



# GREEN INDUSTRIAL HUBS IN VESTLAND

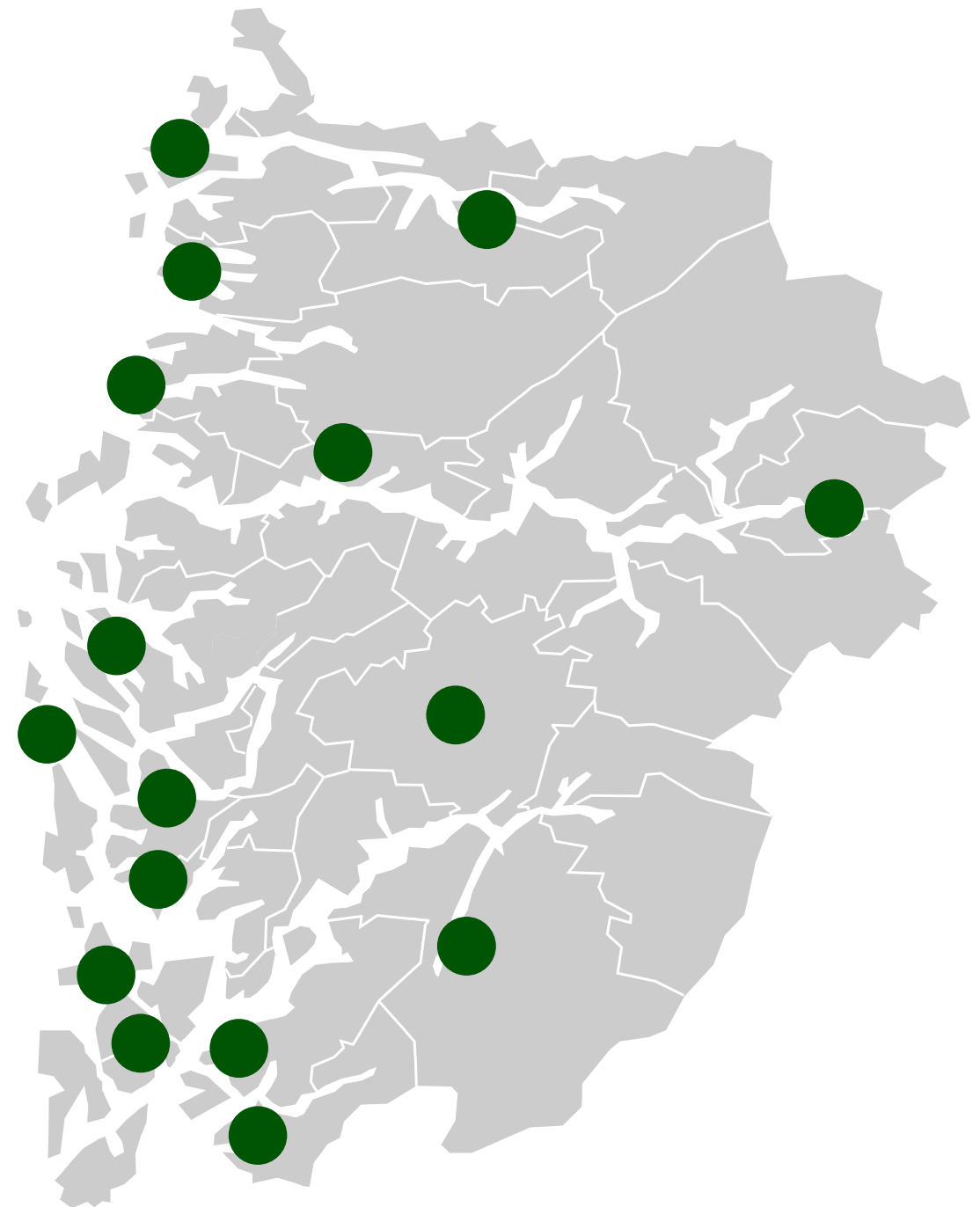
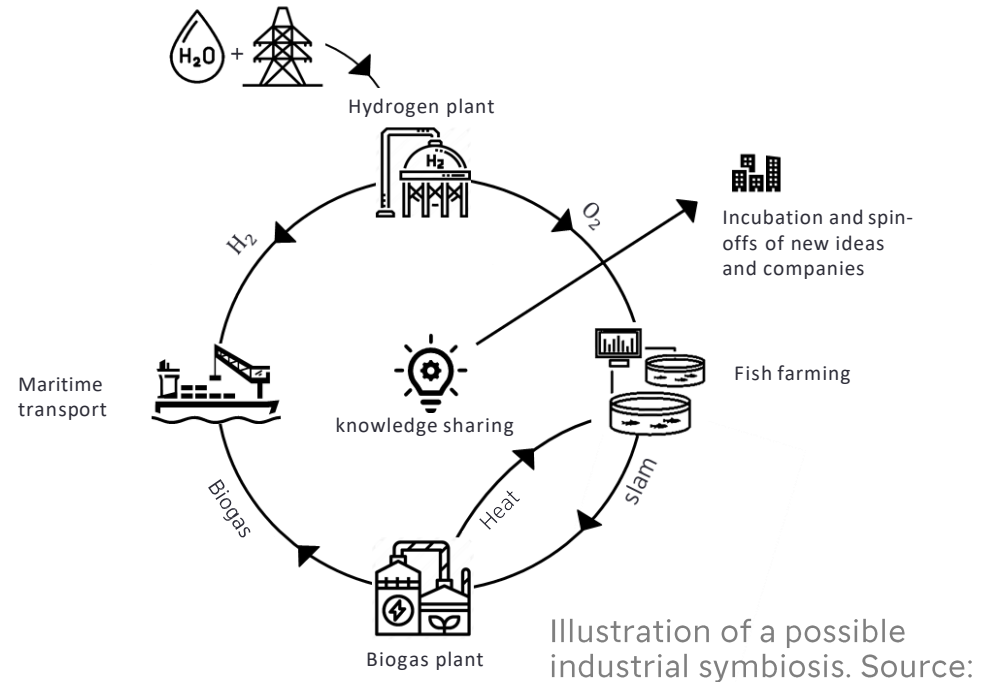


# Green Region Vestland

Green Region Vestland has identified 16 industry hubs which have strategic roles in

- transition to sustainable industry
- developing new green value chains in the region

The identified hubs have the greatest potential for industrial symbiosis across value chains



# Green Region Vestland

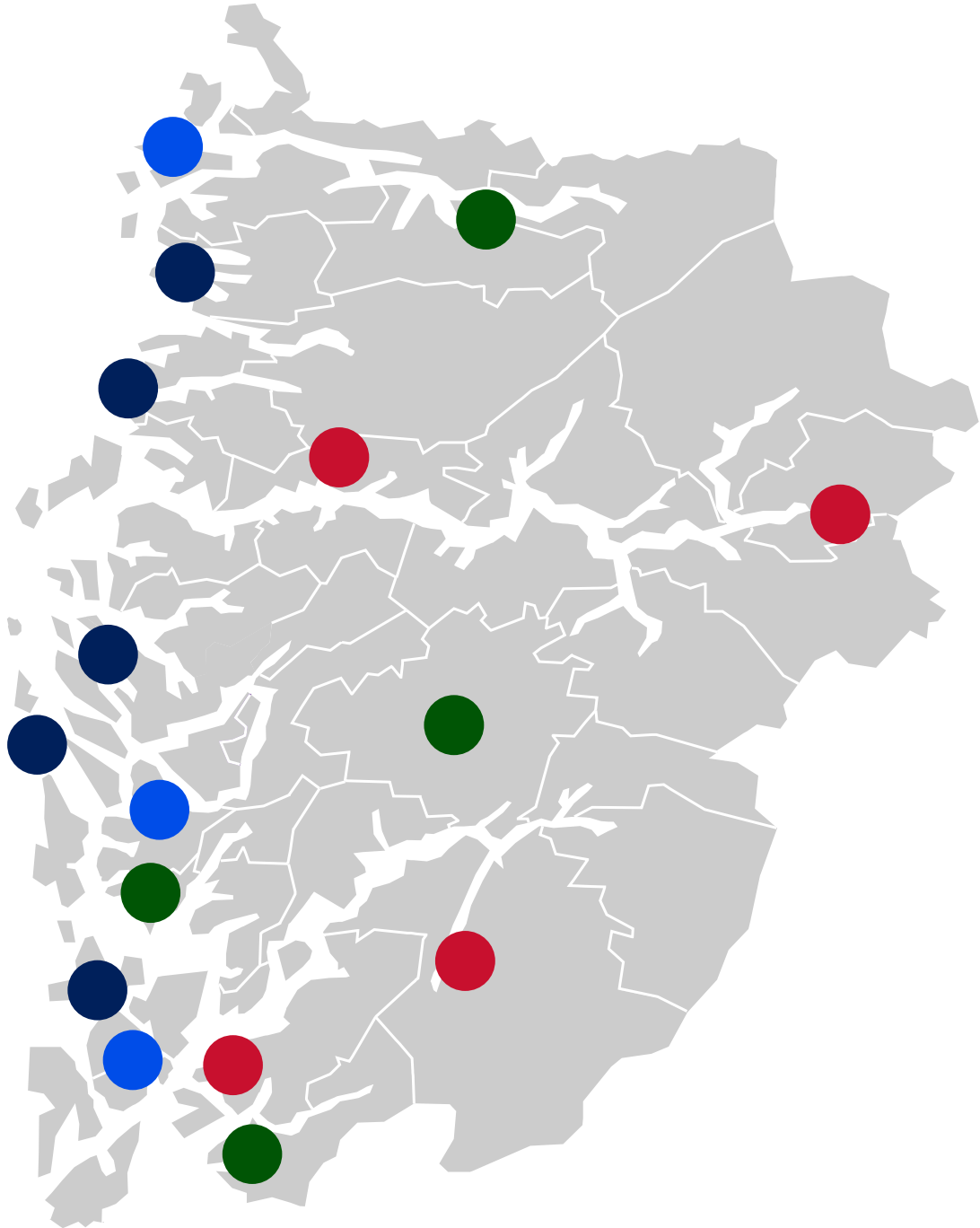
The green industry hubs are segmented in four categories broad categories based on main industry, but most have projects across industries and value-chains

- Maritime**
- Hjeltefjord Basin
- Fensfjord Basin
- Maritim Technology Cluster
- Fjord Base
- Lutelandet

- Process industry**
- Hardanger Hub
- Årdal Technology Park
- Circular Høyanger
- Green Industry Park Kvinnherad

- Bio**
- Bio-Gloppen
- Bio-Voss
- Bio-Bergen
- Bio-Sunnhordland

- Marine**
- Ocean City Bergen
- Ocean Region Fjordane
- Ocean Region Sunnhordland



**Maritime industry hubs**

# Hjeltefjord Basin

Ågotnes, Kildn, Kollsnes, Hanøytangen and Horsøy

## PROJECTS (key examples)

- Onshore terminal for CO2 (Northern Lights) – CCS (carbon capture and storage)
- Energy park CCB – hydrogen production and circular economy
- First zero emission port in Europe at Ågotnes
- First zero emission cruise port Kildn at Askøy
- Ocean wind power supersite at Hanøytangen

