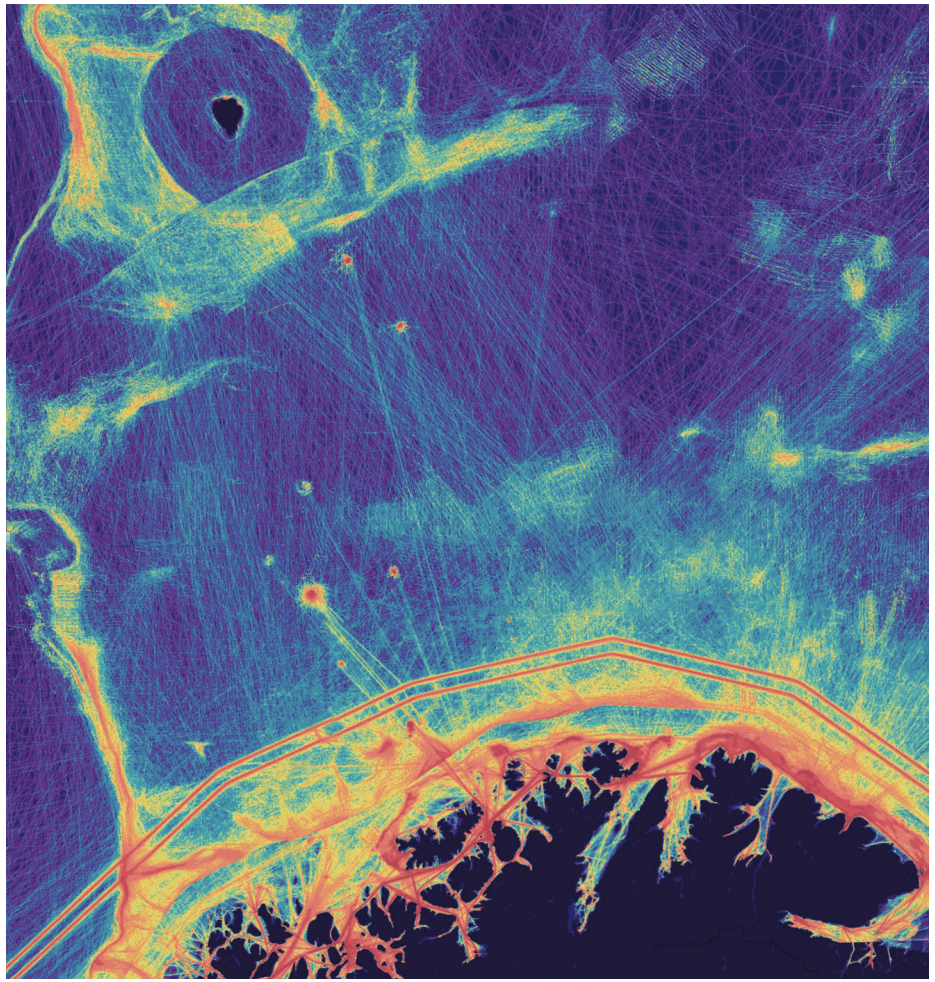


OFFSHORE URBANISM

Using design to understand, represent and employ human-sea relations in the spatial reorganisation of the Barents Sea.

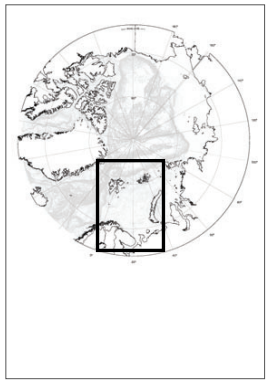
P5 presentation
Marijne Kreulen
4451309

TU Delft, Faculty of Architecture
MSc Architecture, Urbanism and Building sciences
Graduation thesis

1 July 2021

SCALES AND DOMAINS

GLOBAL



ARCTIC

climate

1:20,000,000

MEGA

BARENTS SEA

geopolitical

1:7,000,000

MACRO

FINNMARK

biophysical

1:2,000,000

MESO

MARITORY

economy of life

1:500,000

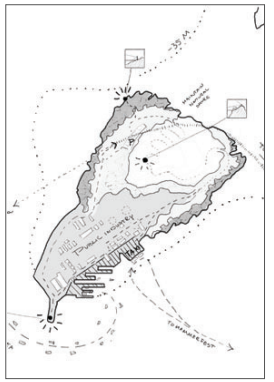
MICRO

HAMMERFEST

socio-cultural

1:50,000

MICRO +

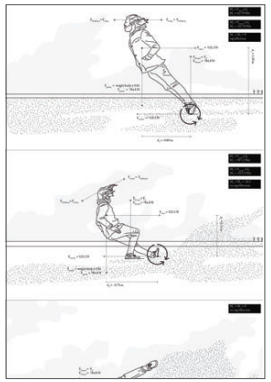


MELKOYA

built environment

1:5,000

NANO



BODY

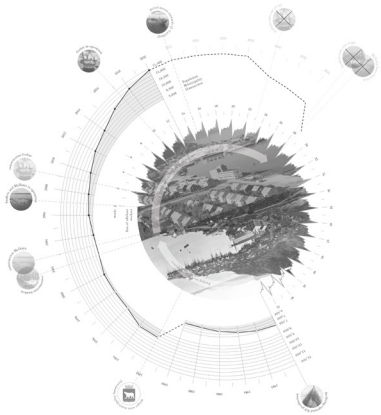
phenomenology

1:1

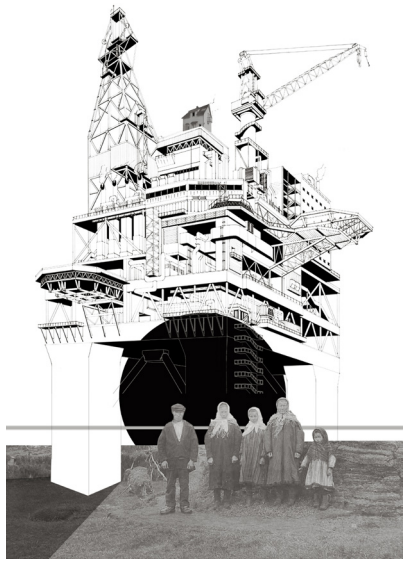
PERSONAL MOTIVATION

- Visit Arctic University of Tromsø in MSc2, 2019.
- Sensitive to place and people
- Respond to issues on a territorial scale
- Bare minimum interventions

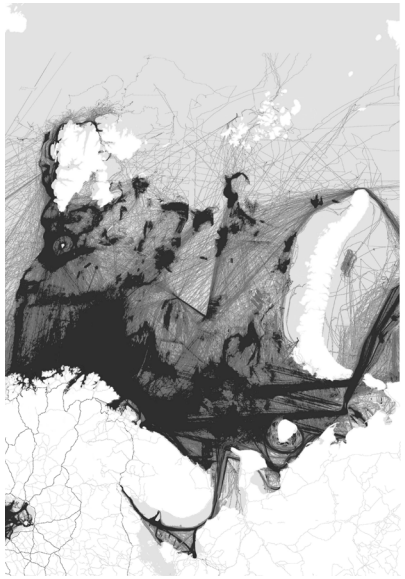
Pictures from field trip MSc2 to Trømso, Norway.
Photographed by author, 2019.



01. Introduction
INTRODUCING THE COMMUNITY

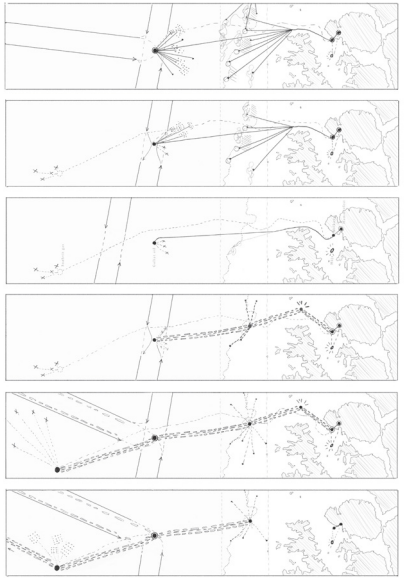


02. Theoretical positioning
WHY OFFSHORE URBANISM?



03. Synthesis
ENTRANCES OF DESIGN

04. Application
REDEVELOPING MELKØYA

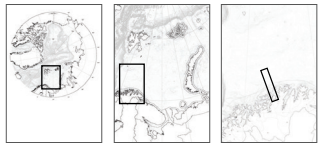


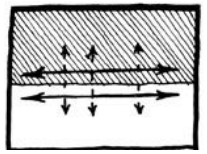
05. Synthesis
PATHWAYS OF CHANGE

SHORELINE MORPHOLOGY

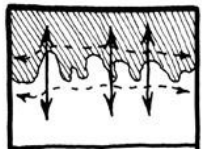
- Hammerfest is a small town on the coast of Finnmark

- Interesting region to study human-sea relations
- Non-lineair shoreline
- Coastal zone rough depth of 100 km
- Ocean reaches far into the land and vice versa
- Diffuse border between land and sea





Interaction and movement along the border

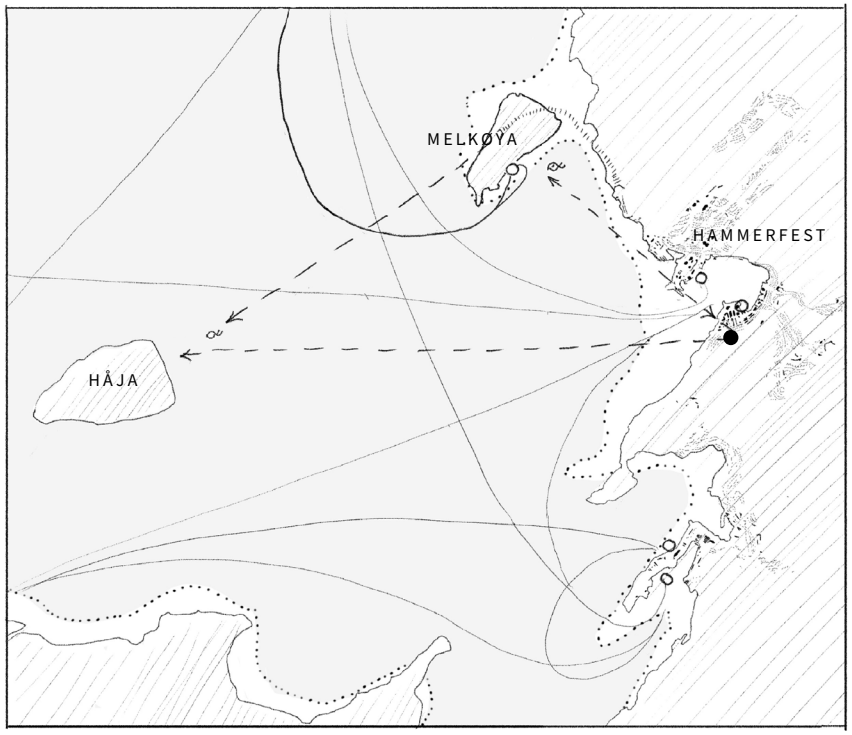


Cross-border interaction and movement

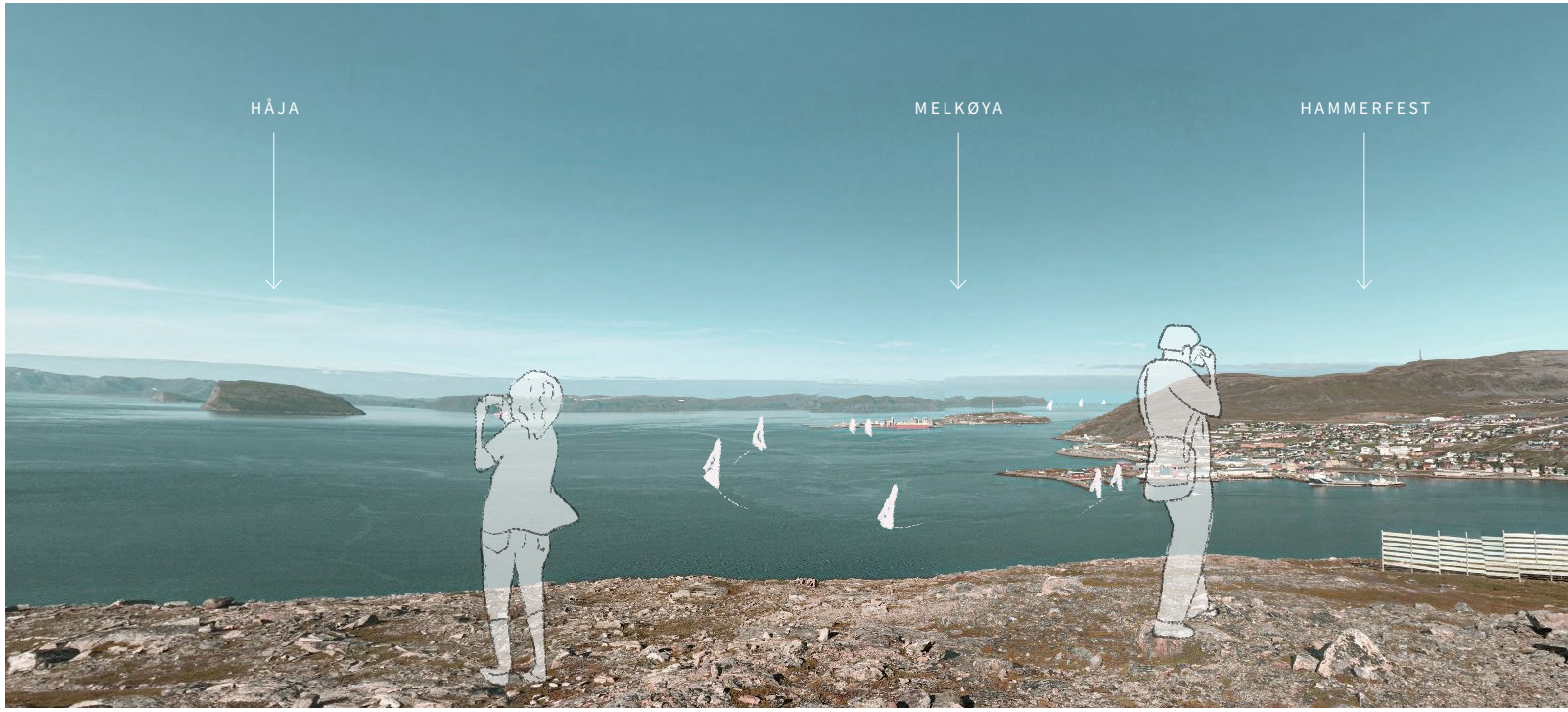
Finnmark scale 1:2.000.000

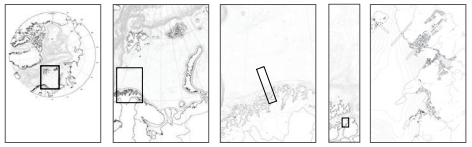
Source: (Olson, Dramstad & Forman 1996. "Landscape Ecology Principles").

HAMMERFEST + MELKØYA + HÅJA



Hammerfest scale 1:50.000



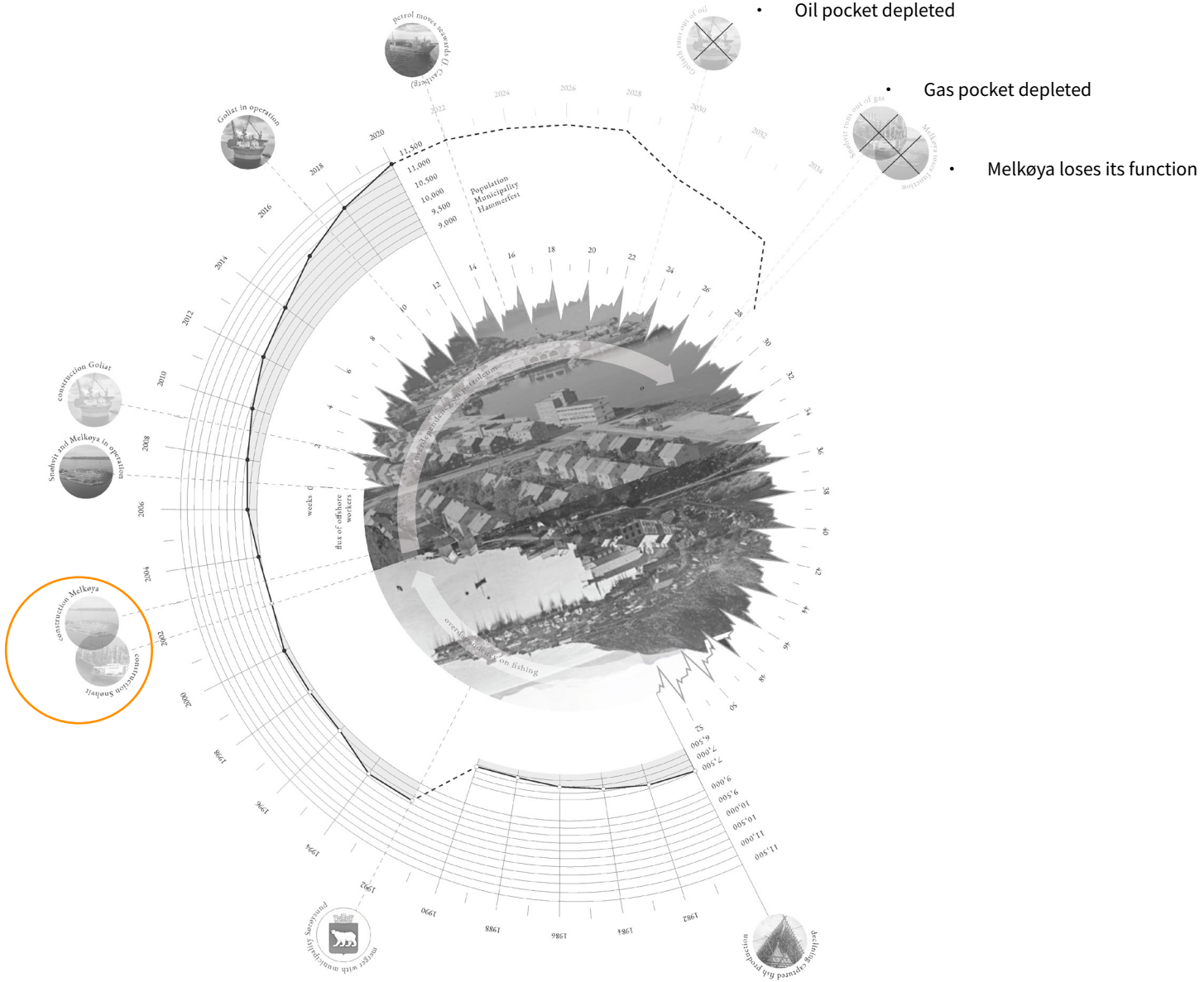


LOCAL IMPACT OF PETROLEUM

- The island Melkøya reconstructed in 2003 as gas processing facility
- Fishing industry untill 2002
- Population suffered severe de-growth
- Arrival of gas engraved in collective memory as turning point

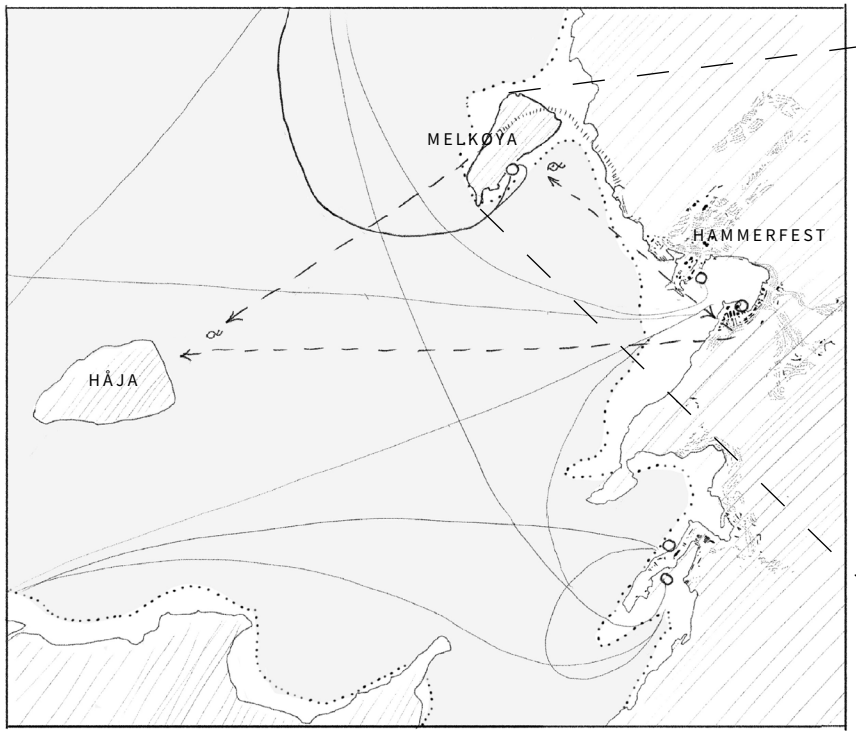
- Local petroleum expected to run out by 2035

- Gas discovered
- Melkøya developed as gas processing plant

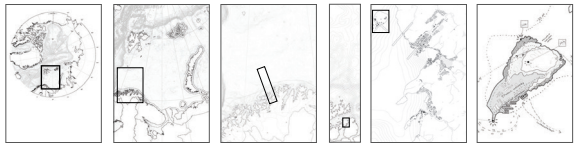


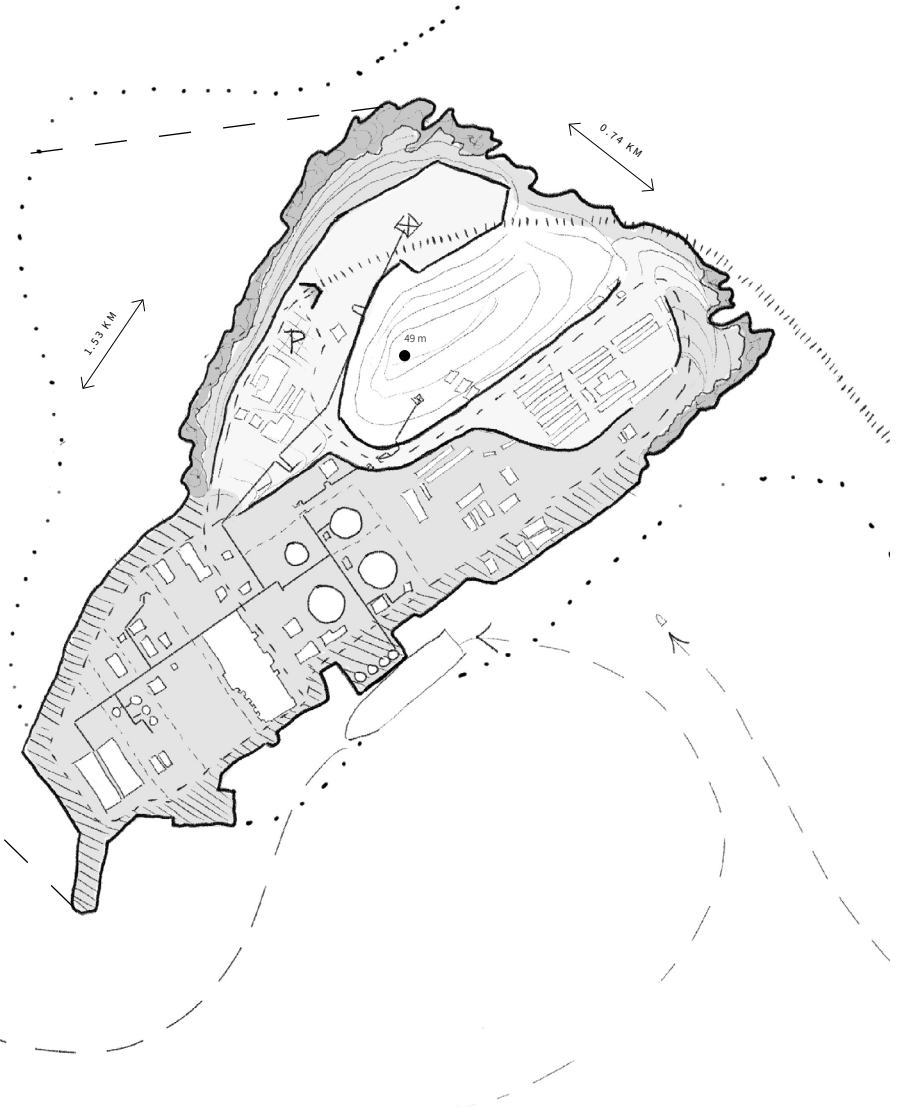
Source data: (Statistics Norway 2013, 2020; Loe & Kelman 2016)
Photos by: (Axel Lindahl 1889; Oskar Puschmann 2004)

MELKØYA



Hammerfest scale 1:50.000





NORTH SIDE

SOUTH SIDE

PERCEIVED DEPENDENCY ON PETROLEUM

"Snow White turned everything upside down – the situation went **from sunset to sunrise.**"

"Everything changed with Snow White. That was when the future came back to Northern Norway."

"It has been a blessing. This is a strong word, but there has been a total change

from pessimism to enormous optimism."

"The most important is to hire local people so there is more to do [job opportunities] here, so that one is able to keep people here."

"Environment? Well, national environmental organizations such as WWF and 'Nature and Youth' were against the development of SnowWhite in Hammerfest – but again, they are against everything.

"If you care so much about the environment, then why are you living here and reaping all the benefits from oil and gas?"

"Petroleum is extremely important for the whole region. It creates jobs, and that is the most important – if not it would have been quite empty here."

"A blessing for Hammerfest, but..."

"I think it is important not to create **social differences**, through high salaries for some groups, and pushing housing prices up. Big companies should think about the social effects of their operations."

"less focus on softer values"
"increased class differences"

"In the construction phase, 3000–4000 people came here from different places. There were many cases of drugs and violence. Statoil should have planed for this... . It was not good for the local community—**a tough time.**"

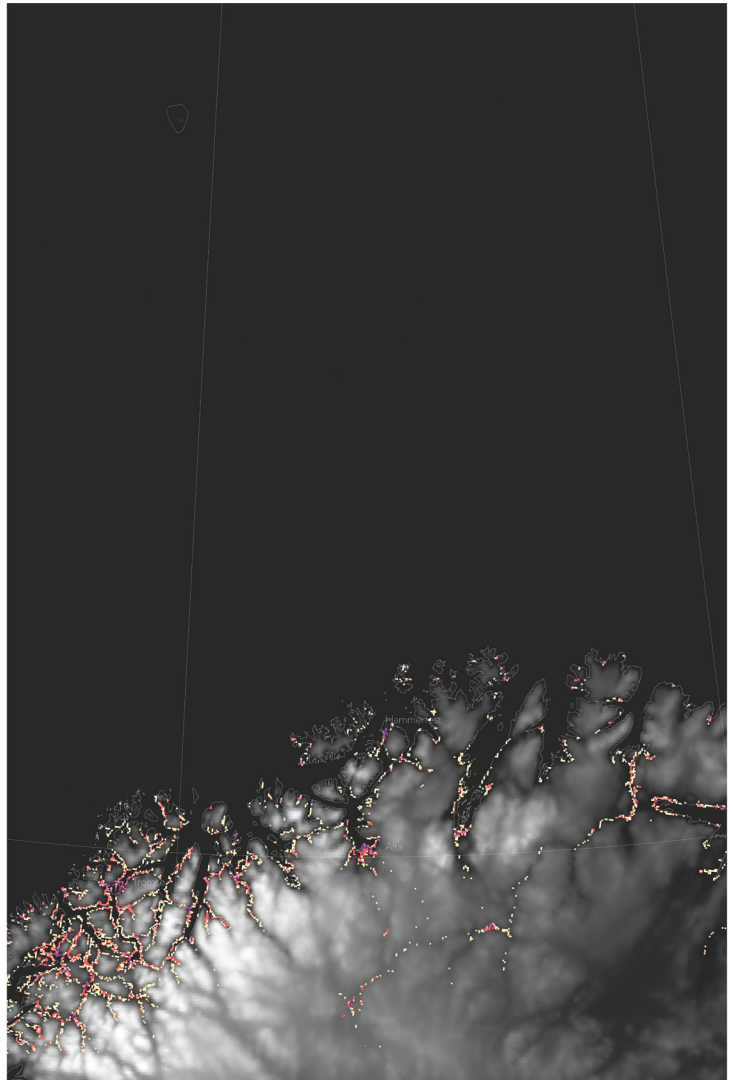
"Money means more than before... .
People care more about status, [material] things and expensive cars. People talk about buying new snow scooters and where they are planning to travel. The petroleum industry has created an illusion that having much money is happiness. It was different before. Calmer."

"For us, it has not been a question of environmental risk but of survival and having a place to work. Our nature and culture in this region is to survive, and we know there is a risk in all activities.

Source data: (Loe & Kelman 2016).

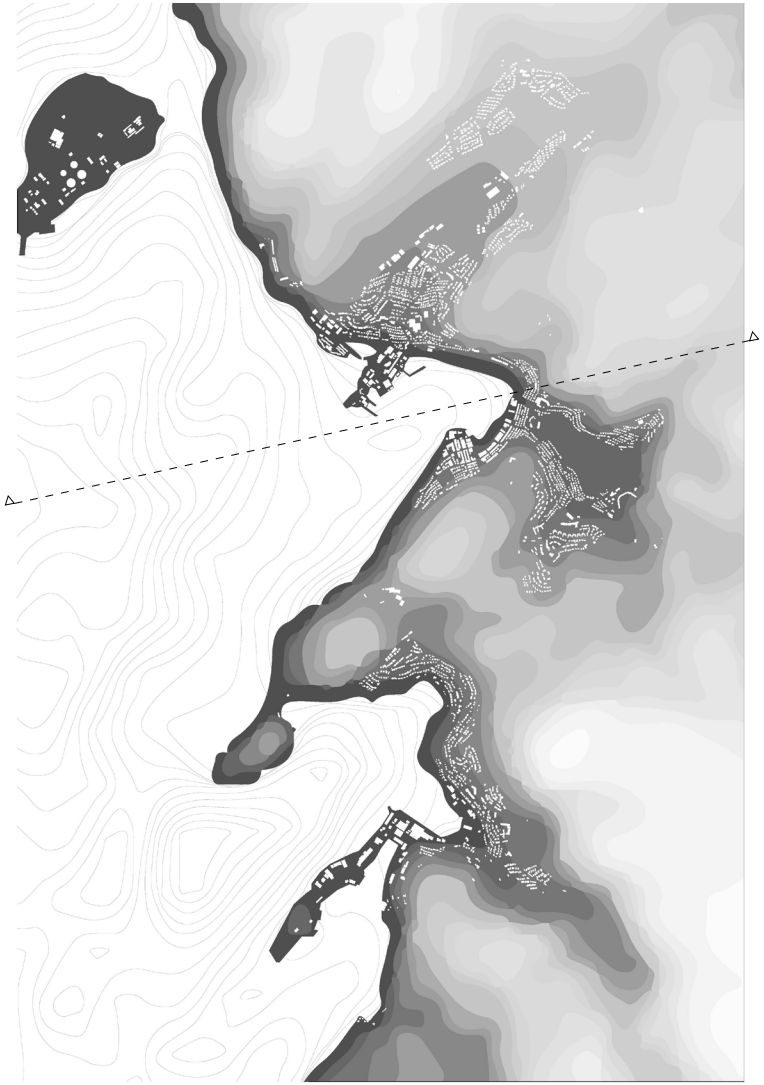
STRANDFLAT TYPOLOGY

- Why this is an interesting place to study human-sea dependency?
- High denisty of settlement along the shore



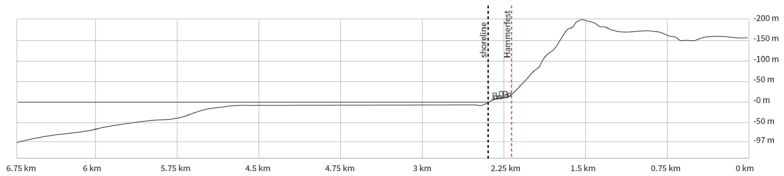
High population density
Moderate population density
Low population density

Finnmark scale 1:2.000.000



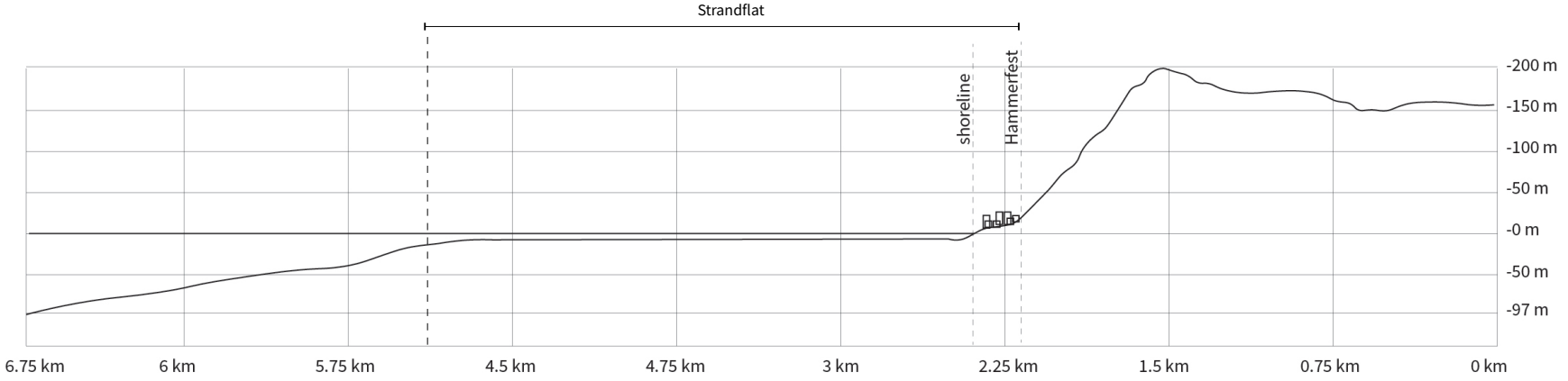
00-10 m elevation
10-20 m elevation
20-30 m elevation
30-40 m elevation
40-50 m elevation
50-60 m elevation
building
bathemetry

