



WORLD CLASS GREEN INDUSTRIAL PARK

Jan I. Gabor
VP property development

BioCirc



PROJECT OWNER:
Elkem Rana

PROJECT LEADER:
SINTEF Helgeland

PROJECT PERIOD:
2019-2021

Project with financial support from regional research funds in Northern Norway

Contacts:
Stig Meisfjord, Elkem Rana
Stig.meisfjord@elkem.no
Per Anders Eidem, SINTEF Helgeland
Per.a.eidem@sintef.no

REDUCING THE PRICE OF BIOCARBON WITH A CIRCULAR ECONOMY APPROACH

Full utilization of main and biproduct flows

Energy integration

Local and efficient logistics



CO₂ HUB NORDLAND

– PROCESS INDUSTRY TOWARDS ZERO EMISSIONS

Support from Climit Demo granted on 17 April 2018, a total of NOK 9.8 million, 65% support

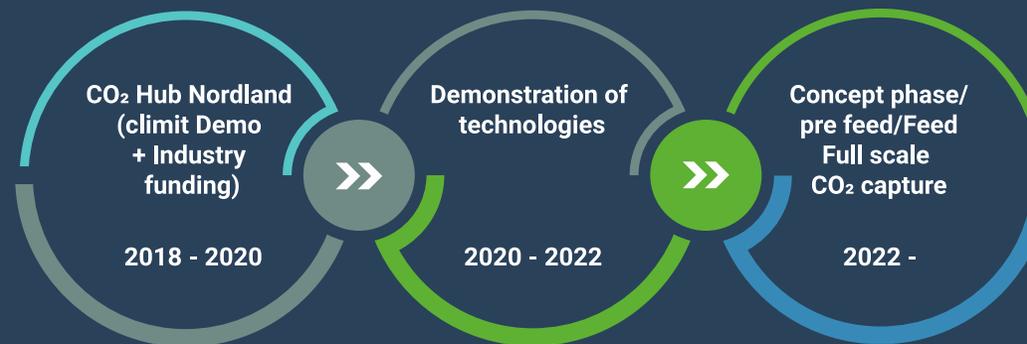
LEVERANSER:

Location-specific assessment of alternative technologies, degree of capture and partial capture.

Design of capture facilities at selected locations

Concretization of a common solution for the region in the form of a "CO₂-Hub" intermediate storage and shipping - logistics.

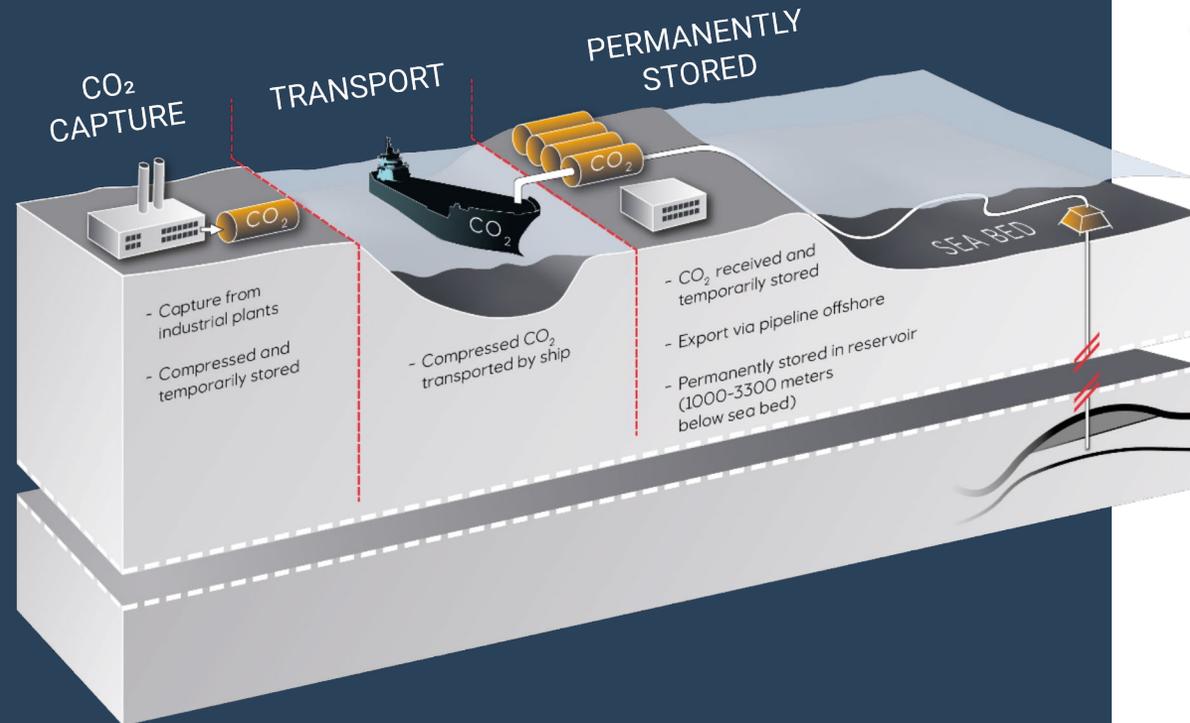
Location-specific evaluation of CCU opportunities



