CAPTURE

TOGETHER WE BECOME CIRCULAR

CENTRE FOR **A**DVANCED **P**ROCESS **T**ECHNOLOGY FOR **U**RBAN RESOURCE **RE**COVERY

www.capture-resources.be

What is CAPTURE?

CAPTURE is a **platform initiative** that operates a physical and virtual place to help researchers and companies to co-create and interact with each other and exchange values under **three pipelines.**

CAPTURE Summary

CAPTURE

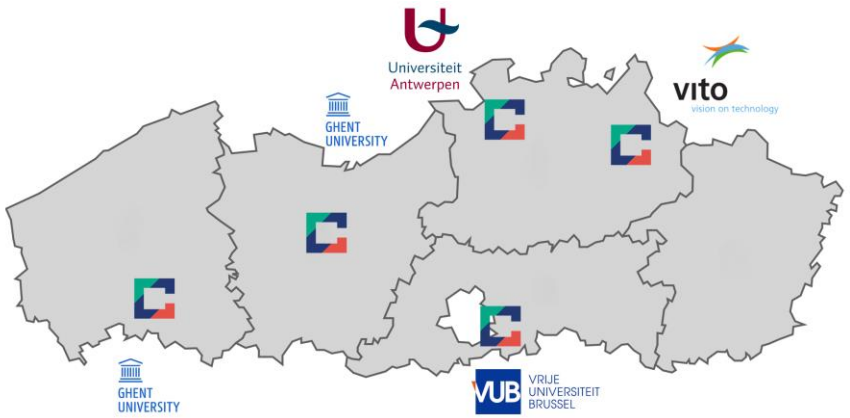
Powered by

Universiteit Antwerpen

GHENT UNIVERSITY

vito vision on technology

VUB



3 Pipelines

14 Programs

68 research group leaders

>45 research groups

>300 researchers involved

3 business platforms

>25 business members

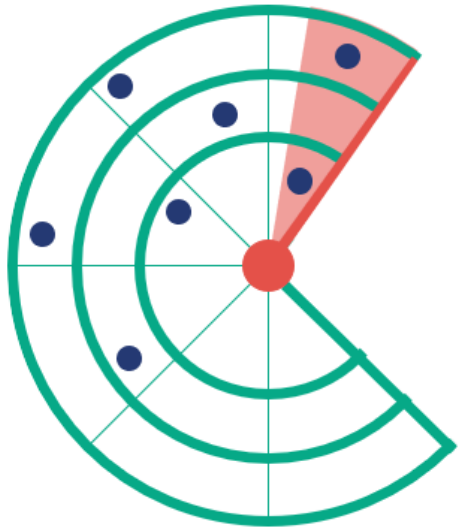
>100 companies we work with

11 staff members

22 supporting members

6 business developers

Why interact with CAPTURE?



CAPTURE as a radar

INFORMATION

- Direction/trends;
- Research intelligence;
- Funding feedback;
- Collaboration contacts
- Talent

INFLUENCE

- Research projects;
- Insight discussions;
- Talent;
- Collaboration contacts.

TRAINING

- Courses
- Seminars
- Workshops

CAPTURE

Pipelines

CO_2 to product

CO_2 PIPELINE

Water 'fit for use'

WATER PIPELINE

Plastics to resource

PLASTICS PIPELINE

Pillars

RESEARCH

TRAINING

VALORIZATION

Water ‘fit-for-use’

Energy & Organics

Identification of useful resource streams

Water fit for use

Nutrient Recovery

Wastewater treatment of the future

Advanced modelling & design for efficient pilot development

Metal recovery

SMART WATER (RE-)USE IN SELECTED DOMAINS

CAPTURE

WATER FIT FOR USE

www.capture-resources.be/water-fit-use

Academic members

VITO

Janelcy CASTANO
Data Science
Digital Water

Inge GENNÉ
General Water Roadmap

Marc SPILLER
Technology assessment
Material flow (N, P, protein)