Hammerfest scale 1:50.000



STRANDFLAT TYPOLOGY

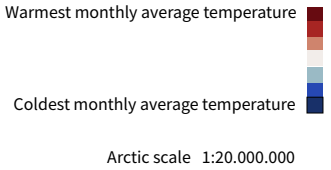
- Why this is an interesting place to study human-sea dependency?
- Strandflat topography limits urban expansion and agriculture inland
- Coastal communities rely on the Barents Sea for resources, economy and infrastructure
- In the case of Hammerfest: offshore petrol

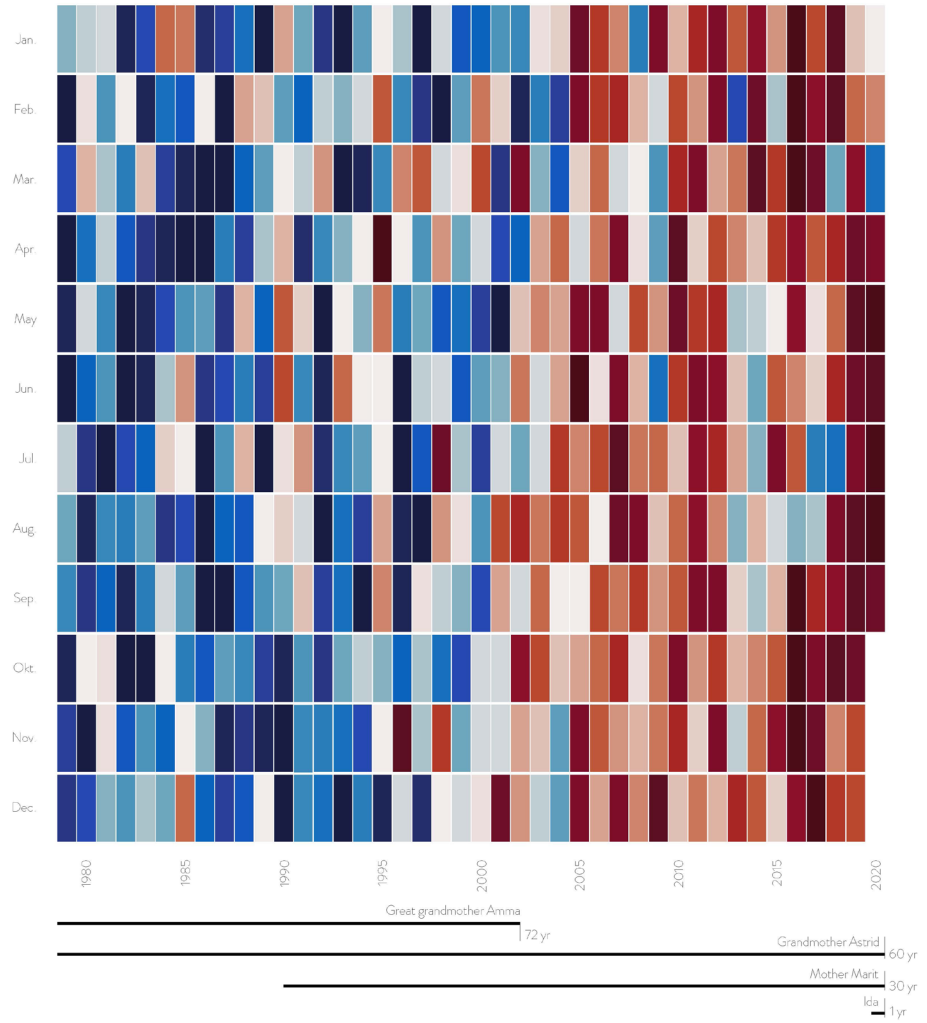


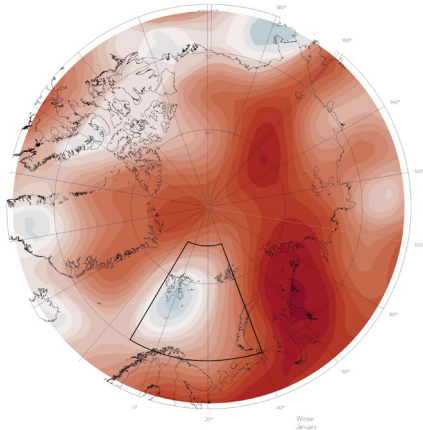
Photograph : by author (2019)
Section data: Google Earth Pro (2021)

HEATING ARCTIC

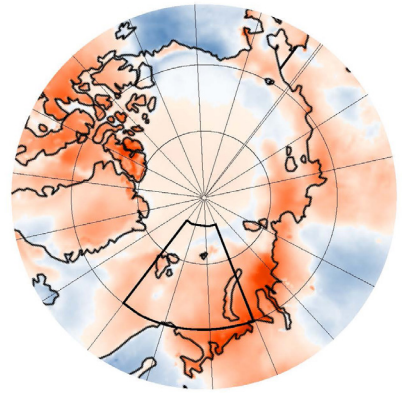
- Marine conditions at the Barents Sea are changing
- Arctic air temperature rises at twice the rate of av. global temperatures
- Anomalities are greater in winter
- Summer temperatures rise most severely near the Barents Sea





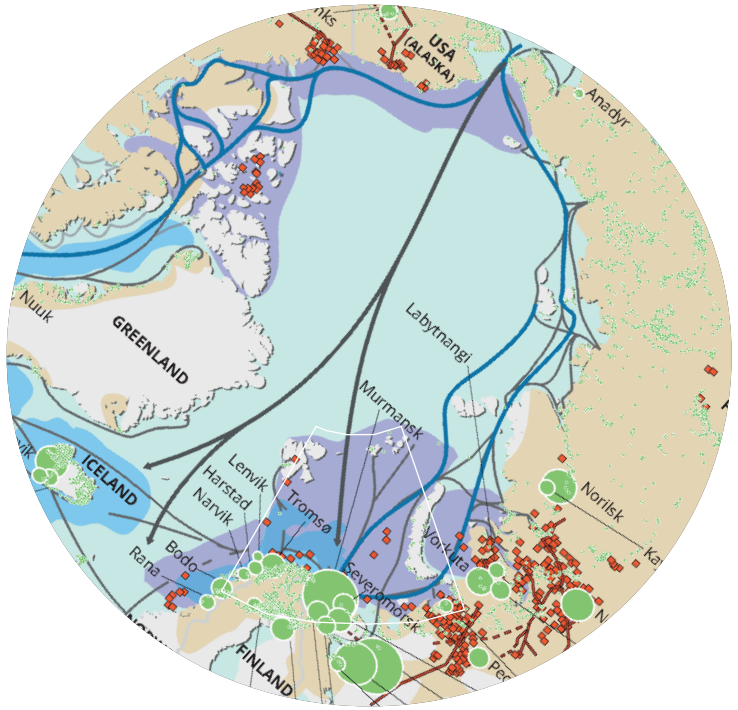


Winter

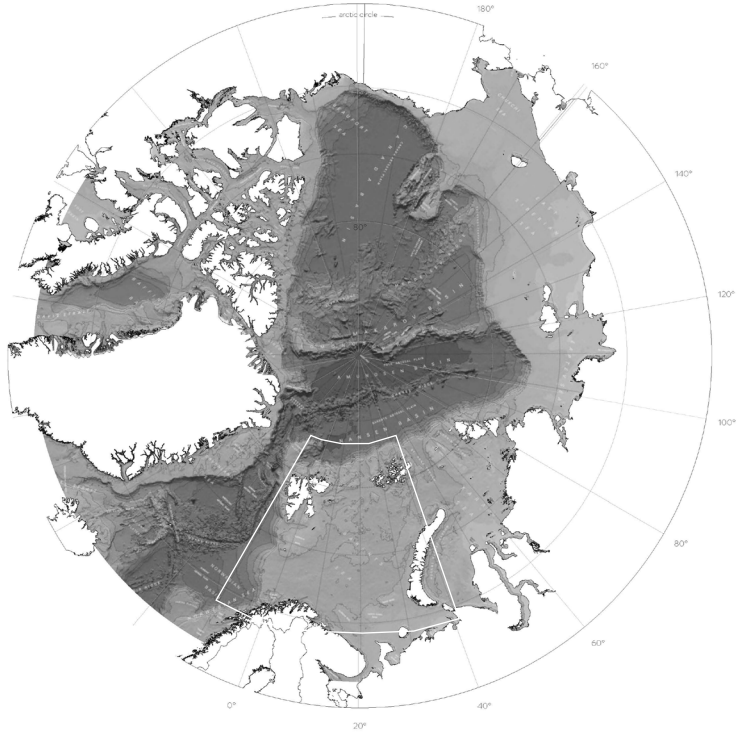


Summer

Source data: (NCEP Reanalysis Derived data provided by the NOAA/OAR/ESRL PSL, Boulder, Colorado, USA, 2020)
Source data: (Statista, 2020; Zachary Labe, 2020).



Increasing marine industry



Depth and accessibility seabed for extraction

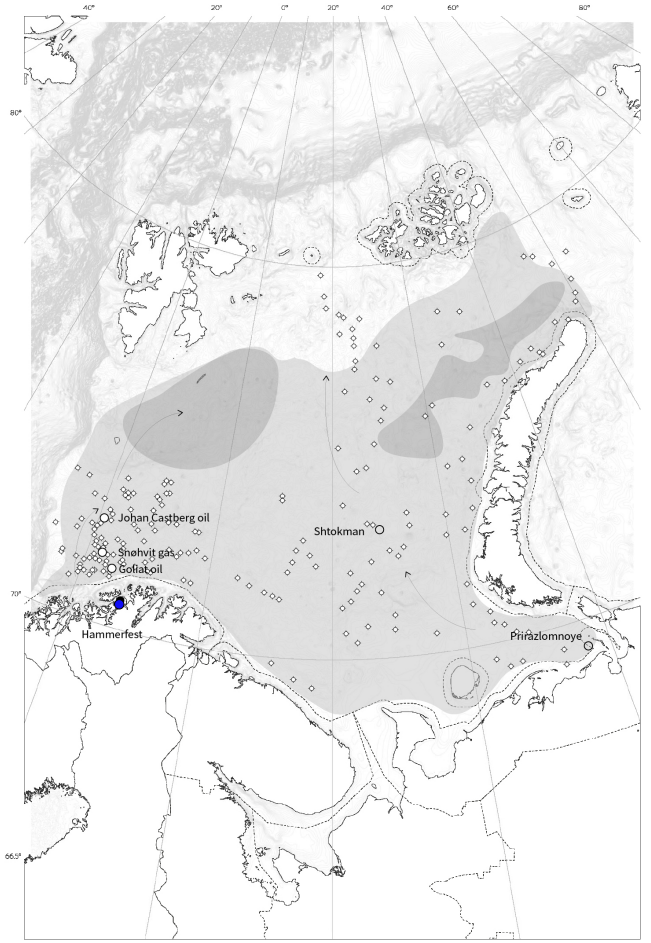
- Urban settlements
- Extraction fields
- Main offshore extraction regions (actual and potential)
- Areas inhabitated by indigenous peoples
- Northern Sea Route
- Future Trans-polar Sea Route

Arctic scale 1:20.000.000

Source: EEA from Nordregio, 2015

SEAWARD TRENDS

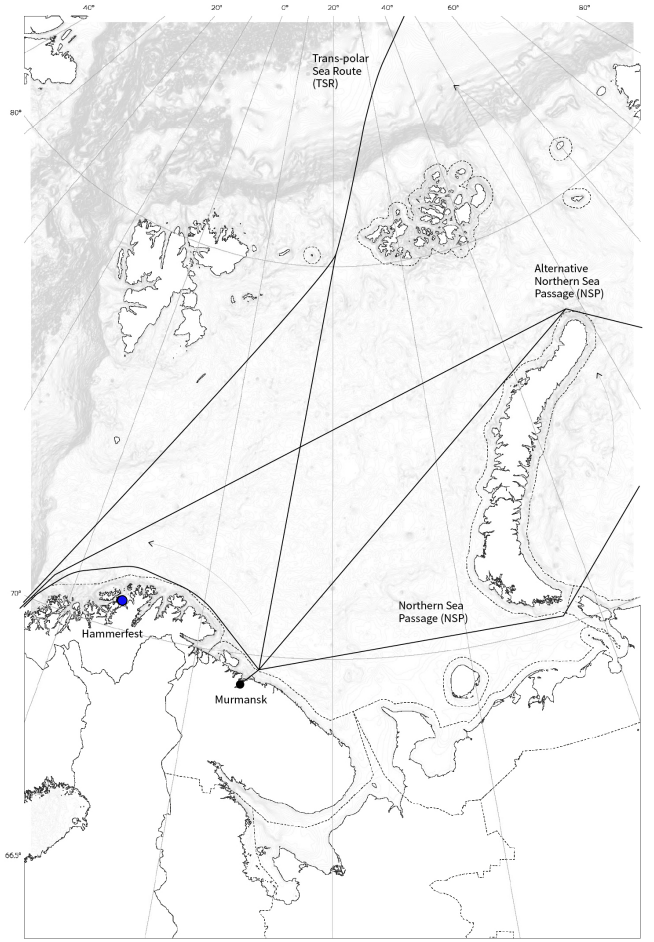
Regressing sea ice



Petrol industry move seaward

- **2035** Goliat (oil) and Snøhvit (gas) near Hammerfest depleted. Extraction moves north (Johan Castberg)

Prospected oil
Prospected gas
Exploration drilling
Extraction field
Barents Sea scale 1:7.000.000

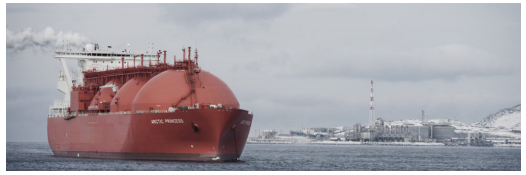


Trans-polar Sea Route

- **2050** sea ice allows seasonal traffic across the pole
- **2100** iceless Arctic
  Trans-polar Sea Route opens as a more economic alternative to the Northern Sea Route


1 / LOCAL ISSUE
Overdependency on petrol
Problem field
Hammerfest' s economy of life is overdependent on the petroleum industy offshore.
Pressure
Local petroleum is expected to run out by 2035 after which it moves further seaward or transitions towards a post-oil scenario.
Socio-economic impact
No job security for the majority of the working community, putting local wellfare at risk.
The flux of offshore employees coming to Hammerfest reduces, causing both temporal and permanent population to decline.
Purpose
Propose pathways of change in which Hammerfest' s economy of life depends less on offshore petroleum industry.
2 / LOCAL ISSUE
Perceived dependency on petrol
Heavy perceived dependence on the petroleum industry as a means of survival.
Collective memory and perception of petroleum as a blessing that saved Hammerfest of severe de-growth around 2002, reviving the town, its population and prospects for a future.
Petroleum has changed the local understanding of growth and causes local reluctance to move to a post-petrol scenario.
Strengthen local sense of ownership and transparancy of the transition to a larger variety of marine industries besides petroleum, by promoting community-led initiatives and public acces to the offshore environment.

HUMAN OCCUPATION AT SEA

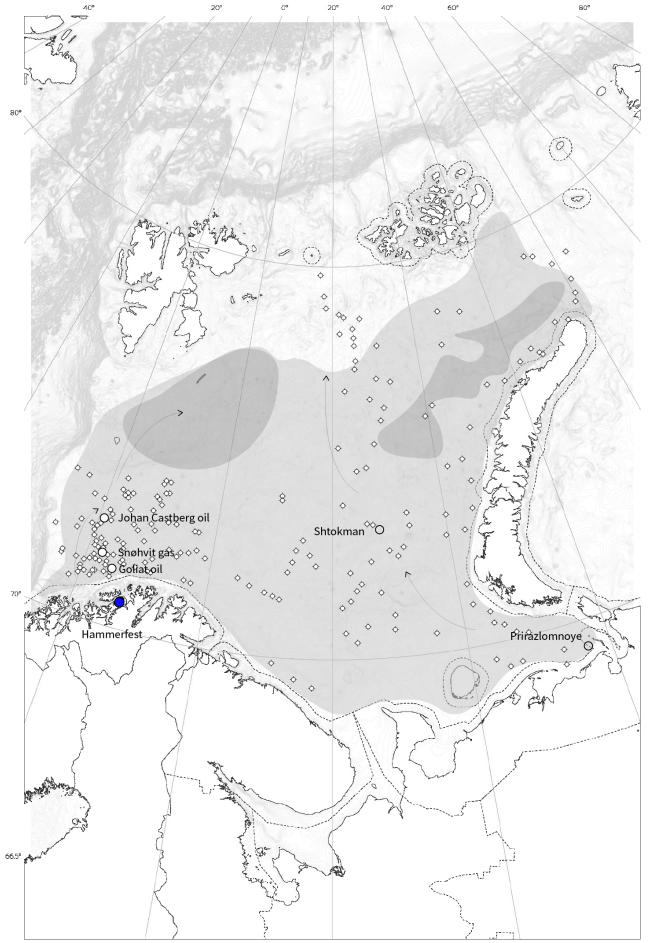


Vessels

Goliat oil rig

Snøhvit extraction and pipelines

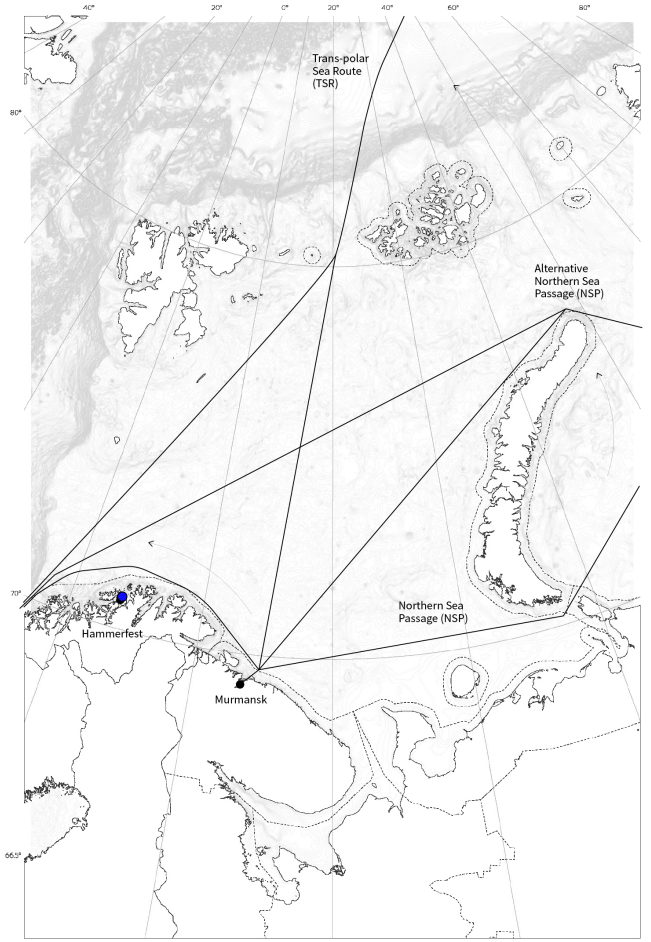
Melkøya gas processing island



More extraction

Prospected oil
Prospected gas
Exploration drilling
Extraction field

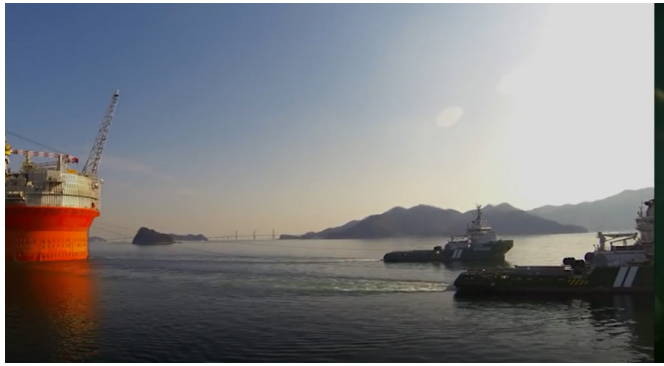
Barents Sea scale 1:7.000.000



More marine traffic

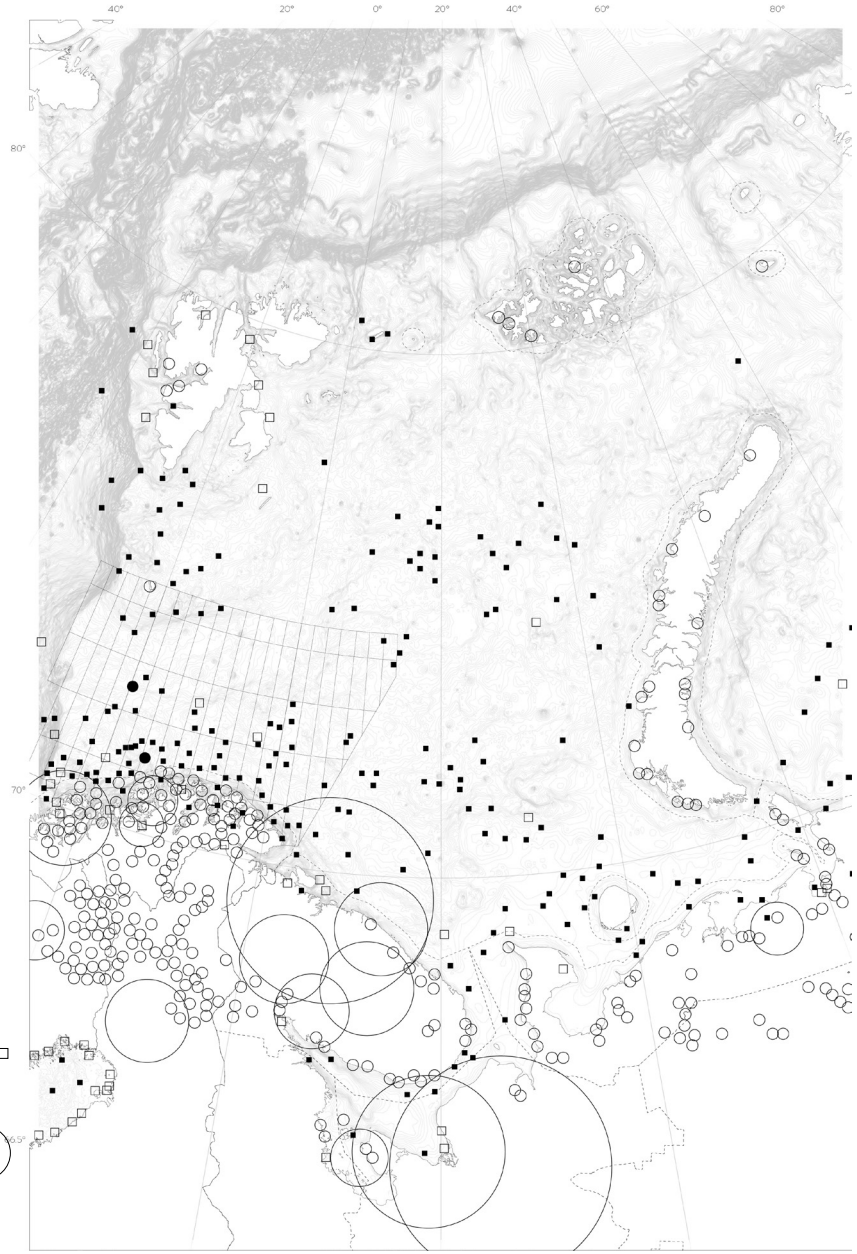
HUMAN SETTLEMENT AT SEA






Montage by author 2020.
Film material by: ENI Video Channel ; National Geographic.

HUMAN INHABITATION OF THE SEA

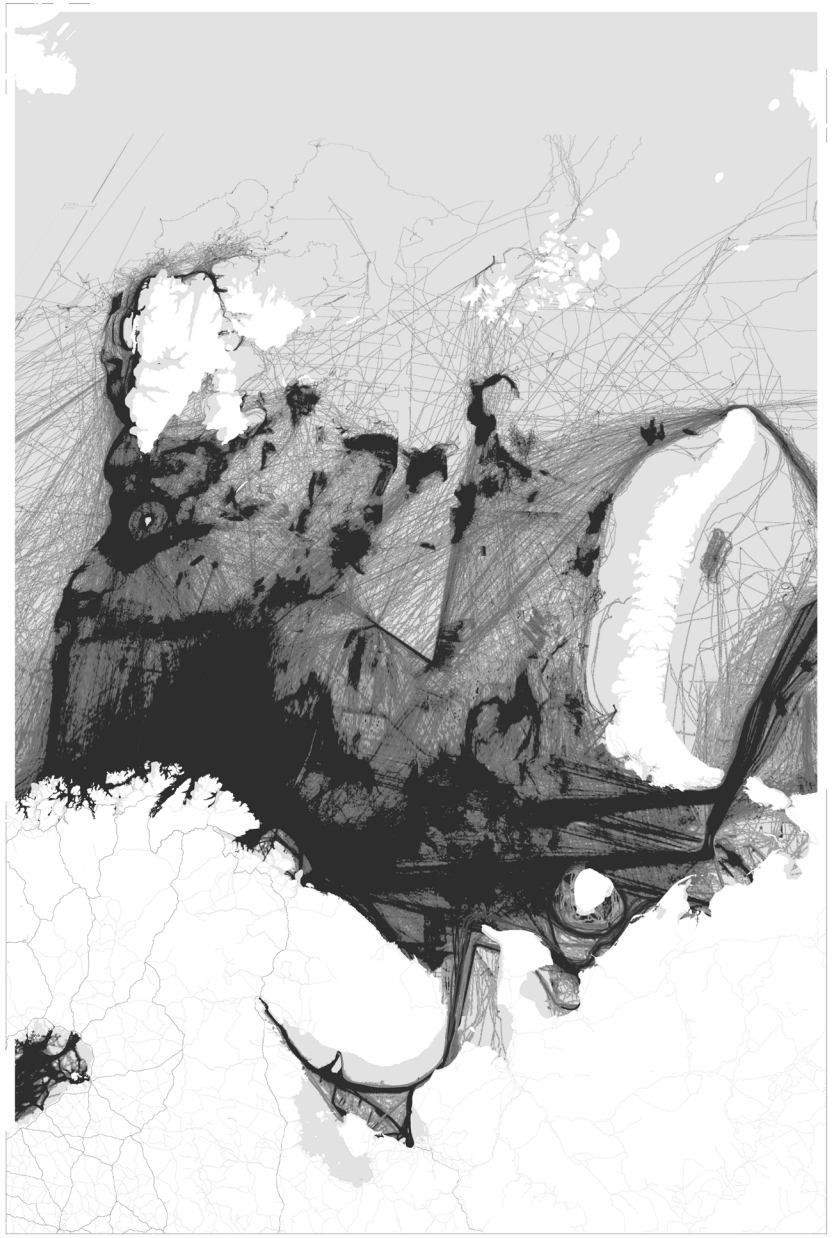


Marine population density

Fixed population density marine (ca. 200 p)
Unfixed population density vessel (ca. 20 p)
(MarineTraffic, 07/12/2020)

Low population density terrestrial
Moderate population density terretrial
High population density terretrial

Barents Sea scale 1:7.000.000



Moving marine population

Source data: (MarineTraffic 2020; OpenStreet-Map 2014)

500.000 routes / 4.89 km² / year

1 route / 4.89 km² / year

Barents Sea scale 1:7.000.000

The Barents Sea is urban(ising)

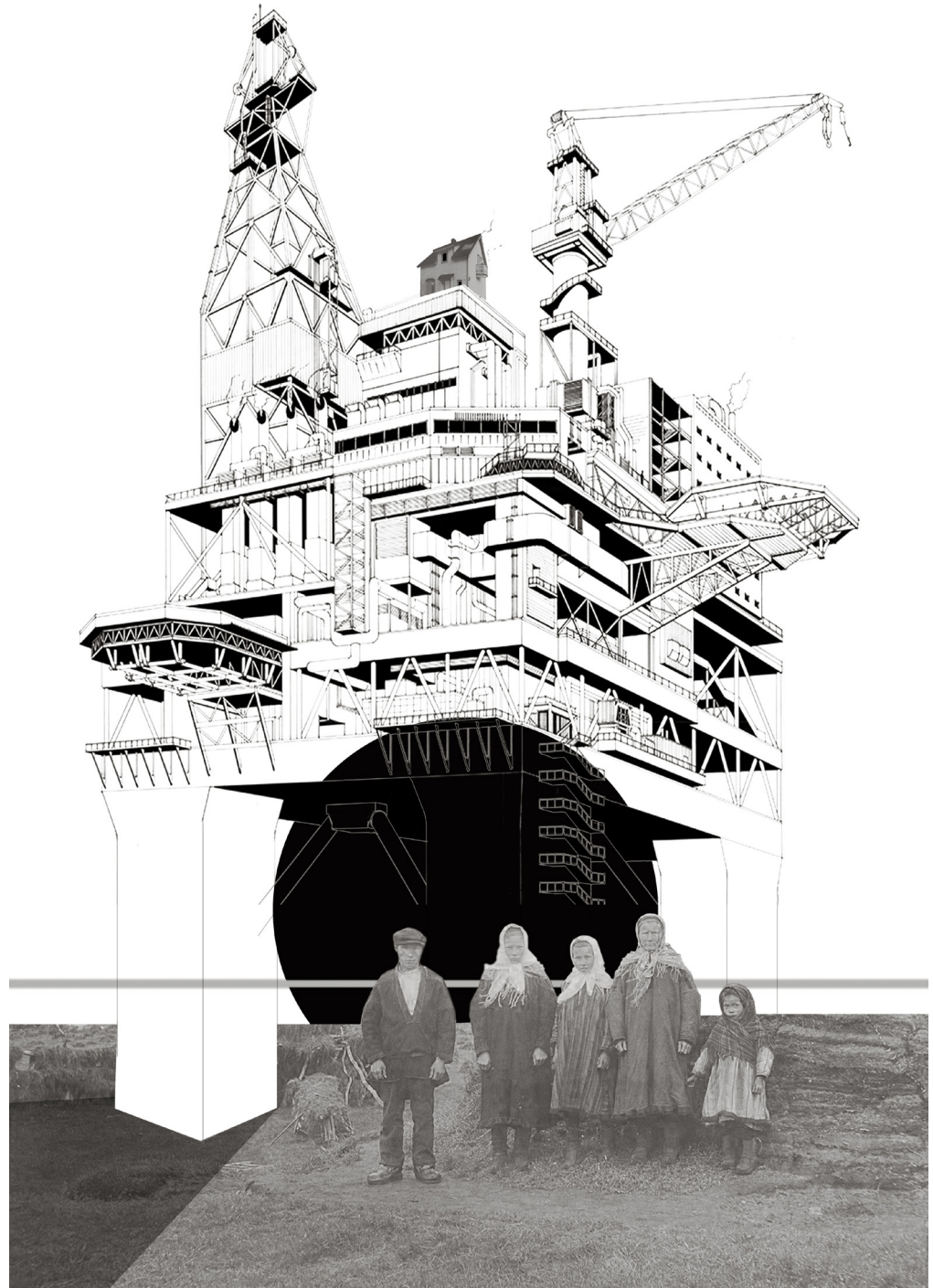
Urbanus (latin) - of the city ; relating to the city.

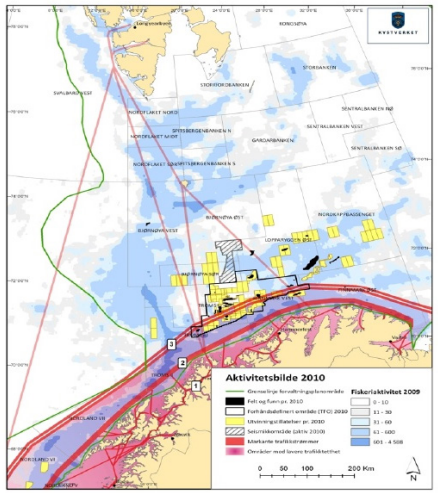
Urban (english) - territory characteristically **inhabited by humans** and **occupied by humans functions**. Both inhabitation and occupation manifest physically in the form of architectural elements like houses, highways, factories: **human settlement**.

- Occupation of the Barents Sea
- Settlement on the Barents Sea
- Inhabitation of the Barents Sea

WHY OFFSHORE URBANISM?

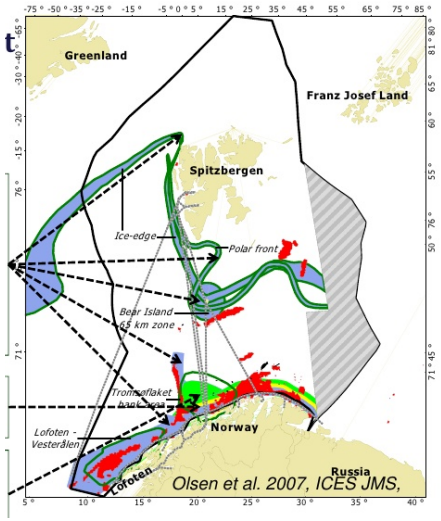
- Conditions at sea are changing
- The ocean is urbanising
- Hammerfest' s economy of life is dependent on the Barents Sea
- Organisation of marine uses impacts coastal communities
- Marine planning should consider human-sea dependencies and socio-cultural risks





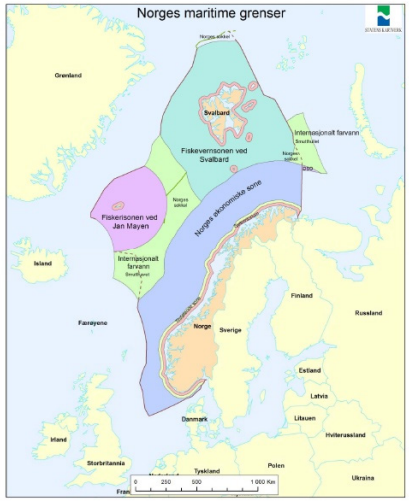
Economic

Logistics and spatial organisation of marine traffic and extraction activity



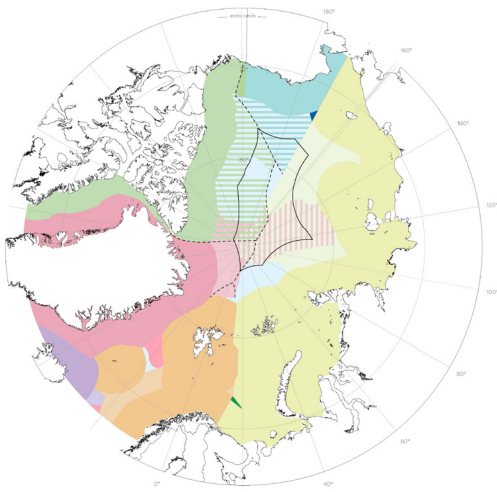
Ecological + environmental

No drilling zones, restoration, protected areas



Management

Legislation, policy, intentions



Geopolitical concerns

Claim, right to resources, responsibilities, power

THESIS

1 / PROBLEM STATEMENT
Human-sea relations

Problem field

The socio-cultural impacts of marine industrialisation at the Barents Sea on coastal communities remain unmapped and underrepresented in both research and practice.