CO₂ HUB NORDLAND

– Carbon capture and storage

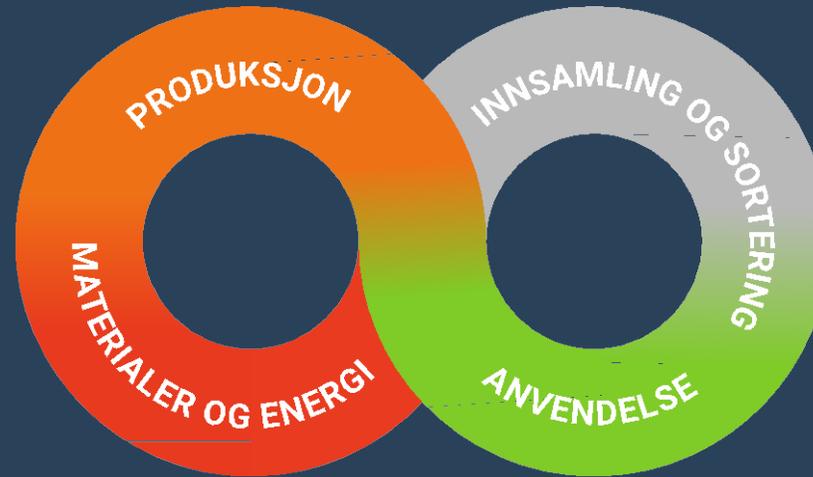
«Longship»-project
«Northern Lights»-prosjektet



Elkem Rana

– In Mo Industrial park





KARBONFANGST

Carbon capture is a possible route to climate-neutral production.

Elkem is conducting a feasibility study on carbon capture supported by Gassnova.

Biogenic CO₂ and Hydrogen enable the production of electric fuel - collaboration with MIP / SLF.

Great technological and financial risk and will require comprehensive support to be realized.

Norway has the prerequisites - and can with investment Carbon capture take a leading position on sustainability.

Sustainability

For Elkem, waste is basically unused value - Elkem Rana is a partner in Enova - supported project for **briquetting** for reuse of other people's / own waste.

Elkem Rana has granted support for the **reduction of Nox**.

