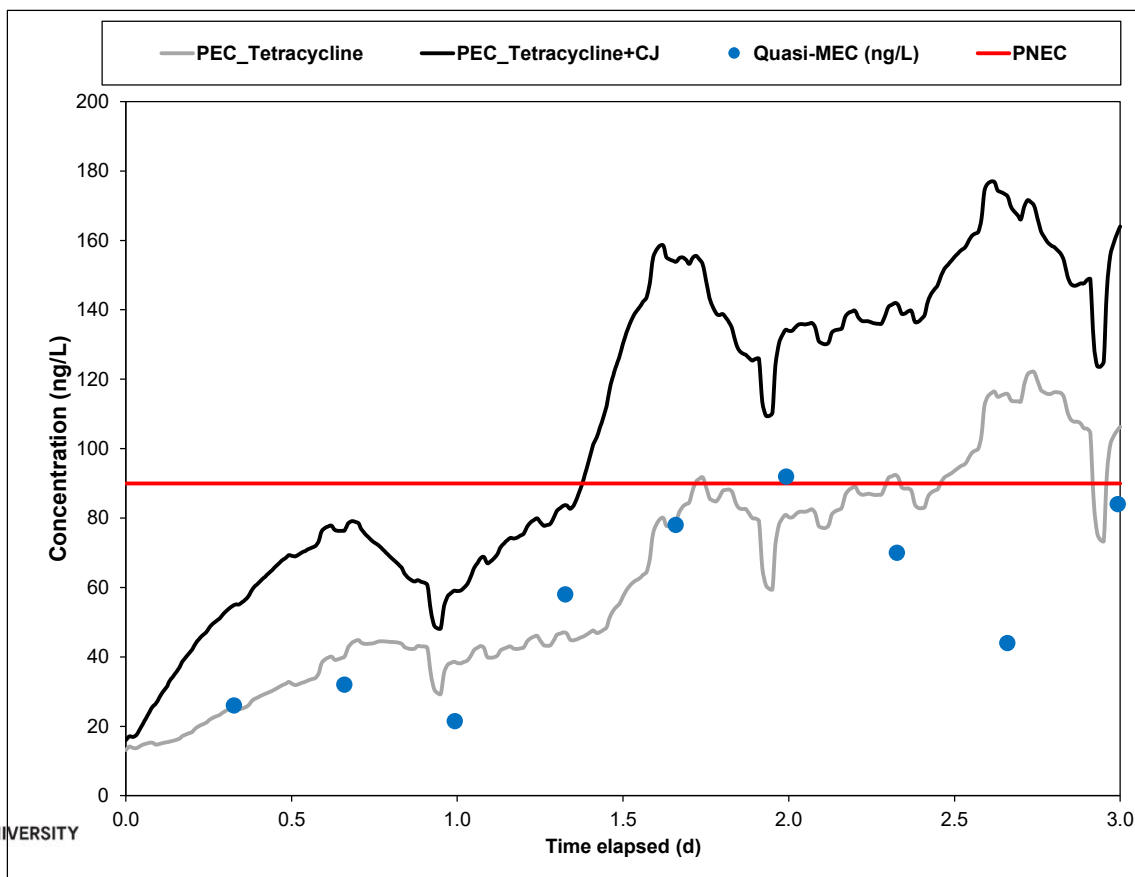
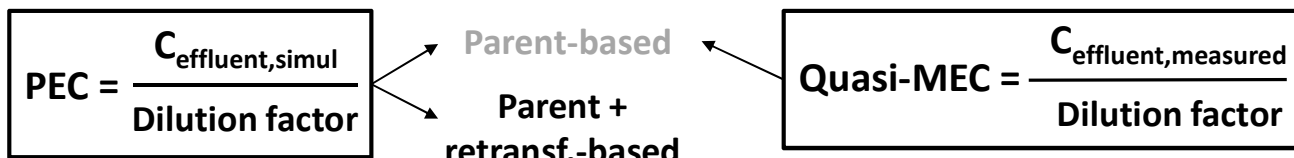


□ Model accuracy: 7-10 % error in prediction (C_{LI}).