2 / PROBLEM STATEMENT
Representation

Planning offshore development relies on objective, univocal mapping of an administrative or proprietary nature, which cannot sufficiently represent socio-cultural values, or visualise human-sea relations between Hammerfest and the Barents Sea.

3 / PROBLEM STATEMENT
Design

The current practice of marine spatial planning at the Barents Sea is limited to economic and ecological analysis, lacks design, and is unable to consider socio-cultural risks and opportunities in the organisation of marine uses.

Pressure

The sea is urbanising in response to global and national demands for resources and economic stability.

Socio-economic impact

Human-sea dependencies and local perceptions on marine industry are not taken into account, **leaving coastal communities vulnerable to change at sea**.

Purpose

Take a localised approach to marine spatial planning, that seeks to understand and employ human-sea relations through design.

TESTCASE HAMMERFEST

1 / LOCAL ISSUE
Overdependency on oil

Problem field

Hammerfest' s economy of life is overdependent on the petroleum industy offshore.

Pressure

Local petroleum is expected to run out by 2035 after which it moves further seaward or transitions towards a post-oil scenario.

Socio-economic impact

No job security for the majority of the working community, putting **local wellfare at risk**.

The flux of offshore employees coming to Hammerfest reduces, causing both temporal and permanent **population to decline**.

Purpose

Propose pathways of change in which Hammerfest' s economy of life **depends less on offshore petroleum** industry.

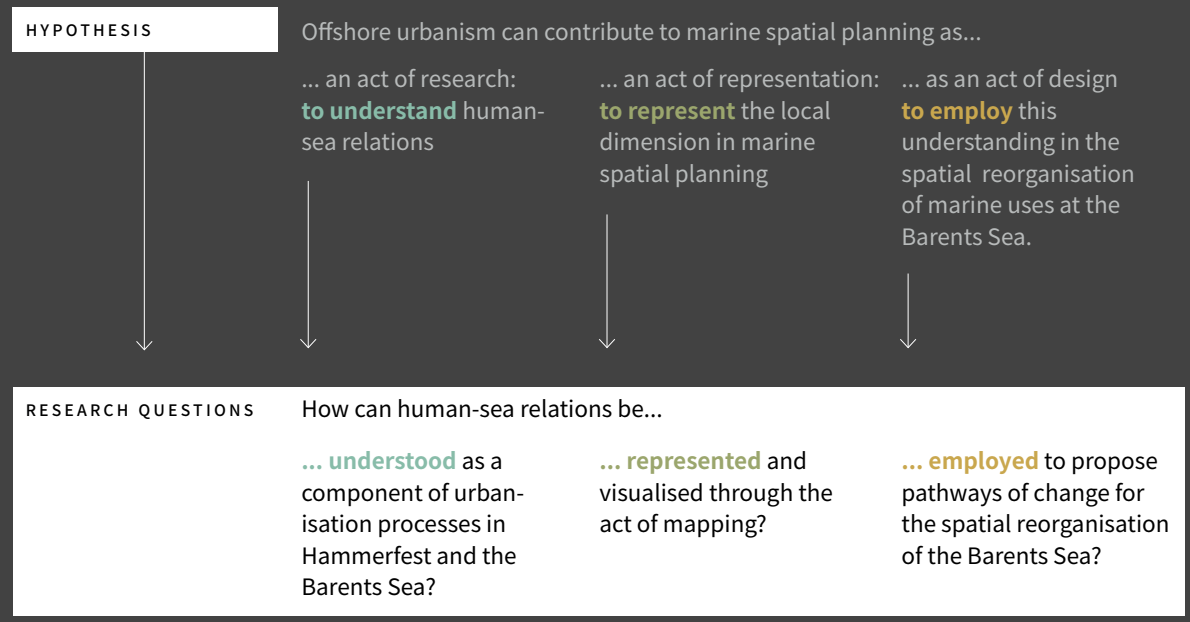
2 / LOCAL ISSUE
Perceived dependency on oil

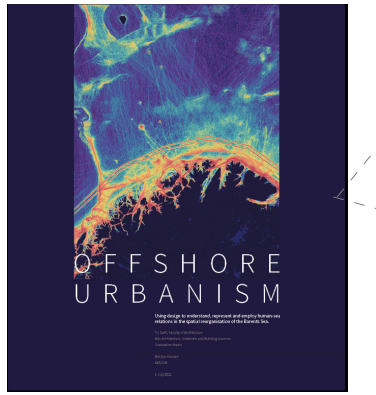
Heavy perceived dependence on the petroleum industry as a means of survival.

Collective memory and perception of petroleum as a blessing that saved Hammerfest of severe de-growth around 2002, reviving the town, its population and prospects for a future.

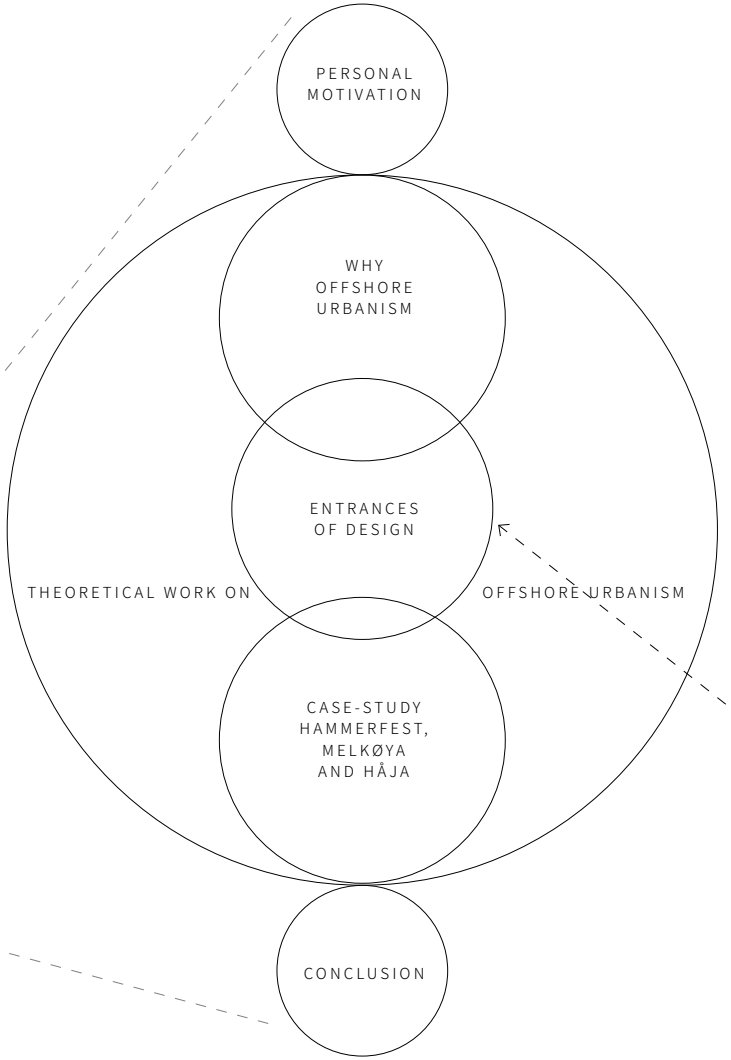
Petroleum has changed the local understanding of growth and causes local **reluctance to move to a post-petrol scenario.**

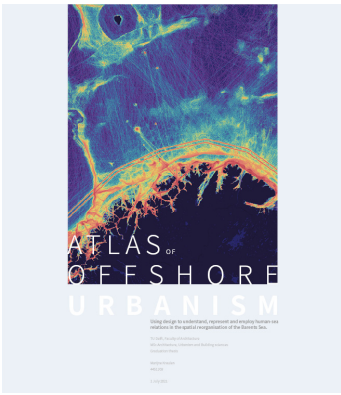
Strengthen **local sense of ownership and transparancy** of the transition to a larger variety of marine industries besides petroleum, by promoting community-led initiatives and public acces to the offshore environment.


HYPOTHESIS
Offshore urbanism can contribute to marine spatial planning as...
... an act of research: to understand human-sea relations
... an act of representation: to represent the local dimension in marine spatial planning
... as an act of design to employ this understanding in the spatial reorganisation of marine uses at the Barents Sea.
RESEARCH QUESTIONS
How can human-sea relations be...
... understood as a component of urban-isation processes in Hammerfest and the Barents Sea?
... represented and visualised through the act of mapping?
... employed to propose pathways of change for the spatial reorganisation of the Barents Sea?

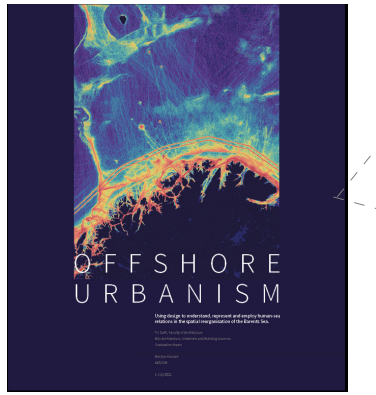


Offshore urbanism
Thesis

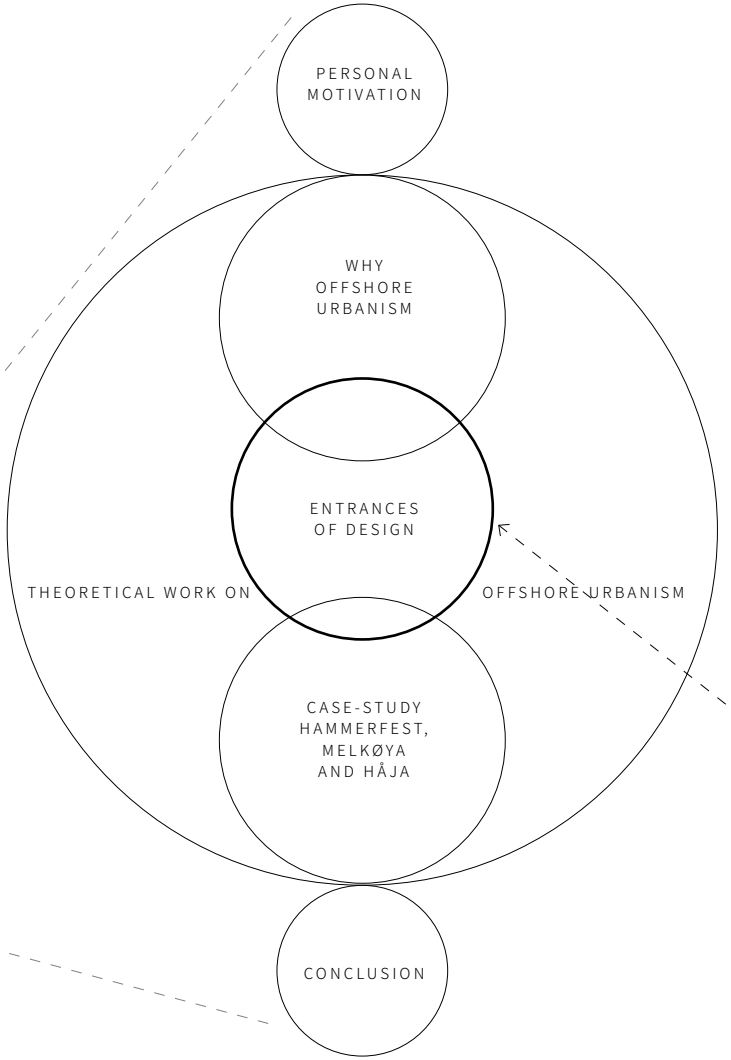


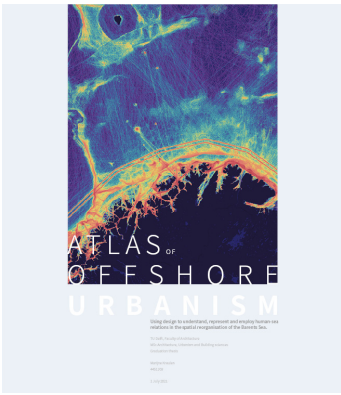


Atlas of
Offshore urbanism



Offshore urbanism
Thesis





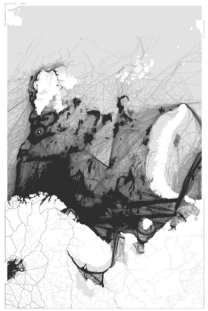
Atlas of
Offshore urbanism

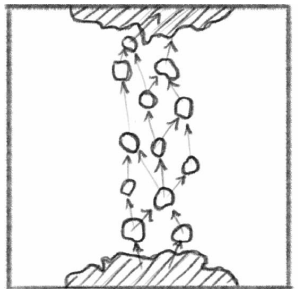
EVERY SHIP AN ISLAND

- Every ship is an island, a place inhabited and occupied by humans: urban node at sea.
- The urban territory spreads with every ship embarking onto the ocean.

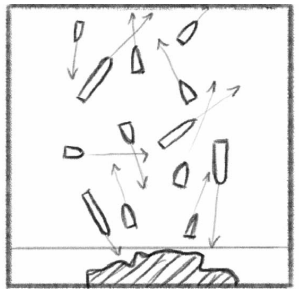
Trinakria Nesos. A performance installation off the coast of Norway. Creating a metaphorical island out of a ship and two searching lights at sea. Source: LCLA.

Remember?

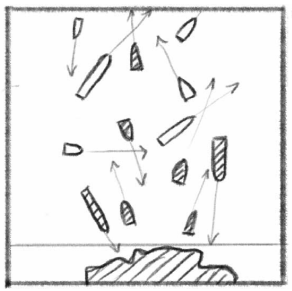




Land / territorial expansion



Sea / maritorial expansion

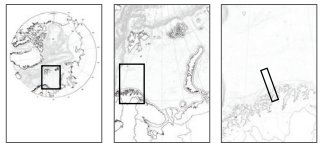


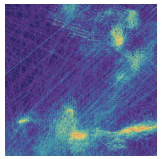
Not all ships extend the territory of Hammerfest ...

... only those with a spatial relation to Hammerfest.

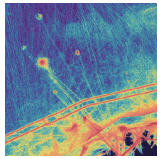
PATTERNS OF MOVEMENT

- Marine traffic density data show movement of ships (urban nodes)
- From patterns of movement we can read the current organisation of marine uses and their spatial relation to Hammerfest
- Urban morphology of the ocean!

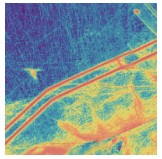




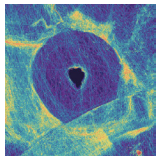
1 / Fishing activity



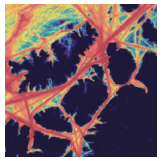
2 / Petroleum activity



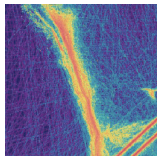
3 / International traffic



4 / Legislative border

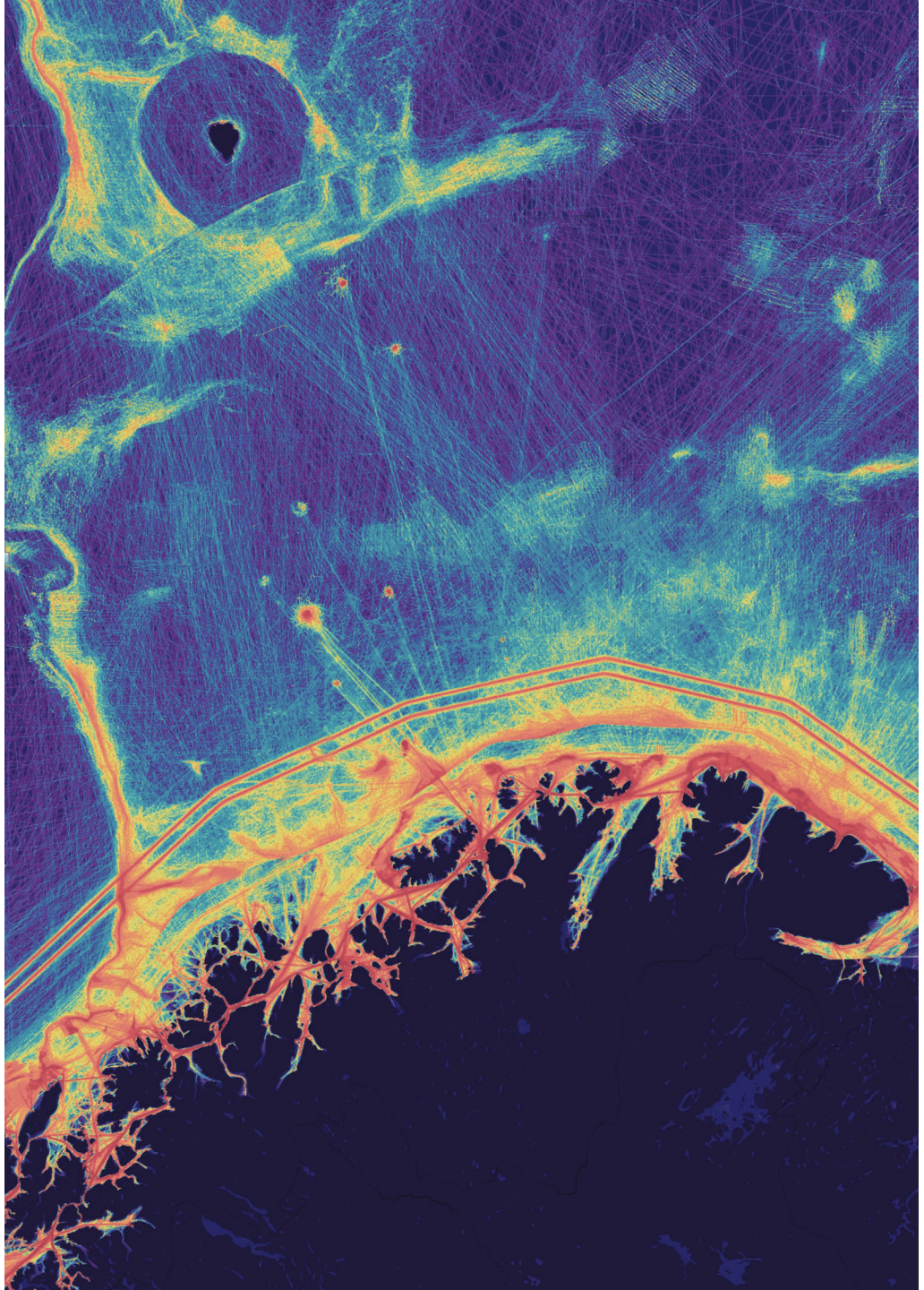


5 / Local traffic



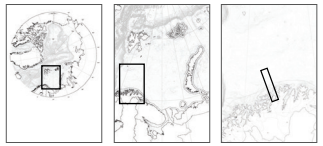
6 / Continental slope

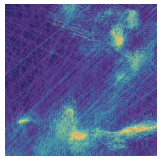
Barents Sea scale 1:7.000.000



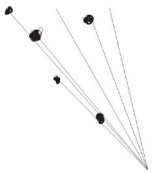
PATTERNS OF MOVEMENT

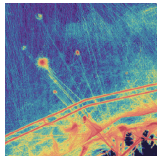
- The maritory can be read as a network of urban nodes that are connected by the movement of goods and people.



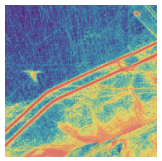


1 / Fishing activity

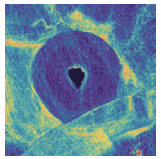




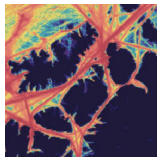
2 / Petroleum activity



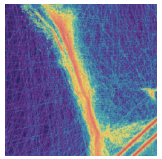
3 / International traffic



4 / Legislative border

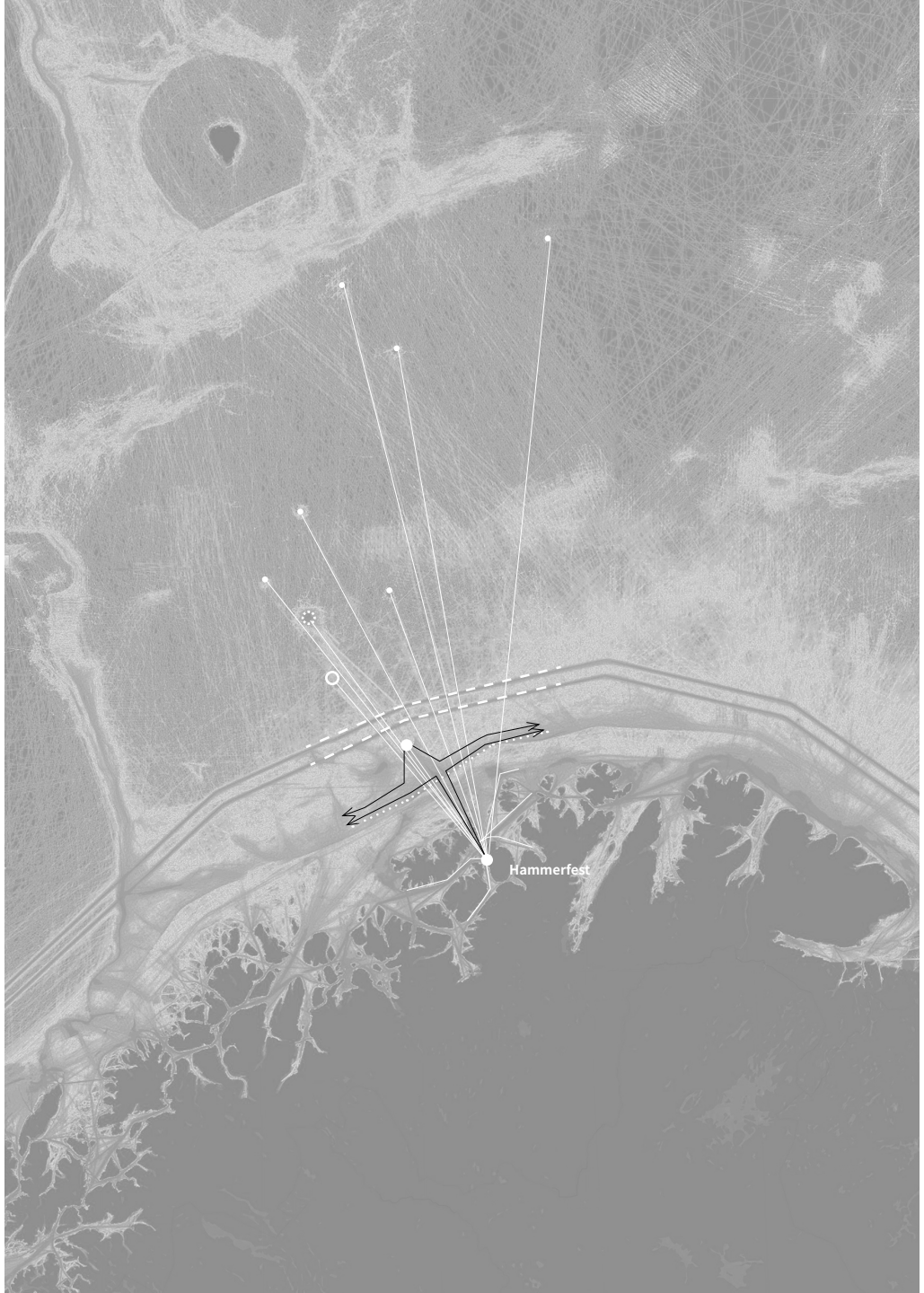


5 / Local traffic



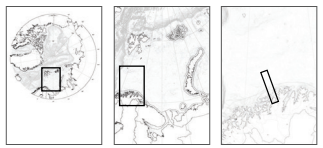
6 / Continental slope

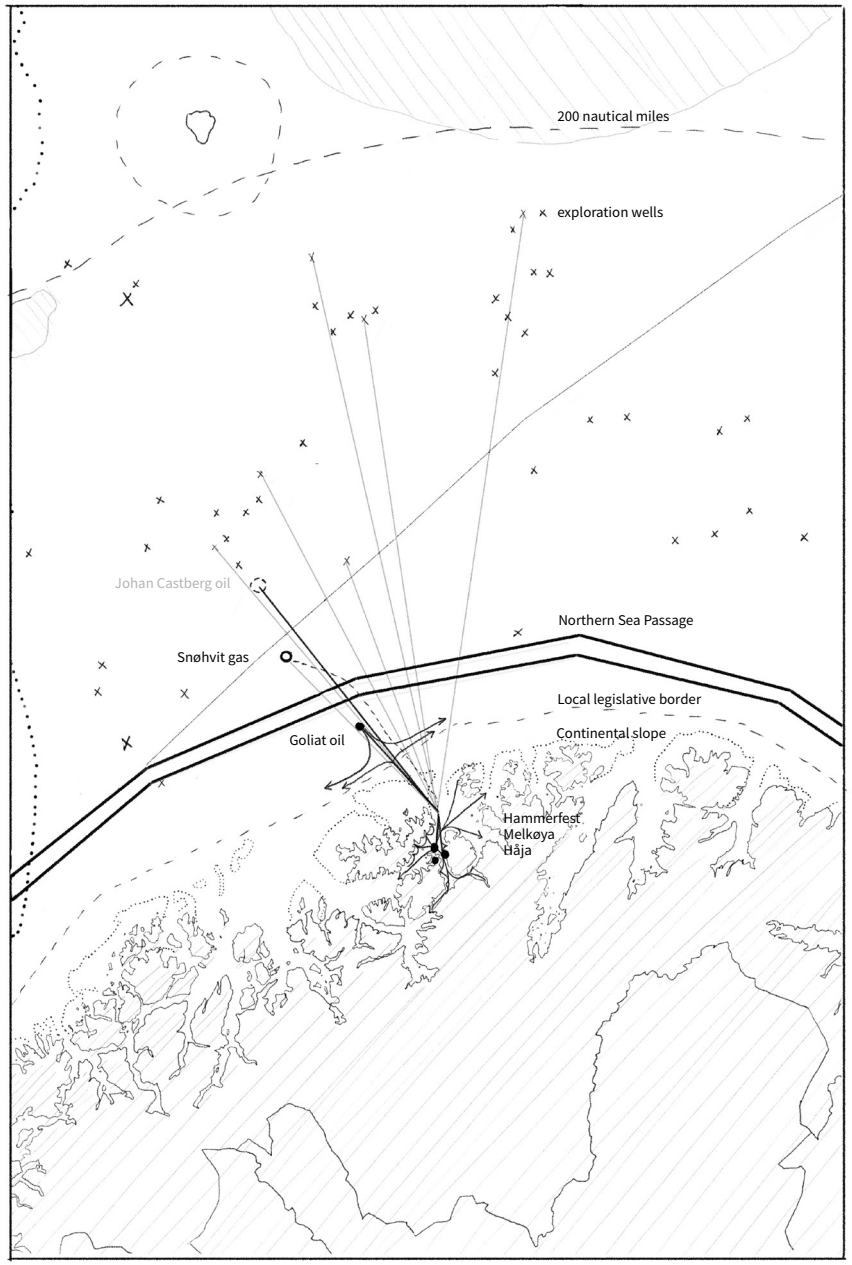
Barents Sea scale 1:7.000.000



NETWORK COMPOSITION

- Hammerfest network composition again reflects the overdependency of Hammerfest on offshore petroleum.
- The understanding of the network forms a key point of entrance for the maritorial design.





