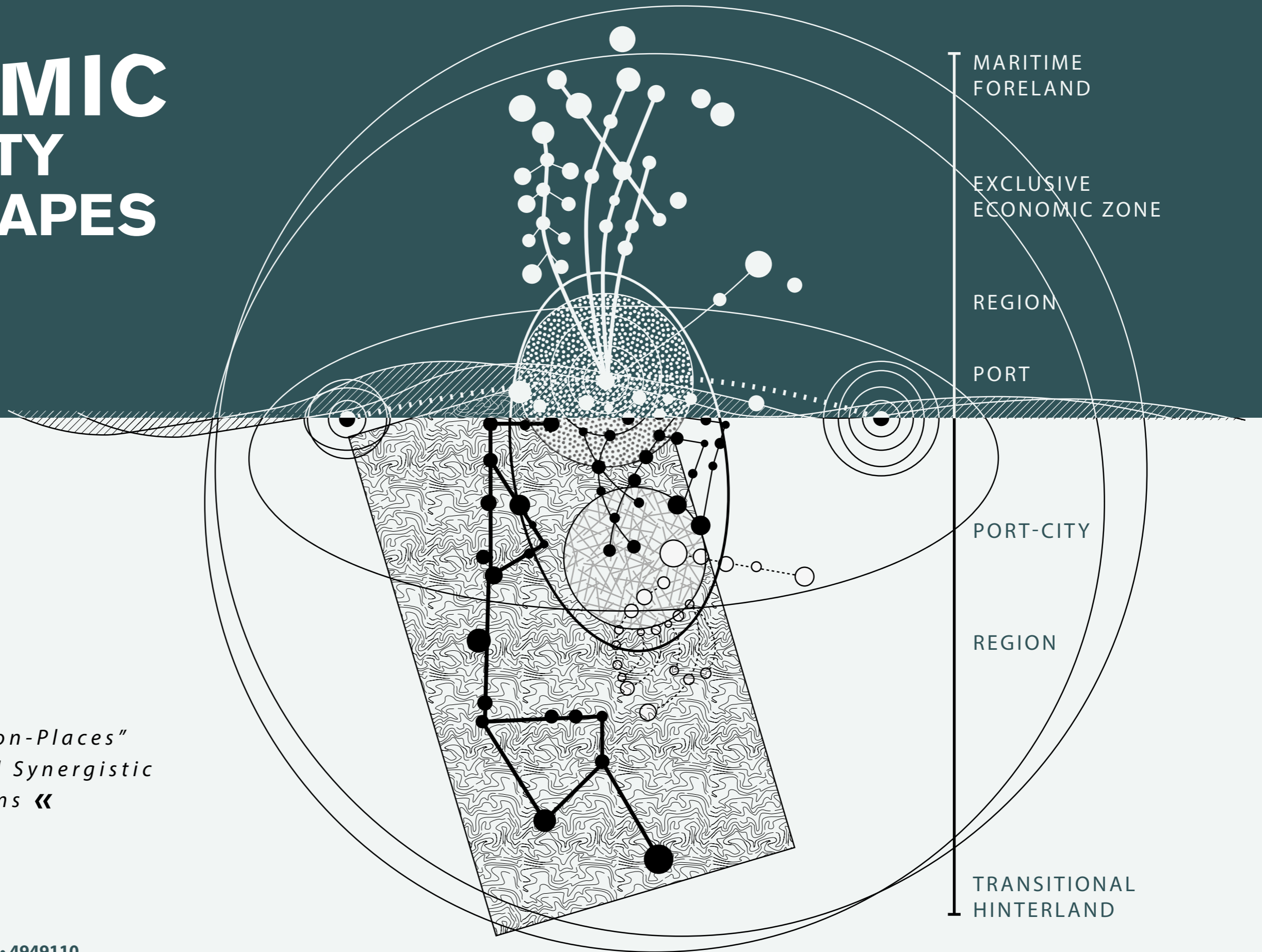


DYNAMIC PORT-CITY SCAPES

» *From Liminal "Non-Places"
to Imaginative and Synergistic
Adaptive Ecosystems* «