## CURRENT STATUS

- Ongoing political process to decide cargo harbour relocation
- Evaluation of Kildn project continues
- Agreement between Northern Lights and CCB energy ensures access to CO2 for local use

## GOING FORWARD

- Focus on new business initiatives
- Need for power grid reinforcement
- Access to industrial estate and infrastructure
- Attract new required competence for circular value chains





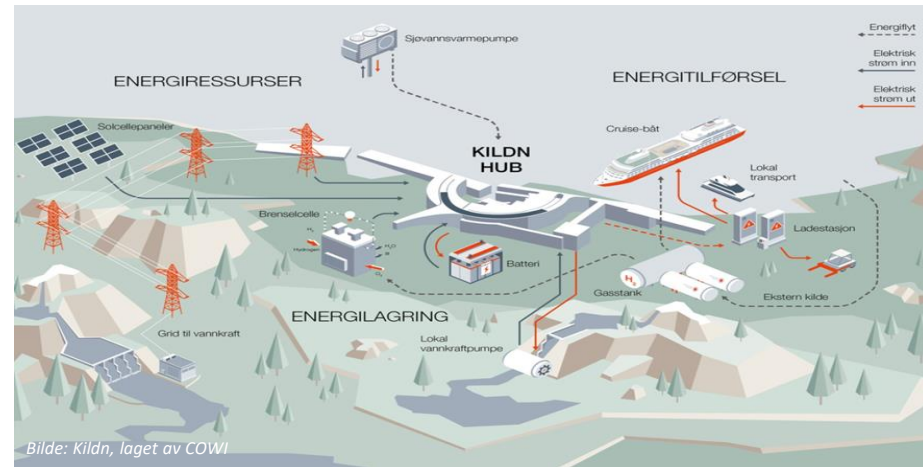
Bilde: Energiparken, CCB Energy Holding AS



Bilde: Hanøytangen, arkivfoto Bergen Group



Bilde: Ågotnes, utklipp fra kampanjevideo på NRK



Bilde: Kildn, laget av COWI

### COLLABORATORS (potential)

Logos of potential collaborators:

- Norscrap West
- SEMCO maritime
- Bergen Havn
- KILDN
- RENOVA (Gjenvinning, Anlegg & Transport)
- OneSubsea (A Schlumberger Company)
- Northern Lights
- ccb energy holding

# Fensfjord Basin

Mongstad, Skipavika og Sløvåg

## PROJECTS (selection)

- Onshore aquaculture Mongstad and Skipavika
- Ocean wind supersite at Sløvåg
- Upgrade of maritime metal at Sløvåg
- Biogas plant to upgrade waste from aquaculture, food and agriculture
- Blue hydrogen
- Energy tunnel
- Plastic recycling

## CURRENT STATUS

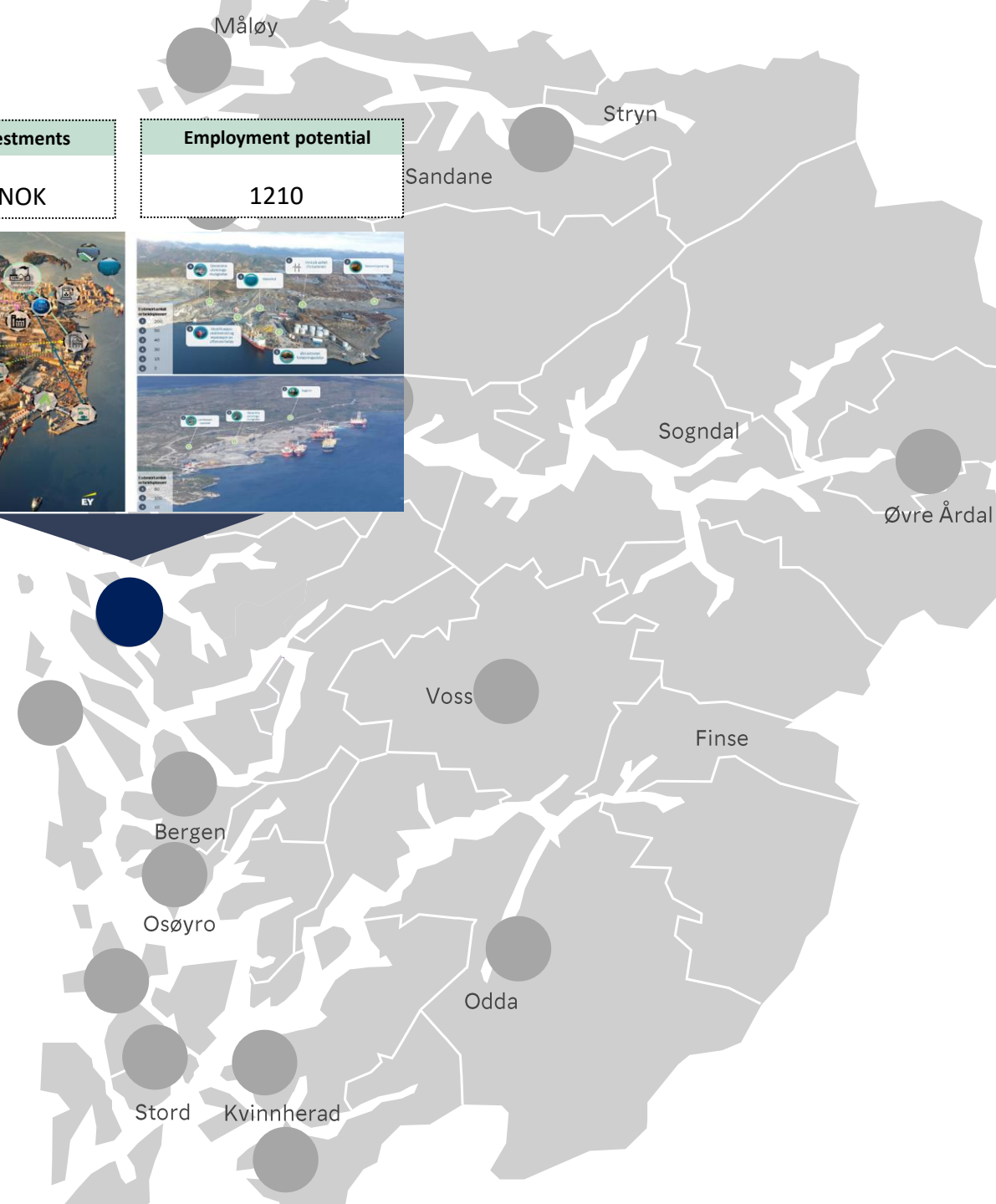
- Aurora project is shelved, new blue hydrogen initiative
- Greenspot Mongstad planning continues
- Hywind Tampen hook up at Sløvåg
- Project for energy optimization and production

## GOING FORWARD

- Define structure for development of hub and cooperation across fjord
- "Green platform" application for financing of strategic development projects

Potential investments  
17,4 bn NOK

Employment potential  
1210



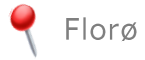


## COLLABORATORS (potential)





# Fjordbase Energy Hub



## PROJECTS (selection)

- Full scale onshore aquaculture
- Green hydrogen for maritime users
- Green ammonia fueling facilities
- Site for hook up of ocean wind turbines

## CURRENT STATUS

- Developing infrastructure and circular models for the hub
- "Green platform"-project for ammonia bunkering network
- Develops hydrogen company HyFuel
- Havlandet's cod fry plant to start august 2022
- Green Ventures initiative

## GOING FORWARD

- Evaluate biogas plant
- Assess strategic partnerships
- Develop Hydrogen node, ref. Enova application





### COLLABORATORS (potential)



# Lutelandet



## PROJECTS (selection)

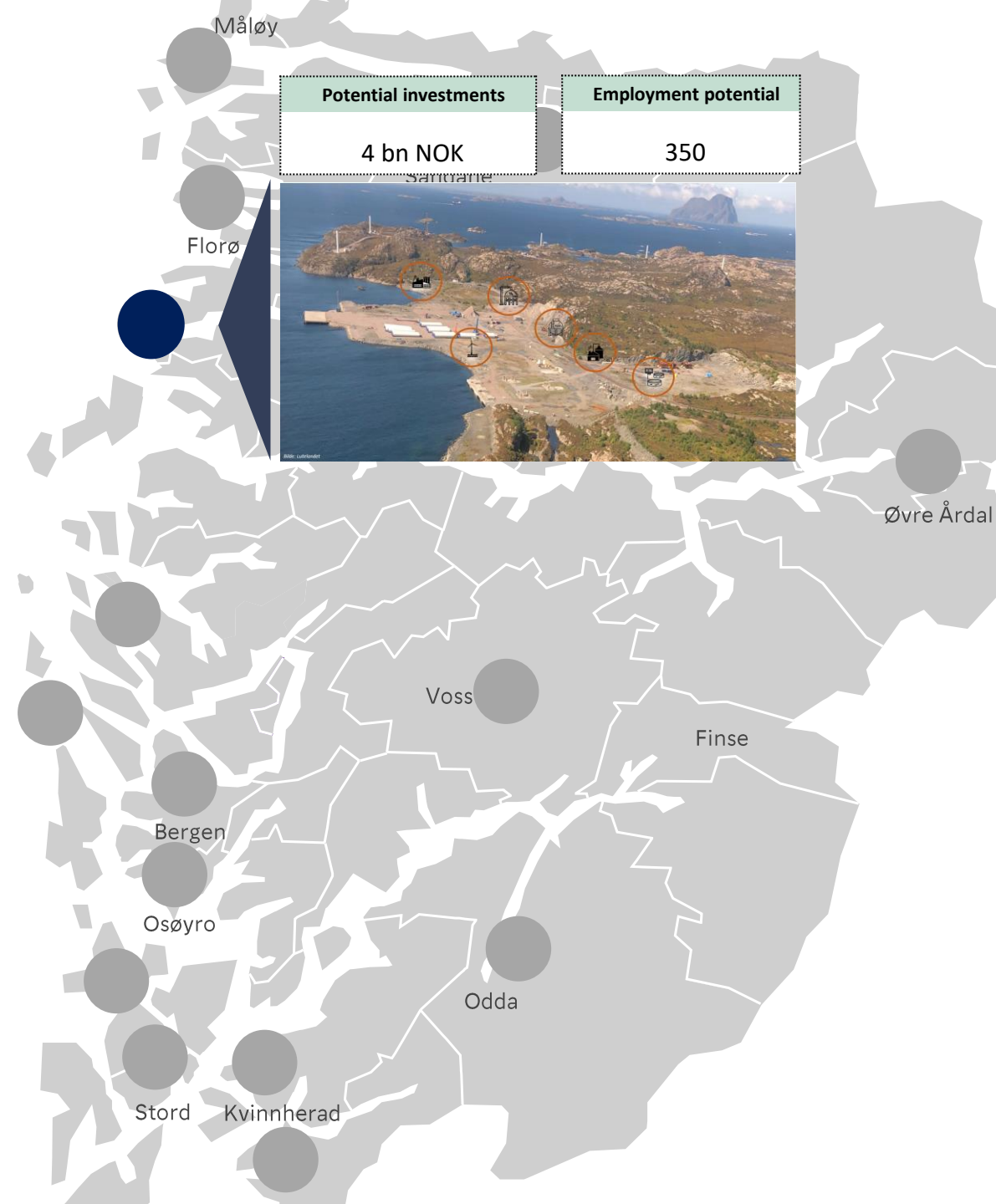
- Production of hydrogen and ammonia
- Full scale onshore aquaculture
- Biogas plant
- Offshore wind turbines
- Process plant for minerals and rock