Barents Sea scale 1:7.000.000

NO ACTION SCENARIO

2021
Now

2023
Johan Castberg starts producing and offloading oil

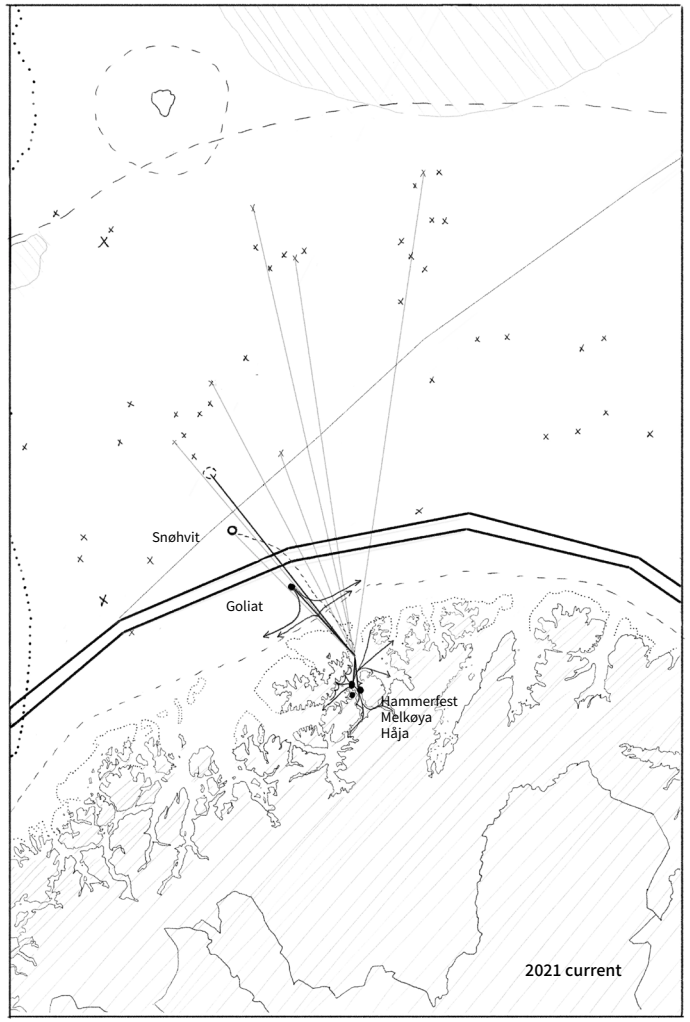
2031
Snøhvit gas field depleted

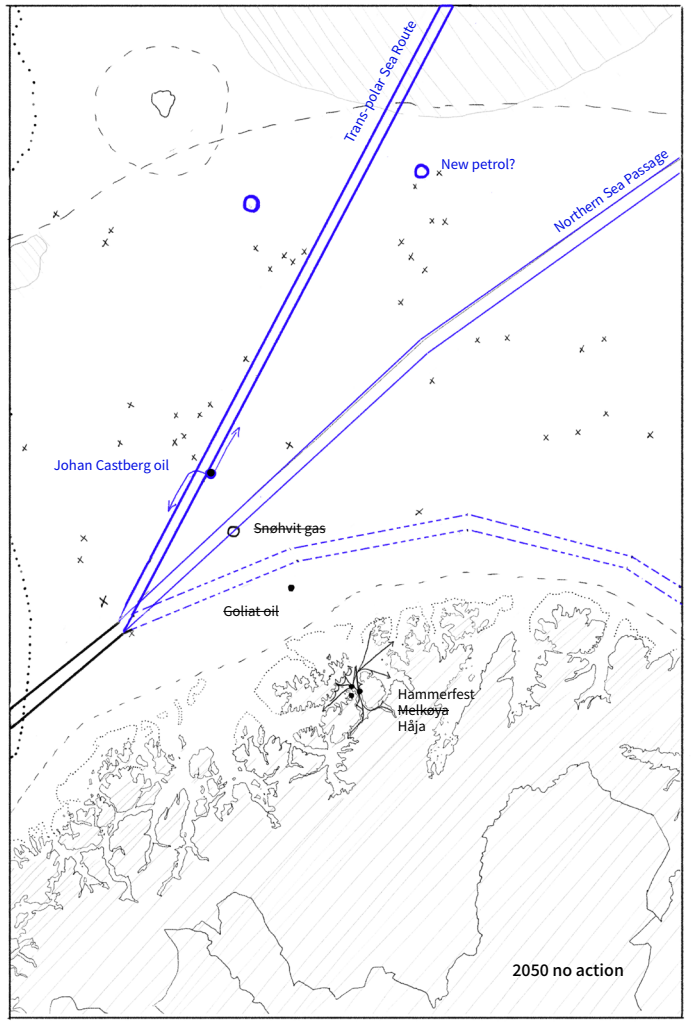
2035
Snøhvit gas field depleted

2050
Trans-polar Sea Route opens seasonally

2053
Johan Castberg is depleted

2100
Ice-less Arctic allows year-round access



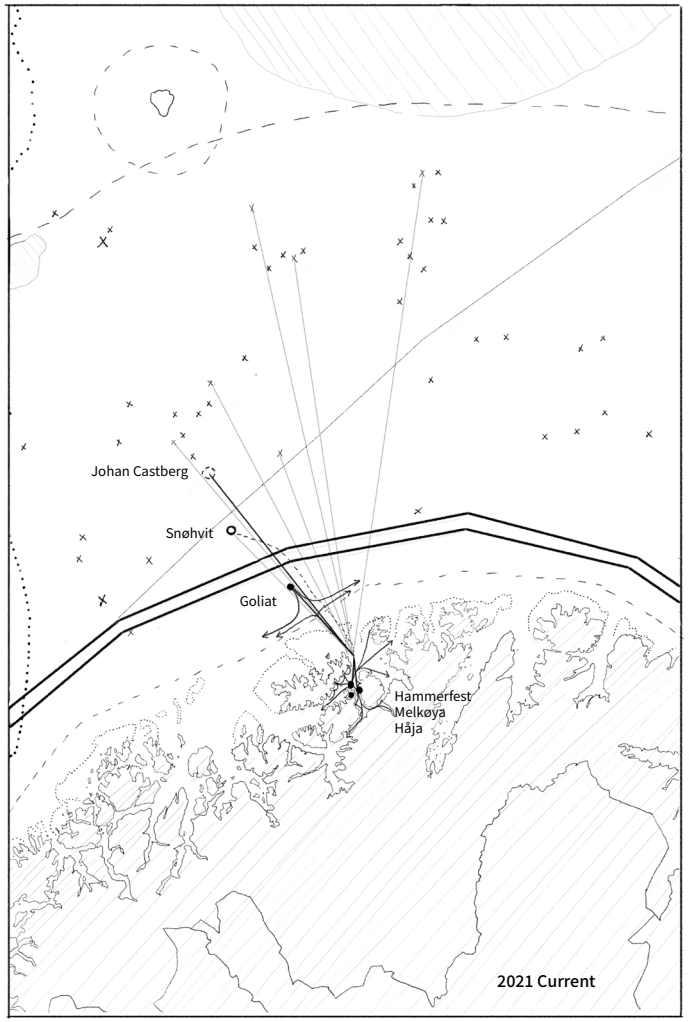


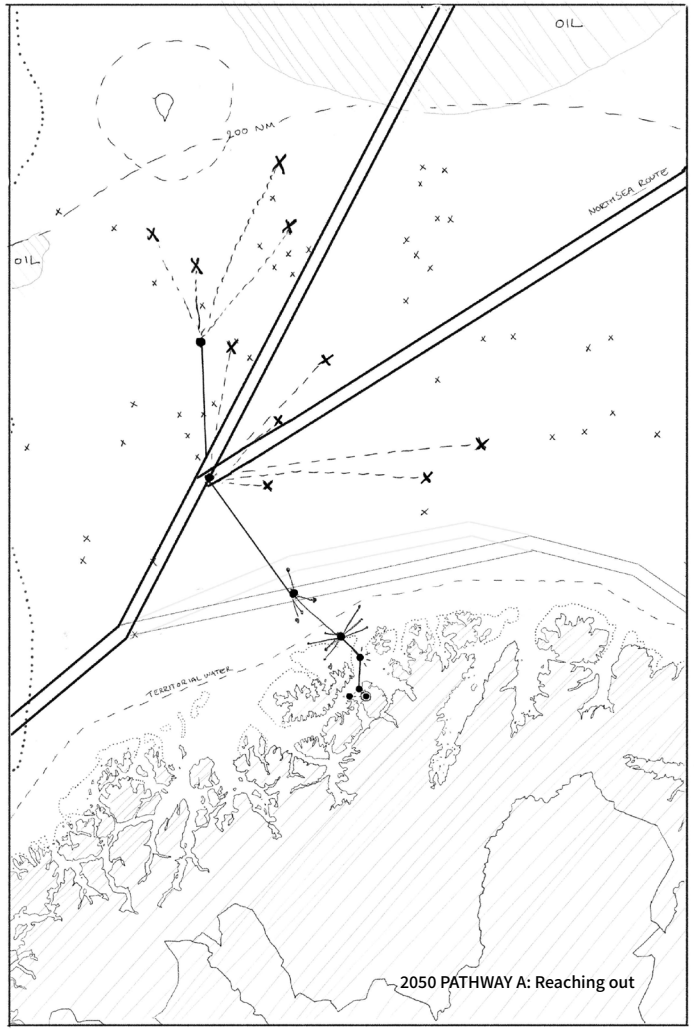
Barents Sea scale 1:7.000.000

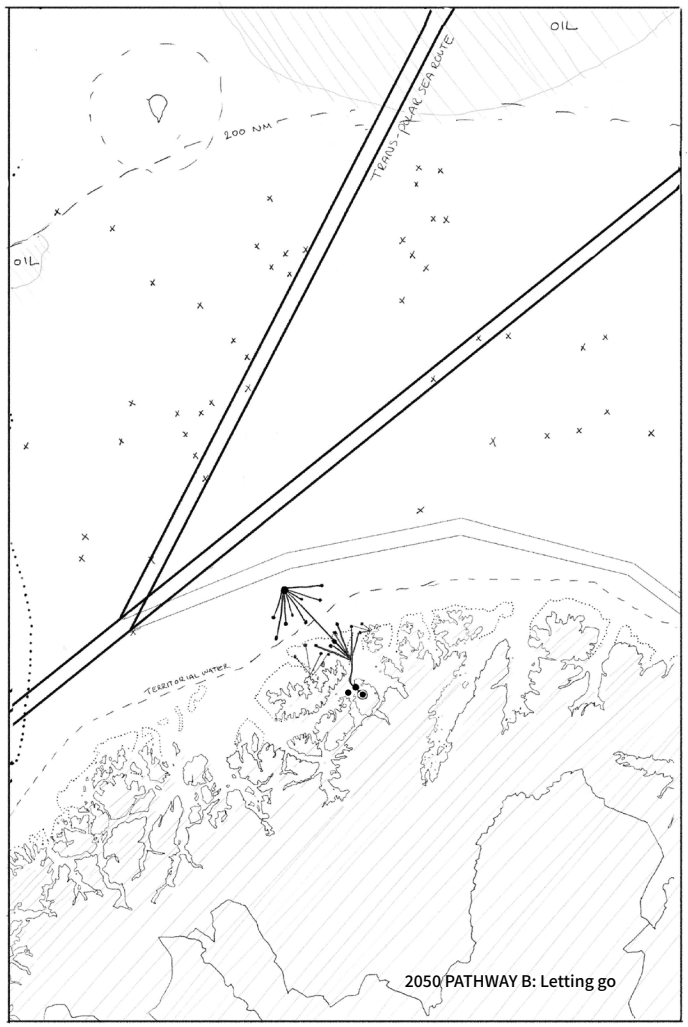
Seaward trends

Less ice
More extraction
More traffic

CHOOSING A PATHWAY OF CHANGE

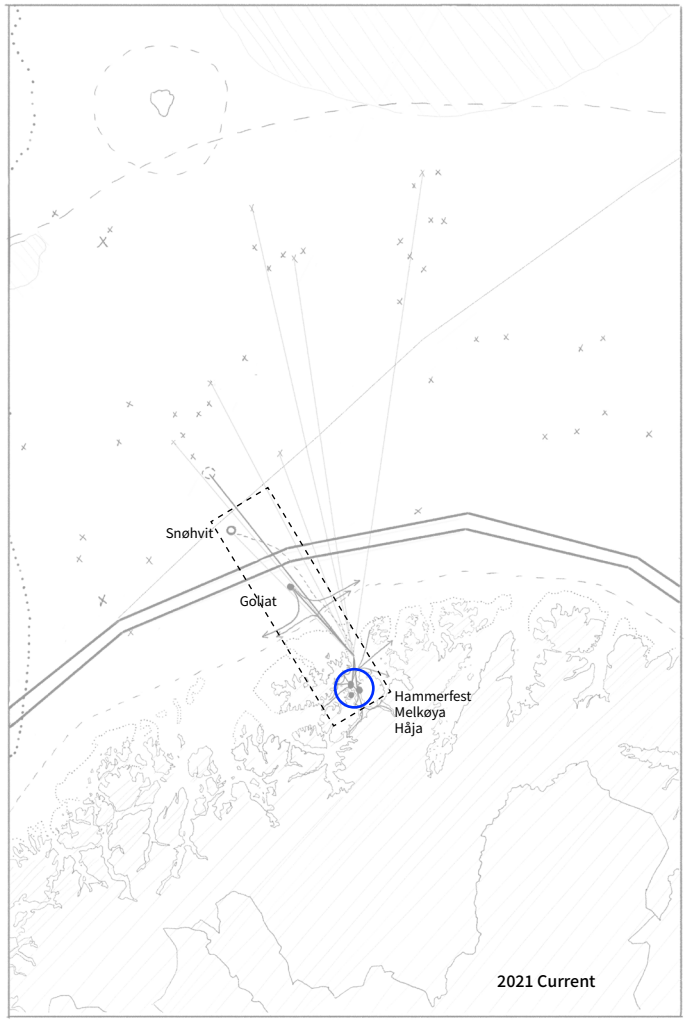


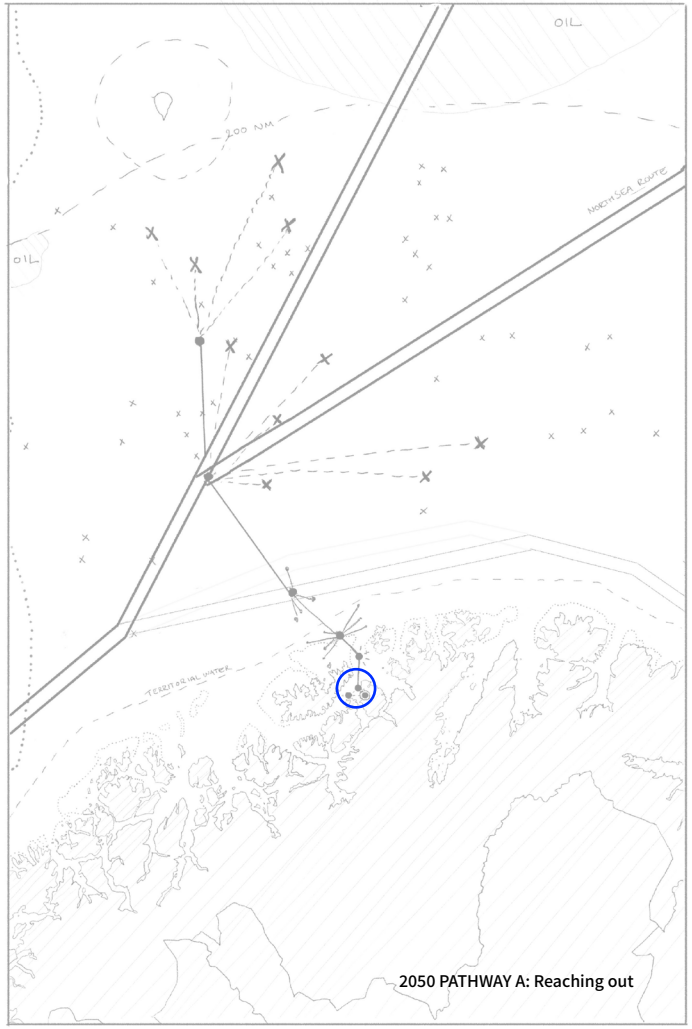


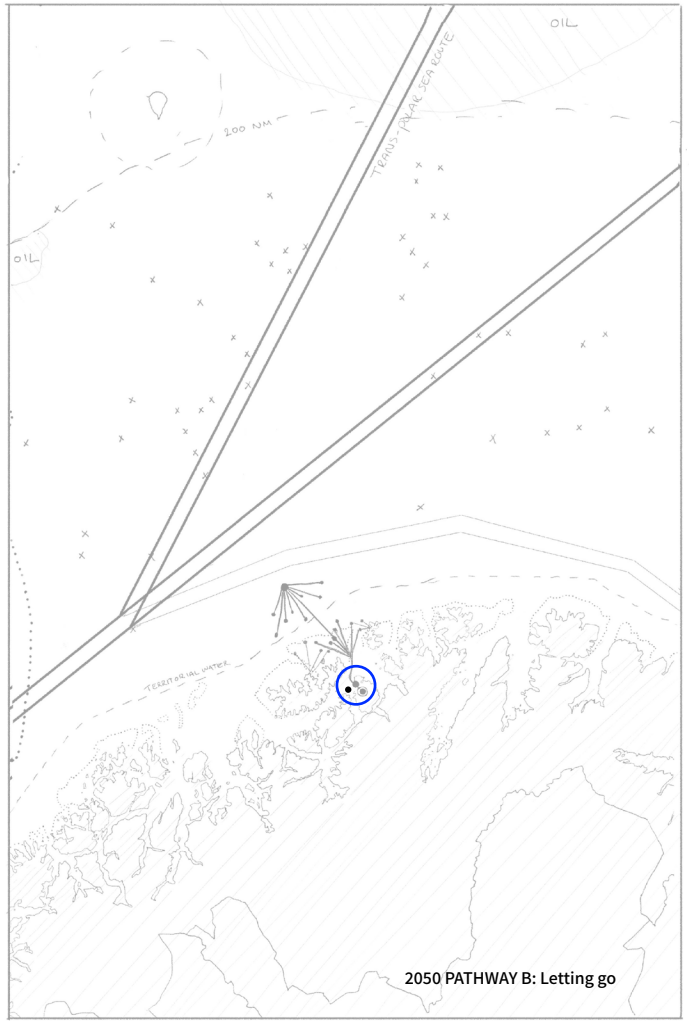


Barents Sea scale 1:7.000.000

THE ROOT OF
THE TRANSITION

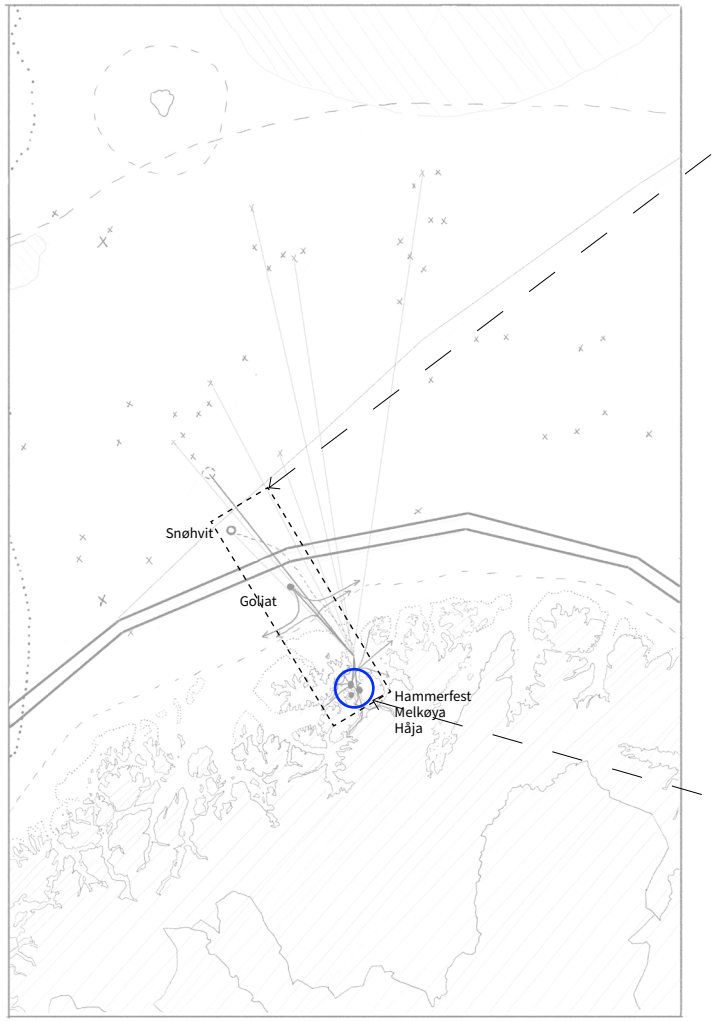




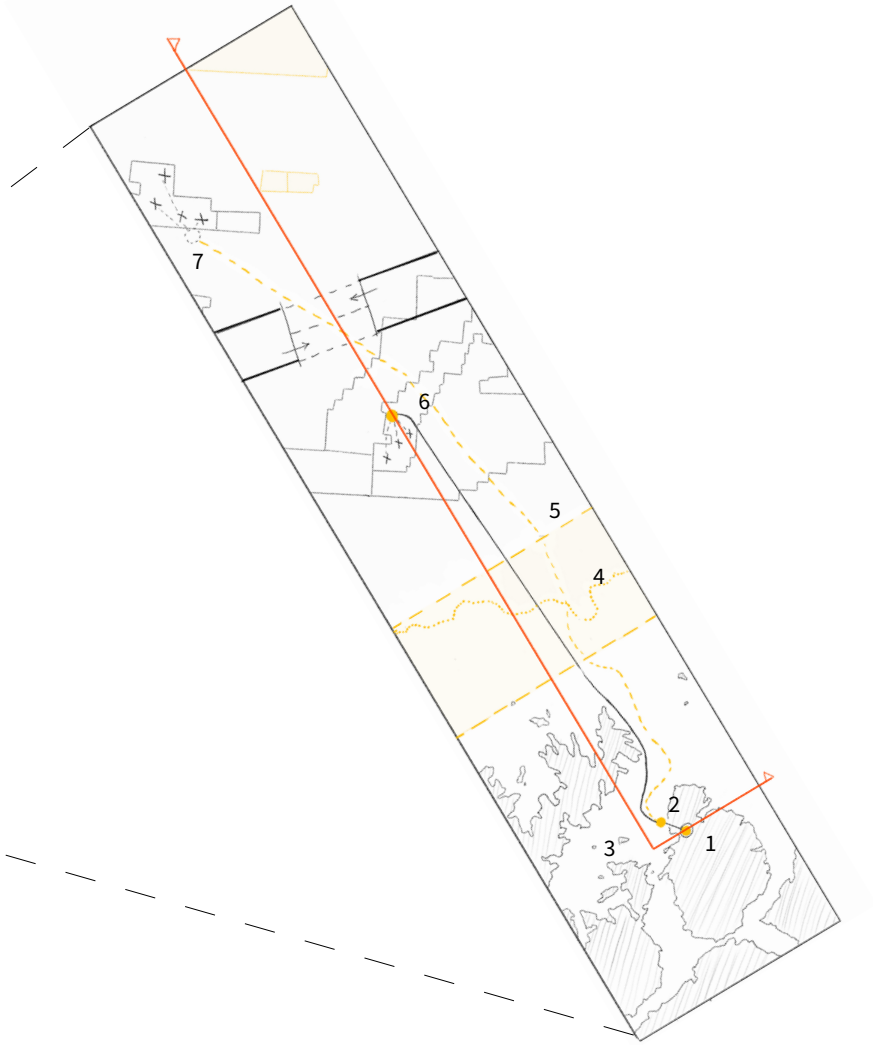


Barents Sea scale 1:7.000.000

SELECTING A NODE IN THE NETWORK AS THE ROOT OF THE TRANSITION



Barents Sea scale 1:7.000.000



Maritory scale 1:500.000

1 / Hammerfest town

2 / Melkøya

3 / Håja

4 / Continental slope

5 / Boundary internal waters

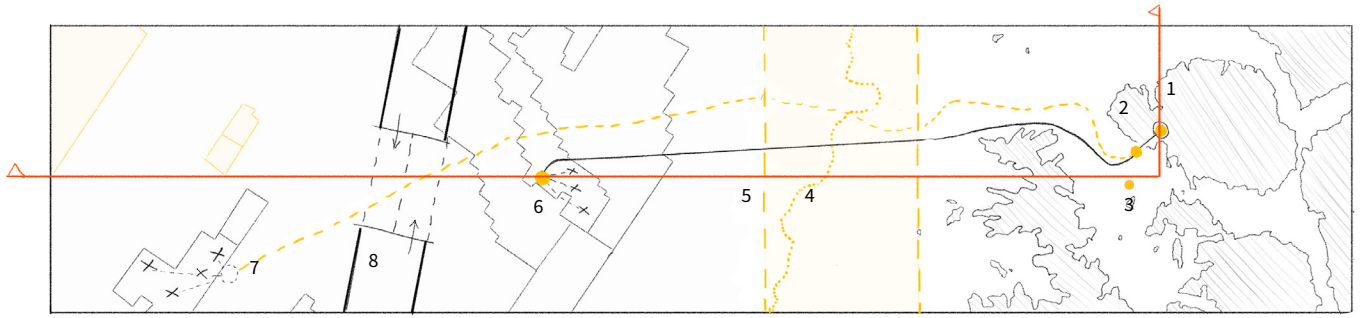
6 / FPSO Goliat

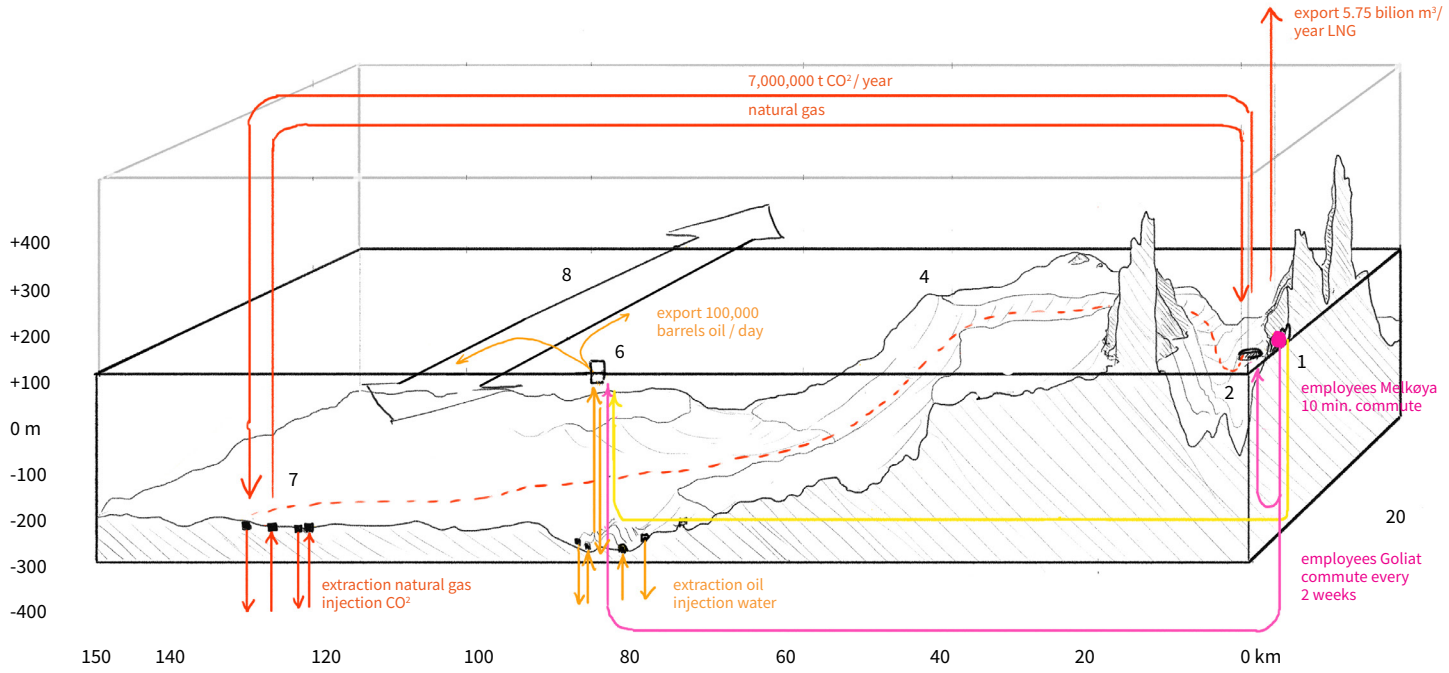
7 / Snøhvit and pipeline

SELECTING A NODE IN THE NETWORK AS THE ROOT OF THE TRANSITION

Nodes:

1 / Hammerfest town
2 / Melkøya
3 / Håja
4 / Continental slope
5 / Boundary internal waters
6 / FPSO Goliat
7 / Pipeline Snøhvit
8 / Licenced petrol activity



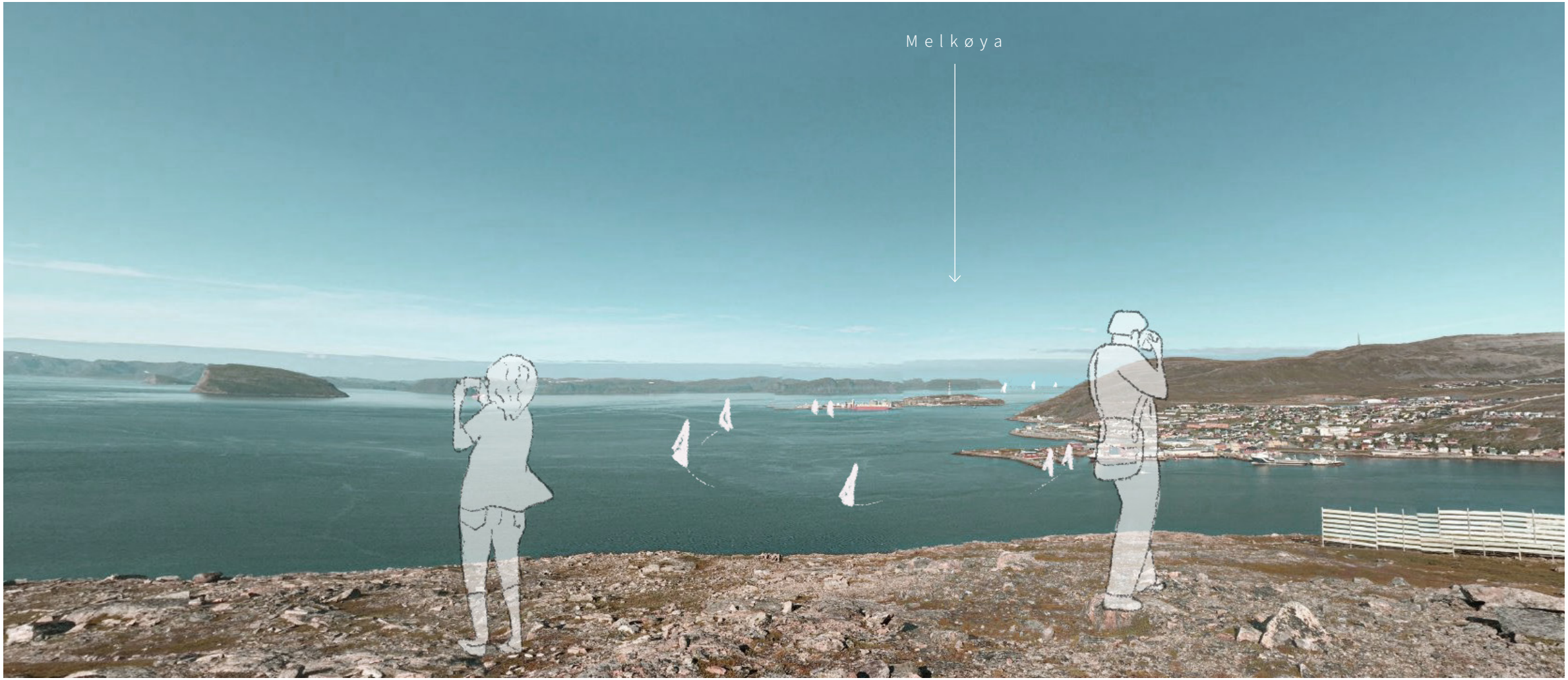


Flows
- Humans
- Gas
- Oil
- Electricity

Maritory scale 1:500.000


PIPELINE
Natural gas to Melkøya
CO² back to Snøhvit
STORAGE
PROCESSING
OFFLOADING
PLATFORM
LNG 145,000 M³ / carrier
30 carriers / year
TUNNEL TO LAND
Private access

SELECTING A NODE IN THE NETWORK

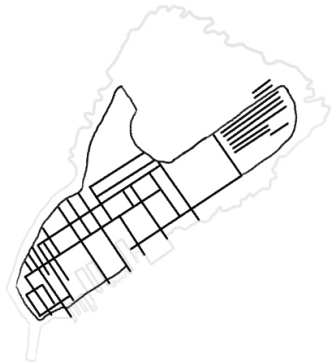


LAYERS

- Provide access and opportunity for public use and the establishment of local businesses pioneering in marine industry

- Bare minimum intervention

- **Repurpose** preferred to deconstruction
- **Removal** preferred to addition
- **Rehabilitation**



Structure

Shoreline

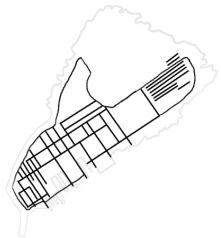
Abandoned industry

Renaturalisation

New industry

Routing and viewpoints

STRUCTURE

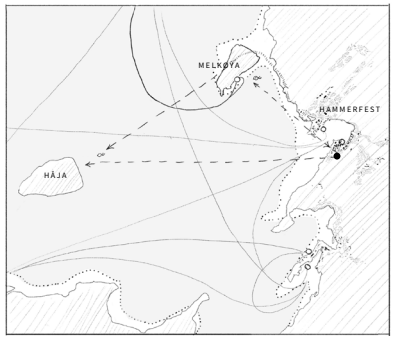


- Start redevelopment before Snøhvit gas field is depleted to enable a smooth evolution once petrol departs Melkøya
- Mitigate impact of petroleum’ s departure while gradually introducing a new economy of life to the community

- Develop along the lines of the current structure so that

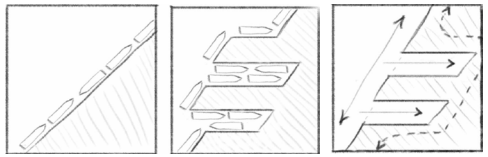
Melkøya scale 1:5.000

SHORELINE



- Increase harbour capacity
- Remove land instead of building new piers attached to the island to maintain original form and relation to Håja

- Position ports where there are no gas facilities that have to be removed, so that processing can remain operative throughout the first phases



Melkøya scale 1:5.000

SHORELINE

- Position ports along the lines of the current structure. Existing paths on the island lead pedestrians unobstructed to the end of the piers

- Maintain offloading platform to reuse as water taxi stop later

Melkøya scale 1:5.000

ABANDONED INDUSTRY

1 / storage tanks

2 / pipelines

3 / processing facility

4 / chimney

- Existing buildings are reused by the pioneering marine industries where possible
- Some striking gas processing facilities remain as a point of recognition and landscape elements
- Limit deconstruction has financial benefits

Melkøya scale 1:5.000

ABANDONED INDUSTRY

1

2

3

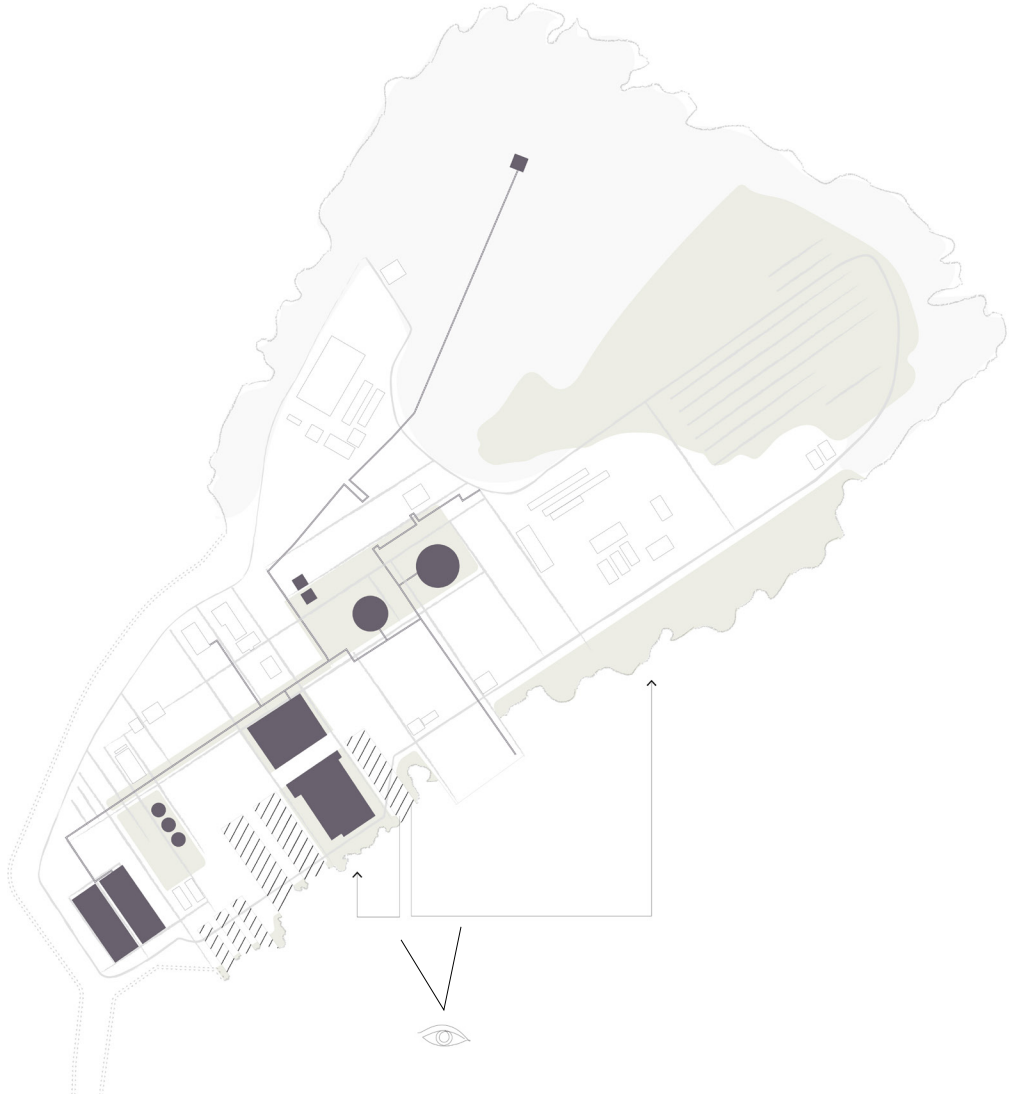
4

0 m 100 300

Melkøya scale 1:5.000

RENATURALISATION

- Focus renaturalisation around abandoned industry structures
- Rehabilitate with phytoremediating plant species
- Severely contaminated plots and vulnerable uses (food processing/ market) will be decontaminated artificially
- The shoreline is renaturalised with dreged rock from site, restoring the natural character of the island.