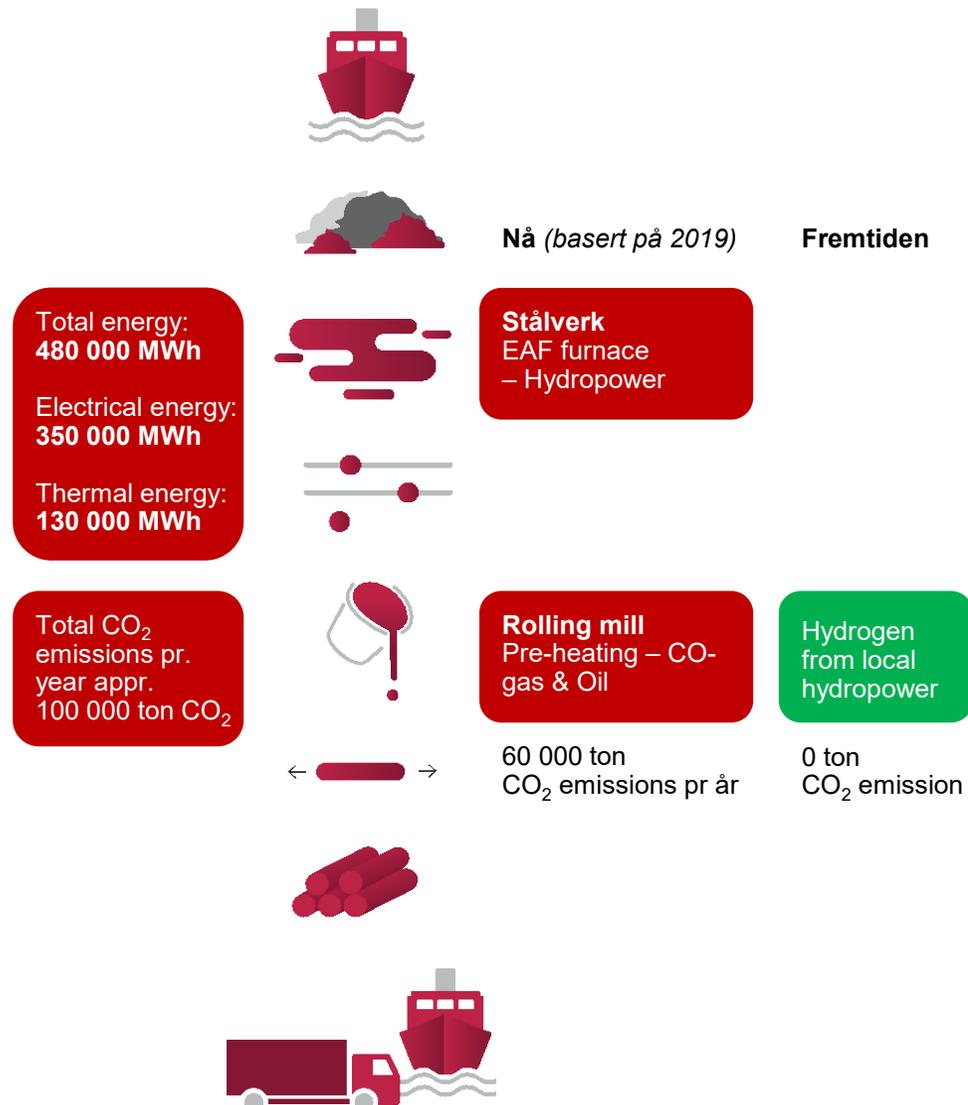
ACT Cluster – **cluster collaboration** for the development of new sustainable solutions and industrial lifts.

Energy efficiency - 90% of energy today goes unused in exhaust gas. We need a continuation of Enova's support scheme for **energy recovery**.

Better support schemes for **circular economic projects** are needed to stimulate this work.