## CURRENT STATUS

- Onshore wind turbines in operation
- HTWO – Fuel awarded financial support from Enova for hydrogen node
- Developing new concept for liquified oxygen
- Strengthening Lutelandet industrial park

## GOING FORWARD

- Planning mineral processing facilities
- Enova clarifications
- Develop infrastructure





Bilde: Lutelandet

## COLLABORATORS (potential)



SOGN OG  
FJORDANE  
ENERGI



# Maritime Technology Cluster

 25+ initiatives

## PROJECTS (selection)

- Developing and testing of green energy carriers
- Production of green hydrogen and ammonia
- Refurbishing of ships to low emission solutions
- Technology and hook up of ocean wind turbines
- Oil platforms decommissioning and recycling
- Manufacturing of plants and components for carbon capture

## CURRENT STATUS

- Lots of activity tied to NCE Maritime CleanTech (national cluster)
- Much attention regarding the world's first full scale test centre for sustainable energy
- UNITECH technology centre is scheduled to open on Rubbestadneset during 2022
- High activity in the business cluster related to energy transformation

## GOING FORWARD

- Define structure for hub development
- Targeting ocean wind initiative
- Attract new business initiatives and constellations





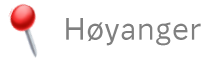
Bilde: Energy House på Stord

### COLLABORATORS (potential)



**Process industry hubs**

# Circular Høyanger



## PROJECTS (selection)

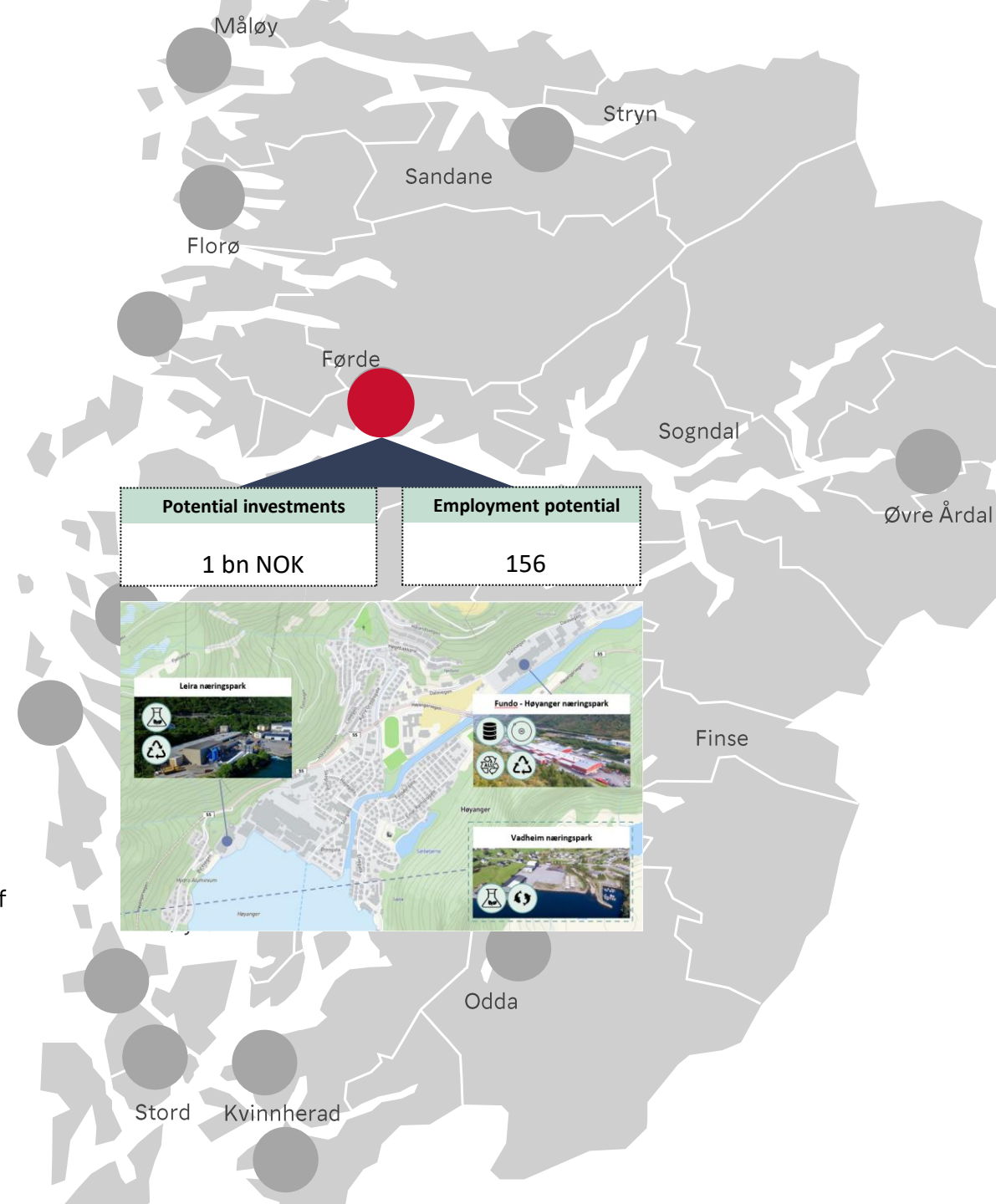
- Circular industry and metal processes
- Green hydrogen
- Green production of materials for low-weight constructions
- Nanofibers
- Gasification/pyrolysis, bio-methanol, OME
- Landbased aquaculture

## CURRENT STATUS

- Further development focusing on power-intensive industry, process and circular economy
- Expected investment decision from Hydro regarding aluminum recycling in June
- Fjordpanel, production of lightweight building material, have carried out feasibility study and signed a letter of intent
- Bergen Carbon Solutions have signed a letter of intent and are planning to establish a factory for production of 240 t. CNF
- Anolytech is operative and will scale for production of hypochlorous acid based in Høyanger
- Høyanger fiber industry: Signed letter of intent regarding production of basalt fiber
- Greenergy, ongoing pilot for recycling of copper from cathode steel
- Vest recycling centre, starting a pilot for recycling of wind turbine blades Q4

## GOING FORWARD

- The need for power and capacity
- Facilitation of commercial areas and infrastructure
- Coordinating and further development of the hub
- Acquisition of financing and capital
- Ensure the right competence and recruitment
- Develop a competence centre







**COLLABORATORS (potential)**



Vadheim Akvapark



Vest • ResirkSenter

GreEnergy • AS

# Årdal Technology Park



Øvre Årdal

## PROJECTS (selection)

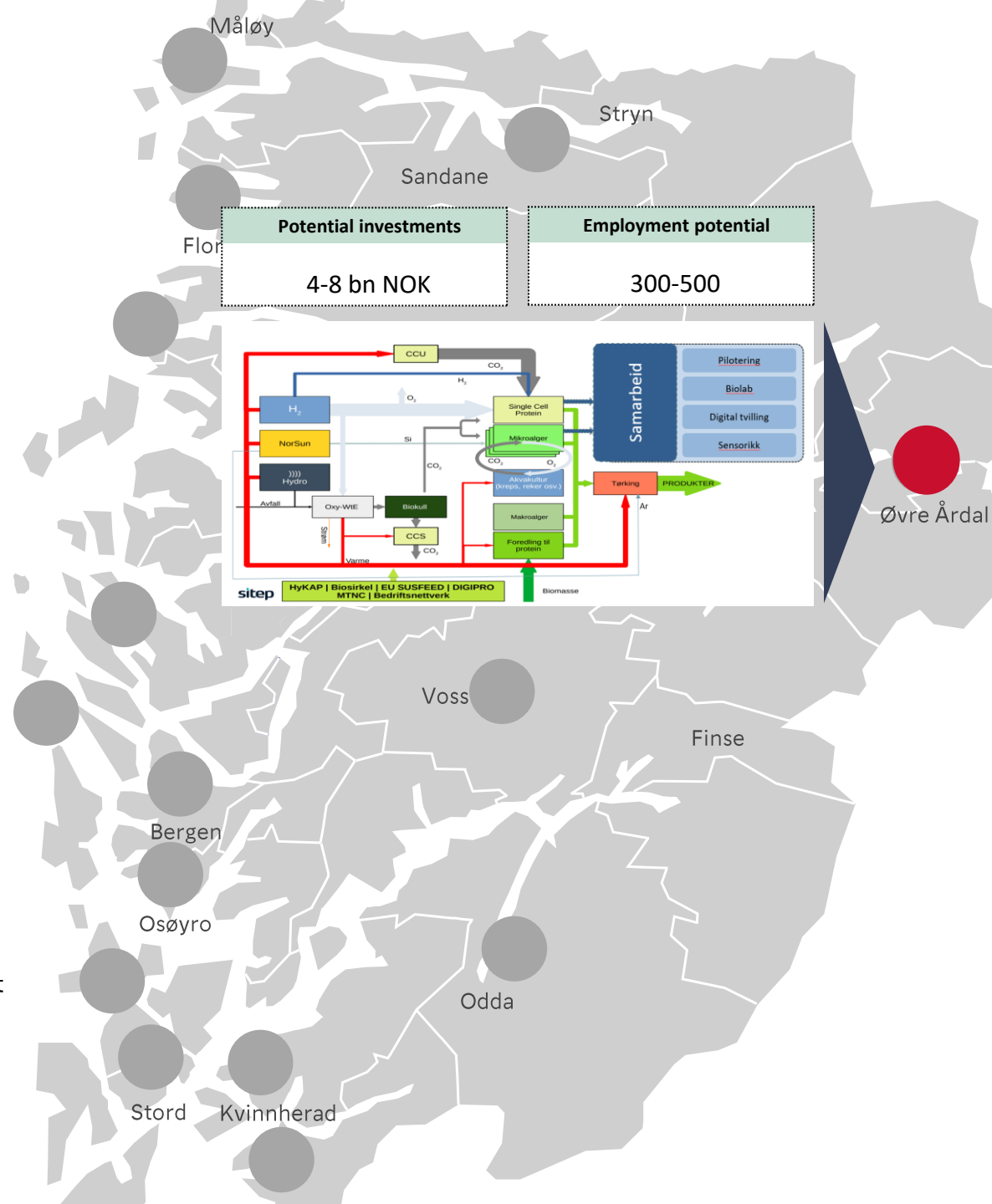
- Recycling of metal
- Green hydrogen substitutes fossil carbon
- Renewable energy as foundation for bio-processes for food
- Drying and district heating from waste heat
- Pilot for CO<sub>2</sub>-free production of primary aluminum
- Cooperation regarding digitalization and streamlining