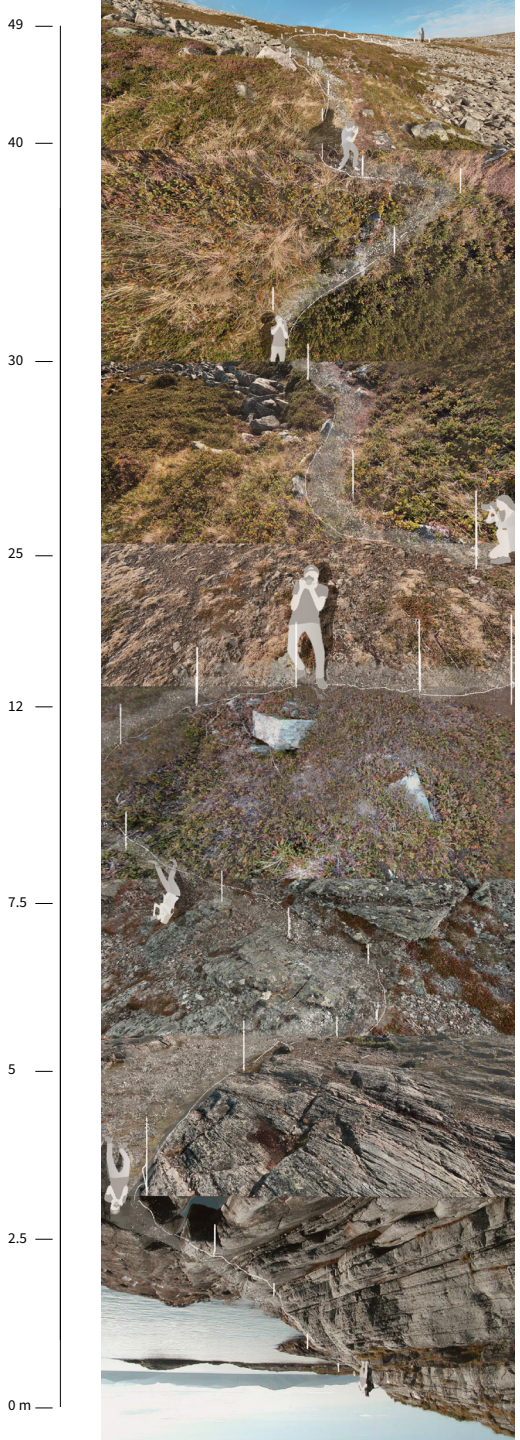
0 m 100 300

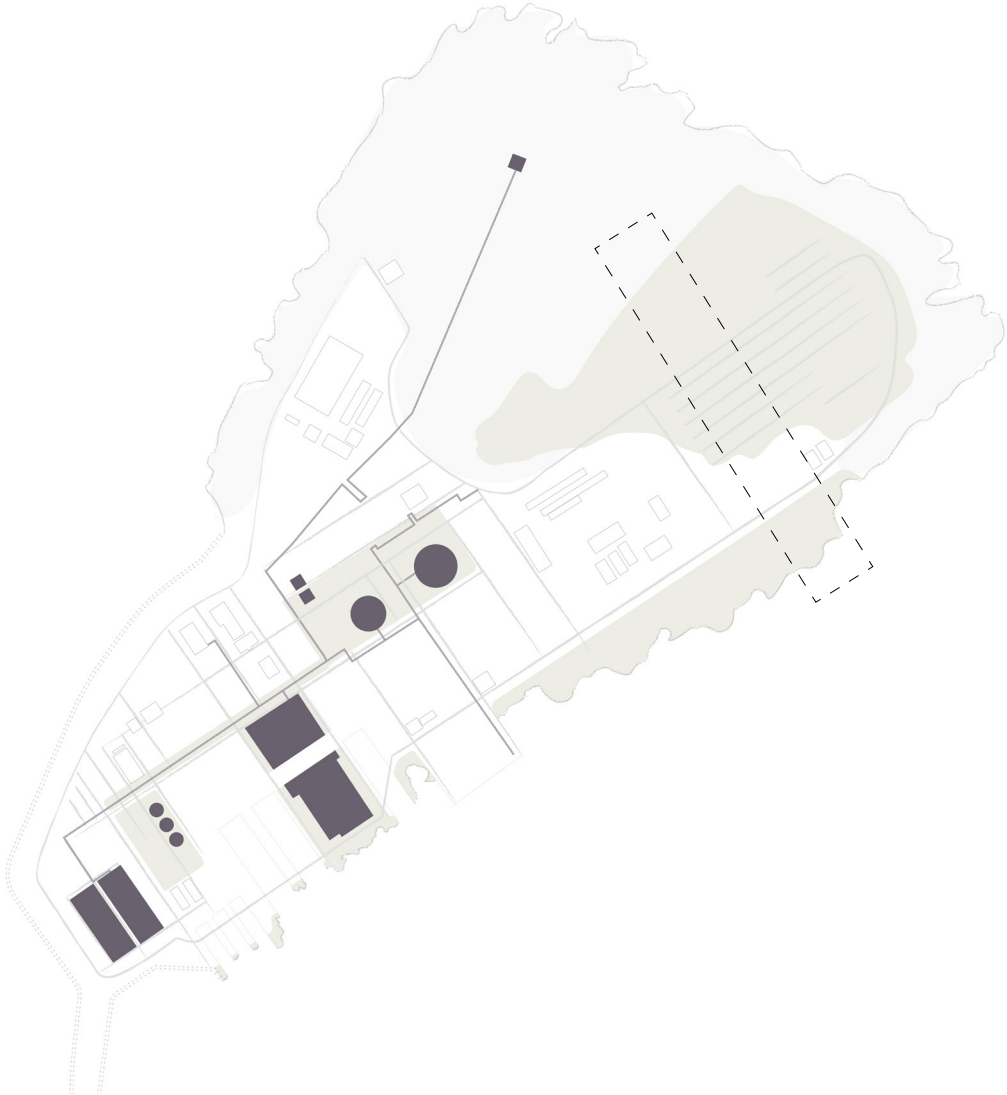
Melkøya scale 1:5.000

RENATURALISATION

- Deconstruct buildings on southside hill
- Foundations remain as landscape elements

- The hillside is renaturalised by reintroducing native plant species, creating a gradient from shore to the top of the hill





0 m 100 300

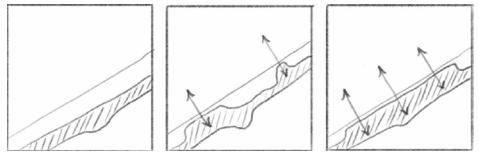
Melkøya scale 1:5.000

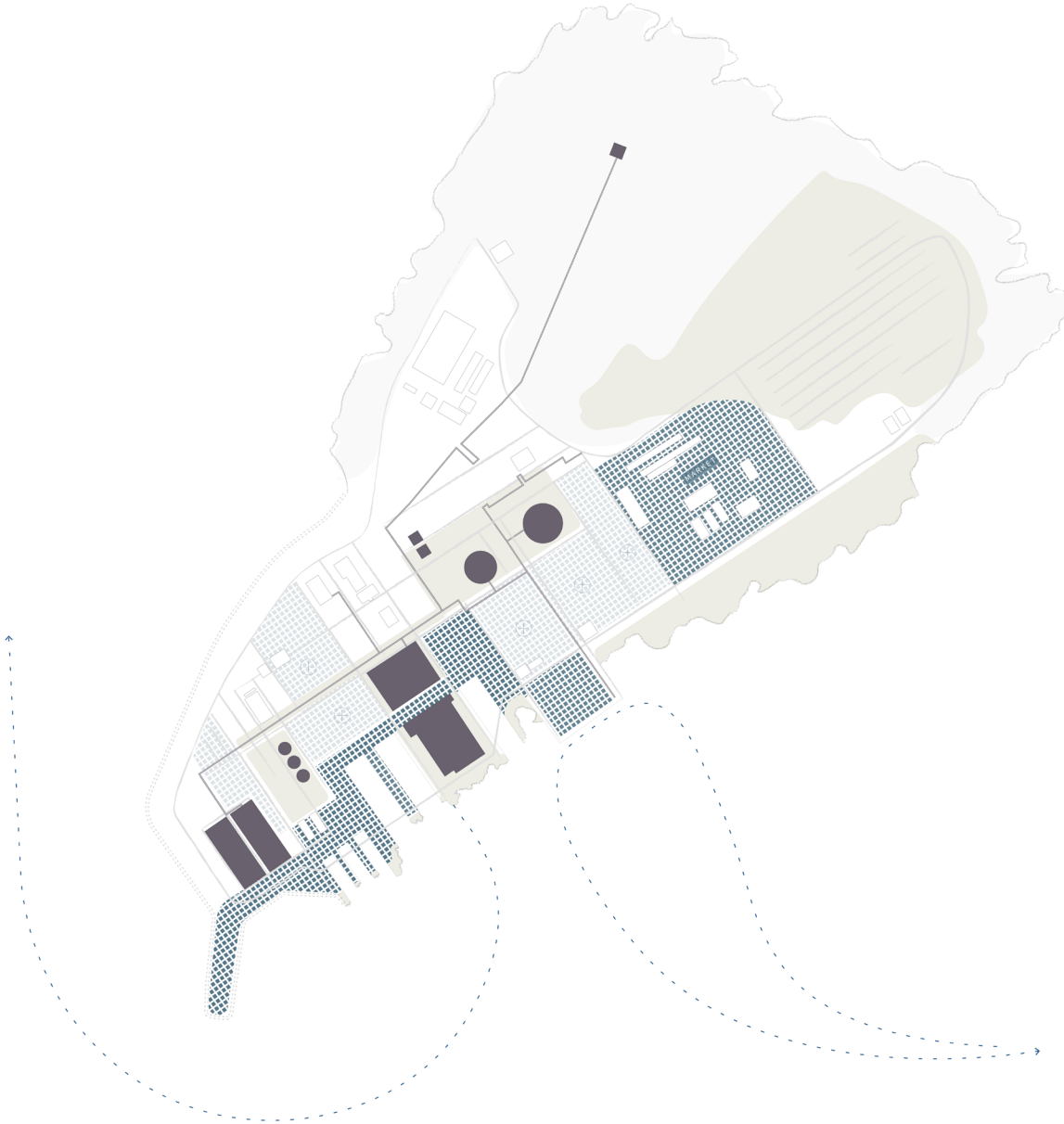
NEW INDUSTRY

- Local pioneers in the marine sector, such as community-led mariculture, habitat restoration and mussel farming

- Produce from the new industry are processed and sold in shops, restaurants or on the market place

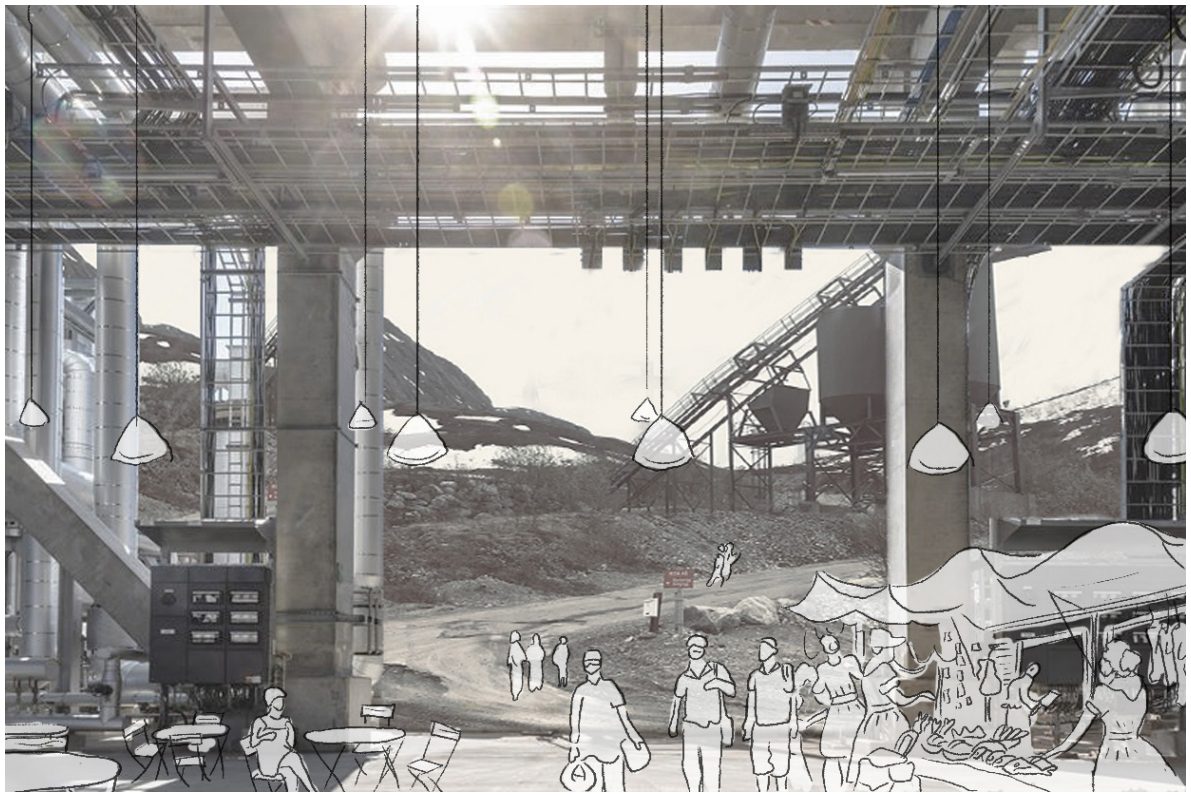
- Public place along the harbour
- Temporary public mooring
- Permanent morring for local business owners





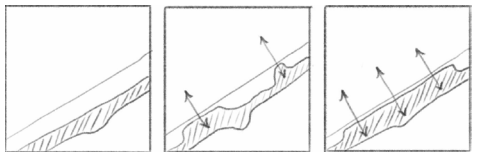
0 m 100 300

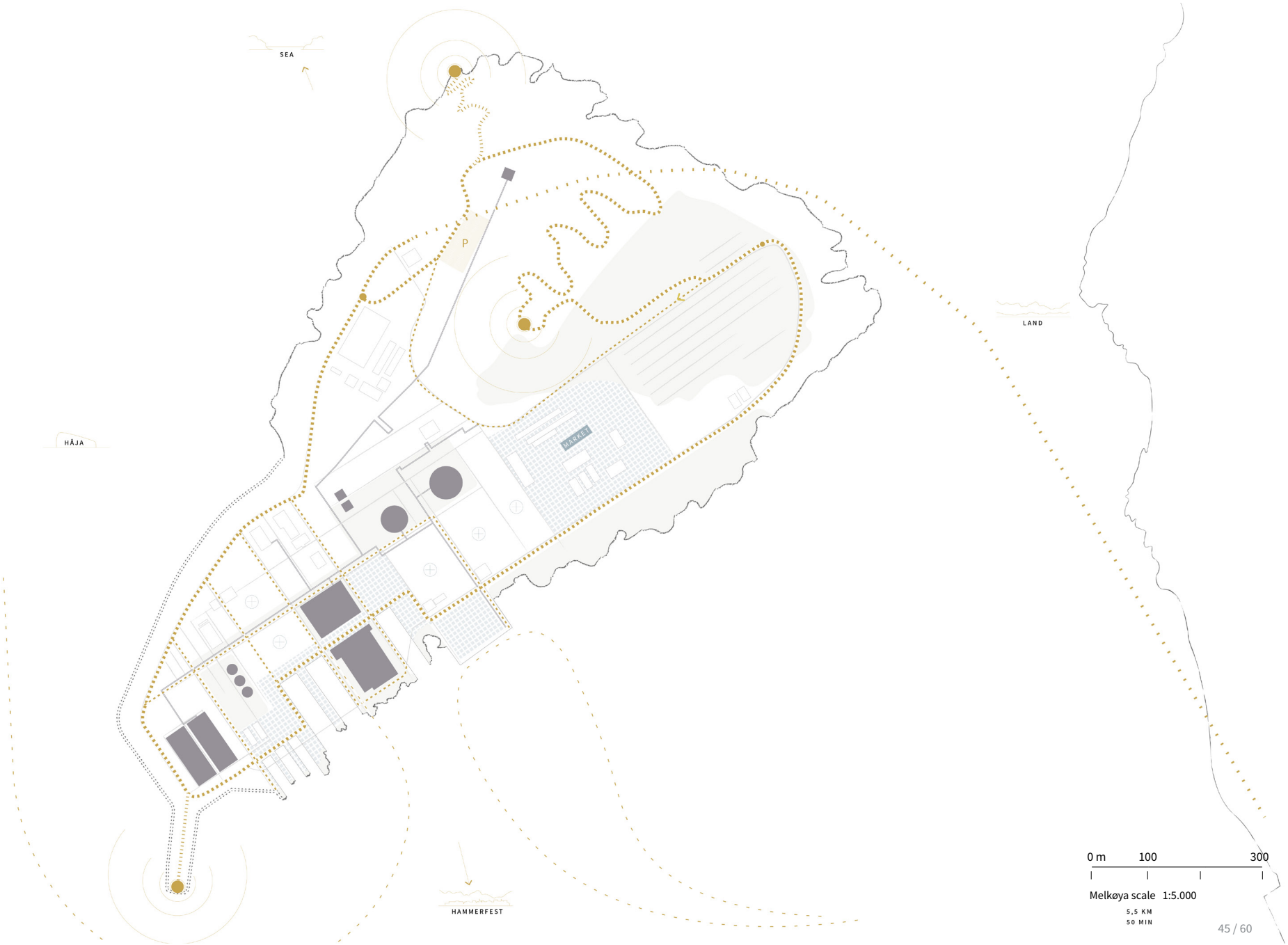
Melkøya scale 1:5.000



ROUTING

- Public access
- Access to the water
- Pathway leads the visitor through the different landscapes of the island



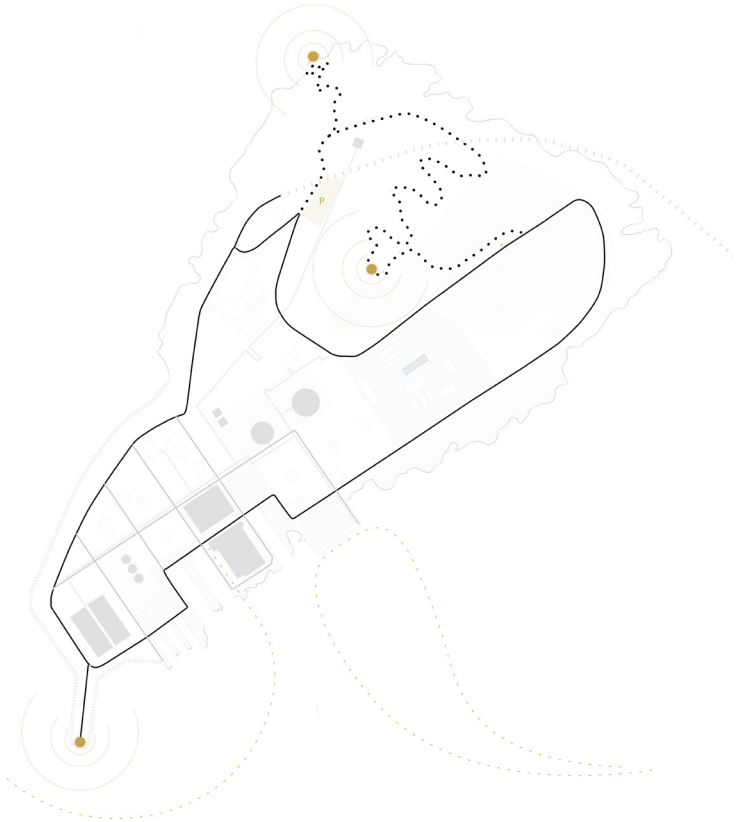


ROUTING

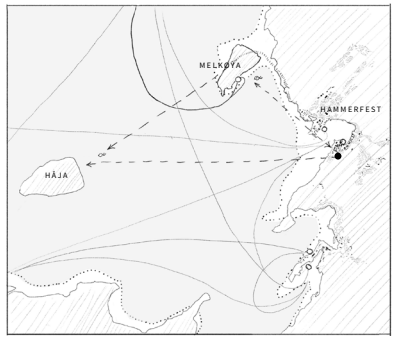
- Simple pathway re-using concrete from deconstruction on site through the industrial part of the island

- Minimal guidelines re-using steel from deconstruction on site through the natural landscape and rock formations on the north side

(reference images from Tudela Culip Restoration project by EMF and Ardevol)



VIEWPOINTS



SEA

5.

4.

2.

P

7.

6.

3.

LAND

HÅJA

8.

9.

10

HAMMERFEST

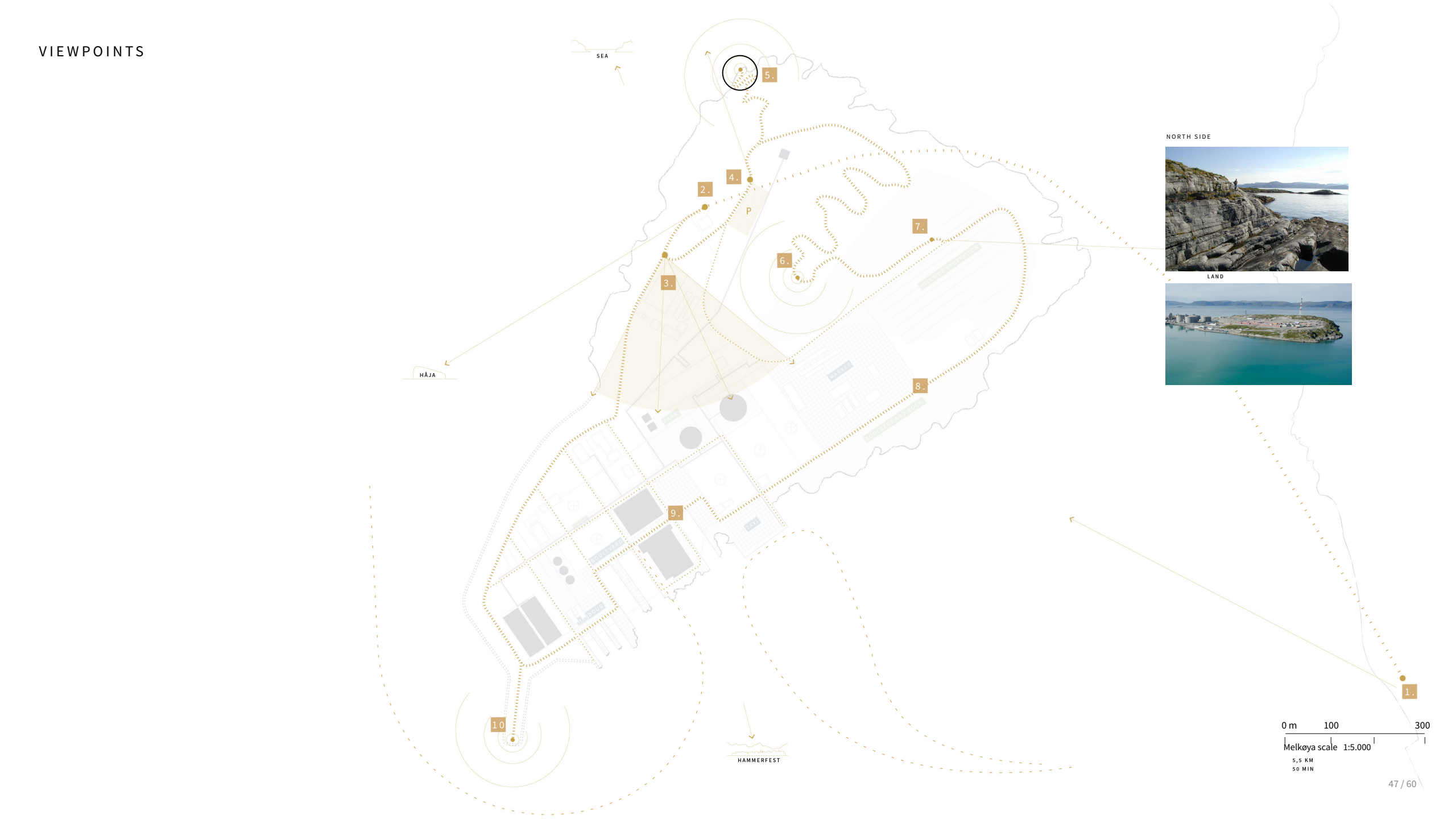
1.

0 m 100 300

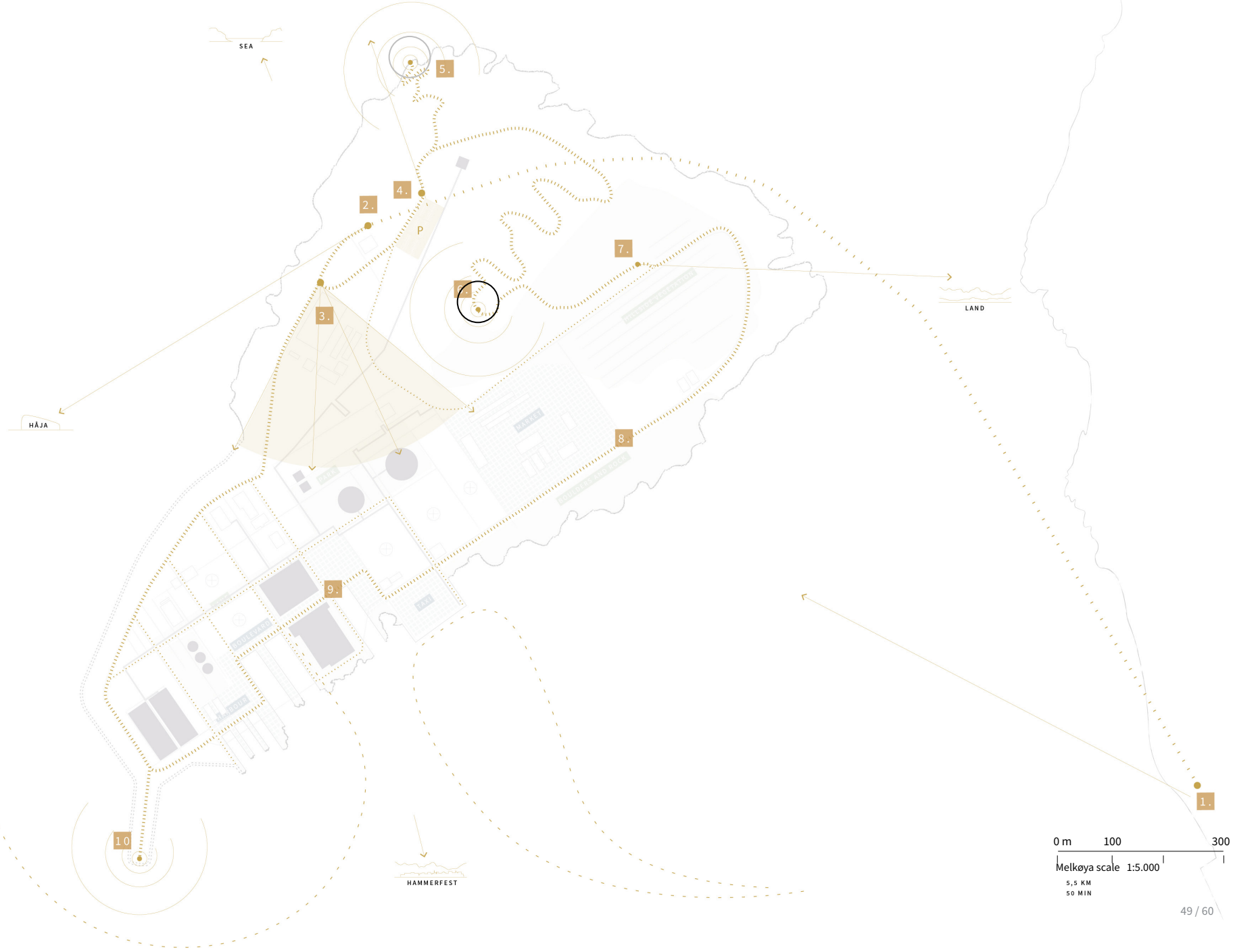
Melkøya scale 1:5.000

5,5 KM
50 MIN

VIEWPOINTS


SEA
5.
4.
2.
P
7.
6.
3.
HÅJA
8.
9.
10
HAMMERFEST
1.
NORTH SIDE
LAND
0 m
100
300
Melkøya scale 1:5.000
5,5 KM
50 MIN

VIEWPOINTS


SEA
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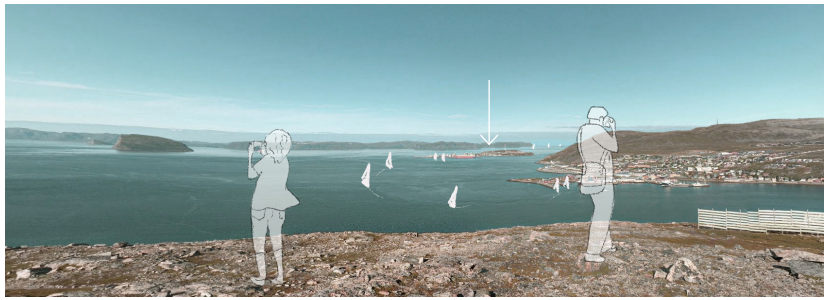
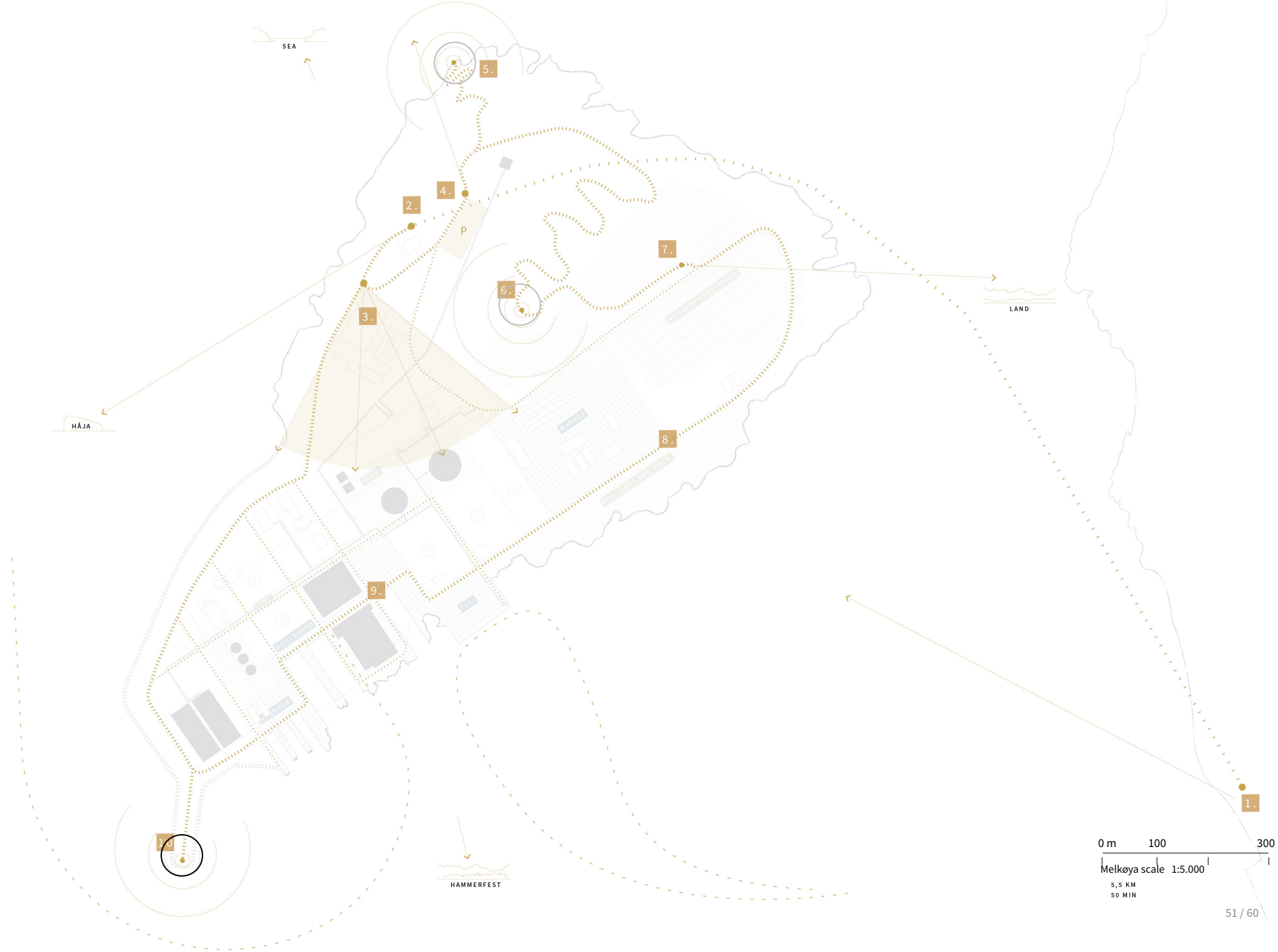
2.
P
7.
6.
3.
LAND
HÅJA
8.
9.
10
HAMMERFEST
1.
0 m
100
300
Melkøya scale 1:5.000
5,5 KM
50 MIN



Looking back

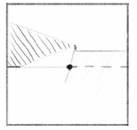
VIEWPOINTS

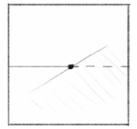
SOUTH SIDE

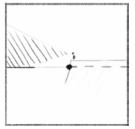


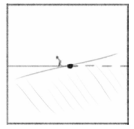
VIEWPOINTS

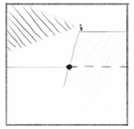
- Variations in slope allowing different types of marine access
- Variations in elevation providing different experiences of the water