□ Re-transformable (C_{CJ}) fraction in influent $\rightarrow C_{LI,Inf} \cdot C_{CJ,Inf} = 0.9$

Tetracyclin – dynamisk predikert miljøkons., Oslo

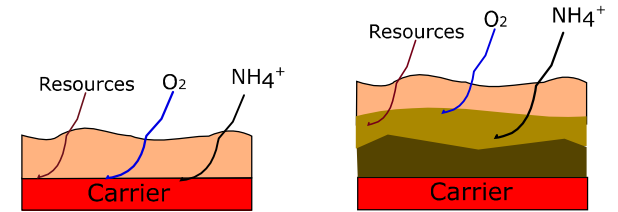
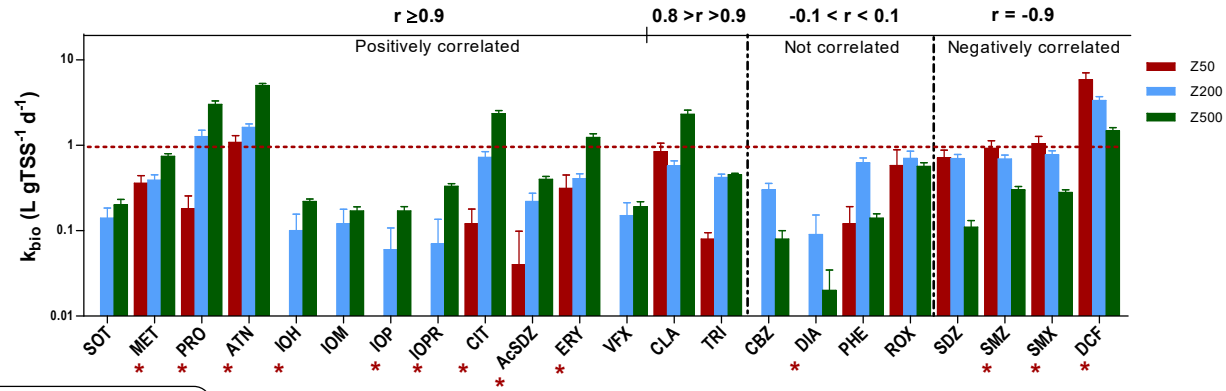
OSLOMET



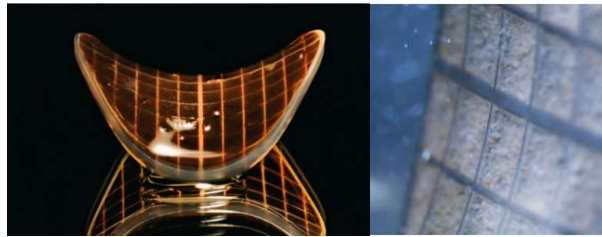
PNEC = 90 ng/L
(Grung et al., 2008)

- **Dynamic-PEC and Quasi-MEC, also exceeding PNEC**
- **Additional risk to be associated to retransformable fraction in effluent**

OSLOMET

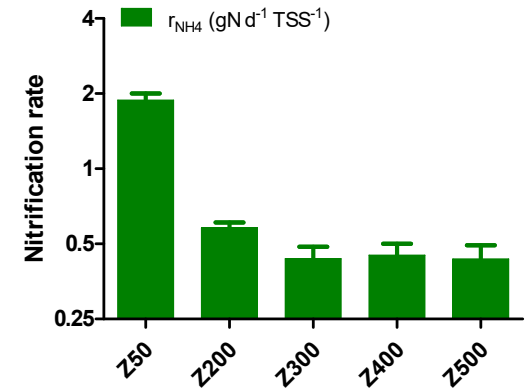
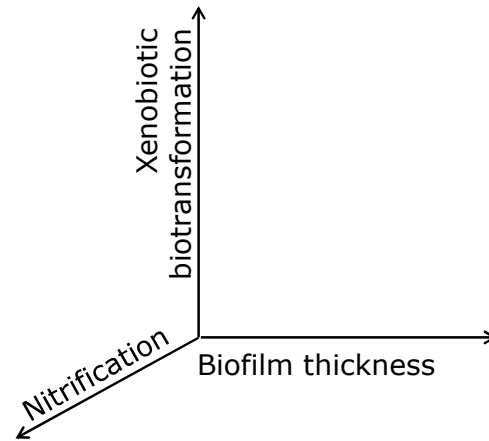