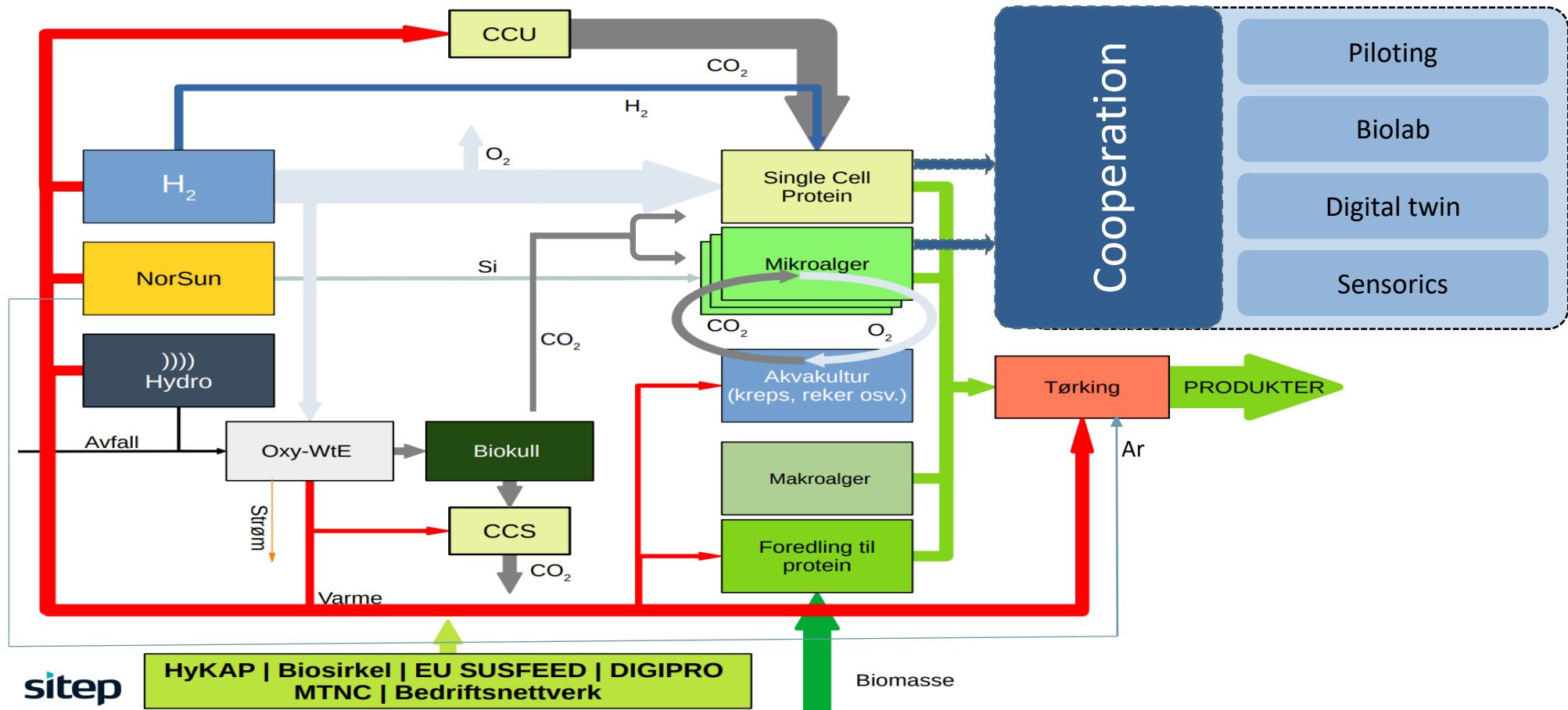
## CURRENT STATUS

- Cooperation between actors and dialogue to attract more
- Multiple ongoing projects supported by FR, RFF, IN, Vestland and Enova. New applications are being processed and prepared – also EU-projects
- Årdal Technology Park is opened, arranged for piloting (e.g algae cultivation)
- Industrial park under planning
- Ongoing preliminary project for digital twin
- Common open laboratory (Biolab) is being established – the project has received some funding
- Developed three new sensors for breeding facilities and algae production

## GOING FORWARD

- Need to formalize the hub-cooperation
- Hydrogen production will make other projects possible, therefore establishing this is a priority
- Need to secure finances for pilot regarding the Oxy WtE-project
- Next step for ongoing preliminary project is to facilitate for scaling





COLLABORATORS (potential)



# Hardanger Hydrogen Hub

 Tyssedal og Odda

## PROJECTS (selection)

- Large scale production of green hydrogen and oxygen
- Technology for underwater storage of hydrogen
- Decarbonisation of the smelters
- Expansion of Boliden
- Landbased animal feed and food production with excess energy from the industry

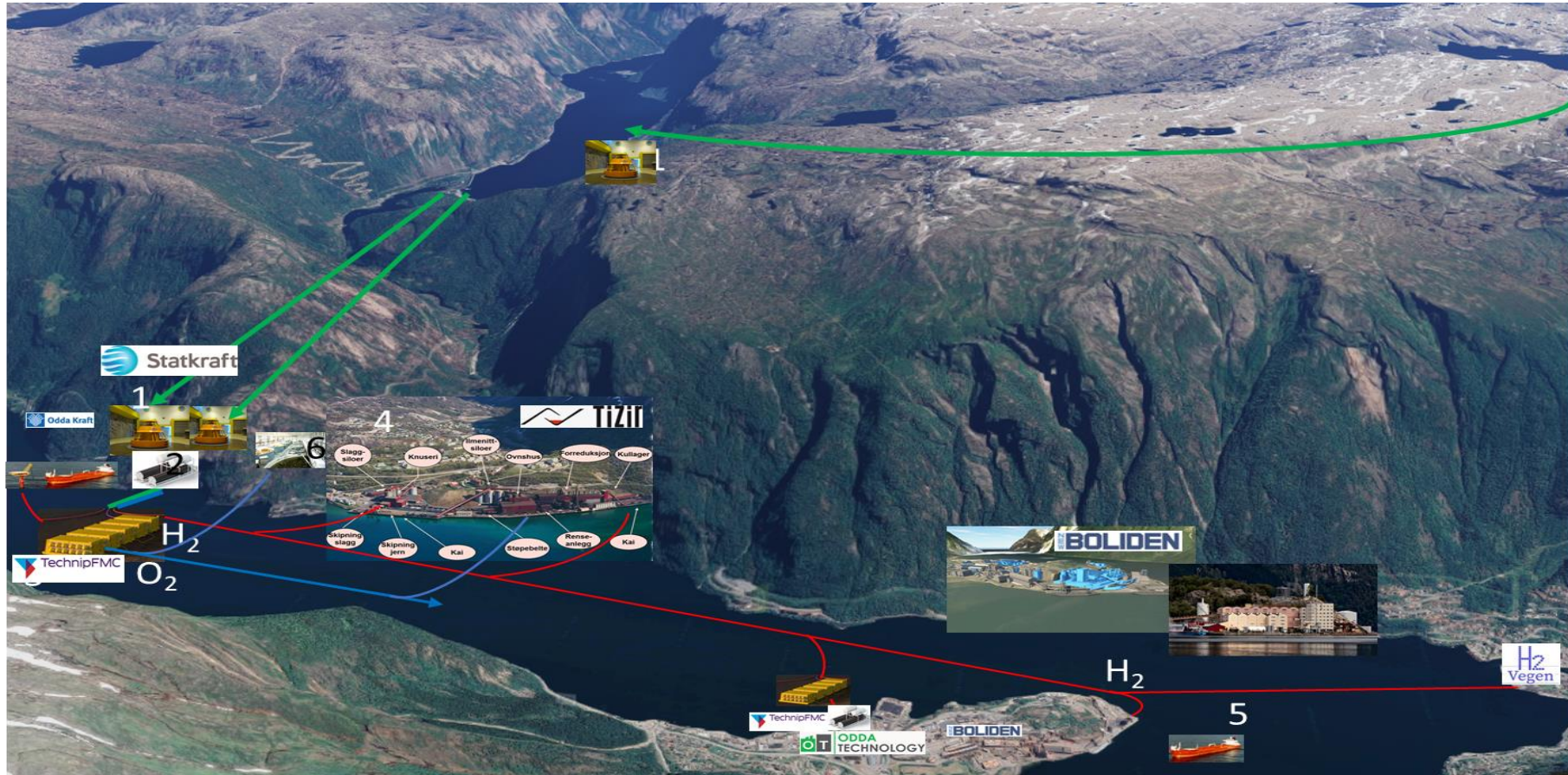
## CURRENT STATUS

- The cooperative consortium Hardanger Hydrogen Hub was established in 2020
- TiZirs hydrogen investment has received up to 261 million kroner from Enova and have become a IPCEI-project
- Prepared application for Grøn plattform for 2022

## GOING FORWARD

- Further develop and formalize the cooperation
- Engage development resources to realize industrial symbiosis
- Coordinate the activity between sub-projects and actors in regards to relevant clusters, industry organisations, authorities and the agent apparatus