HYDROGEN HUB MO





MOTIVATION:

Long term sustainability

Emission reduction:
 CO₂, Nox, dust, oil

Long term competitive edge

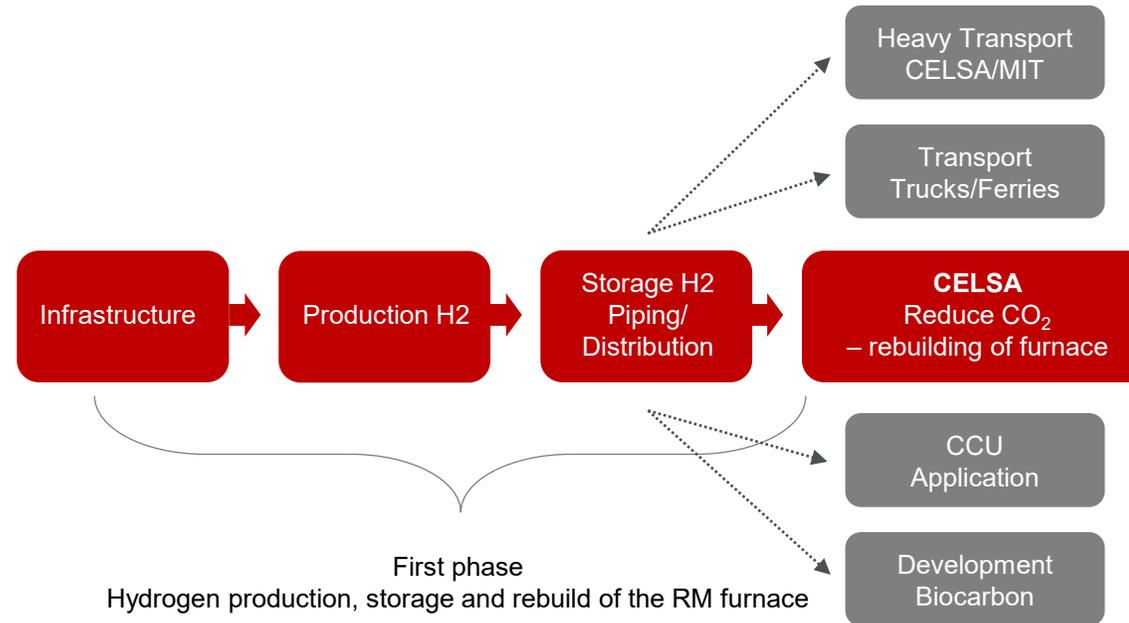
Technology, green steel, efficiency

Energy recovery

Up to 16 GWh / year energyrecovery
 (~ 27 kWh/t)

Industrialization for H2

Value Chain Industrial H2 in MO



CELSA reduserer sine direkte utslipp med 60%, dvs, 100% fra valseverket og totalt nærmere 60.000 tonn CO₂ per år

600 MNOK (CAPEX og OPEX)
Fase 1 -10 nye arbeidsplasser
Fase 2- 100++ nye arbeidsplasser
Fullskala produksjon innen januar 2024, (elektrolysør og valseverk)

Mo Industrial E-fuel AS

Above EUR 100 Mio. invested by SLF last decade | ready to roll out
In Nordland for Norway, up to 94 % reduction in CO₂ emission compared to gasoline

Nordland
Hydropower
Conversion into H₂



Nordland CO₂ feedstock



Nordland infrastructure
Local storage and usage
International shipment



Hydrogen usage and storage via e-fuel plants

Capacities and Rollout

Train 1 in Mo Industriepark

HYDROGEN PRODUCTION

- 15'000 t p.a.
- 91 MW / 760 GWh
- 120'000 t p.a. oxygen, by-product for usage in Mo Industriepark circular economy
- CAPEX € 120 - 140 Mio.
- OPEX € 23 – 26 Mio., 90% of that are power costs
- 10-15 employees

CARBON CAPTURE

- 120'000t CO₂ out of biocarbon from Elkem silicon plant
- First large-scale carbon capture plant from metal industry globally

E-METHANOL PRODUCTION / HYDROGEN STORAGE

- 100 Mio. Liter / 80'000 t e-methanol
- 4 MW
- 94% GHG reduction vs. fossil gasoline, means 160'000t CO₂ savings p.a.
- 1 Billion km equivalent of green car transportation p.a.