P5 Presentation • Lukas Höller • 4949110
Friday, 28th of August, 2020



CONTENT

- 01** PROBLEM FIELD
ARCTIC EXPANSION
 - 02** PROBLEM FIELD
PORT-CITY
 - 03** METHODOLOGICAL
FRAMEWORK
 - 04** ANALYSIS
KIRKENES PORT-CITY SCAPE
 - 05** FROM FRICTION TO FICTION
PORT-CITY PARADO[$\frac{x}{s}$]YNERGY SCAPE
- CONCLUSION**

01 PROBLEM FIELD ARCTIC EXPANSION

▼ Photo/01 The Northern Sea Route

» The Arctic situation now goes beyond its original inter-Arctic States or regional nature, having a vital bearing on the interests of States outside the region and the interests of the international community as a whole, as well as on the survival, the development, and the shared future for mankind. It is an issue with global implications and international impacts. «

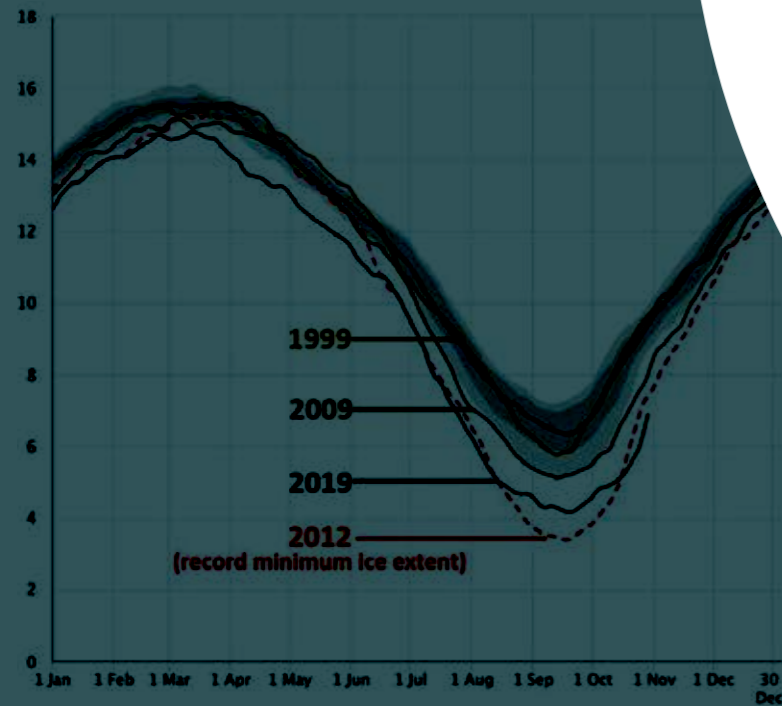
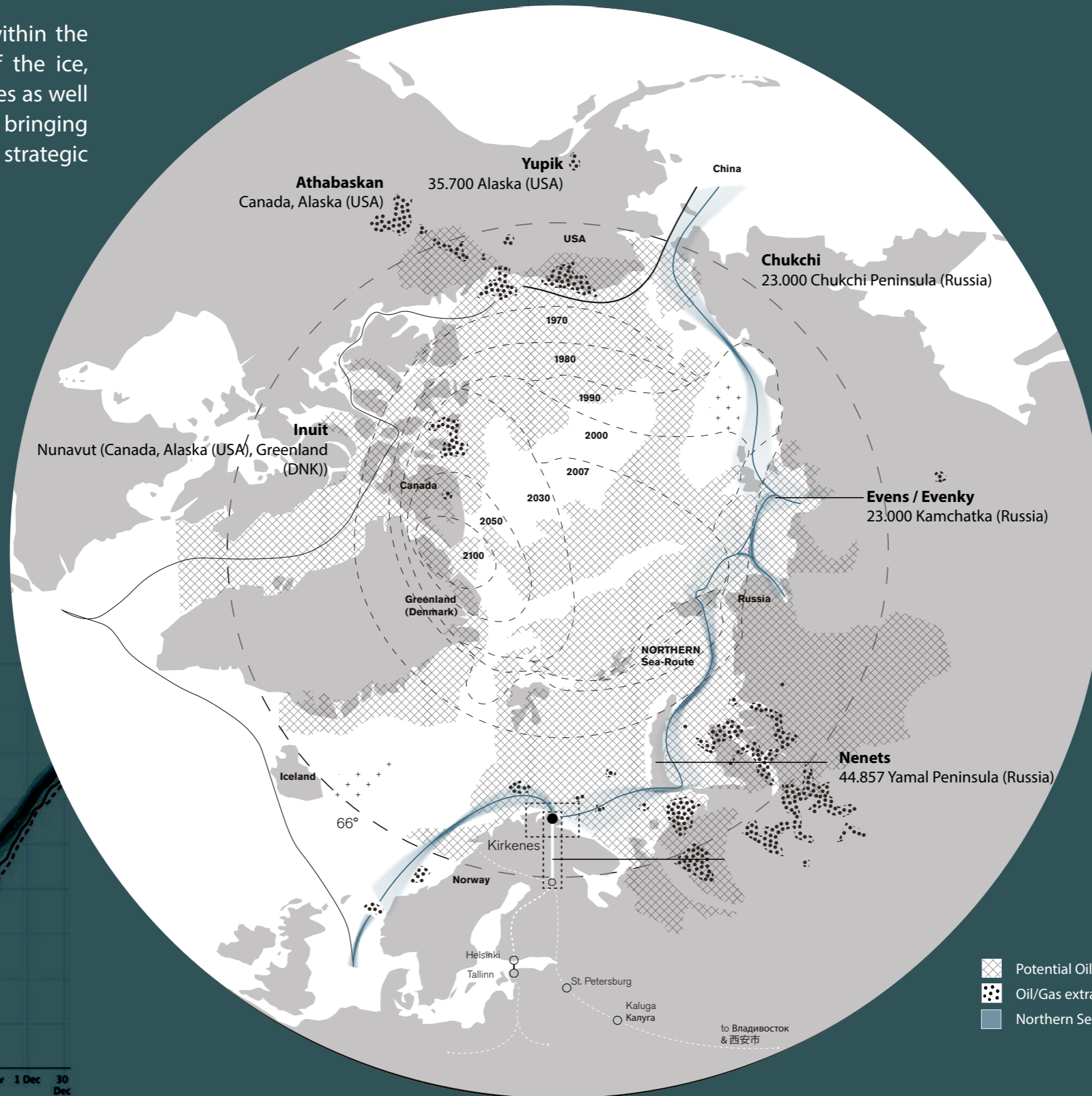
STATE COUNCIL INFORMATION OFFICE OF THE
PEOPLE'S REPUBLIC OF CHINA , 2018, N.P.