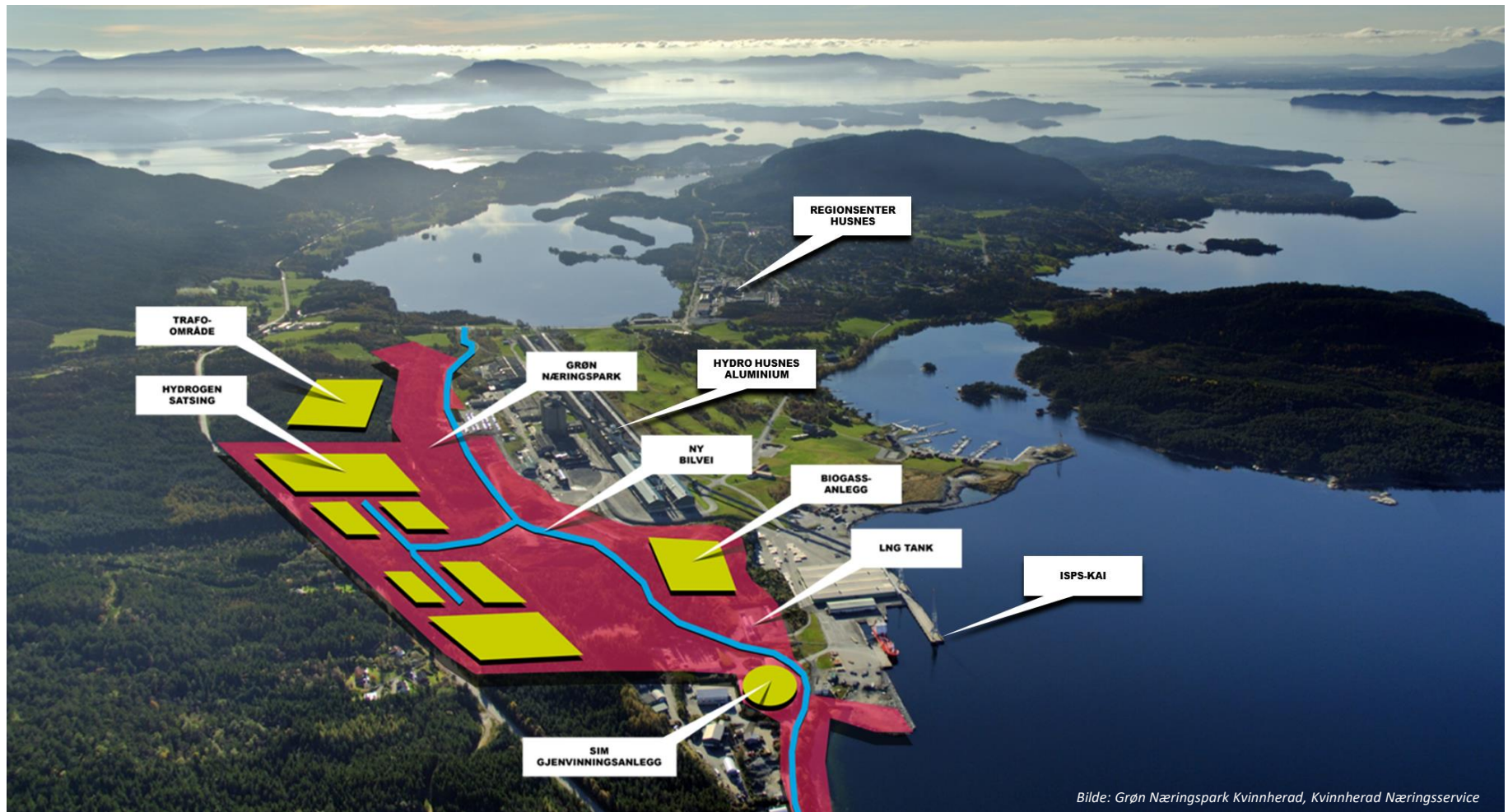




COLLABORATORS (potential)







Bilde: Grøn Næringspark Kvinnherad, Kvinnherad Næringservice

### COLLABORATORS (potential)



**Bio hubs**



# Bio-Sunnhordland

 Stord, Etne og Kvinnherad

## PROJECTS (selection)

- Biogas facility transforms waste from agriculture, fishing and households
- Yearly transformation of 155 000 tons, with a energy potential of 170 GWh
- International attention: reactors use only 5-7 days to transform the waste
- Smart sensorics makes the facilities more effective
- CO2-capture and liquefaction of raw biogas

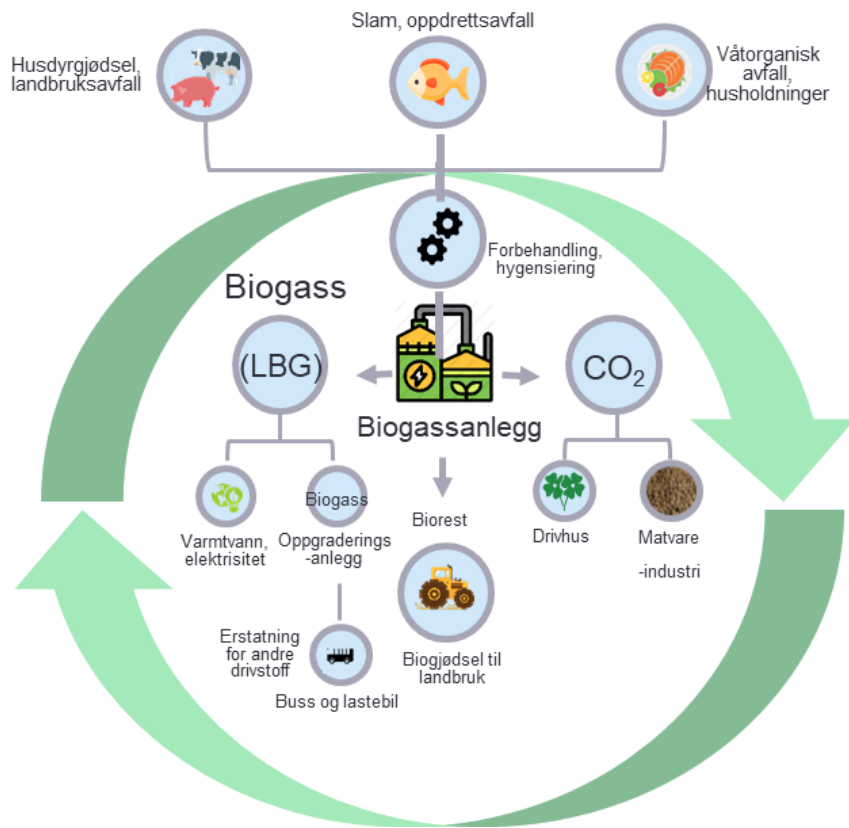
## CURRENT STATUS

- Renevo Biogas facility officially opened in Stord 24. mai 2022
- Renevo has signed agreement of delivering biogas to Aker Solutions

## GOING FORWARD

- Renevo gets 60 million kroner from Enova to build giant facility in Etne
- Renevo aspires to build 10 facilities in Norway
- Specific request regarding establishment of a biogas facility in the industrial park at Husnes





### COLLABORATORS (potential)



Sunnhordland Bionæring

# Bio-Bergen



## PROJECTS (selection)

- Industrial network to speed up bioproduction through recirculation of food waste and organic waste
- The goal is to use captured CO2 to create new green industry and jobs through production of carbon nanofiber

## CURRENT STATUS

- Large activity in the region and building of industrial networks
- Carried out preliminary project with the goal of increased insight regarding the potential, costs and industrial conditions for carbon capture in Rådalen

## GOING FORWARD

- Considering modul-based capture facility for CO2 – final decision in 2022
- Focusing on the structure for development of the hub and concretizing goals





Bilde: BIR

## COLLABORATORS (potential)



# Bio-Voss



## PROJECTS (selection)

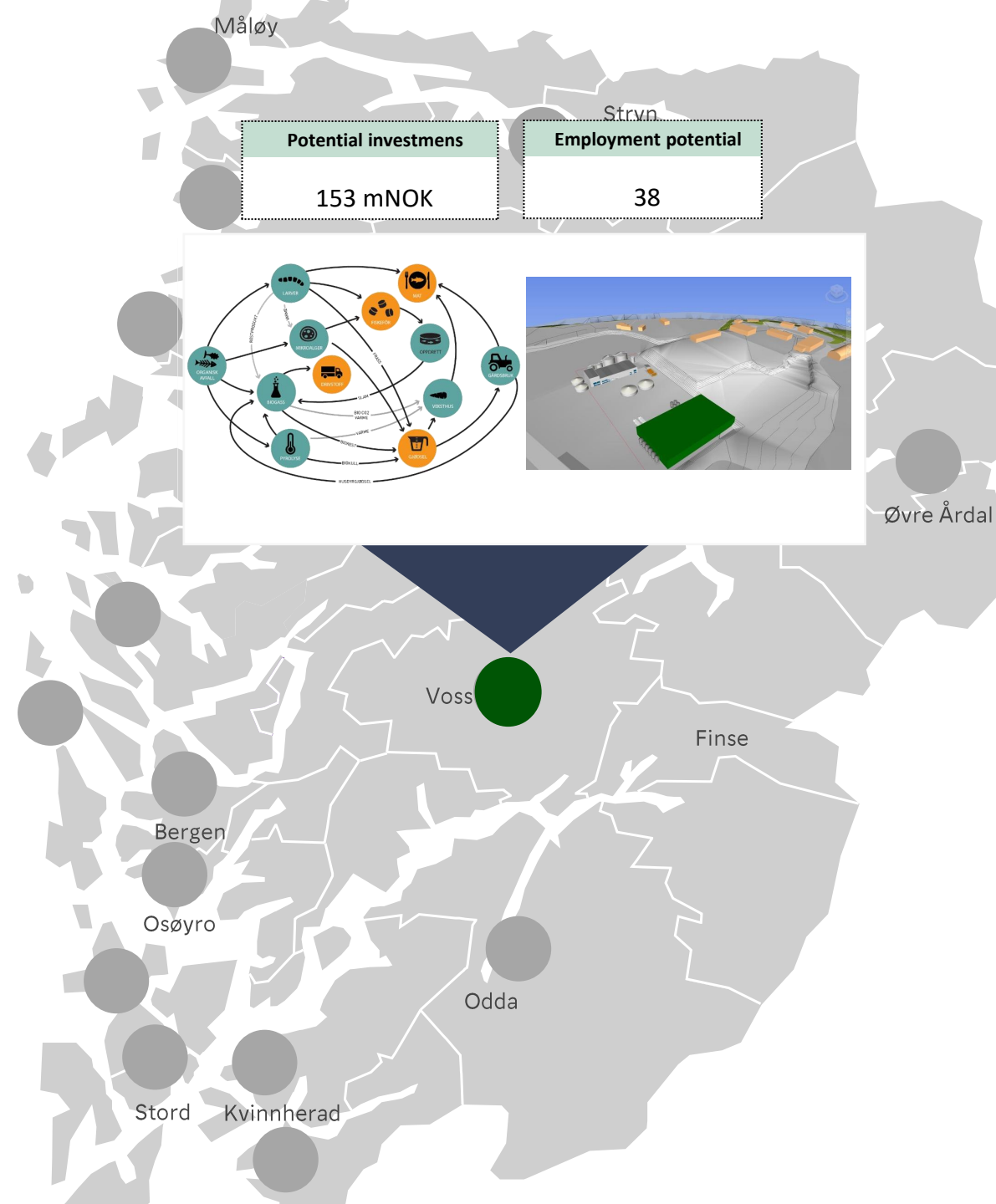
- Bio-Voss aims to upcycle resources through circular business models
- Convert agricultural and household to energy
- Capacity to process 45 000 metric tons of waste with an annual energy potential of 22 GWh
- Utilize the collected food waste for the production of insects as a protein source for human consumption and feed for aquaculture and livestock, in addition to using the insect waste as organic fertilizer
- Production capacity of 70 metric tons of larvae per week

## CURRENT STATUS

- Has begun the process establishing the biopark in Voss
- In 2021, BIR og Indre Hordaland Miljøverk (IHM) formed a joint venture, Biosirkel Vestland AS, with the aim of realizing biogas production in Voss
- The consortium linked to industrial symbiosis and the biopark in Voss has sent a draft to Grønn Plattform
- NorgesGruppen have invested in Invertapro AS (insect production), which provides a proof of marked, access to skills and financing
- The plot is regulated, and a letter of intent between IHM and the landowner has been