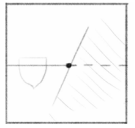


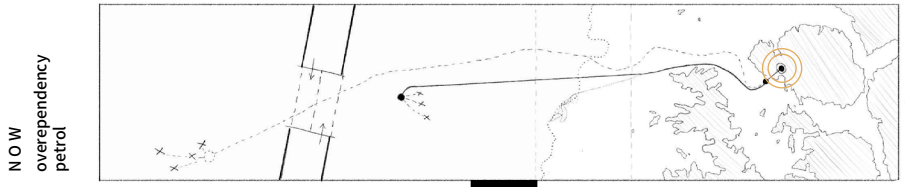




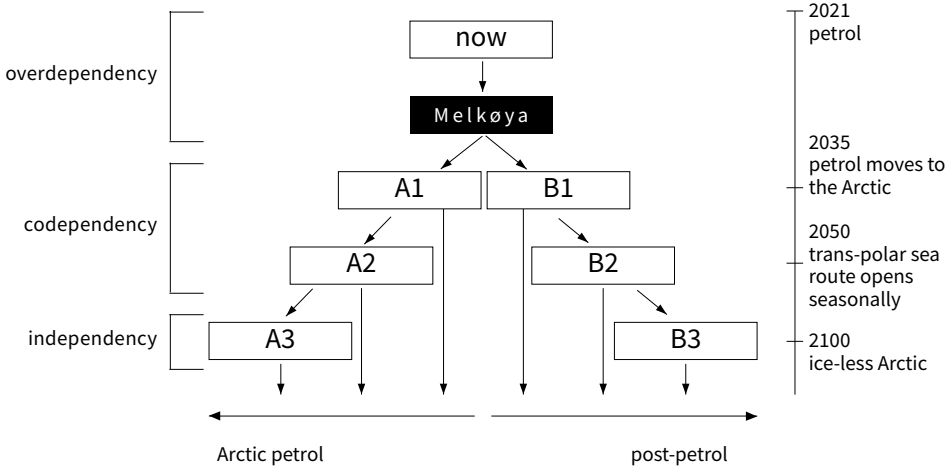


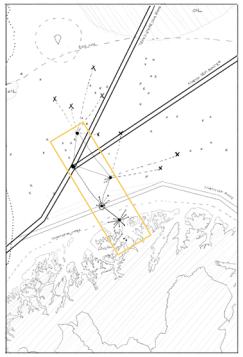


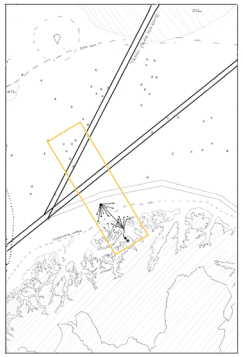




Melkøya





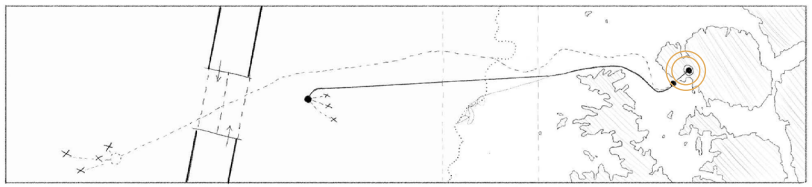


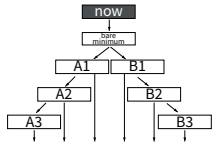
Pathway A: reaching out for petrol

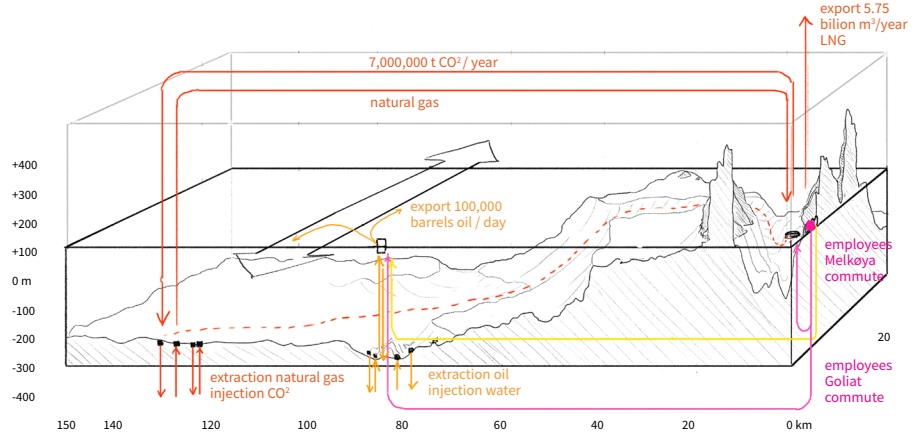
Pathway B: letting go of petrol

PATHWAY A:
REACHING OUT FOR PETROL

NOW
overependency
petrol

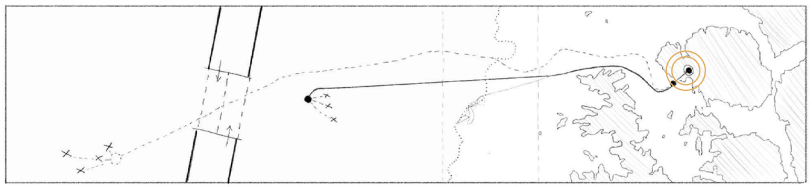


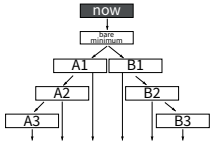


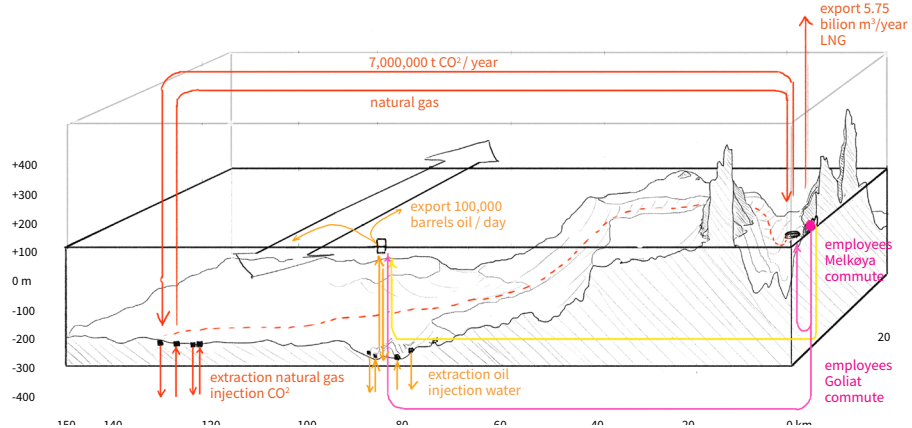


PATHWAY A:
REACHING OUT FOR PETROL

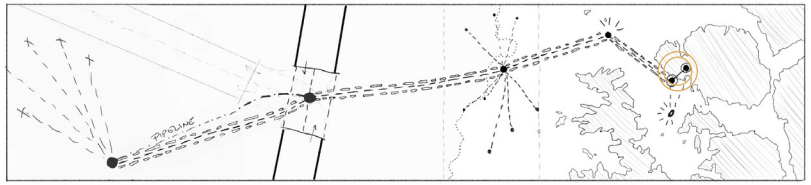
NOW
overependency
petrol

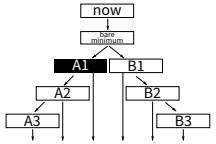


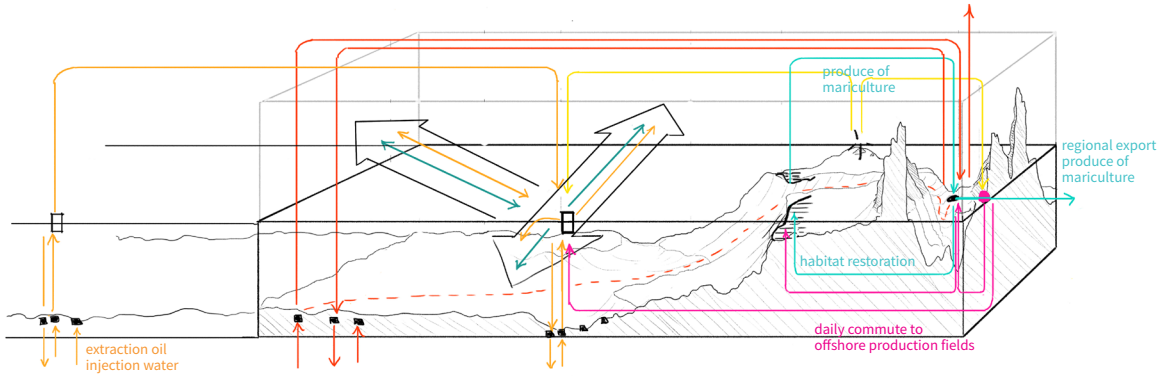




A 1
codependency
petrol

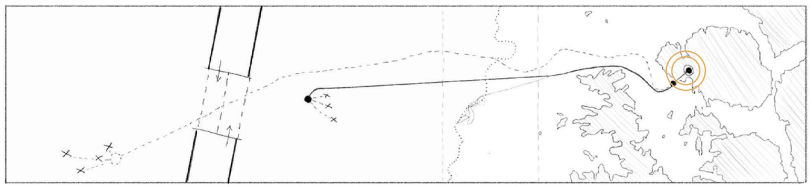


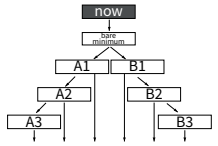


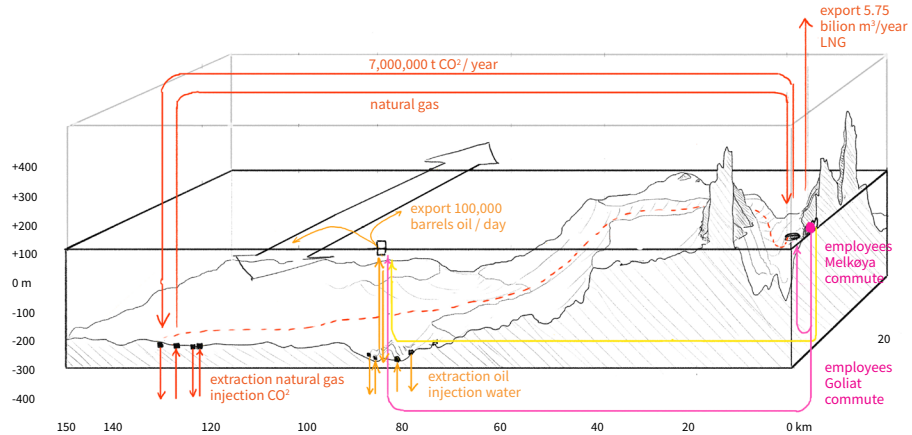


PATHWAY A:
REACHING OUT FOR PETROL

NOW
overependency
petrol







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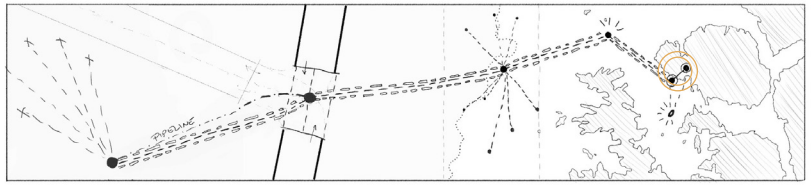
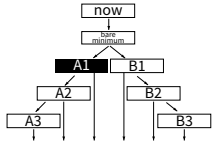
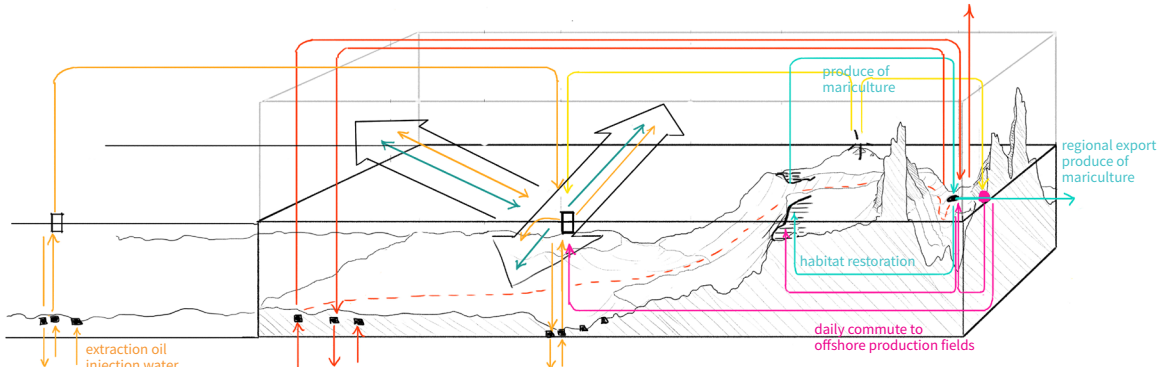
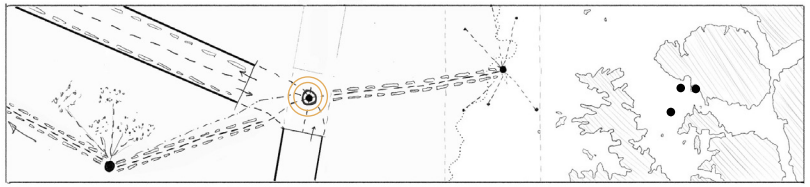
codependency
petrol

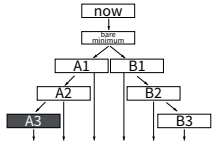


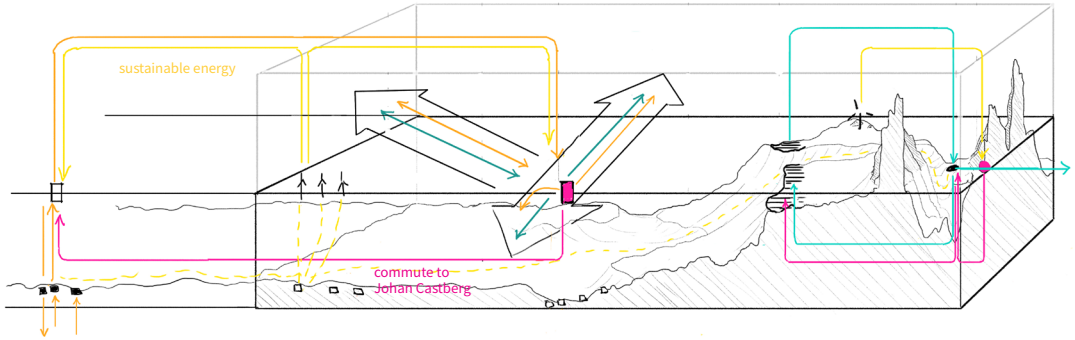




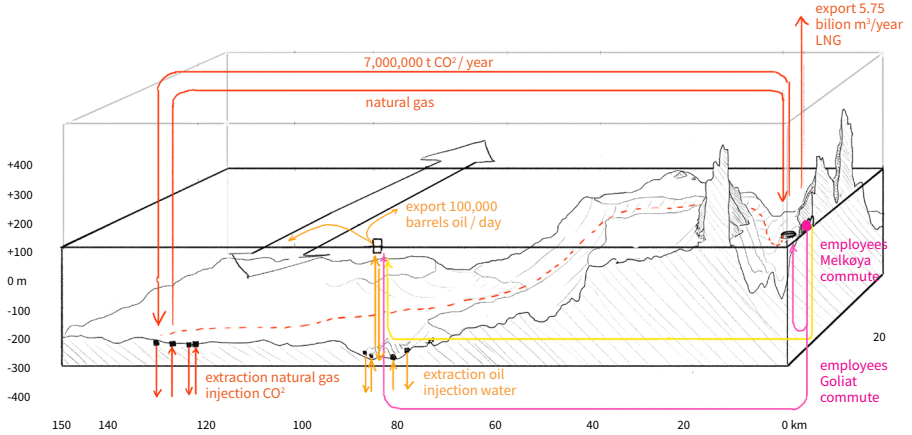
A 3
independency
arctic petrol

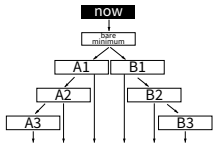


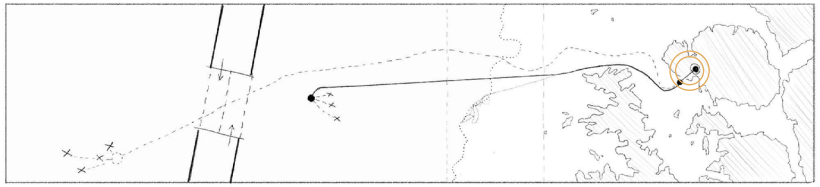




PATHWAY B:
LETTING GO

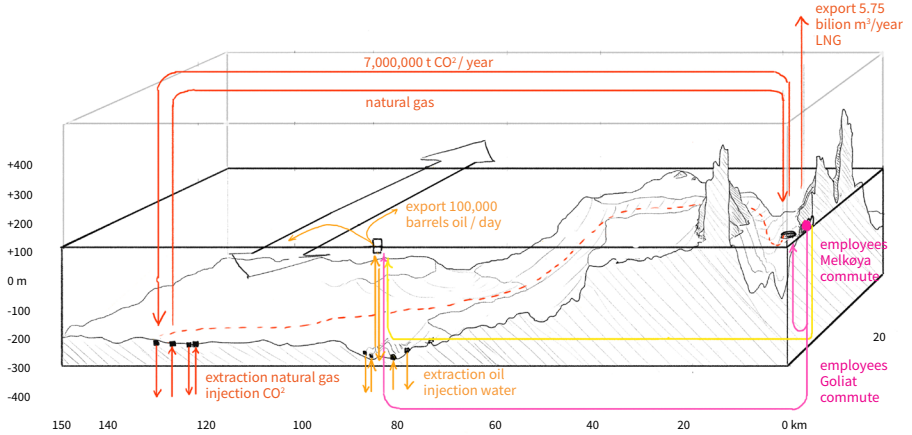


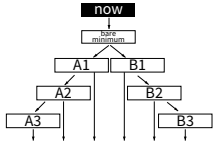


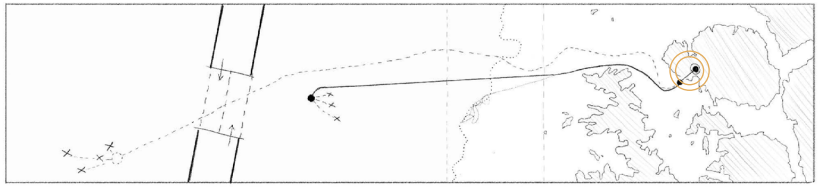


NOW
overependency
petrol

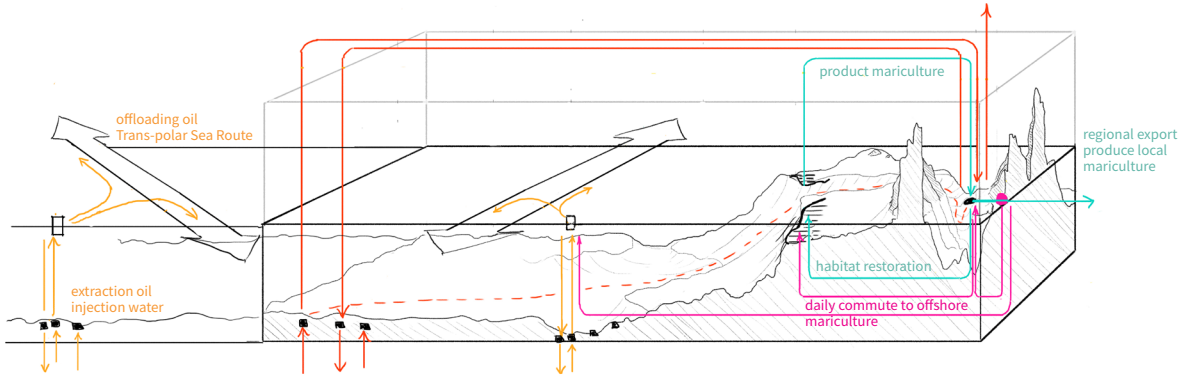
PATHWAY B:
LETTING GO

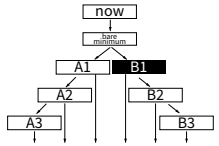


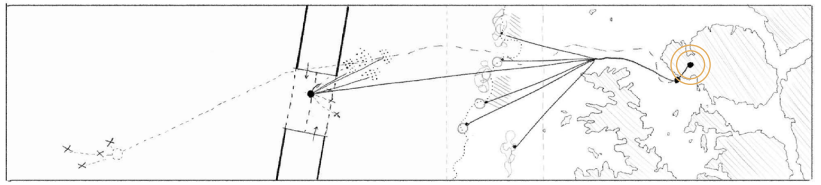




N O W
overependency
petrol

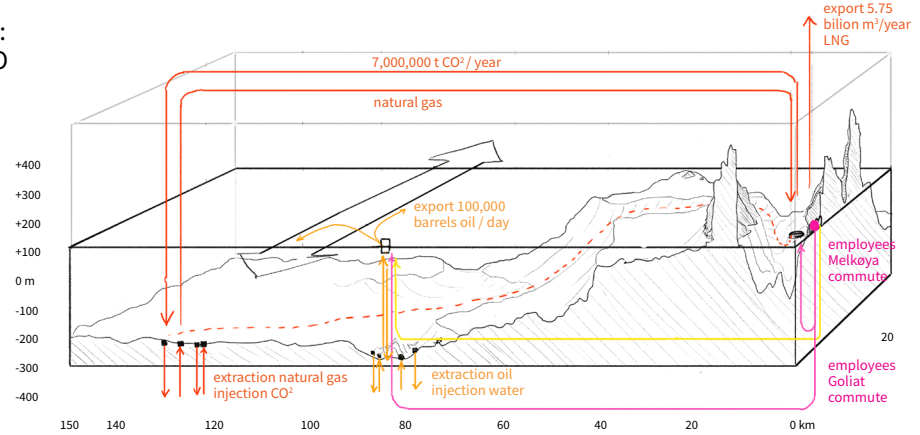


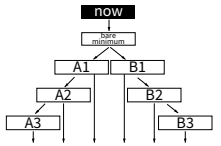


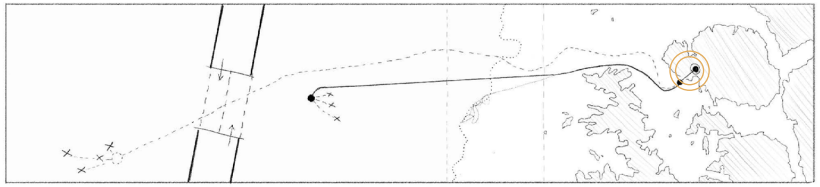


B 1
codependency
petrol

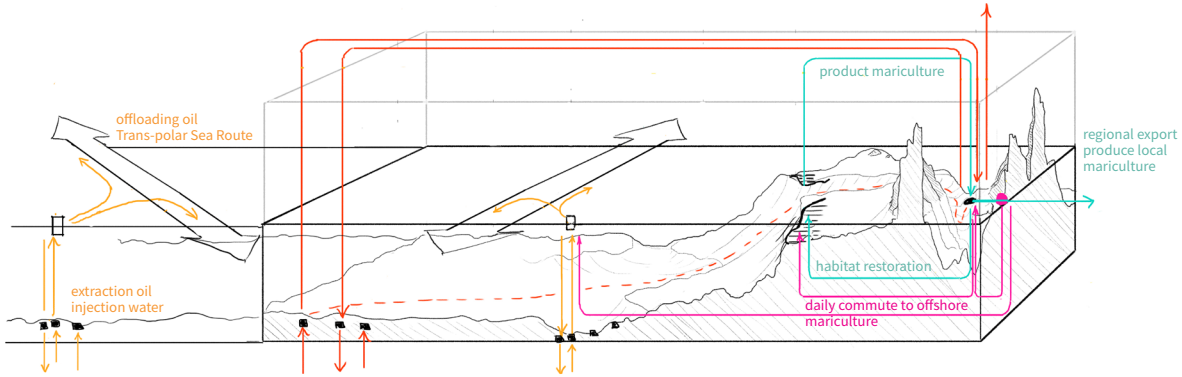
PATHWAY B:
LETTING GO

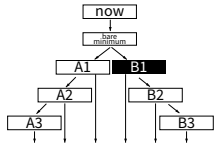


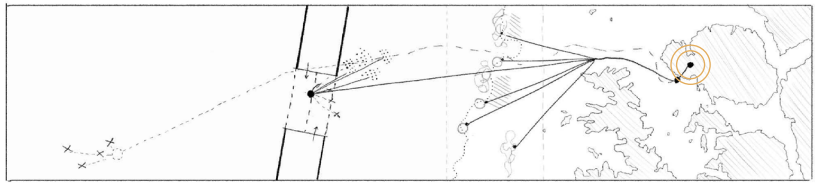




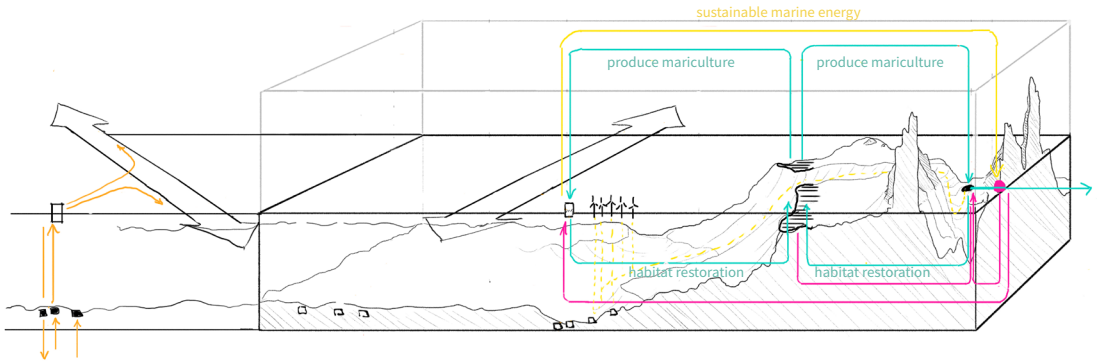
N O W
overependency
petrol

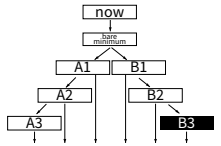


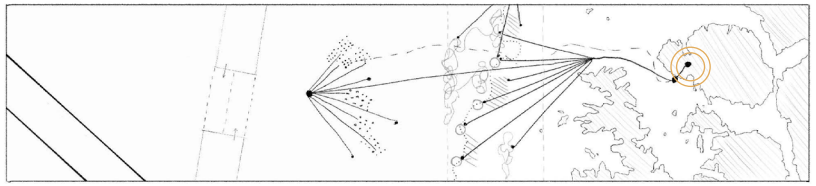




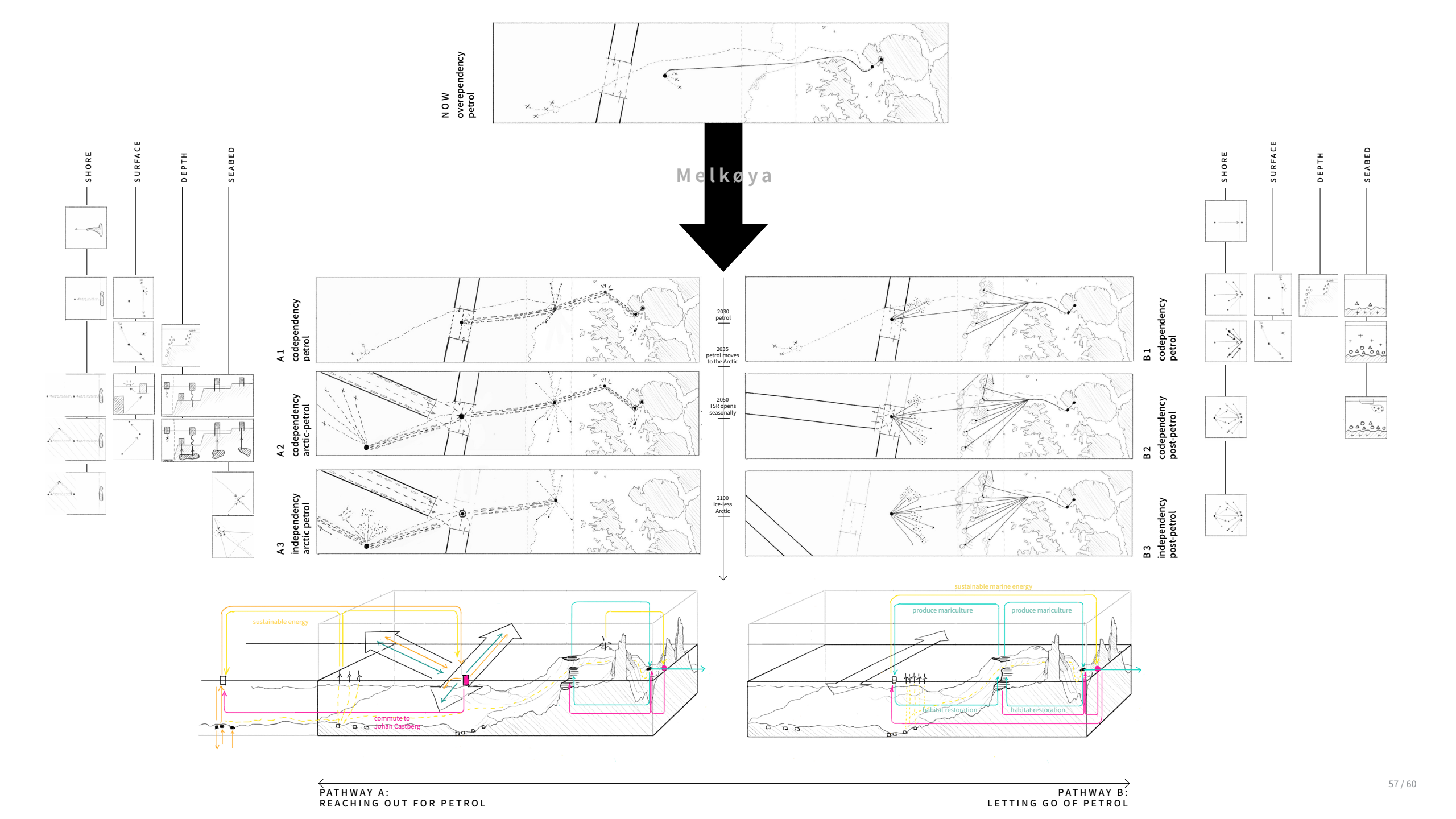
B 1
codependency
petrol



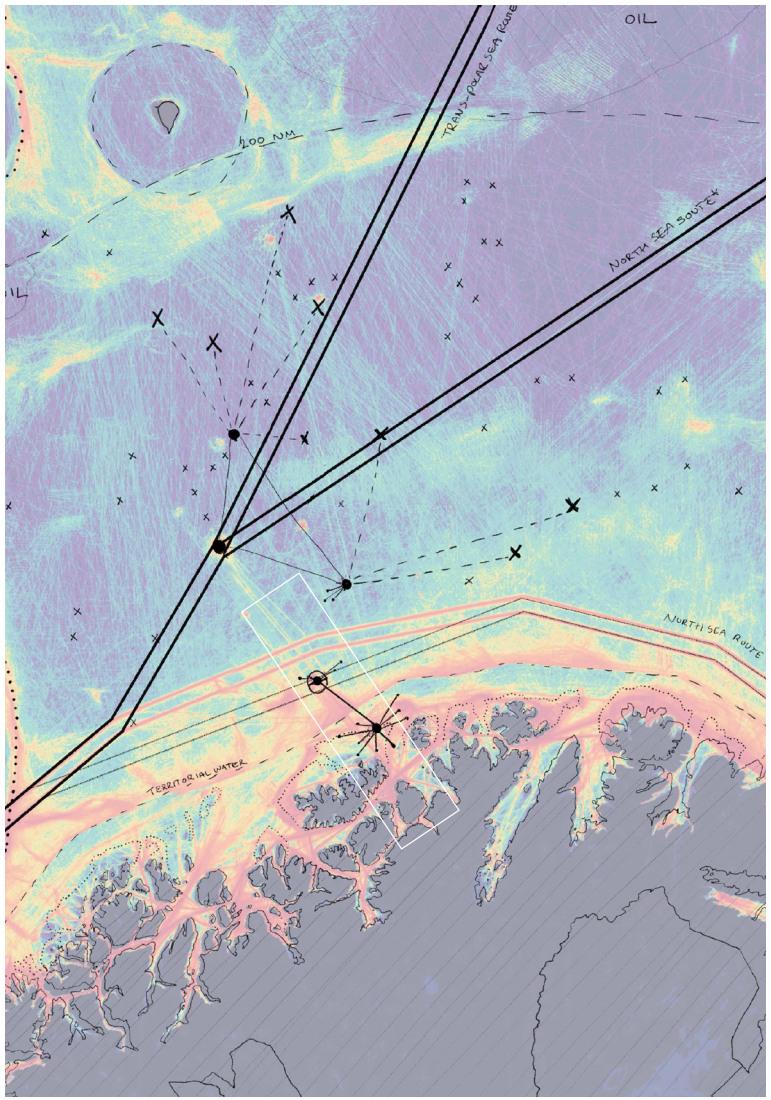


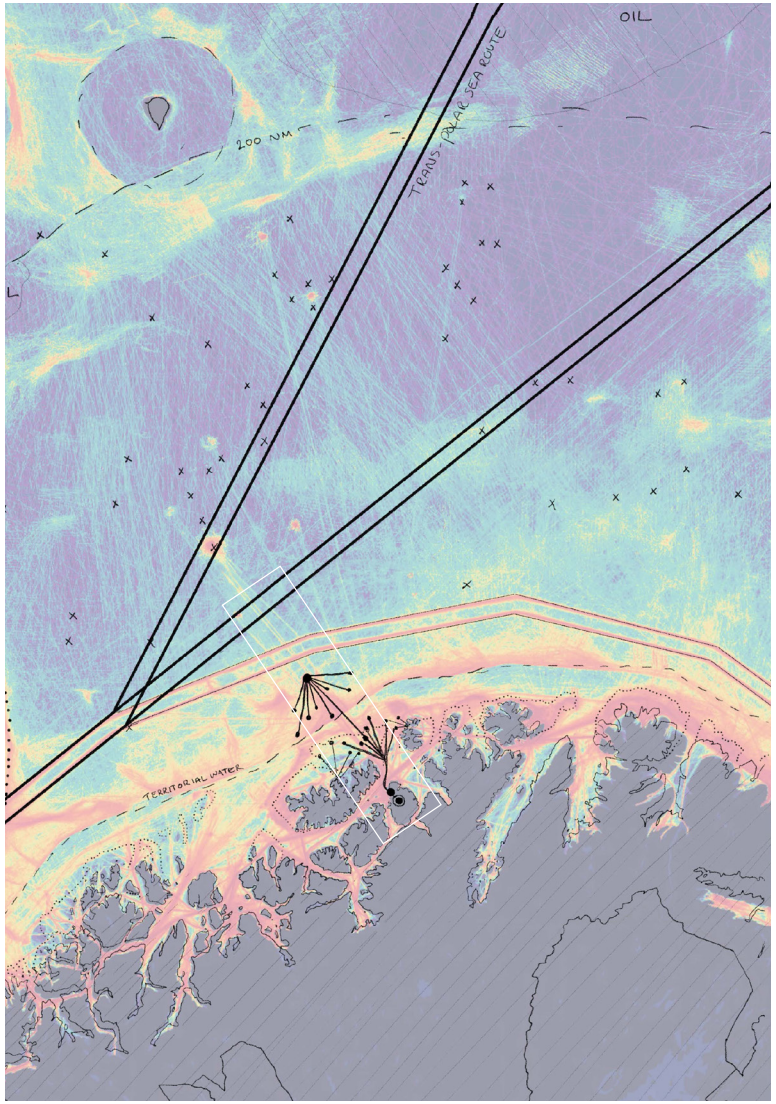


B 3
independency
post-petrol


NOW
overependency
petrol
Melkøya
SHORE
SURFACE
DEPTH
SEABED
A 1
codependency
petrol
A 2
codependency
arctic-petrol
A 3
independency
arctic petrol
2030
petrol
2035
petrol moves
to the Arctic
2050
TSR opens
seasonally
2100
ice-less
Arctic
B 1
codependency
petrol
B 2
codependency
post-petrol
B 3
independency
post-petrol
sustainable energy
commute to
Johan Castberg
sustainable marine energy
produce mariculture
produce mariculture
habitat restoration
habitat restoration
PATHWAY A:
REACHING OUT FOR PETROL
PATHWAY B:
LETTING GO OF PETROL