- CAPEX € 120 - 150 Mio.
- OPEX € 11 - 14 Mio. p.a.
- 15-25 employees including administration

Hydrogen usage and storage via e-fuel plants

Capacities and Rollout

Train 2 / Roll out

TRAIN 2 IN MO INDUSTRIEPARK

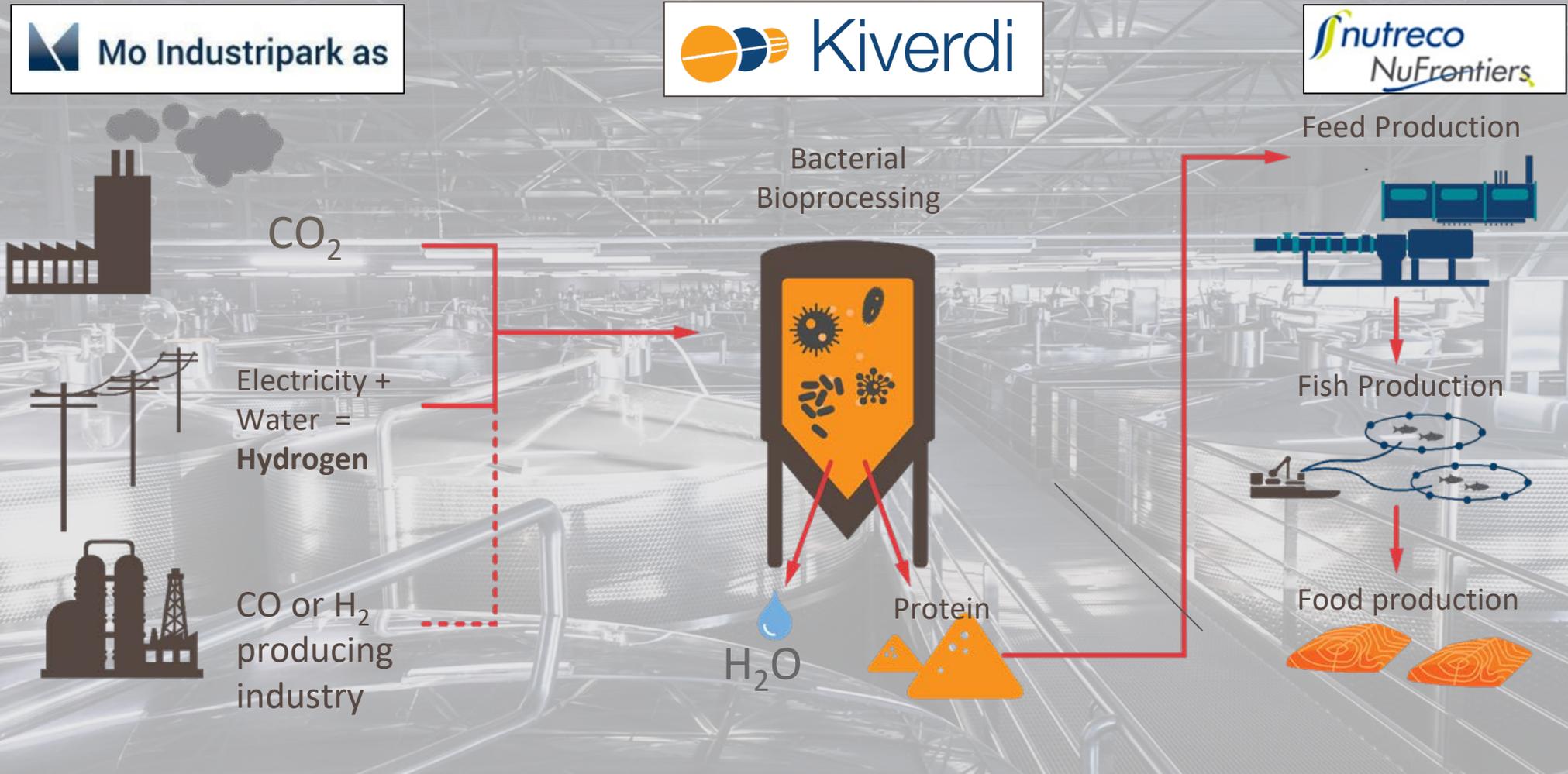
- 24'000 t hydrogen production p.a.
- 160 Mio. Liter / 128'000 t e-methanol
- 180'000 t CO₂ captured p.a.
- 255'000 t CO₂ savings p.a.
- 2.6 Billion km equivalent of green car transportation p.a.