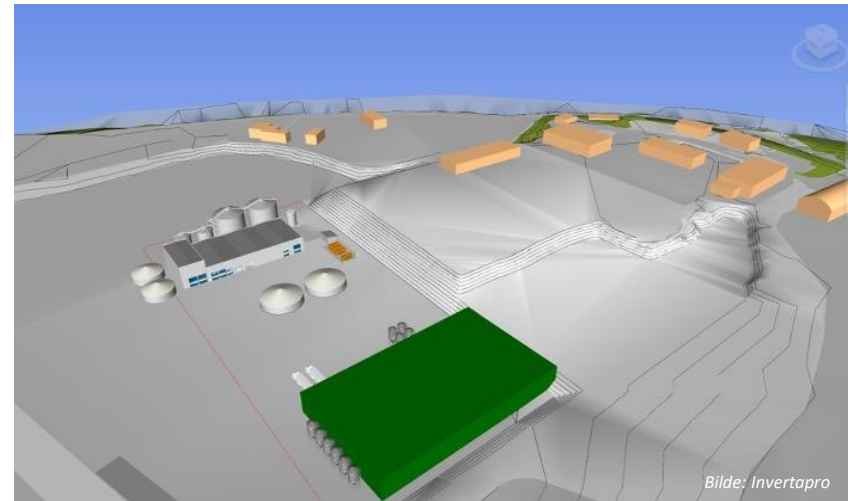
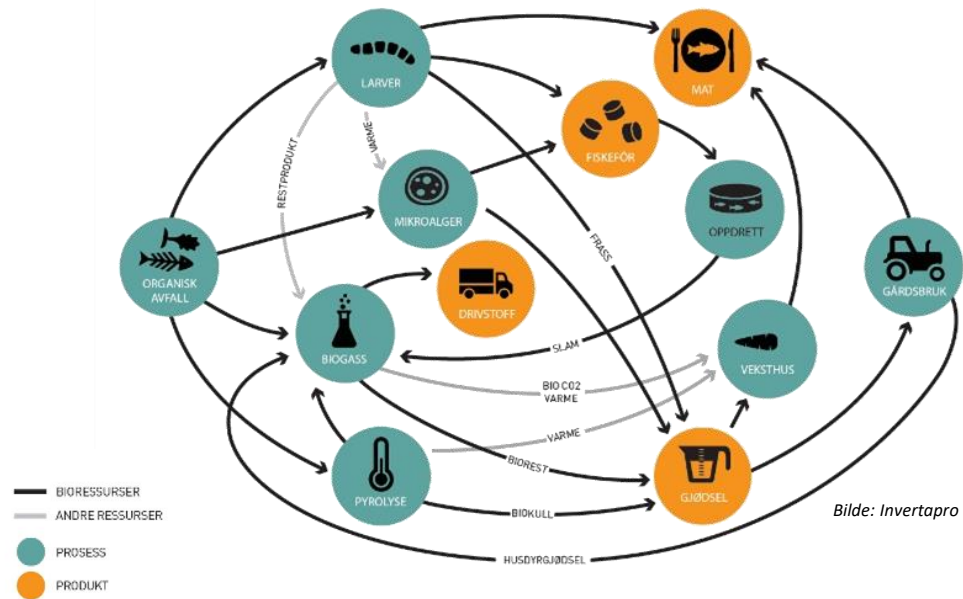
## GOING FORWARD

- Identify, research and include more opportunities, such as microalgae, land-based aquaculture and vertical farming
- Apply for funding from Vestland County Council with the aim of realizing the green hub
- Apply for EU funding



Potential investments  
153 mNOK

Employment potential  
38



### COLLABORATORS (potential)



Voss kommune bygd for sterke opplevingar



# Bio-Gloppen



## PROJECTS (selection)

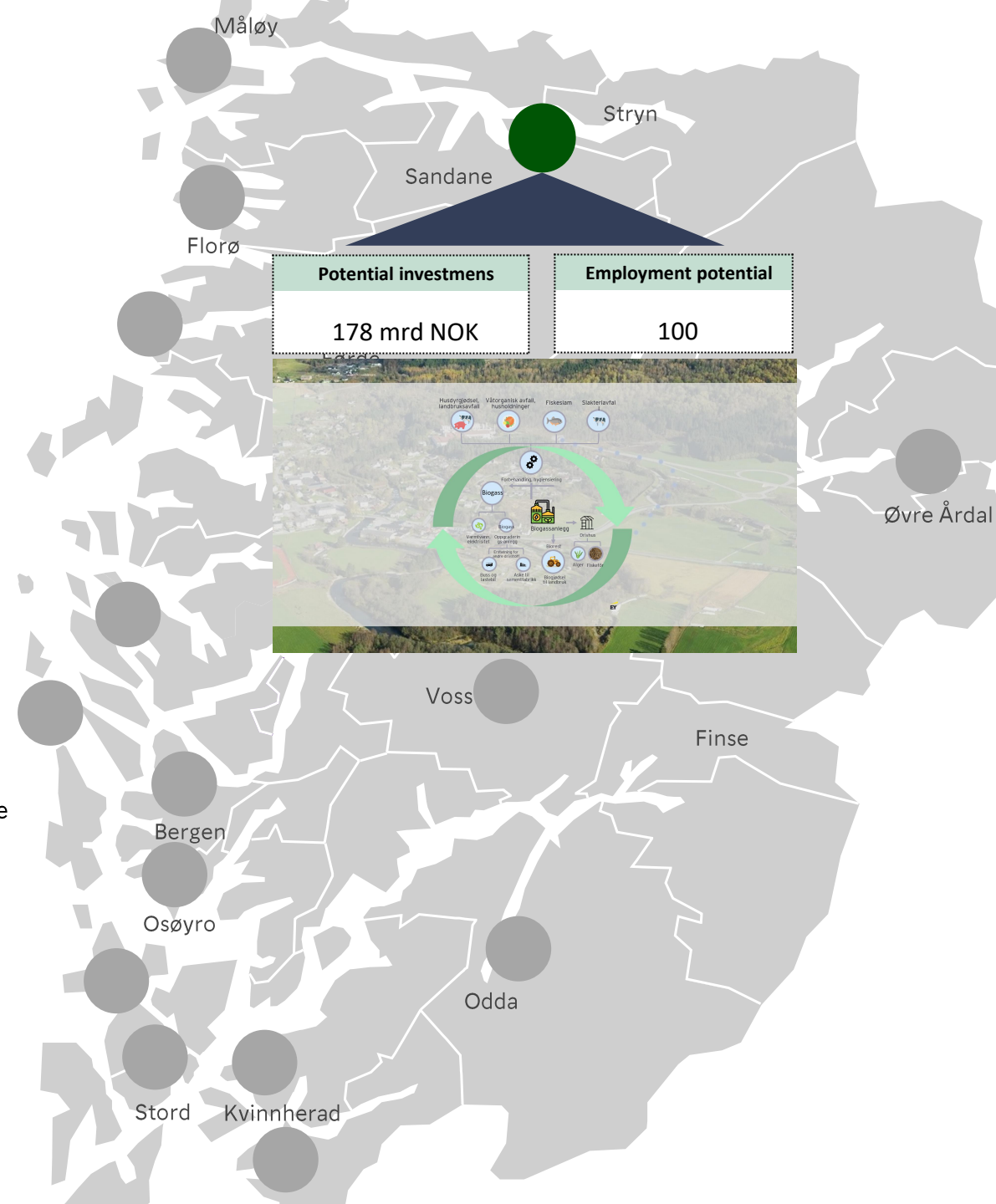
- Converting agricultural waste, wet-organic waste from households, aquacultural sludge and Slaughter house waste to biogas
- Annual energy potential of 60 GWh
- Parts of the biogas process may also involve the production of microalgae and feed for aquaculture

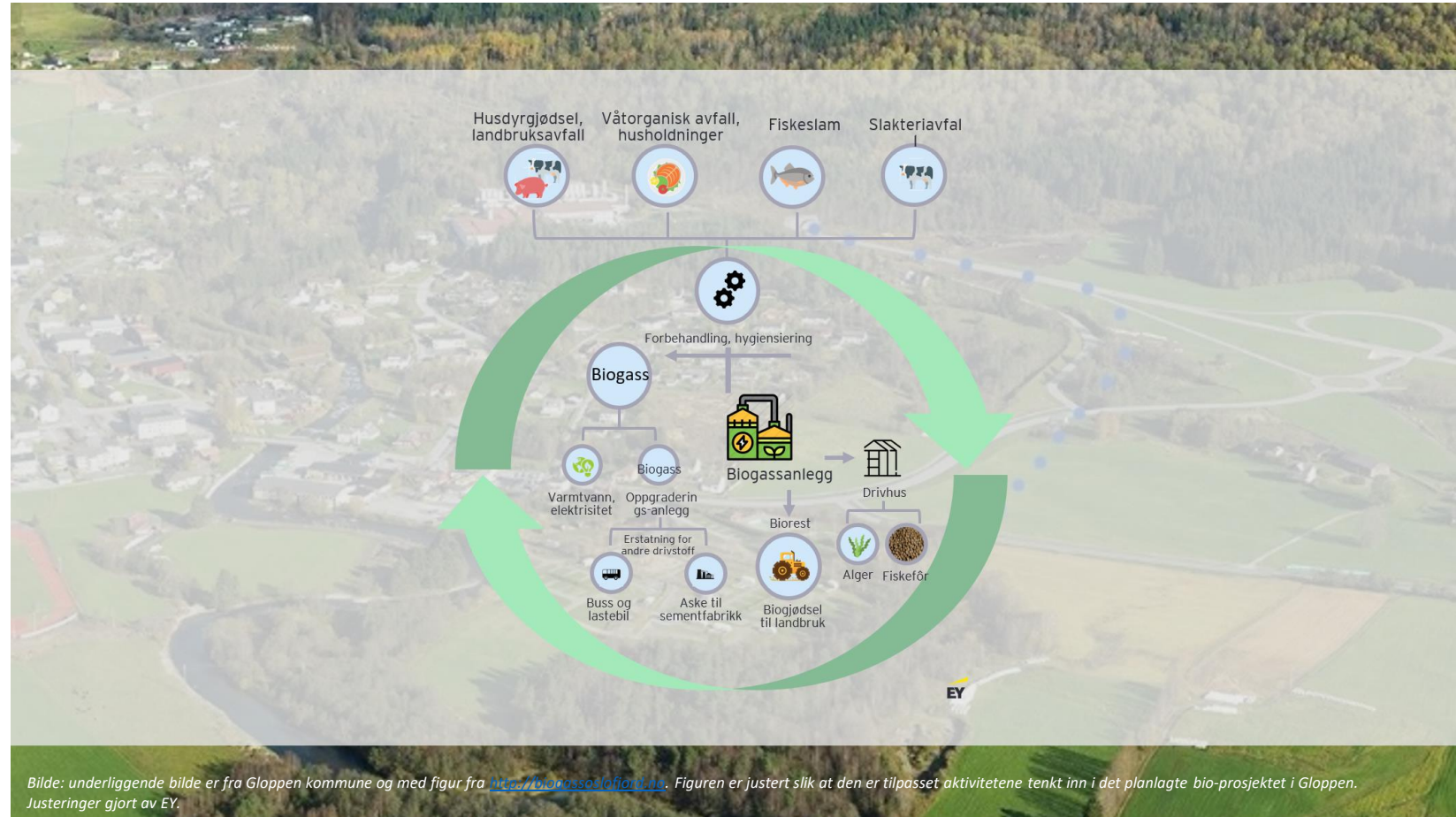
## CURRENT STATUS

- The biogas project is proceeding as planned
- The aim is to finalize the preliminary project during the second half of 2022