IMPACT ON
PATTERNS OF MOVEMENT





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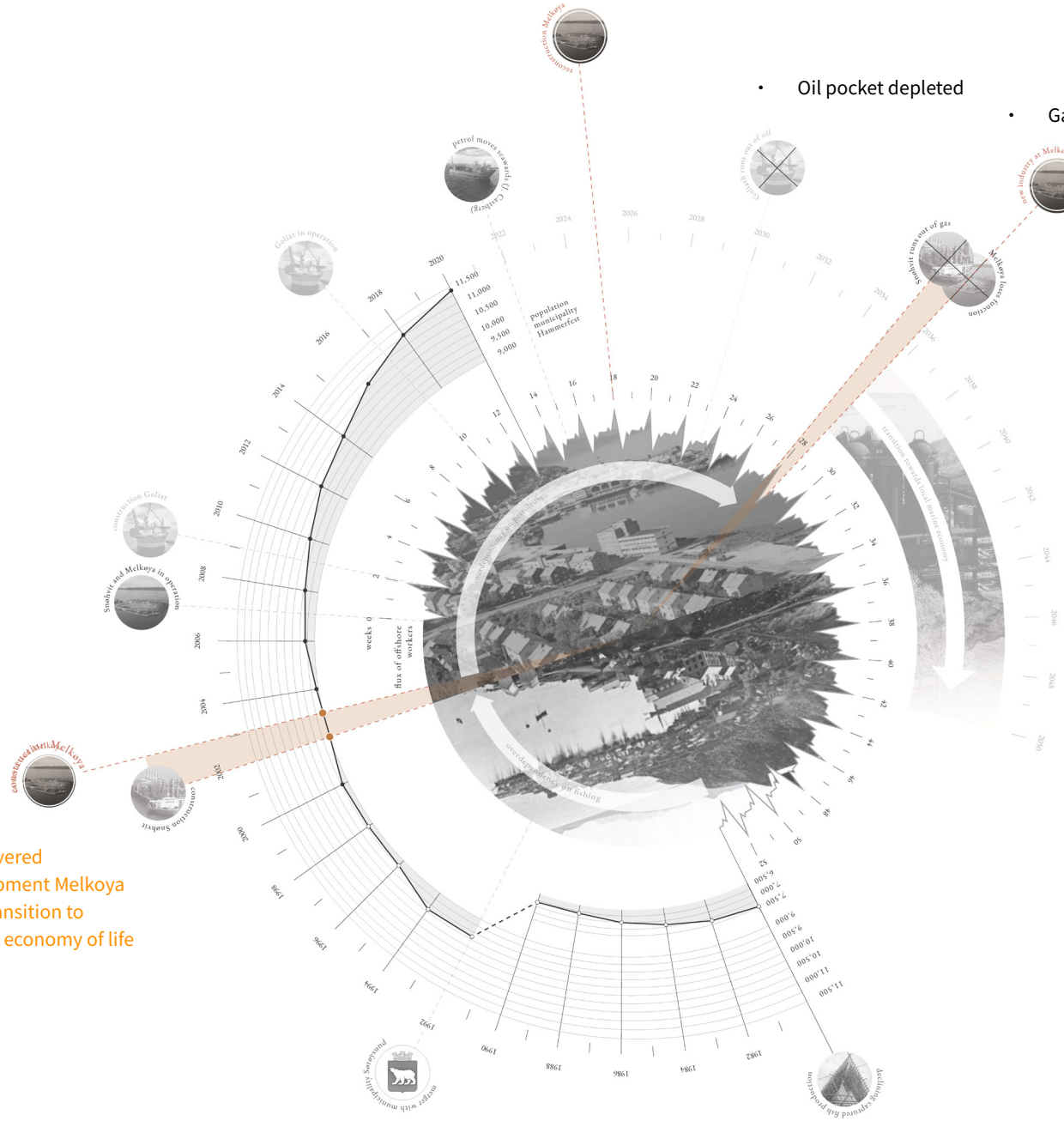
PATHWAY A:
REACHING OUT FOR PETROL

PATHWAY B:
LETTING GO OF PETROL

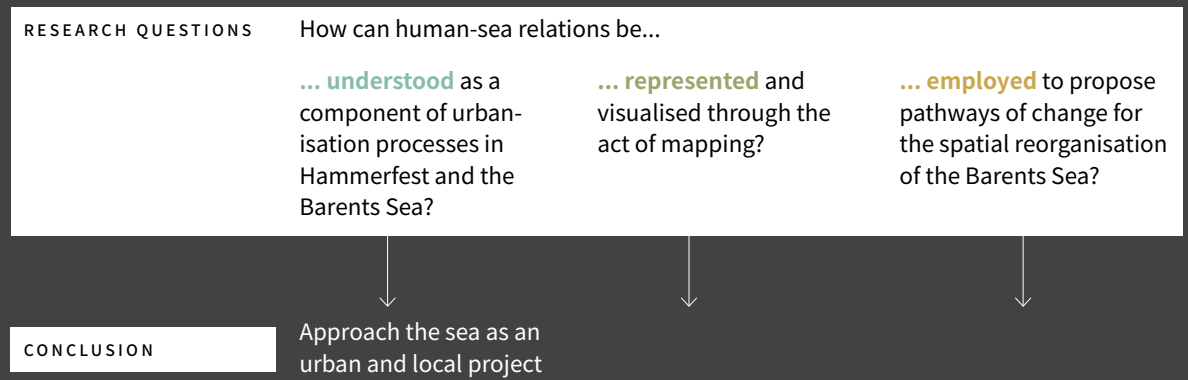
USING COLLECTIVE MEMORY TO INDUCE ACCEPTANCE

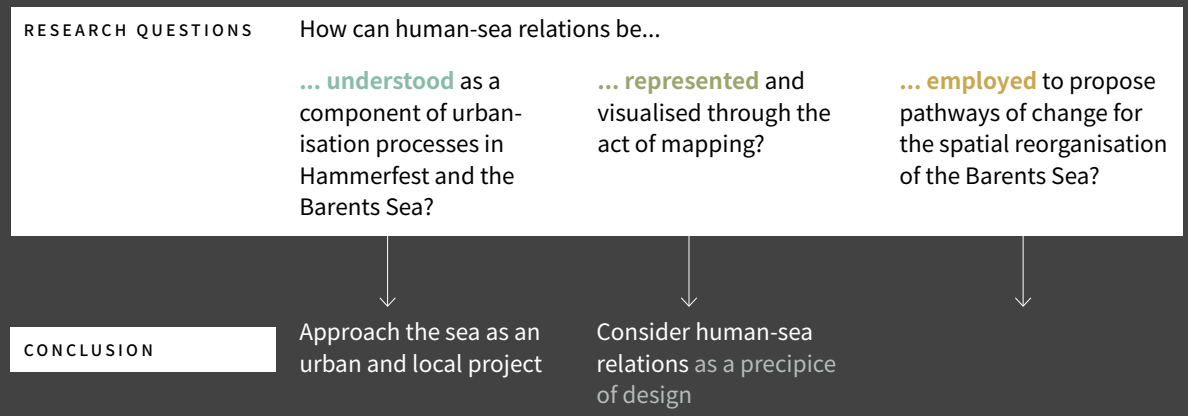
- Arrival of petrol is remembered as a blessing that revived the town in 2002, bringing jobs and prospects for a future
- Turning point in local history visibly manifested in the reconstruction of Melkøya as gas processing plant
- By selecting Melkøya to redevelop as the root of the new transition, the project induces acceptance
- The island again marks a turning point in time



- Oil pocket depleted
- Gas pocket depleted
- Redevelopment Melkøya triggers the transition to post-petrol economy of life

- Gas discovered
- Redevelopment Melkoya triggers transition to petroleum economy of life


RESEARCH QUESTIONS
How can human-sea relations be...
... understood as a component of urban-isation processes in Hammerfest and the Barents Sea?
... represented and visualised through the act of mapping?
... employed to propose pathways of change for the spatial reorganisation of the Barents Sea?
CONCLUSION
Approach the sea as an urban and local project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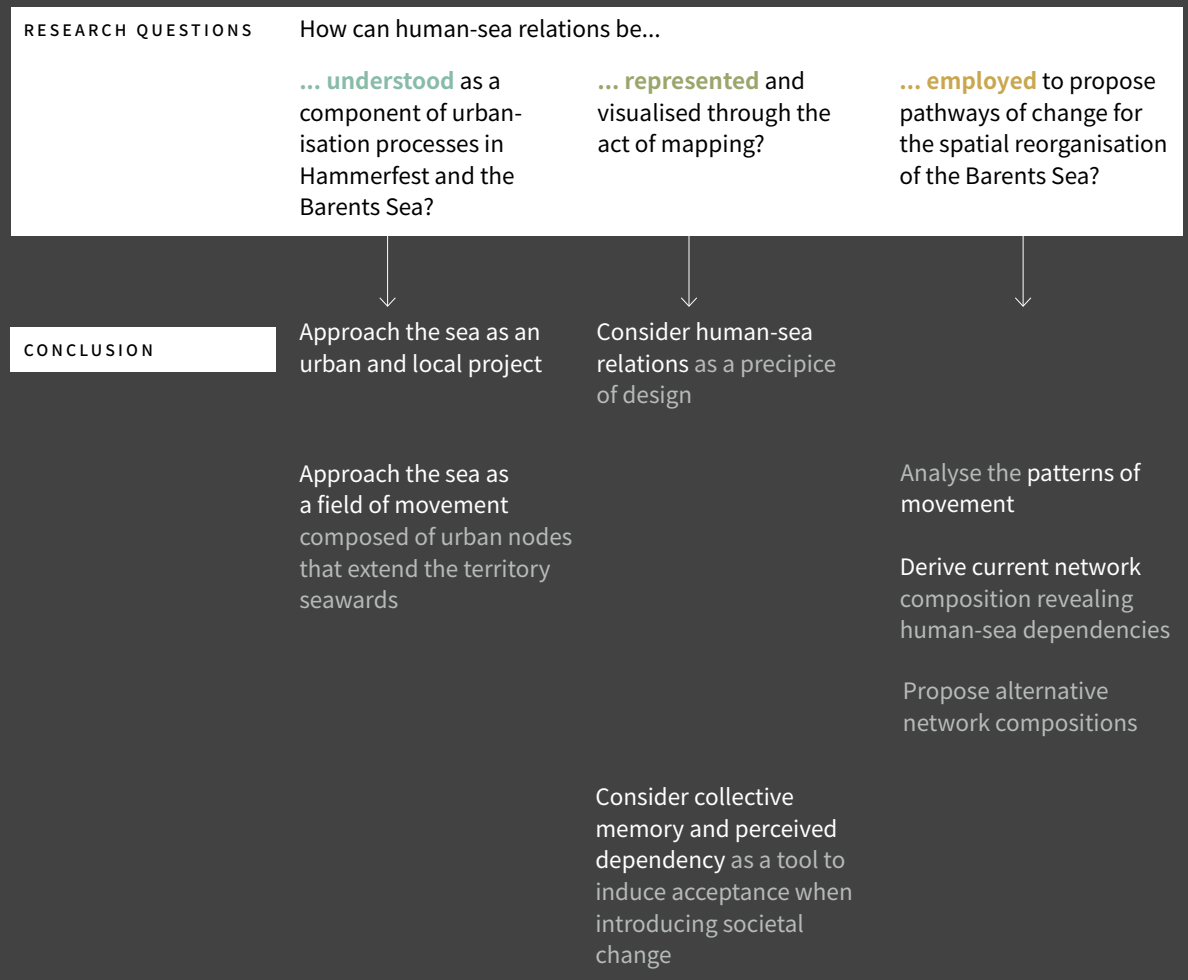
CONCLUSION
Approach the sea as an urban and local project
Consider human-sea relations as a precipice of design

RESEARCH QUESTIONS	How can human-sea relations be...		
	... understood as a component of urban-isation processes in Hammerfest and the Barents Sea?	**... represented** and visualised through the act of mapping?	**... employed** to propose pathways of change for the spatial reorganisation of the Barents Sea?

CONCLUSION		
	Approach the sea as an urban and local project	Consider human-sea relations as a precipice of design
	Approach the sea as a field of movement composed of urban nodes that extend the territory seawards	

RESEARCH QUESTIONS	How can human-sea relations be...		
	... understood as a component of urban-isation processes in Hammerfest and the Barents Sea?	**... represented** and visualised through the act of mapping?	**... employed** to propose pathways of change for the spatial reorganisation of the Barents Sea?
CONCLUSION	Approach the sea as an urban and local project Approach the sea as a field of movement composed of urban nodes that extend the territory seawards	Consider human-sea relations as a precipice of design	Analyse the patterns of movement Derive current network composition revealing human-sea dependencies Propose alternative network compositions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... represented and visualised through the act of mapping?
... employed to propose pathways of change for the spatial reorganisation of the Barents Sea?
CONCLUSION
Approach the sea as an urban and local project
Approach the sea as a field of movement composed of urban nodes that extend the territory seawards
Consider human-sea relations as a precipice of design
Consider collective memory and perceived dependency as a tool to induce acceptance when introducing societal change
Analyse the patterns of movement
Derive current network composition revealing human-sea dependencies
Propose alternative network compositions

RESEARCH QUESTIONS	How can human-sea relations be...		
	... understood as a component of urban-isation processes in Hammerfest and the Barents Sea?	**... represented** and visualised through the act of mapping?	**... employed** to propose pathways of change for the spatial reorganisation of the Barents Sea?

CONCLUSION			
	Approach the sea as an urban and local project	Consider human-sea relations as a precipice of design	
	Approach the sea as a field of movement composed of urban nodes that extend the territory seawards		Analyse the patterns of movement Derive current network composition revealing human-sea dependencies Propose alternative network compositions
		Consider collective memory and perceived dependency as a tool to induce acceptance when introducing societal change	Proactively transform a node of the existing network as the root and trigger of the transition

thank you

Societal relevance of the thesis

- The aim of this thesis is to understand the human-sea relations between Hammerfest and the Barents Sea and questions how **offshore urbanism can accommodate for local demands allowing them to compete (and comply) with global or economic demands.**
- In this light, the thesis approaches **the ocean as a local project**.
- It proposes different pathways of change towards a future where the Hammerfest' s economy of life does not solely depend on the global industry of petroleum. In doing so, the **community becomes more resilient to changes at sea and the petrol industry**.

Scientific relevance of the thesis

- As an interplay between art and science, facts and interpretations, urbanism is able to understand human-sea relations and employ this understanding in a design, where the current (political) practice of Marine Spatial Planning (MSP) cannot. **The thesis proposes 'offshore urbanism' to bridge the socio-cultural gap in MSP.**

Professional relevance of the thesis

- The thesis expands the notion of 'the built environment' into the Barents Sea and approaches the **ocean as an urban project**.
- Offshore urbanism provides a unique **opportunity to further develop our discipline.**
- Alongside scientific research, the role of education systems in socially sustainable seas is equally important. Universities can contribute by including the study of marine space in the design curriculum and engaging both students and academics in the offshore urbanism discourse.

4 / RESEARCH FRAMEWORK

PERSONAL MOTIVATION
To understand a complex system and from this understanding, enable change

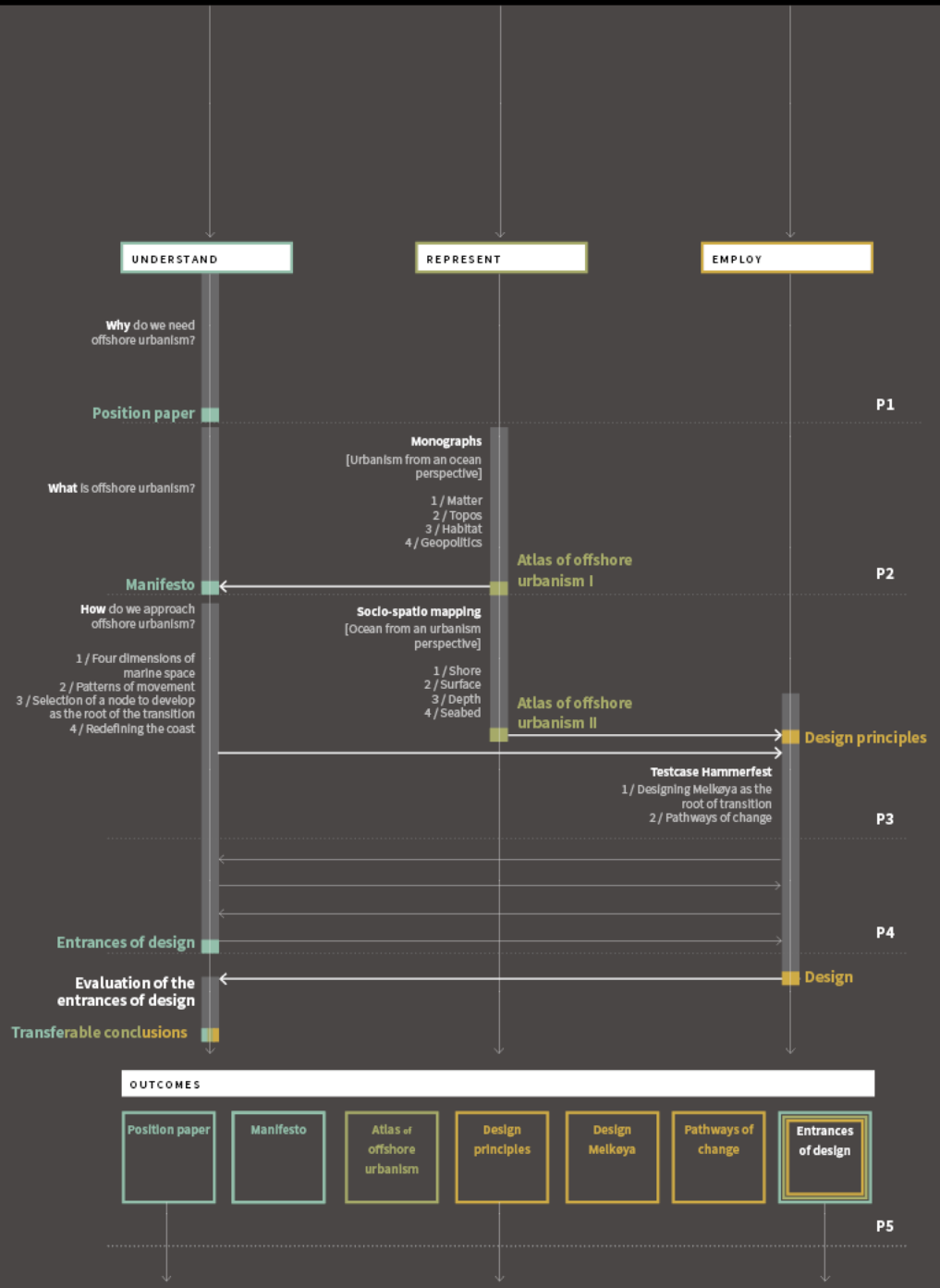
PROBLEM FIELDS
Human-sea relations | Representation | Design

PROBLEM STATEMENTS
- The socio-cultural impacts of offshore development at the Barents Sea on coastal communities remain relatively unmapped and unknown.
- MSP relies on objective, univocal mapping which cannot represent non-monetary values or visualise human-sea relations.
- Marine spatial planning is limited to economic and ecological analysis, and lacks design.

RESEARCH PURPOSE
To actuate urbanists to take a localised approach to marine spatial planning, that seeks to understand, represent and employ human-sea relations through design.

HYPOTHESIS
Offshore urbanism is...
- ... an act of research: **to understand** human-sea relations
- ... an act of representation: **to represent** the local dimension in marine spatial planning
- ... as an act of design **to employ** this understanding in the spatial reorganisation of marine uses at the Barents Sea.

RESEARCH QUESTIONS
How can human-sea relations be...
- ... understood as a component of urbanisation processes in Hammerfest and the Barents Sea?
- ... represented and visualised through the act of mapping?
- ... employed to propose pathways of change for the spatial reorganisation of the Barents Sea?



METHODOLOGY

SURFACE

move | perceive

economic route from anchor A to anchor B

strategic position anchor along most economic route

anchor at surface as guide for movement

manipulating the patterns of movement by adding / (re)moving anchor

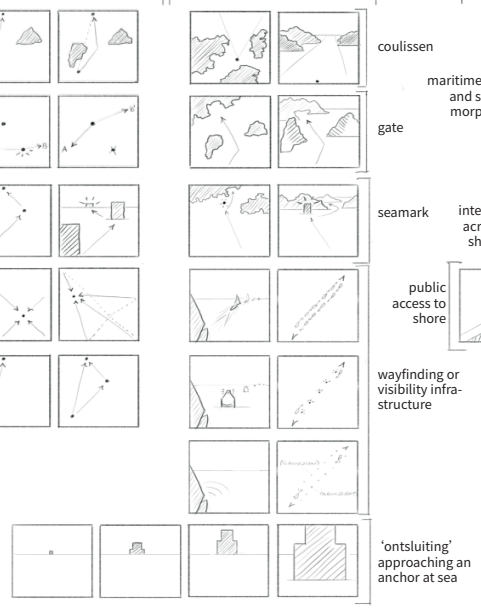
coulissen

gate

seamark

wayfinding or visibility infrastructure

'ontsluiting' approaching an anchor at sea



SHORE

move | perceive

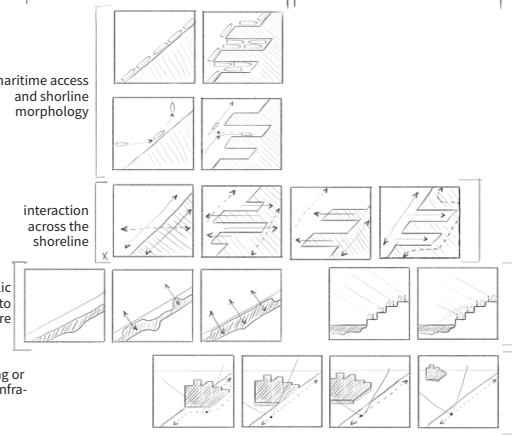
maritime access and shorline morphology

interaction across the shoreline

public access to shore

public visual access to water from shore

position marine industry in relation to shore and visibility

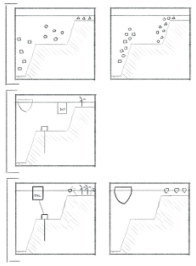


DEPTH

depth and species population

depth and human occupation

depth scale occupation



SEABED

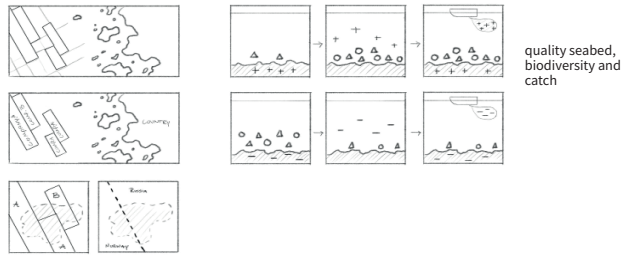
resources | biodiversity

scale and rigidity borders inland and seaward

scales of ownership inland and seawards

discrepancy borders of claim and claimed (resources)

quality seabed, biodiversity and catch



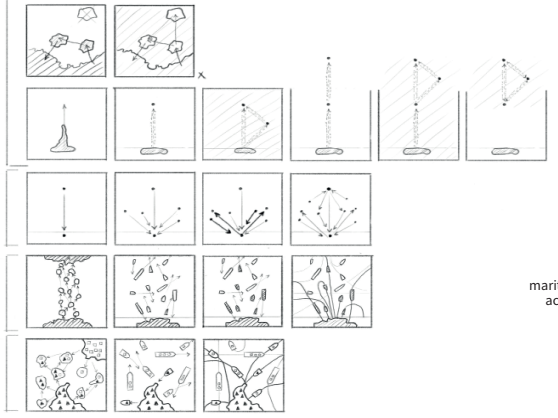
SURFACE+ SHORE

urban growth along infrastructure

dependency

territorial expansion

human population

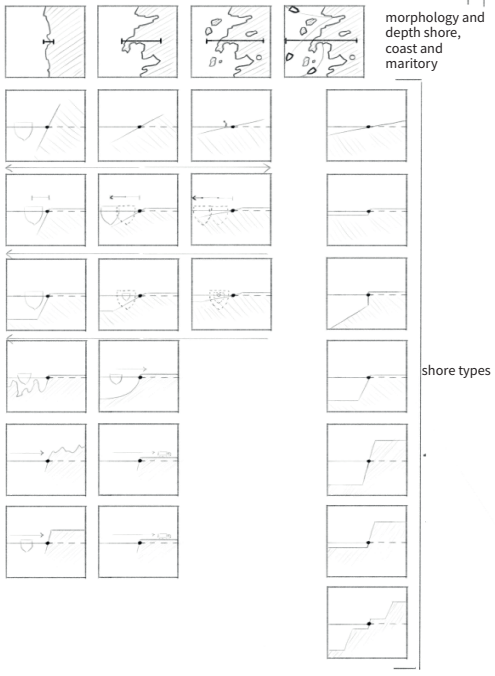


SHORE + DEPTH

maritime access

morphology and depth shore, coast and maritory

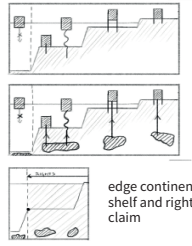
shore types



DEPTH + SEABED

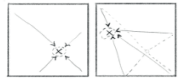
depth and access to seabed and its resources

edge continental shelf and right to claim



SEABED + SURFACE

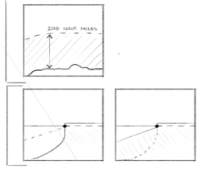
pressence of resources in seabed as anchor for movement on surface



SHORE + DEPTH + SEABED

seaward depth and right to resources

dredging and filling



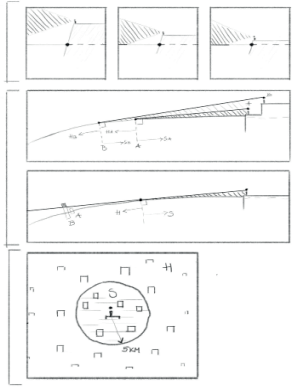
SURFACE + SHORE + DEPTH

height viewer and orientation towards ocean surface or horizon from shore

height viewer andvisible surface and horizon from shore

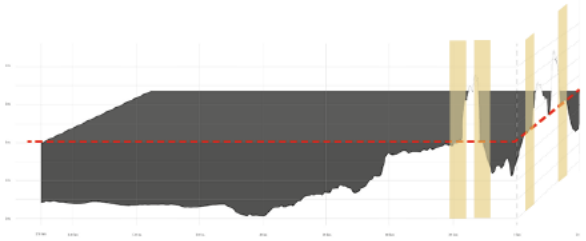
height object and its visibility from shore

the surface and the horizon

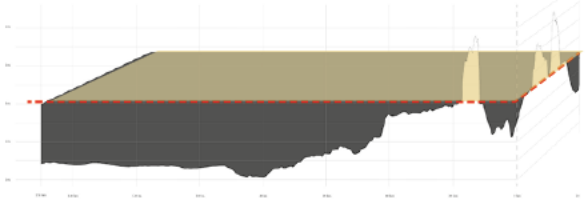


FOUR SPACES OF DESIGN

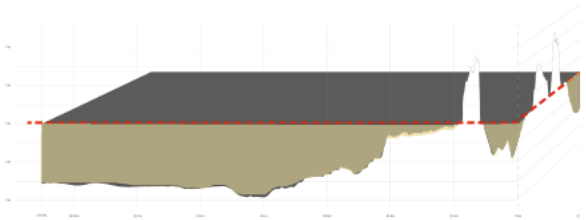
The first entrance is to approach the ocean through four marine spaces of design: Shore, Surface, Depth and Seabed. Comparable to the Dutch layers approach (De Hoog, Sijmons en Verschuuren 1998), Offshore Urbanism should distinguish these four dimensions and study it as an coherent system. "We consider this coherence between the [dimensions] as the domain of spatial planning" (78). Thus, keeping in mind that the conditions of marine space always relate to the other dimensions. For example, maritime access is determined by the depth of the water, sea routes on the surface and the lenght of the shoreline. Maritime access can be improved by dredging the seabed. In short, a condition is never determined by one space alone.



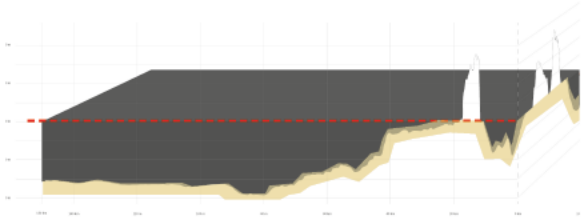
Shore



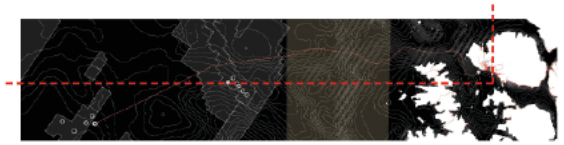
Surface



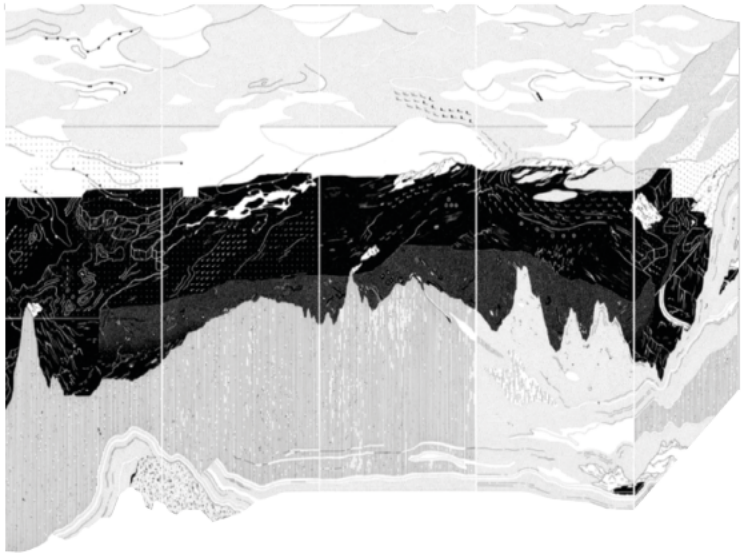
Depth



Seabed

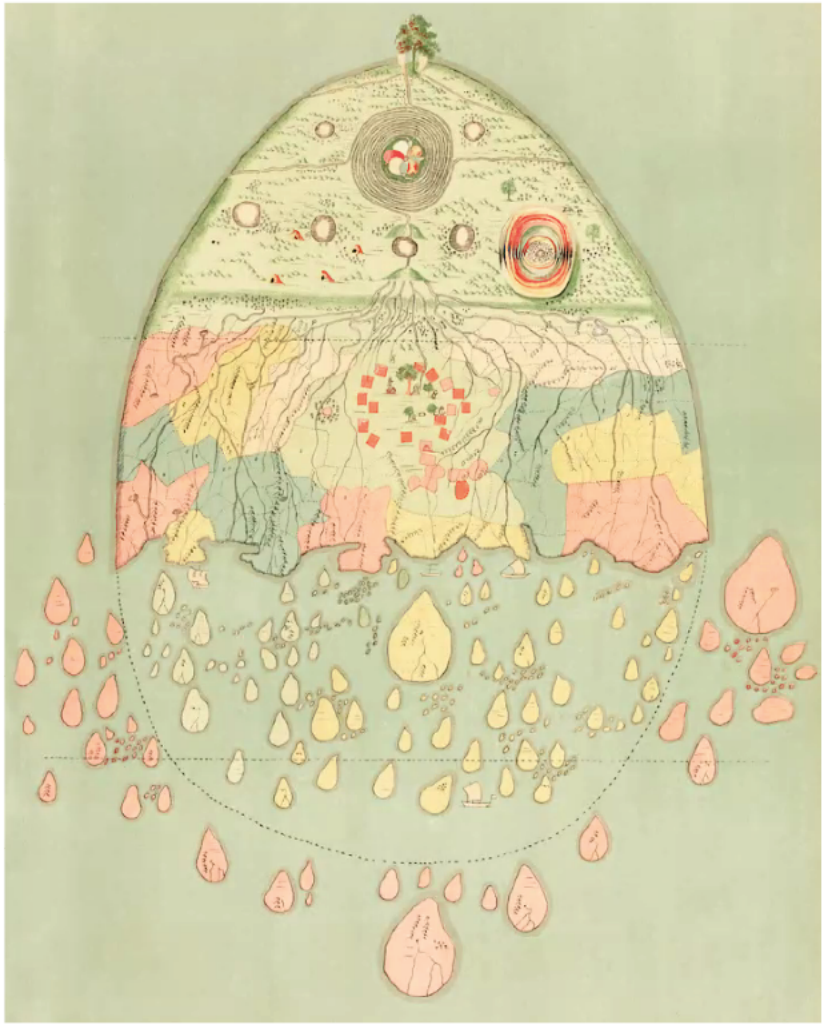


Location sections in plan



Above / [title, source]

Left / The four dimensions of marine space as an entry point of the maritorial design depicted in transect. Image by author.