Dores CIRNE
Bioprocesses
(waste)water

Piet SEUNTJENS
Digital Water
IoT monitoring

UNIVERSITY OF ANTWERP

Pegie COOL
Photocatalysis
sorbentia

Karolien DE WAEL
Sensors
Electrochemistry

Iris CORNET
Fermentation
Phenolics valorization

Jan DRIES
Industrial WWT
Granular systems

Siegfried VLAEMINCK
Nutrient valorization
microbial env. tech

VRIJE UNIVERSITEIT BRUSSEL (VUB)

Wim DE MALSCHE
Microfluidics

Marijke HUYSMANS
Groundwater,
groundwater modelling

Heidi OTTEVAERE
Photonic sensors

Ann VAN GRIENSVEN
Hydrological modelling

Academic members

GHENT UNIVERSITY

Nico BOON
Drinking Water
Microbiology

Emile CORNELISSEN
Membrane technology

Bart DEGUSSEME
Drinking water
Technology

Steven DE MEESTER
Sustainable design

Kristof DEMEESTERE
Micropollutants
Trace organics

Jo DE VRIEZE
Anaerobic Digestion
Molecular Biology

Tom DEPOVER
Metal corrosion
Hydrogen embrittlement

Gijs DU LAING
Trace Elements
sorbentia

Ramon GANIGUÉ
biocatalysis
gas fermentation

Stijn LUCA
Statistical analysis

Ingmar NOPENS
CFD Modelling
Advanced modelling

Korneel RABAEY
electrification
biotechnology

Frederik RONSSE
Gassification
pyrolysis

Diederik ROUSSEAU
Nature based
solutions

Filip TACK
Trace elements
analytics

Elena TORFS
Ontologies

Stijn VAN HULLE
Advanced oxidation
Nutrient removal

Kim VERBEKEN
corrosion

Arne VERLIEFDE
Phys/chem WWT
Membrane technology

Pieter VERMEIR
Analytics

Jan VERWAEREN
Artificial intelligence

Eveline VOLCKE
Biological domestic wwt
Monitoring & control

Di WU
Saline water
Sulfur-cycle biotech

Water business platform

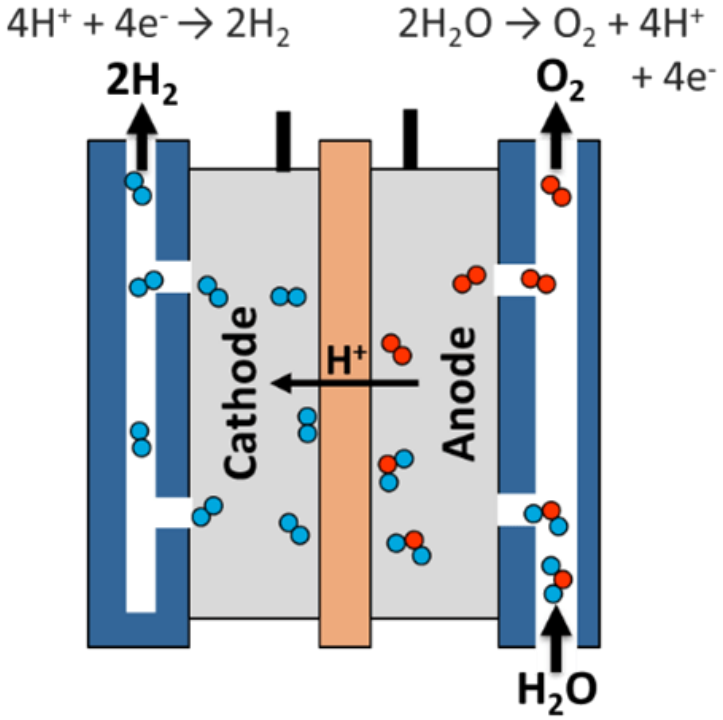
Aim: Develop long-lasting relationships to build develop future water technology solutions with focus on pre-competitive research so companies are more eager to interact openly.