## GOING FORWARD

- Progress is dependent on financing of the remaining work on developing a
  - Business plan
  - Ownership model and financing
  - Available area and facilities
  - Synergies and ripple effects
  -





SOGN OG FJORDANE  
BONDELAG



STRYN BETONG AS

COLLABORATORS (potential)



RETURA<sup>®</sup>



ASKO





# Marine hubs

# Ocean Region Fjordane

20+ initiativer

## PROJECTS (selection)

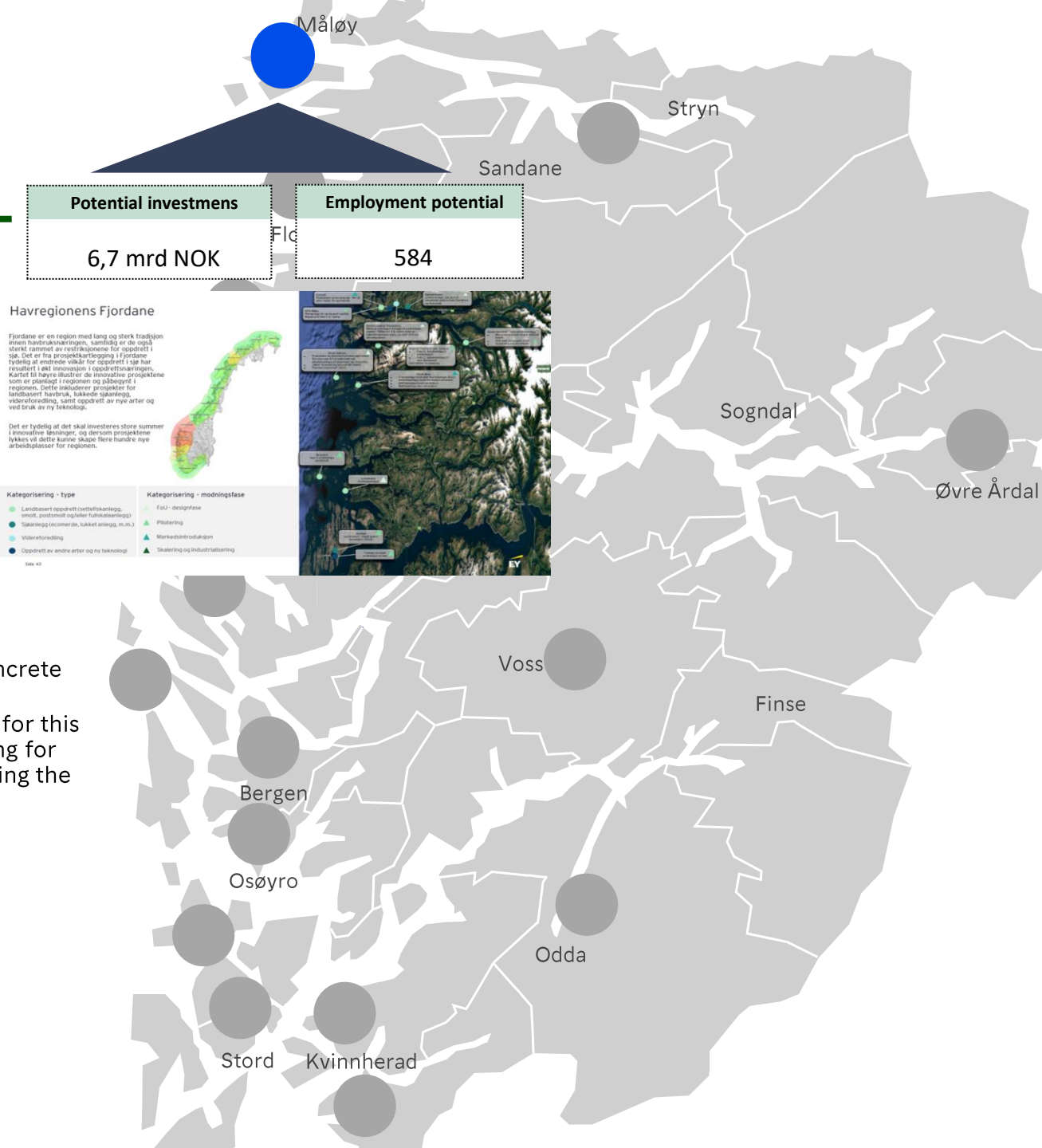
- Land-based aquaculture (fry, smolt, post-smolt, maturation of cod and salmon)
- Closed- and semi-closed containment systems for ocean-based aquaculture
- Farming new species
- Developing and utilizing new technologies both in fisheries and aquaculture

## CURRENT STATUS

- The region is home to a large portfolio and many activities which covers the entire marine value chain. A complete overview is being developed
- A selection of key projects:
  - Bulandet Miljøfisk has completed a land-based pilot facility and deployed their first generation of salmon
  - OFS-gruppen is currently building ONTEC Academy and OFS Måløy pilot facility
  - Ecobait is developing line- and trap bait for fish and shellfish. Working on commercialization and the establishment of a factory in the Måløy area
  - Several planned projects in aquaculture, closed- and semi-closed

## GOING FORWARD

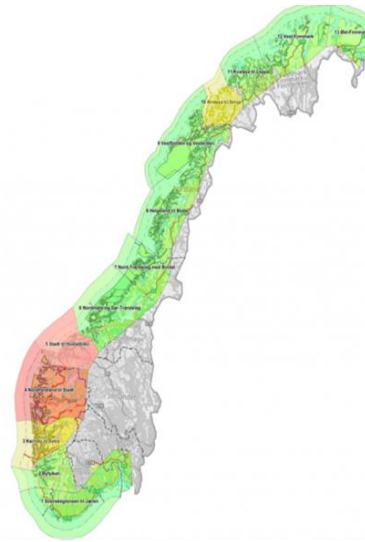
- Needs more time to develop concrete goals for the hub
- Need for financing and capacity for this development of the hub. Applying for funding with the aim of developing the hub in the fall of 2022.



# Havregionen Fjordane

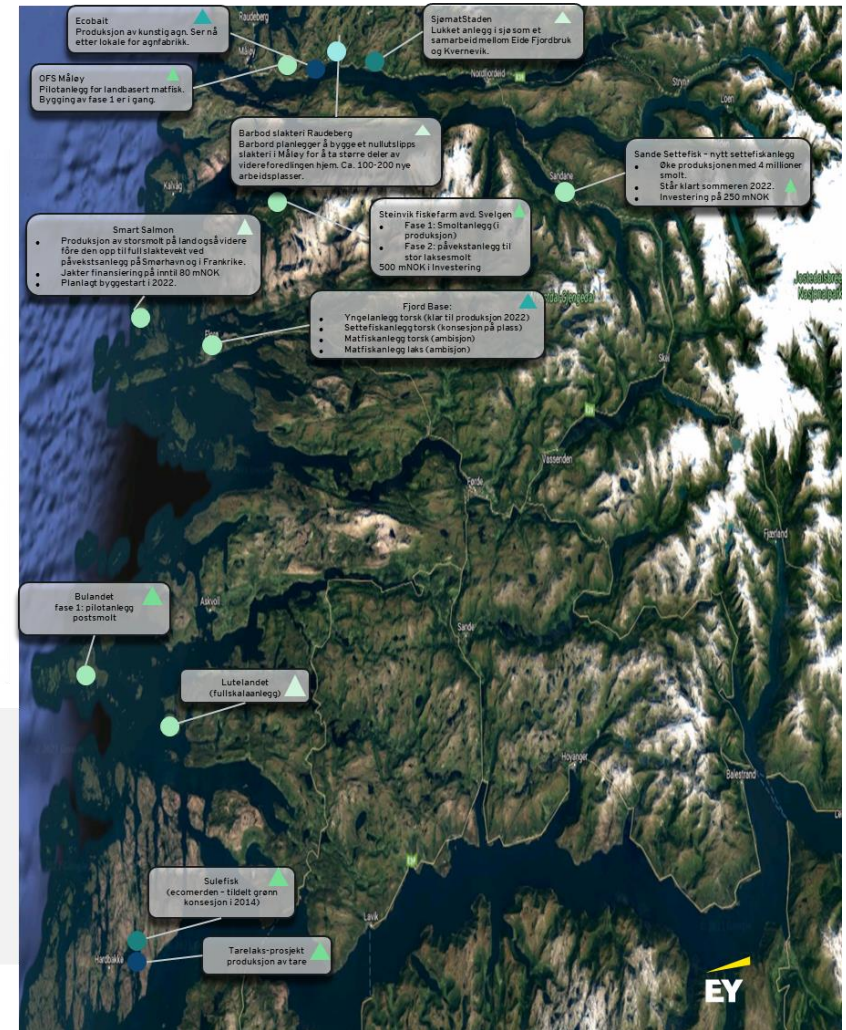
Fjordane er en region med lang og sterk tradisjon innen havbruksnæringen, samtidig er de også sterkt rammet av restriksjonene for oppdrett i sjø. Det er fra prosjektkartlegging i Fjordane tydelig at endrede vilkår for oppdrett i sjø har resultert i økt innovasjon i oppdrettsnæringen. Kartet til høyre illustrer de innovative prosjektene som er planlagt i regionen og påbegynt i regionen. Dette inkluderer prosjekter for landbasert havbruk, lukkede sjøanlegg, videreføring, samt oppdrett av nye arter og ved bruk av ny teknologi.

Det er tydelig at det skal investeres store summer i innovative løsninger, og dersom prosjektene lykkes vil dette kunne skape flere hundre nye arbeidsplasser for regionen.