Microbiology



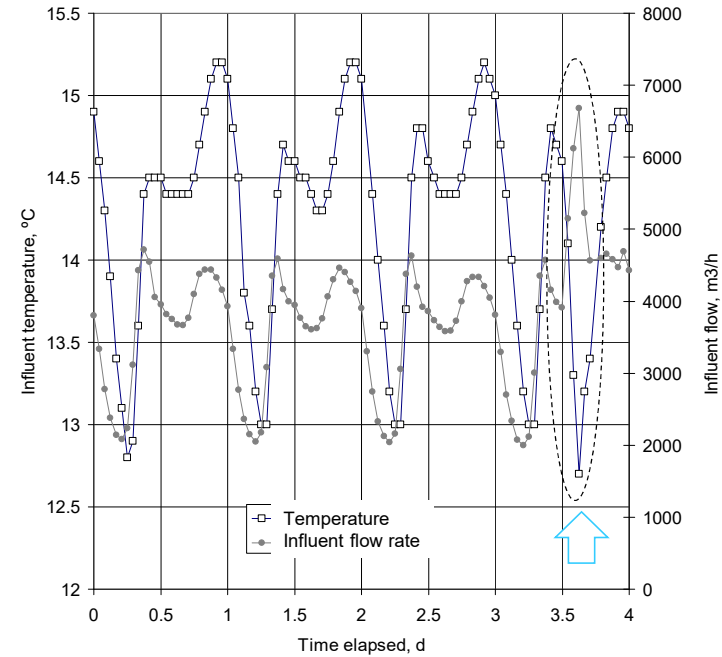
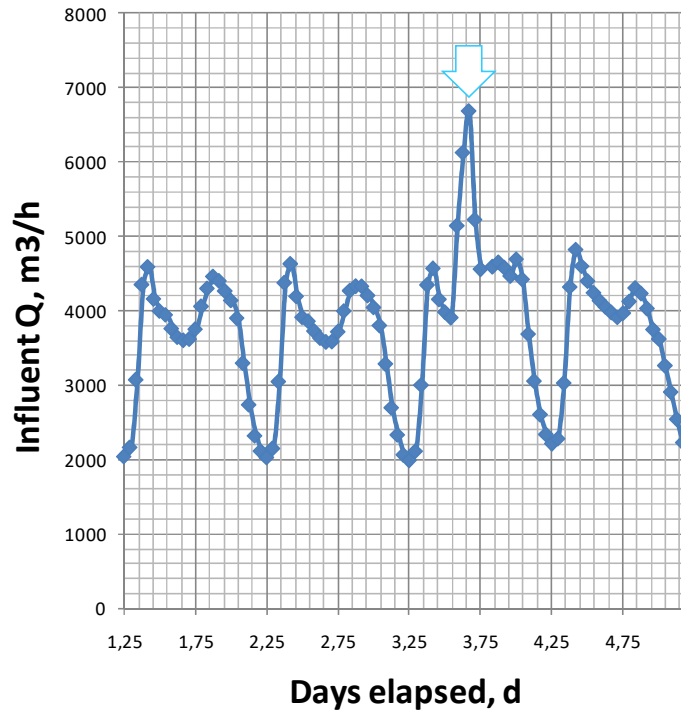
Experimentation