19 companies

- 3 drinking water
- 3 WWT
- 2 Large industry
- 13 technology providers
- 8 consulting

Some numbers on H_2 & H_2O

Anode reaction: $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$
Cathode reaction: $4H^+ + 4e^- \rightarrow 2H_2$



- Theory: 9 L water per kg of H_2
- Practice: 10 – 23 L water per kg H_2
  - Efficiency losses at H_2 side
  - Efficiency losses at water side
  - Cooling

- => 6 - 10 $m^3\ d^{-1}\ MW_{installed}^{-1}$

Some numbers on H_2 & H_2O

=> 6 - 10 $m^3\ d^{-1}\ MW_{installed}^{-1}$

~ 100L per person per day for household use

=> 60 – 100-person water use $d^{-1}\ MW_{installed}^{-1}$

Jaar	Elektrisch vermogen (GW)	Elektriciteit (PJ)	Geproduceerde waterstof (PJ_{LHV})
2021	0	0	0
2025	0,25	3,78	2
2030	2,50	37,80	21
2035	4,20	63,50	35
2040	4,20	63,50	35
2050	4,20	63,50	35

Tabel 2.4: Overzicht electrolysecapaciteit projecten CES 2022

CES 2022

Some numbers on H_2 & H_2O

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Tabel 2.4: Overzicht electrolysecapaciteit projecten CES 2022

CES 2022

min. 240.000-person water

Some numbers on H_2 & H_2O

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Tabel 2.4: Overzicht electrolysecapaciteit projecten CES 2022

CES 2022

min. 240.000-person water

Zeeland: 390.000 persons

Steel: 720.000 persons

Options:

- Less installed power

- Use of other water sources:
  - For cooling
  - For electrolysis

  - Effluent (industrial or domestic)
  - Groundwater
  - Brackish
  - Salt

Options:

- ~~Less installed power~~

- Use of other water sources:
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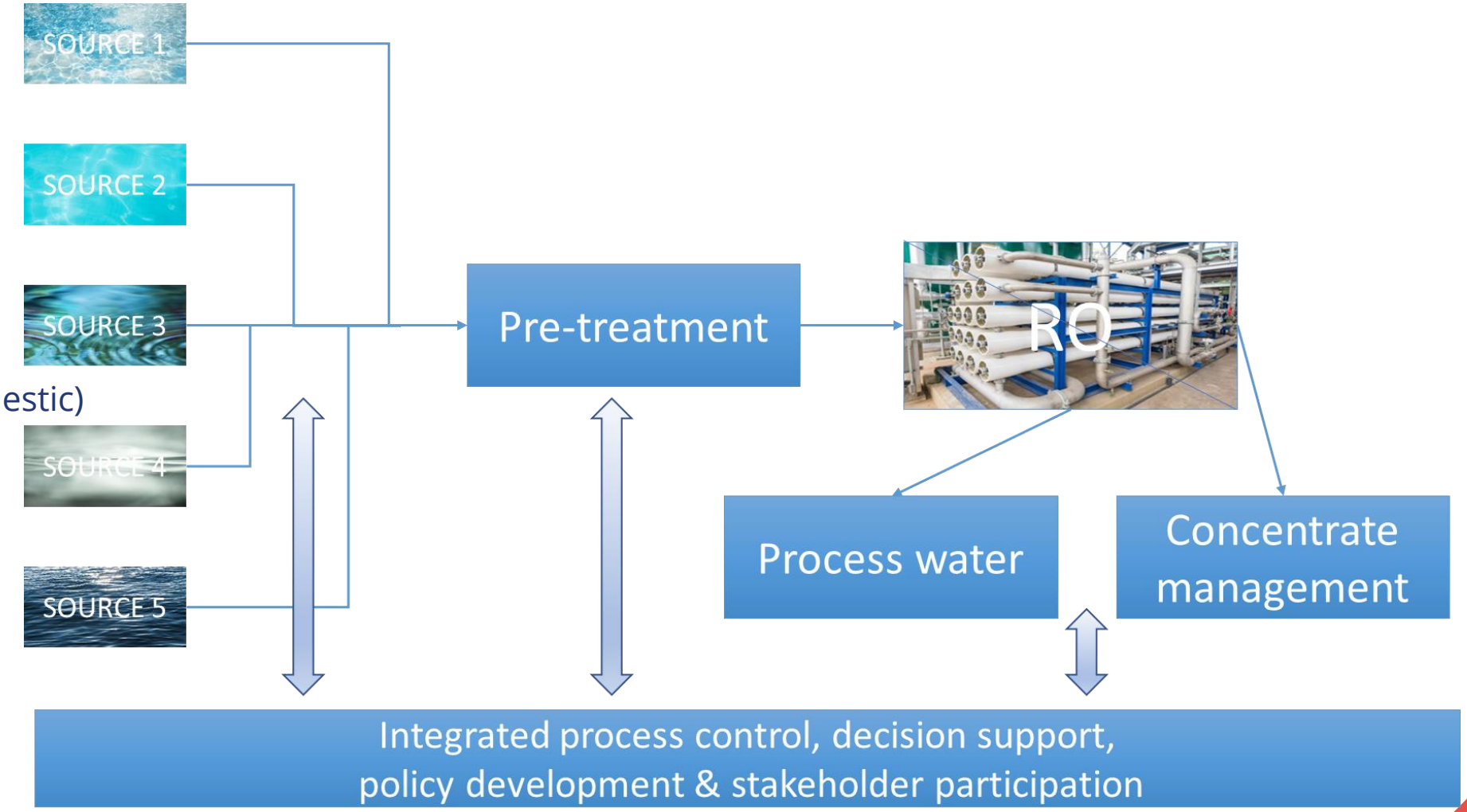
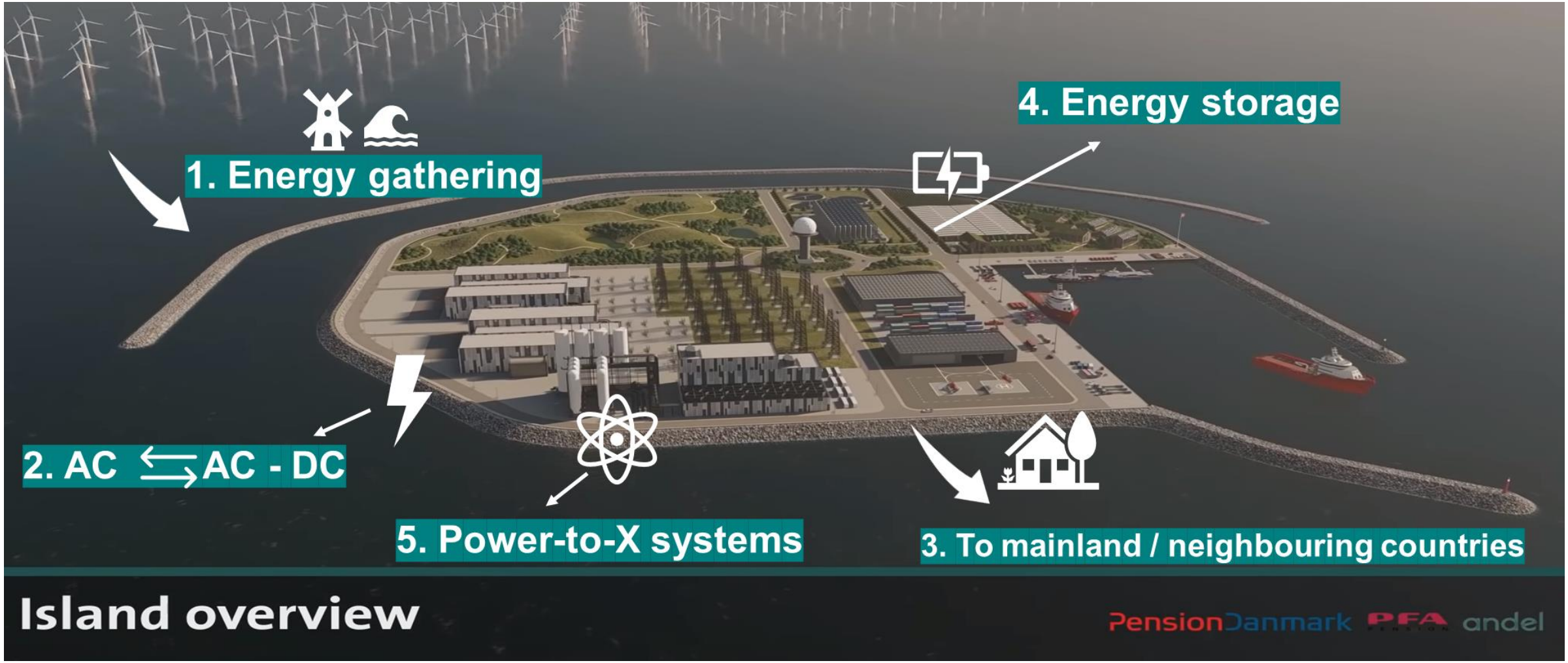
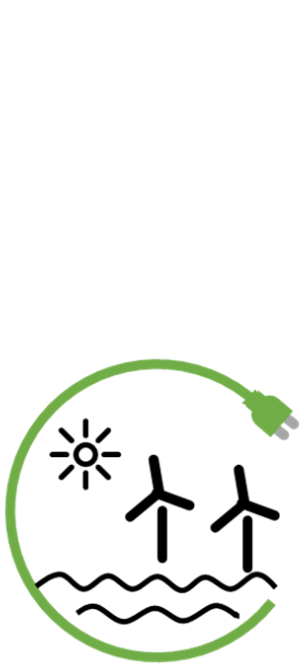