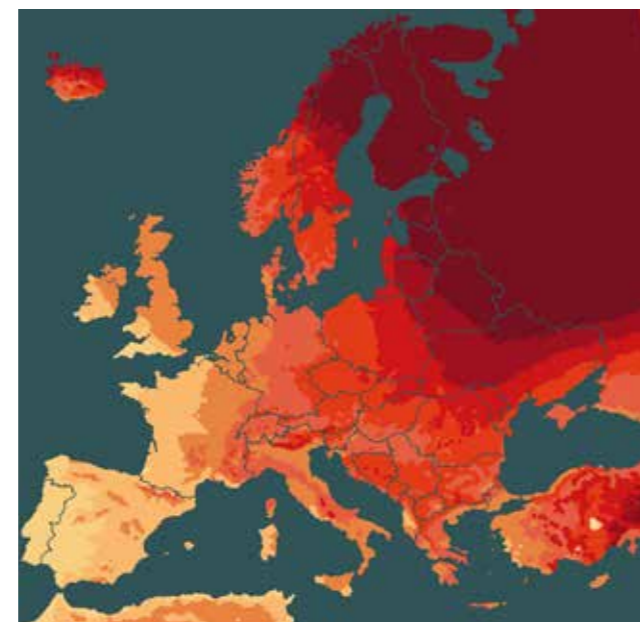
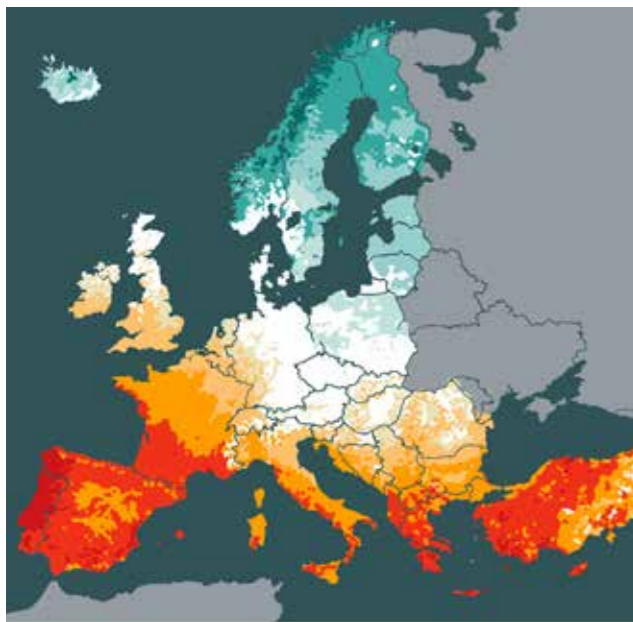
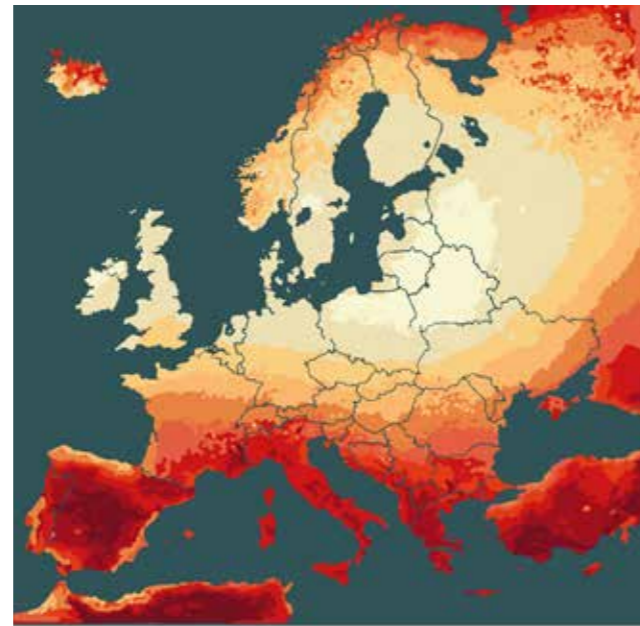
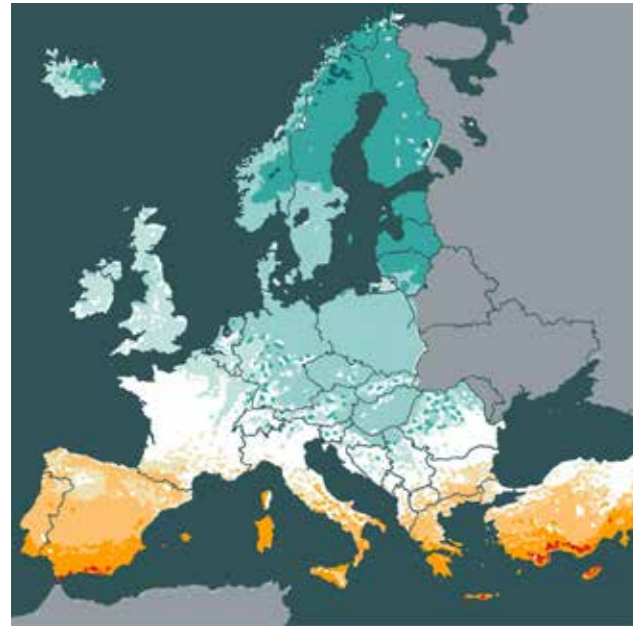
ARCTIC CHANGES