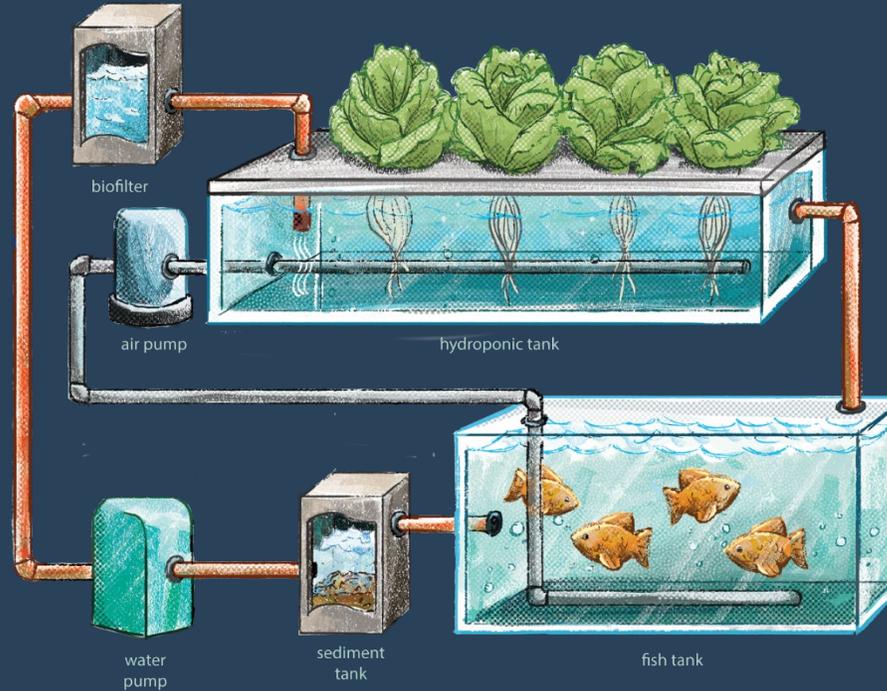
ADDITIONAL 4 SITES IN NORWAY

- 150'000 t hydrogen production p.a.
- 1.05 Billion Liter / 840'000 t e-methanol
- 1.3 Mio. t CO₂ captured p.a.
- 1.7 Mio. t CO₂ savings p.a.
- 10.5 Billion km equivalent of green car transportation p.a.



GOAL: LARGE-SCALE PROTEIN PRODUCTION FOR AQUACULTURE FROM CO₂





FEASIBILITY STUDY ON ESTABLISHING LARGE SCALE AQUAPONICS WITHIN MIP WITH THE GOAL OF:

Utilizing excess nutrients in water sludge from Kvarøy Smolt.

Utilizing excess industrial heat and CO2.

Increasing self-sufficiency and quality on fresh greens in Northern Norway.

PROJECT OWNER:
Kvarøy Smolt

PROJECT LEADER:
SINTEF Helgeland

PROJECT PERIOD:
2020-2021

Project with financial support from Nordland Fylkeskommune through the MoFI FORREGION program by the Research Council of Norway.

Contacts:

Ada Louise Heyerdahl Jervell,
SINTEF Helgeland
Ada.jervell@sintef.no
Pia Møller, Kvarøy Smolt
pia@kvaroysmolt.no