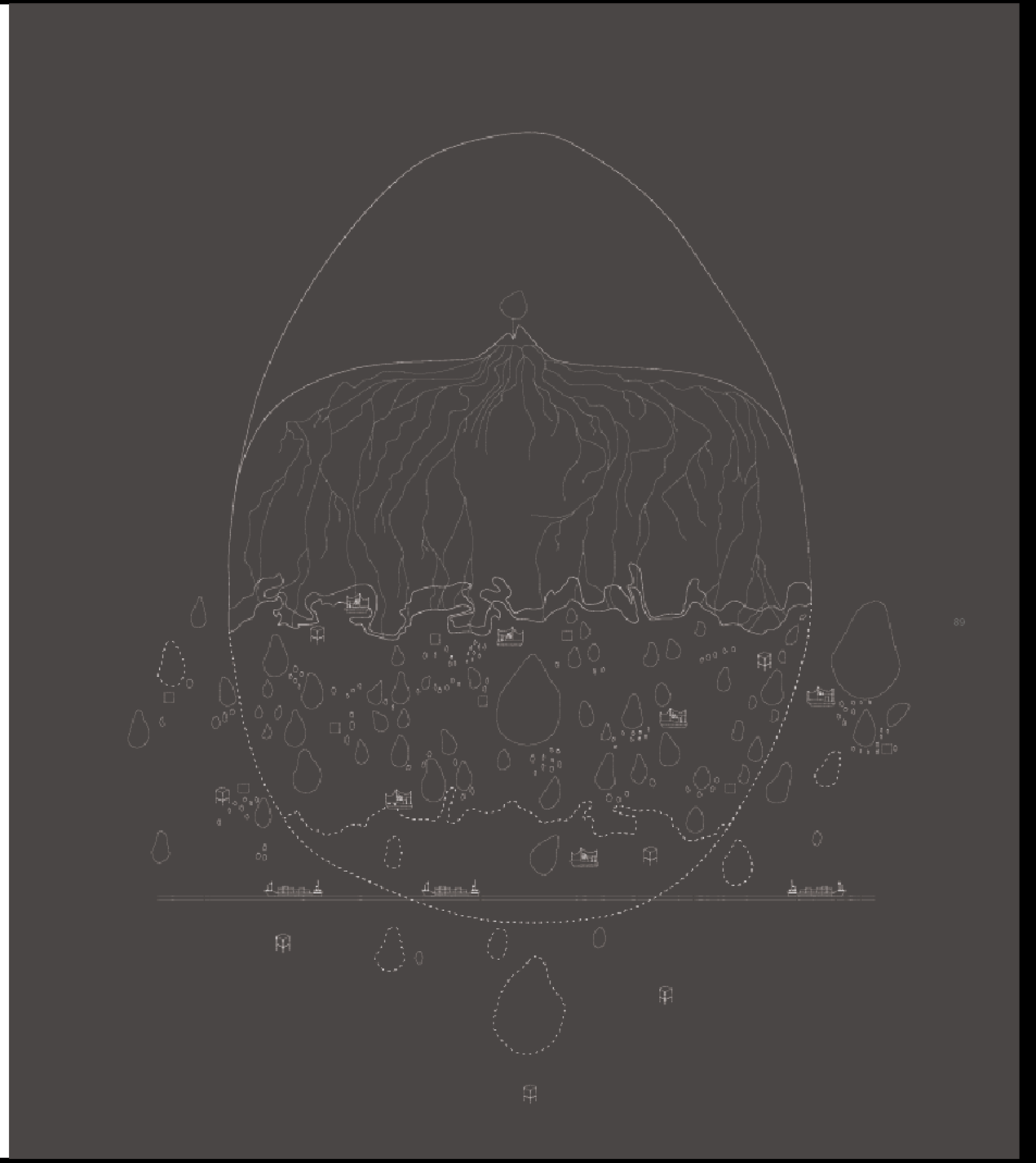


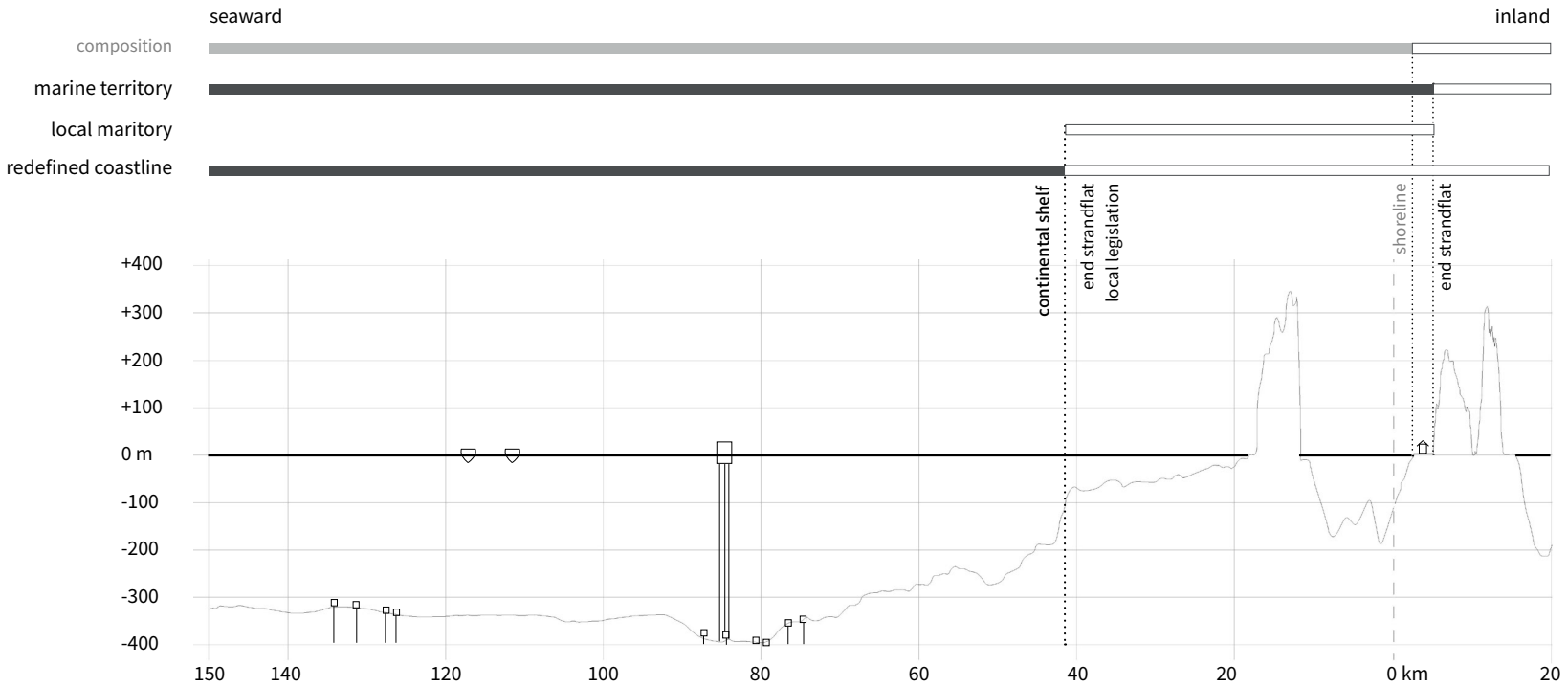
Above /

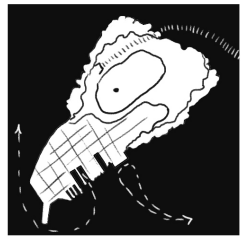
A Burma Map of the World. Representing the sea as a composition of islands that originate from and relate to the land. Source: unknown.

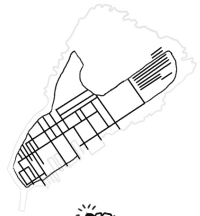
Right /

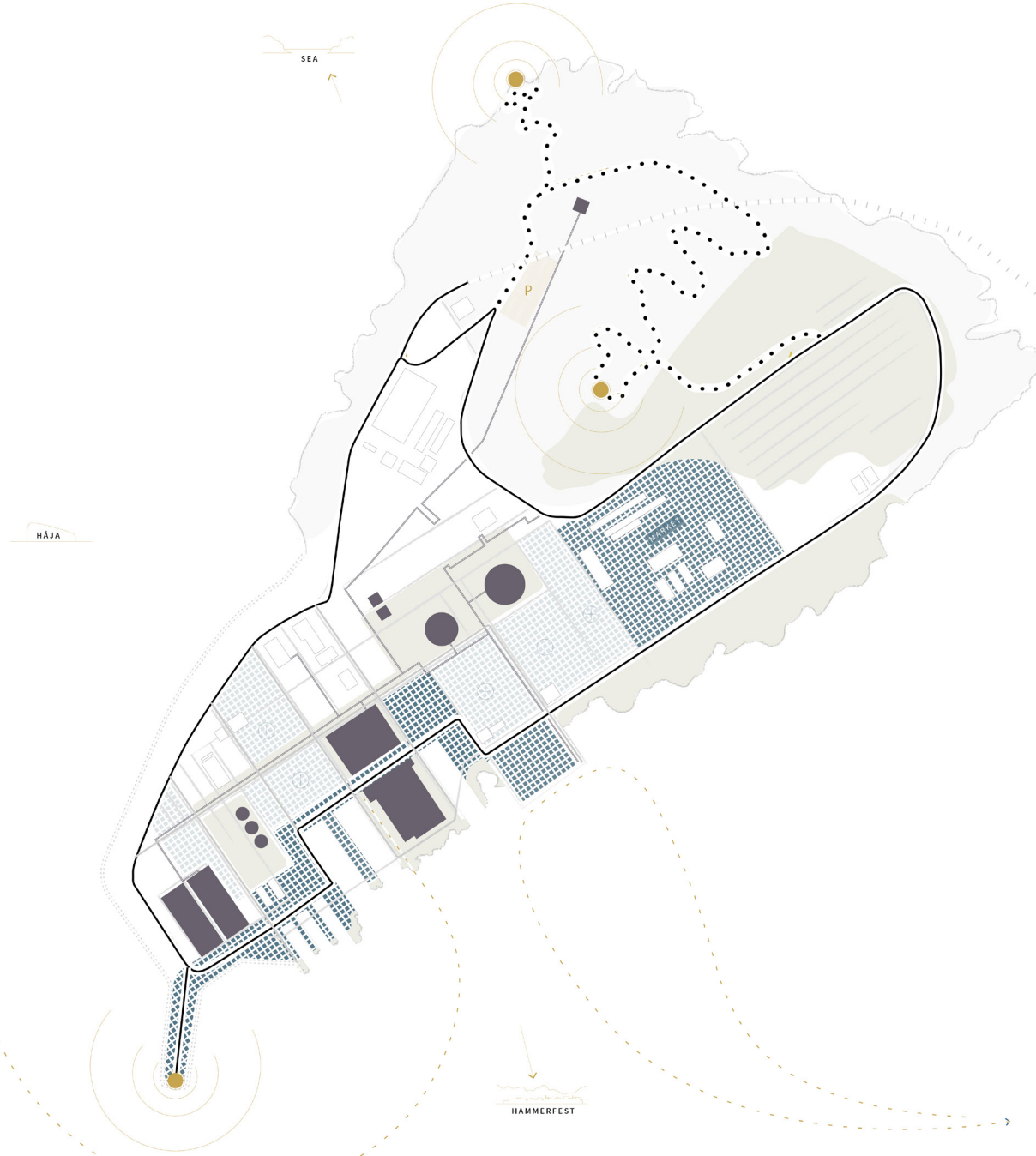
Adapted version of 'A Burma Map of the World' to my understanding of the Hammerfest Maritory as a composition of urban nodes that originate from and relate to the land.




seaward
inland
composition
marine territory
local maritory
redefined coastline
continental shelf
end strandflat
local legislation
shoreline
end strandflat
+400
+300
+200
+100
0 m
-100
-200
-300
-400
150
140
120
100
80
60
40
20
0 km
20

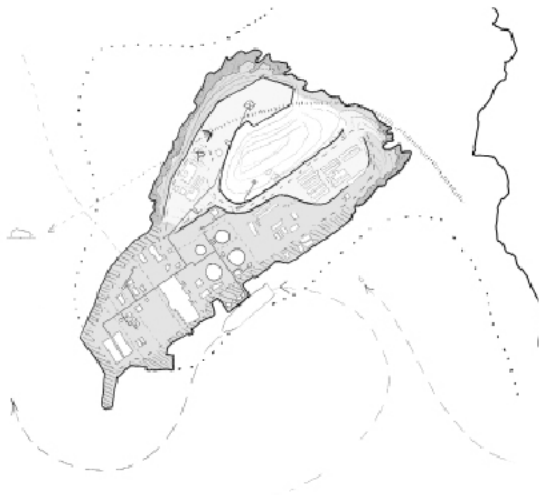


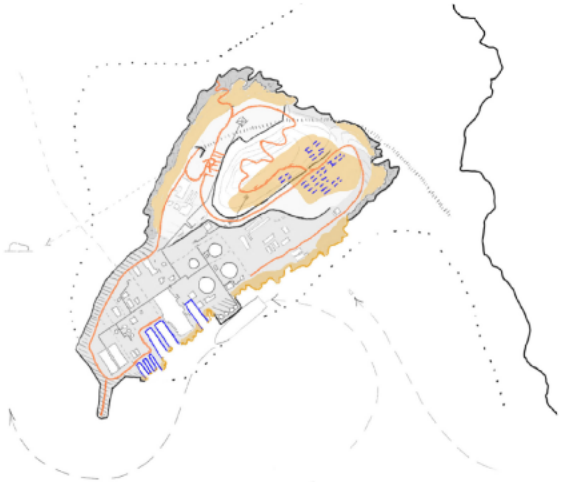


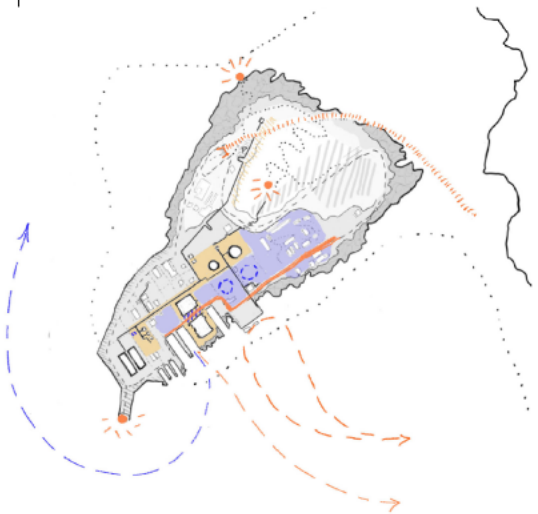

SEA
HÅJA
LAND
HAMMERFEST
P
5,5 KM
50 MIN

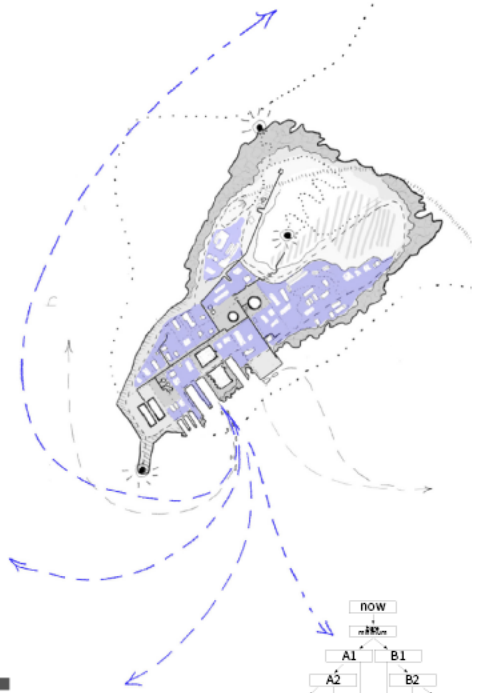
ALIGNMENT WITH MELKØYA

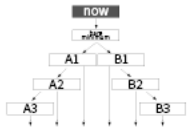
Transition of Melkøya through the phases for pathway A and B. Note that Actions to transform Melkøya are the same for both pathways until 2035- when petrol moves to the arctic. It is then that the two paths split and Melkøya develops accordingly.



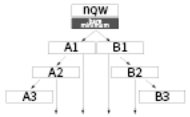








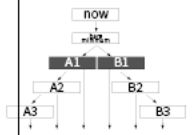
2021
NOW



2025
PHASE 0

Bare minimum

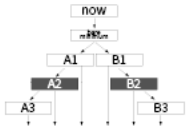
- 1 / Dig out new ports at the southside of the island.
- 2 / Renaturalise shoreline with dredged rock.
- 3 / Remove buildings on the southern hillside.
- 4 / Renaturalise the area using decontaminating plant species.
- 5 / Establish the new paths and parking lot using deconstructed concrete and steel form the site.
- 6 / Gas processsing remains operative.
- 7 / Offloading of LNG continues.
- 8 / Car tunnel is maintained for private use.



2035
PHASE 1

Petrol moves to the Arctic

- 1. Maintain striking gas facilities when petroleum leaves the island.
- 2. Allow temporary public mooring.
- 3. Open tunnel for public use.
- 4. Make offloading platform accessible as water taxi stop.
- 5. Establish the three viewpoints
- 6. Decontaminate and renaturalise the most polluted plots.
- 7. Local pioneers in marine economy settle on the island, reusing the abandoned buildings of the gas industry.



2050
PHASE 2

Trans-polar Sea Route opens seasonally

Pathway A: Reaching out

- 1. New industry slowly grows on the island.

Pathway B: Letting go

- 1. Now that petrol has moved away, Hammerfest invests heavily in local marine economy. New marine industry grows rapidly on the island.
- 2. Marine traffic from Melkøya to offshore production and nourishment fields visibly increases.

2035
PHASE 3

Ice-less Arctic

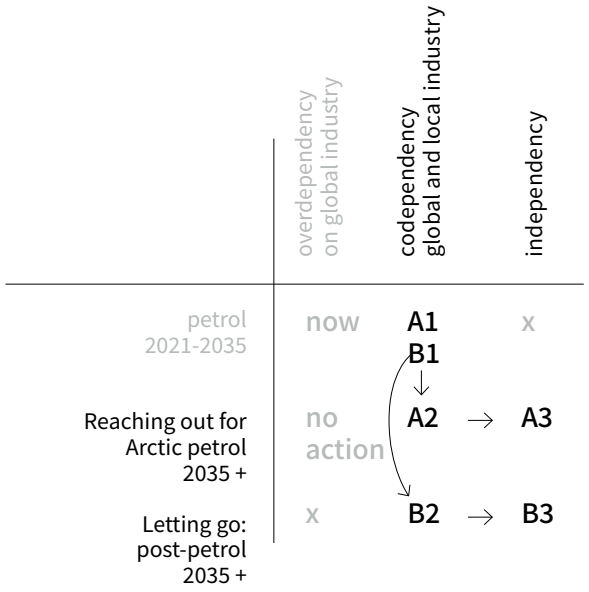
Pathway A: Reaching out

- 1. Once a part of the community has permanently migrated to sea, the new industry stops growing. A small and local industry remains operative. The community that remains uses the island as recreational space. It has a unique hybrid identity: abandoned industry, local industry and natural growth.

Pathway B: Letting go

- 1. Now completely independent of petroleum, the new industry blooms. The island densifies and gains the characteristics of a new urban center, that is publicly used.
- 2. Melkøya becomes an important node in the regional network, as an export port of local products and as a regional point of attraction.

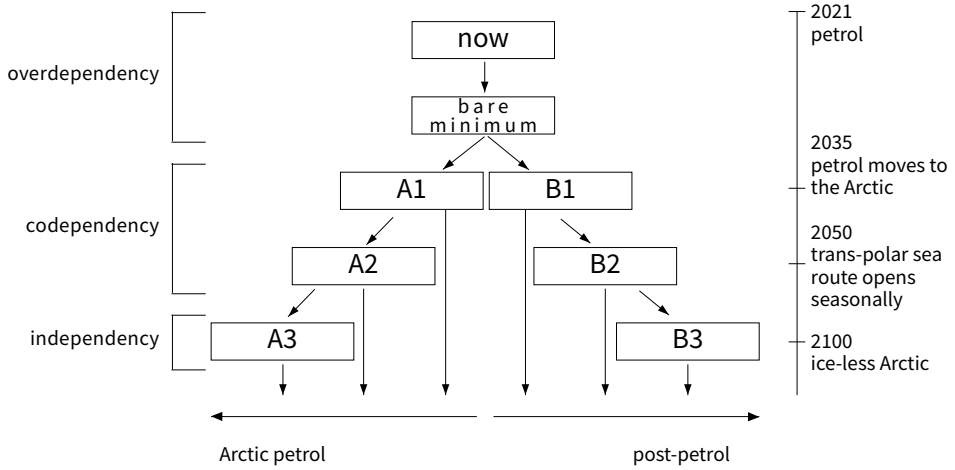
CHOOSING A PATH



CHOOSING A PATH
Entrances of design

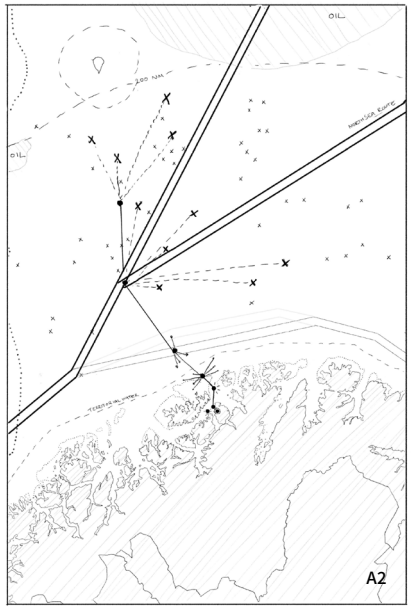
Response to seaward trends

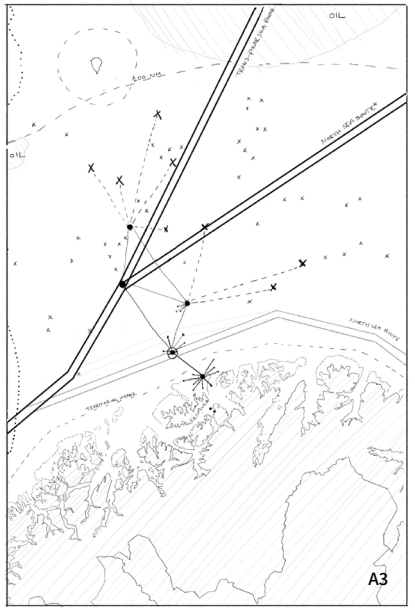
	overdependency on global industry	codependency global and local industry	independency
petrol 2021-2035	now	A1 B1	x
Arctic petrol 2035 +	no action	A2 →	A3
post-petrol 2035 +	x	B2 →	B3



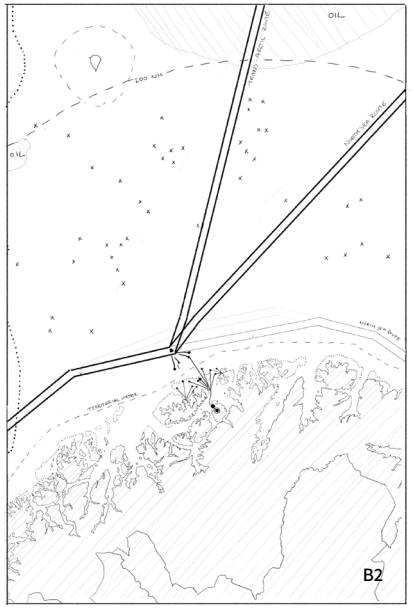
Codependency

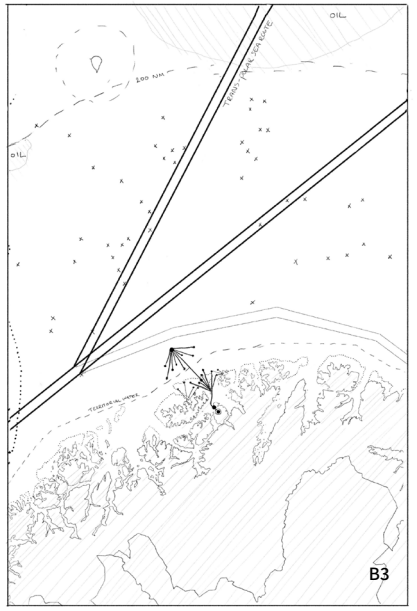
Independency





PATHWAY A
Reaching out
Arctic petrol

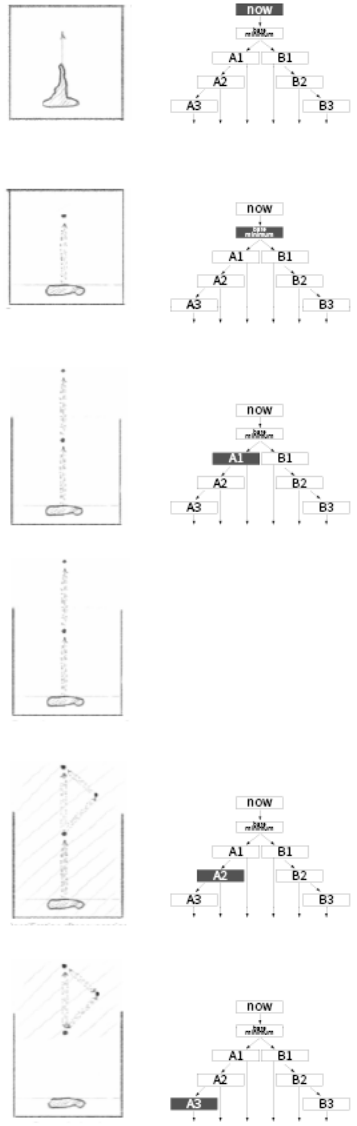




PATHWAY B
Letting go
Post-petrol

Network compositions

Network compositions transitioning through three phases. For each of the phases, actions are listed that make the composition a physical reality.



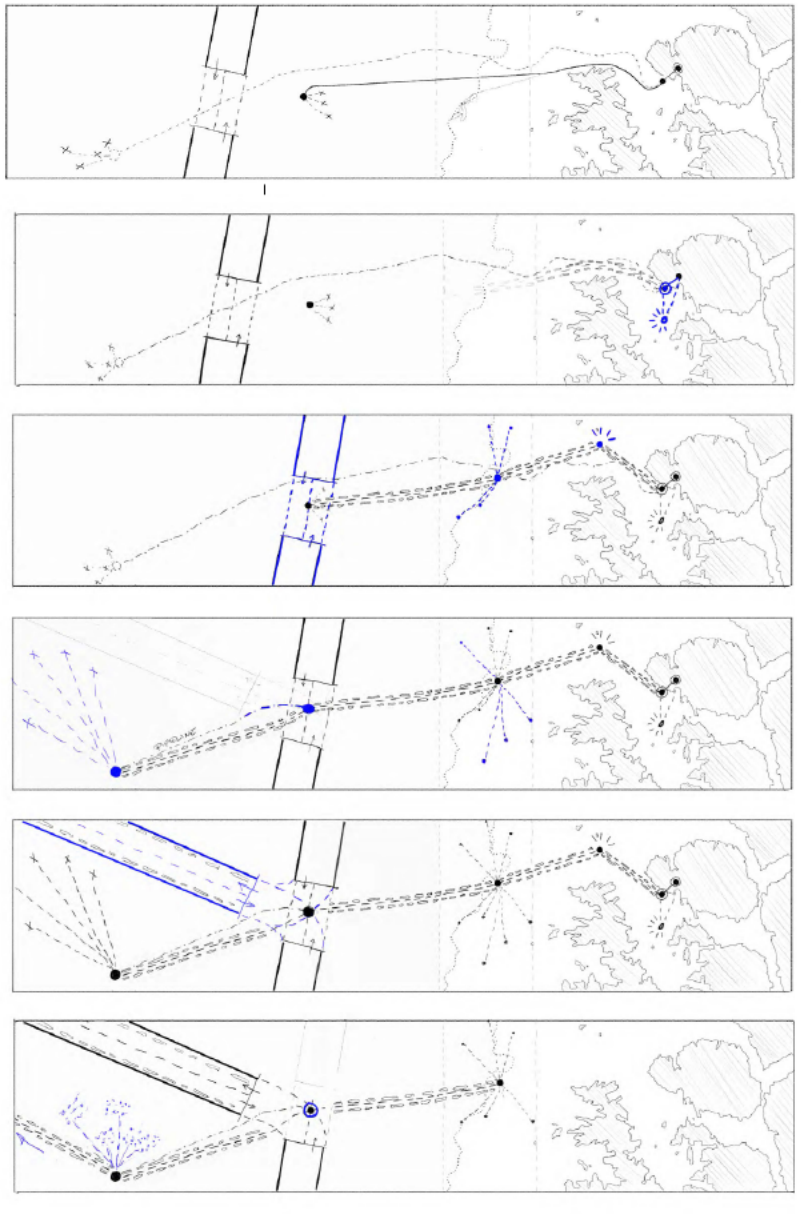
NOW overependency petrol

0 bare minimum

A1 codependency petrol

A2 codependency arctic-petrol

A3 independency arctic petrol



2021 NOW

2025 PHASE 0 Melkøya

- Redevelop Melkøya.

2030 PHASE 1 shifting seaward

- Start restoration and nourishment of seabed on the edge of the strandflat.
- Allow community-led mariculture to develop on the edge of the strandflat.
- Reposition Northern Sea Route to pass Goliat.

2035 PHASE 1 petrol moves to the arctic

- Repurpose Goliat as offshore harbour.
- Maintain gas/oil storage and offloading facilities.
- Support new marine economy to develop on Melkøya as gas operation decreases towards 2031.
- Petroleum extraction moves north when the operating fields run out.
- Produce from the new extraction facility is transported to Goliat for offloading reusing the pipeline.

2050 PHASE 2 trans-polar sea route open

- Once the sea ice allows seasonal traffic along the Trans-polar Sea Route, connect the route to Goliat and the Northern Sea Route.

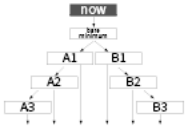
2100 PHASE 3 Ice-less Arctic

- Redevelop residential quarters in Goliat as permanent residence.
- Petroleum extraction moves north again when the operating field runs out.
- The abandoned extraction facility is activated as renewable energy production field (wind, wave, solar energy).
- Product from local mariculture, petroleum extraction and marine energy production are exported to market from harbour Goliat.

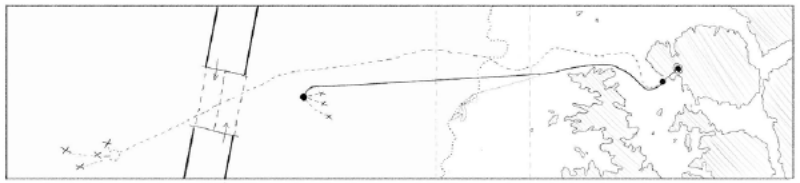
PATHWAY B: LETTING GO
Choosing post-petroleum

Network compositions

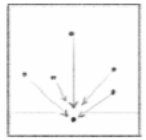
The network compositions of pathway B transitioning through three phases. For each of the phases, actions are listed that make the composition a physical reality.

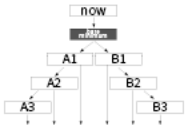


2030
NOW
overependency

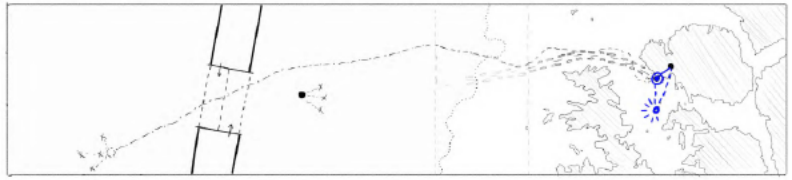


2021
NOW



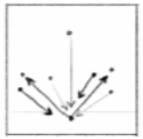


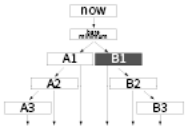
2025
bare minimum



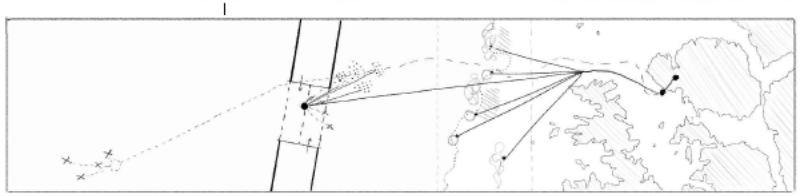
2025
PHASE 0
Melkøya

- Redevelop Melkøya.



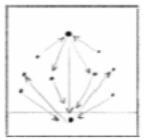


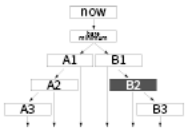
2030
PHASE 1
shifting seaward



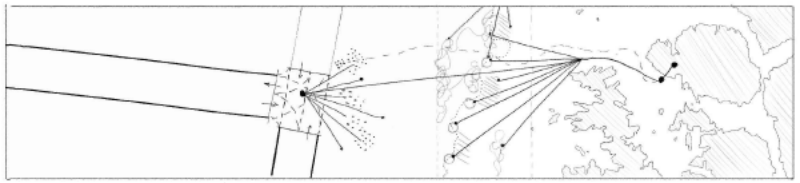
2035
PHASE 1
petrol moves
to the arctic

- Start restoration and nourishment of seabed on edge of the strandflat.
- Invest in community-led mariculture to develop along the edge of the strandflat.
- Support new marine economy to develop on Melkøya as gas operation decreases towards 2031.
- Petroleum extraction moves north when the operating fields run out.



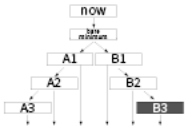


2035
PHASE 2
post-oil

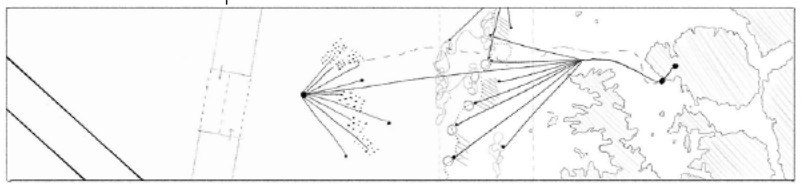


2050
PHASE 2
trans-polar sea
route open

- Repurpose Goliat as offshore energy production facility. For example: experimenting with wave energy technology and offshore windfarms.



2050
PHASE 3
trans-polar sea
route open



2100
PHASE 3
Ice-less Arctic

- As extraction and traffic moves further north, the network becomes independent.
- Other coastal communities in the region invest in local marine industry as well, creating market competition.