Process modelling



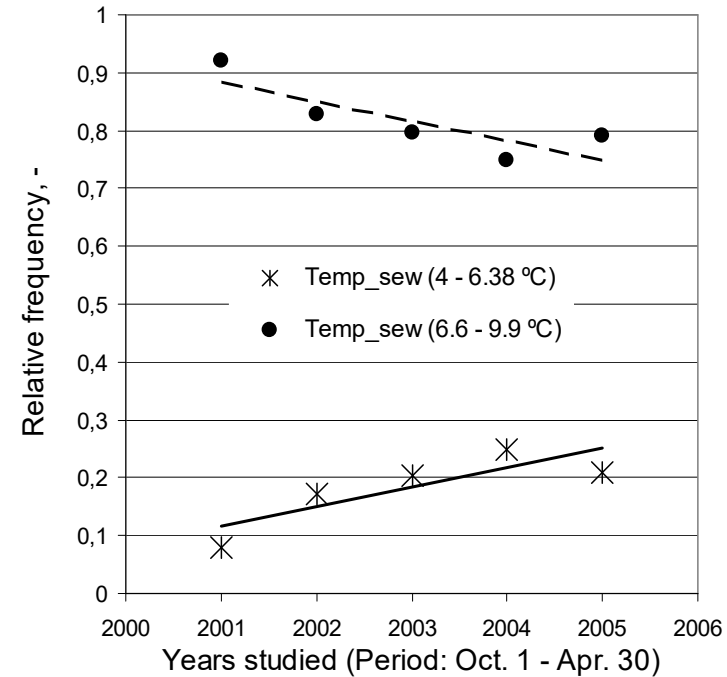
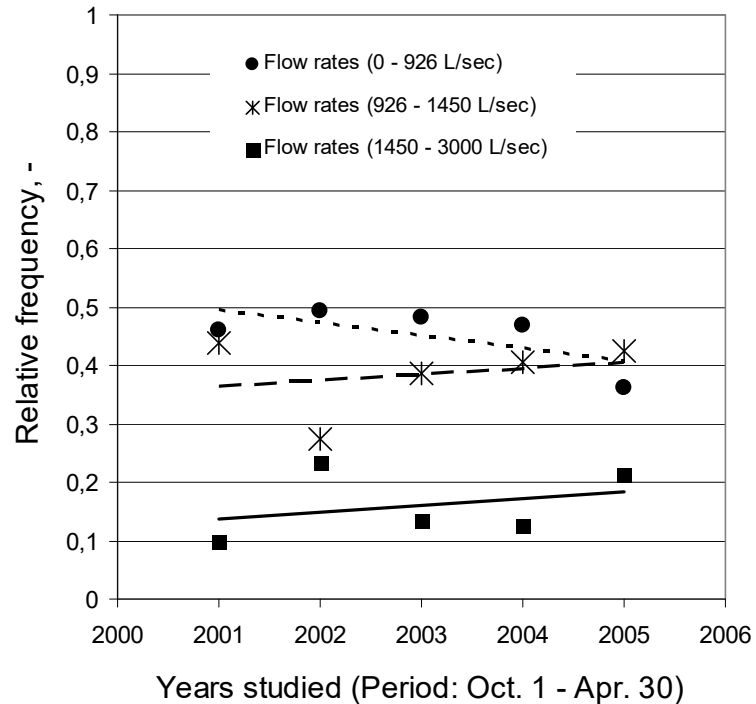
Torresi et al. (2016) *ES&T*

Snøsmelting strøm behandling



❖ Legg merke til temperaturfallet

Klimaendringer påvirker innflytende strømning og temperatur



- ❖ Progressivt øke de relative frekvensene av svært høy innflytende strømningshastighet og svært lav innflytende kloakktemperatur i Norge!