Kategorisering - type	
<span style="color: green;">●</span>	Landbasert oppdrett (settefiskanlegg, smolt, postsmolt og/eller fullskalaanlegg)
<span style="color: blue;">●</span>	Sjøanlegg (ecomerde, lukket anlegg, m.m.)
<span style="color: cyan;">●</span>	Videreføring
<span style="color: darkblue;">●</span>	Oppdrett av andre arter og ny teknologi

Kategorisering - modningsfase	
<span style="color: lightgreen;">▲</span>	FoU - designfase
<span style="color: green;">▲</span>	Pilotering
<span style="color: cyan;">▲</span>	Markedsintroduksjon
<span style="color: darkgreen;">▲</span>	Skalering og industrialisering



Only available in Norwegian for now

## CENTRAL ACTORS WITH DEVELOPMENT PROJECTS



ECOBAIT



BABORD



# Ocean City Bergen



## PROJECTS (selection)

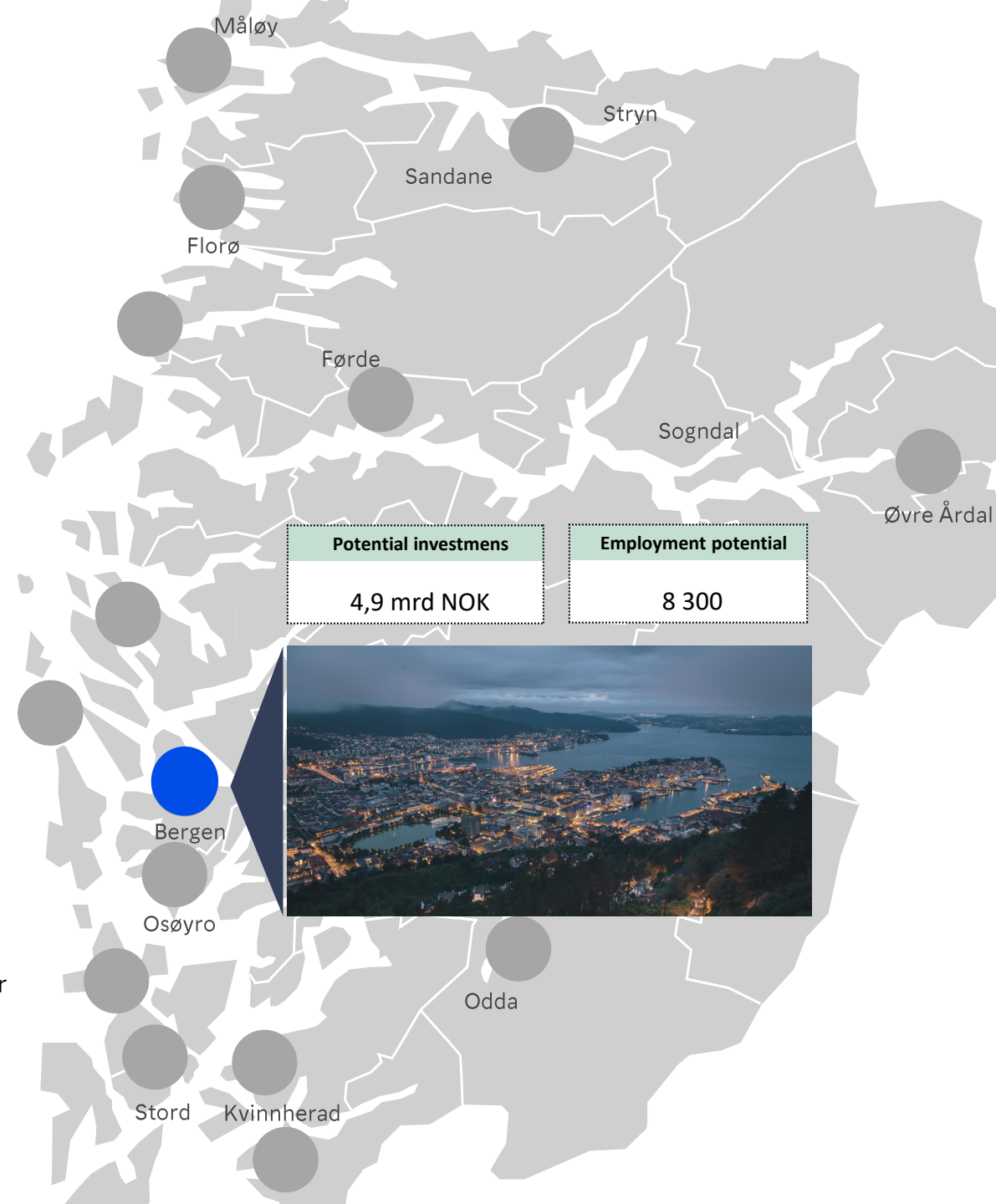
- New facilities and co-location of the Aquarium, The Institute of Marine Research and The Norwegian Directorate of Fisheries
- Ocean City Bergen working towards global recognition of Bergen as the ocean capital
- Increased value-added and cooperation between science, education and the marine business clusters

## CURRENT STATUS

- The region is home to a large portfolio and many activities which covers the marine value chain. A complete overview is being developed
- Some key projects:
  - Ocean City Bergen has been established as a 3 year project by lead partners City of Bergen and Vestland County Council
  - Marine knowledge cluster at Marineholmen
  - Shared research and test infrastructure at Marineholmen

## GOING FORWARD

- The project Ocean City Bergen are planning events and PR activities (e.g. One Ocean Week and Ocean Day)
- Develop collaborative projects with multiple partners
- Recruit new partners to the project
- The foundation for a decision on whether to move the freight port from Dokken to Ågotnes is currently with the owning municipalities





Bilde: Bergen



UNIVERSITETET I BERGEN



BERGEN  
KOMMUNE

## SELECTION OF PARTNERS

OCEAN  
INNOVATION

NORWEGIAN  
CATAPULT  
CENTRE



Marineholmen  
RASLab



GCE  
Ocean  
Technology



Bergen  
Havn



FISKERIDIREKTORATET

BERGEN  
NÆRINGSRÅD  
Bergen Chamber of  
Commerce and Industry



AKVARIET  
I BERGEN

40 samarbeidspartnere har signert avtalen i dette unike prosjektet.

# Ocean Region Sunnhordland

📍 25+ initiativer

## PROJECTS (selection)

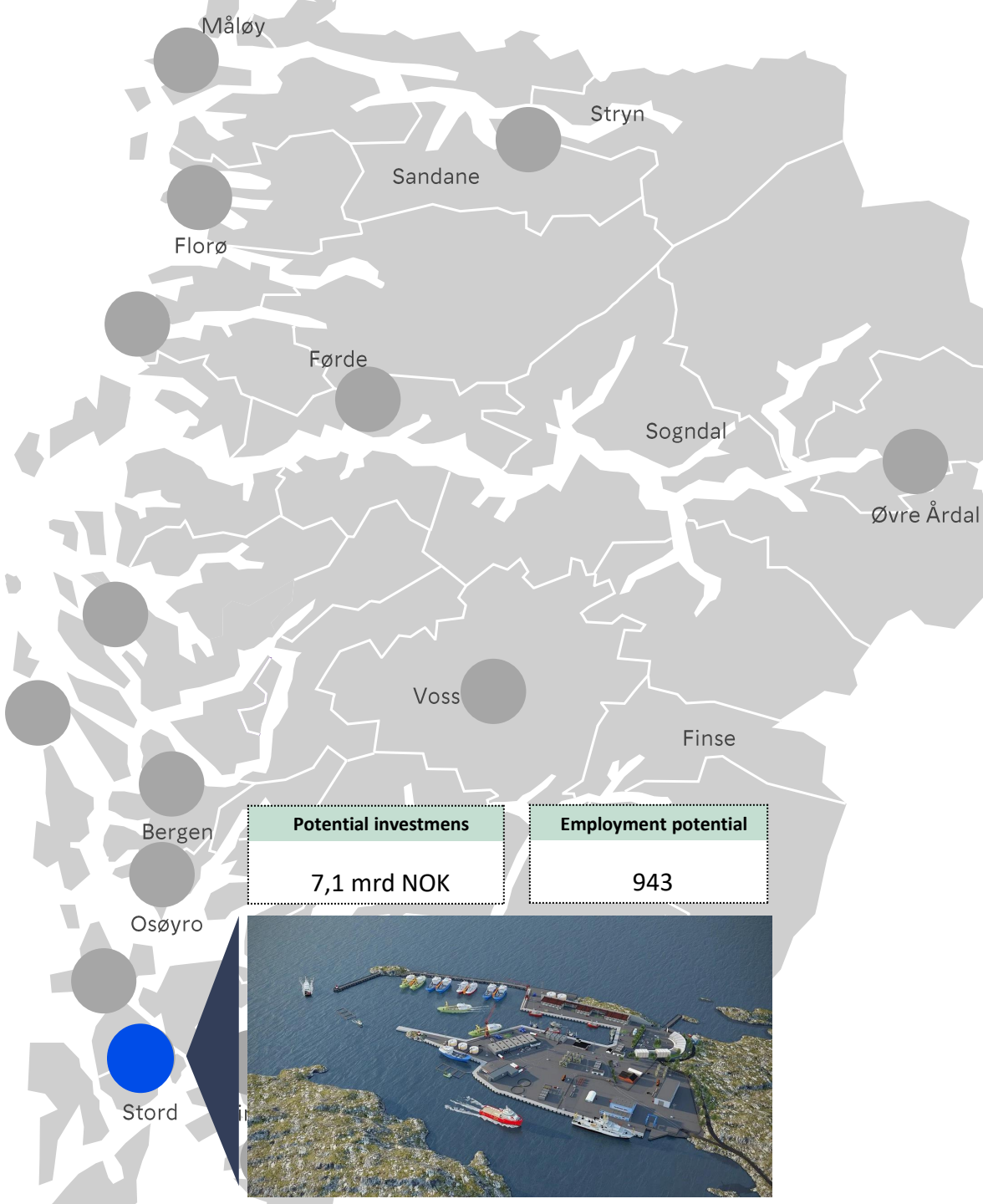
- Land-based aquaculture (fry, smolt, and post-smolt)
- New fishing port
- Processing facilities
- Farming new species
- Technology for reducing emissions and energy consumption

## CURRENT STATUS

- The region is home to a large portfolio and many activities which covers the entire marine value chain. A complete overview is being developed
- Some key projects:
  - Development of the new fishing port is well under way, such as the new wharf which will be ready in 2024/25
  - The first pilot of the closed containment systems for ocean-based aquaculture, “Egget”, has been launched

## GOING FORWARD

- Focusing on securing continued innovation and secure funding and support for innovative projects
- Build on the existing marine value chain and land more new leads in the region





## COLLABORATORS (potential)



# Want to know more?



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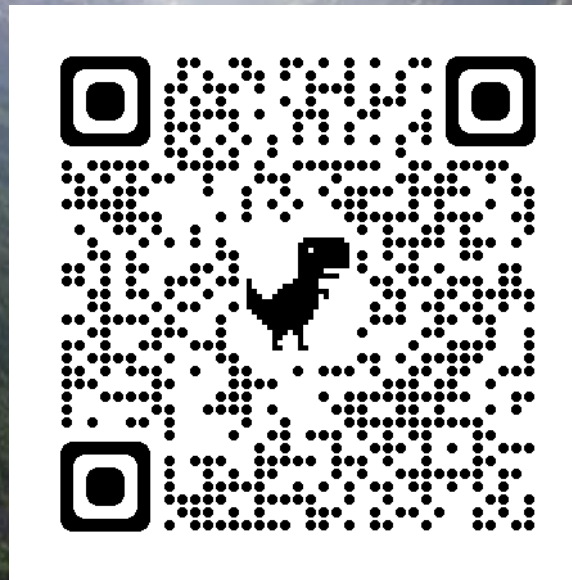
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Facebook:



[fb.me/gronregionvestland](https://fb.me/gronregionvestland)

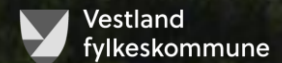
Web:



[vlfk.no/gronregion](http://vlfk.no/gronregion)



Innovasjon  
Norge



Vestland  
fylkeskommune