Molecules @ Sea (MuSE) project

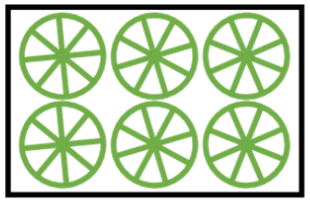


Molecules @ Sea (MuSE) project



WP 1 Energy integration

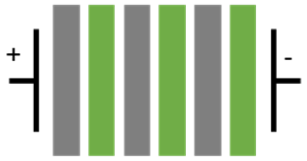
renewable energy



WP 2
Direct Air Capture

CO_2

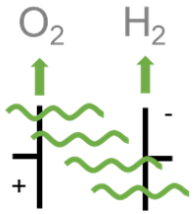
renewable energy



WP 3
CO_2 extraction from seawater

$CO_2 + H_2$

renewable energy



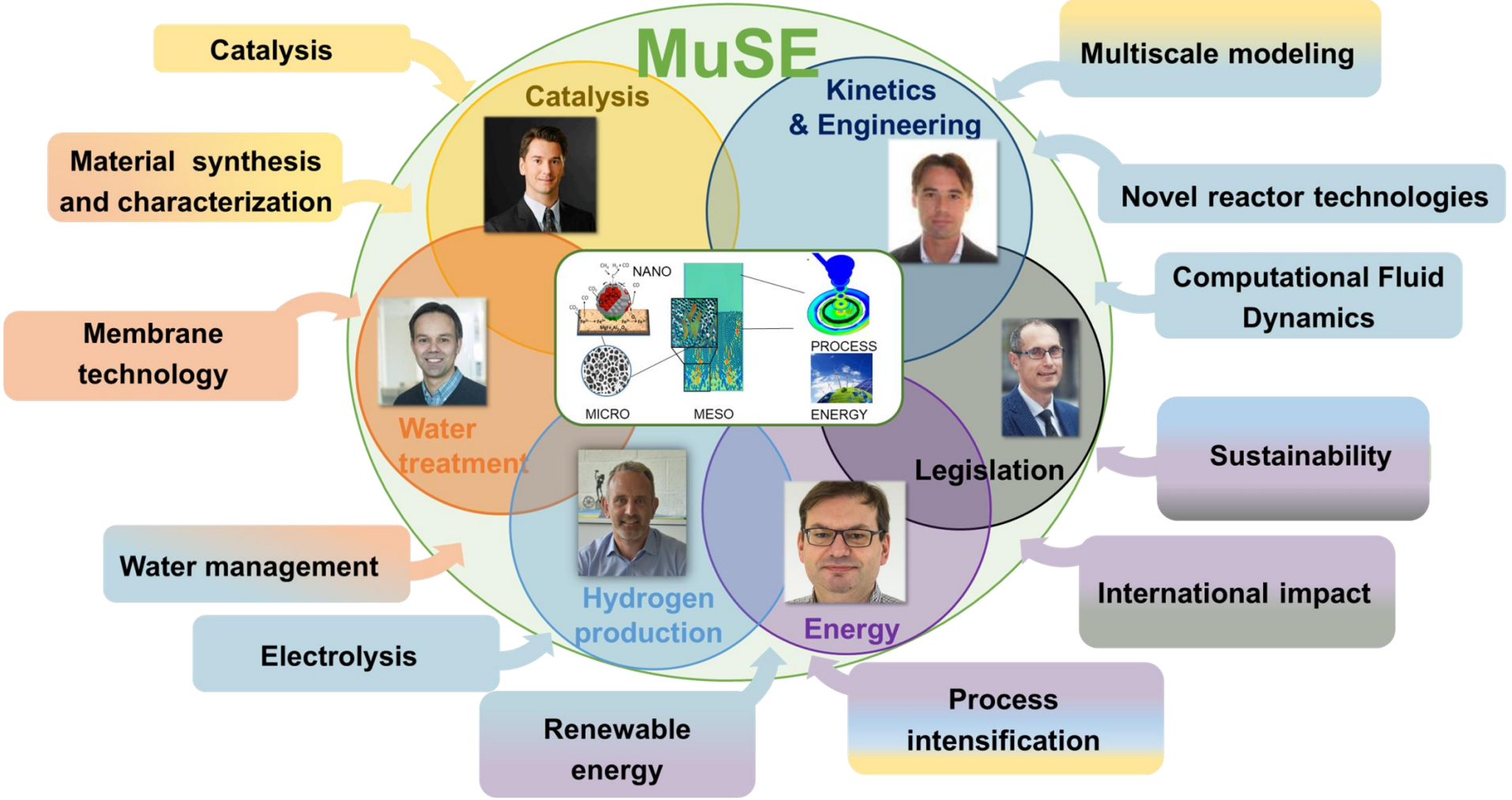
WP 4
Hydrogen production from seawater

H_2

WP 5 Production of **GREEN** molecules

WP 6 Certification of (renewable) **HYDROGEN** and other **GREEN** molecules

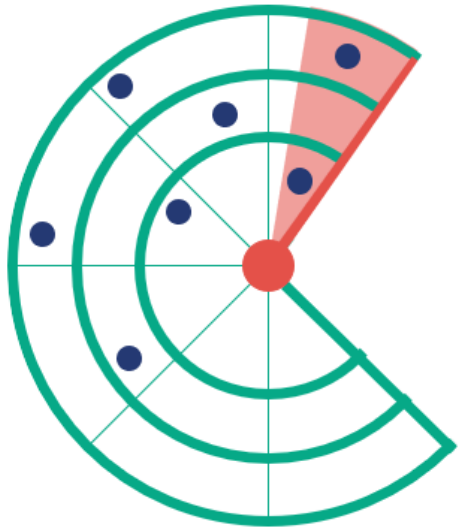
Molecules @ Sea (MuSE) project



Wrap-up

- Water use for the sustainable energy transition is not trivial but also not unsurmountable
- Water for energy transition also costs energy (~4 kWh m^{-3})
- Solutions, both technical & digital are in development
- Linking sources to applications is essential
- All stakeholders should be involved in setting up a framework

Why interact with CAPTURE?



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