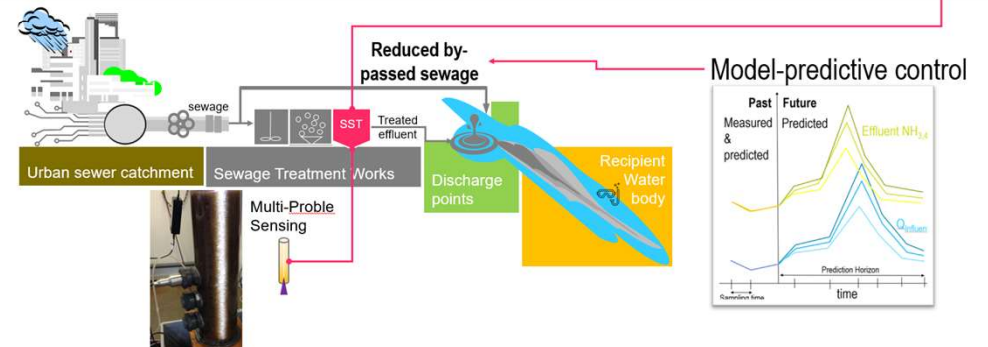
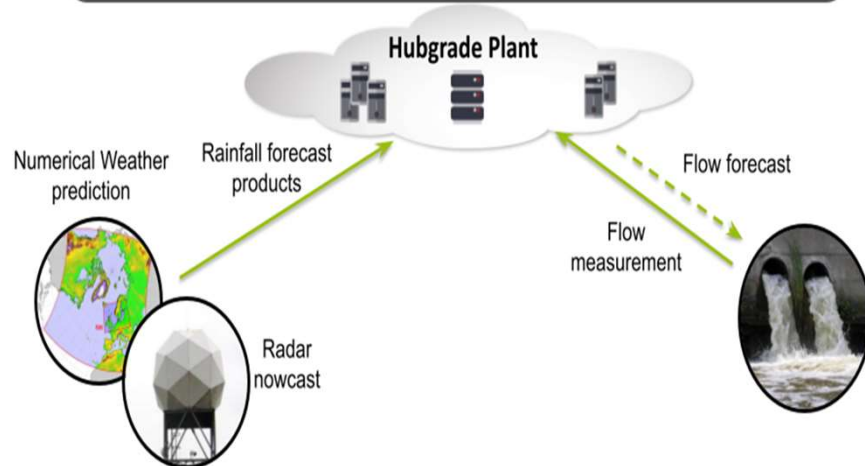
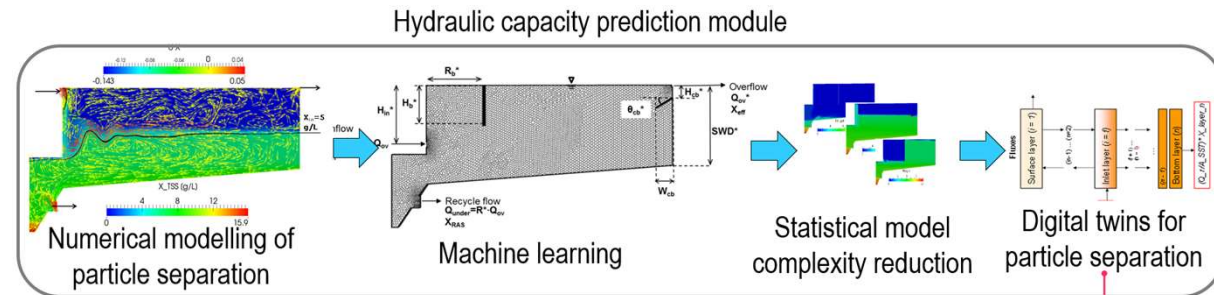
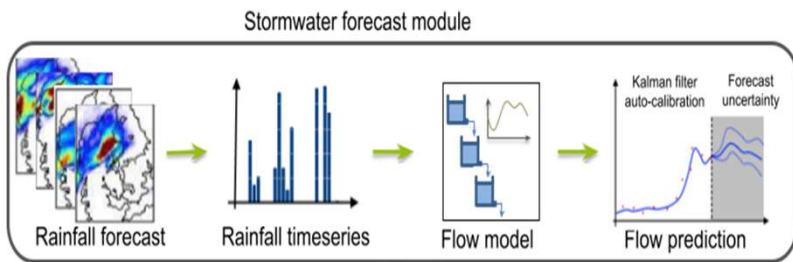
Prosjekt – Håndtering av overvann/stormvann



For å minimalisere kombinerte kloakkoverløp under storm og snøsmelting strøm

- ❖ Model Predictive Control (MPC) rutine for "smart" bruk av kloakkoppbevaringsbasseng volumene

- ❖ Redusere kloakk-omføring i WRRF-er ved hjelp av multi-probe-sensorer og digitale tvillinger



Takk.

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Faculty of Technology, Art and Design
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Smart vannteknologi (SWING)

SWING fokuserer på ingeniørforskning og utdanning, og fremmer bærekraftig utvikling av urban vanninfrastruktur.

Vi er en ressurs for [masterspesialiseringen i smart vannteknologi](#), på [masterstudiet i bygg – sivilingeniør](#). Forskergruppen legger ellers vekt på:

- tilpasning og demping av klimaendringer
- vannsystemer modellering og analyse
- vannforurensning og ressursteknikk
- spororganiske medikament- og antibiotikabiomarkører i vannsystemer
- urban vanninfrastruktur