▼ Map/01 Arctic changes / Höller

This map shows the ongoing changes within the Arctic Region, related to the melting of the ice, potential undiscovered oil and gas resources as well as potential new maritime trade routes, bringing infrastructural development in form of strategic ports with it.

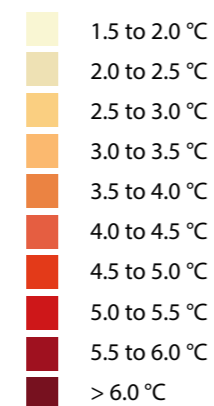
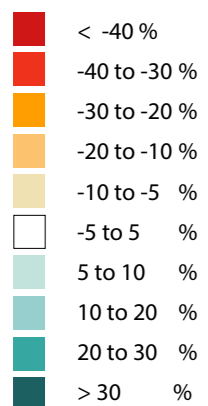


GLOBAL CONTEXT CLIMATE CHANGE



▲ Map / 02-03 Projected change in annual and summer precipitation, 2071 - 2100

▲ Map / 04-05 Projected change in annual, summer and winter temperature for the forcing scenarios RCP 8.5



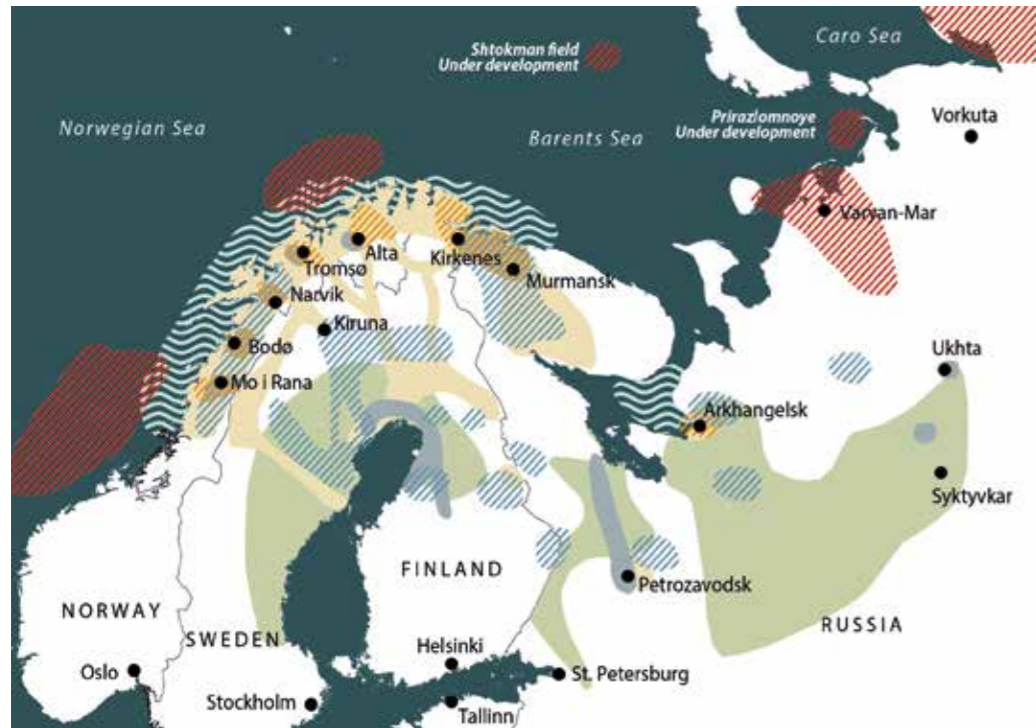
Climate change is already having very detrimental impacts on the Arctic environment and ecosystems

- Increased **warming** and changes in **precipitation** within arctic and subarctic territories is progressing **2x higher** compared to the **world-wide average**
- **Melting of the permafrost**, releasing **CO₂** formerly trapped under the frozen peat/bog surface as well as causing **landslides**
- **Disappering sea ice** and the loss of habitats
- **Boreal-Shift:** Greening/Browning of the Tundra and increasing **Albedo Effect**

▼ Photo / 02 Glaciers in the Arctic are shrinking by as much as 300m a year, a Scottish-based research team has found.



HIGH NORTH CONTEXT SOCIETY + ECONOMY



◀ Map/06
Rough illustration of raw materials and main industries in different parts of the Barents Region

- Oil/Gas producing area
- Service for oil/gas industry
- Mining industry
- Metal industry
- Seafood industry
- Forest industry
- Tourism



◀ Map/07
Cargo turnover in ports, Barents Region

20
10
5 Million tonnes (2012)

- Port
- Port under construction
- Main sea route
- Inland port

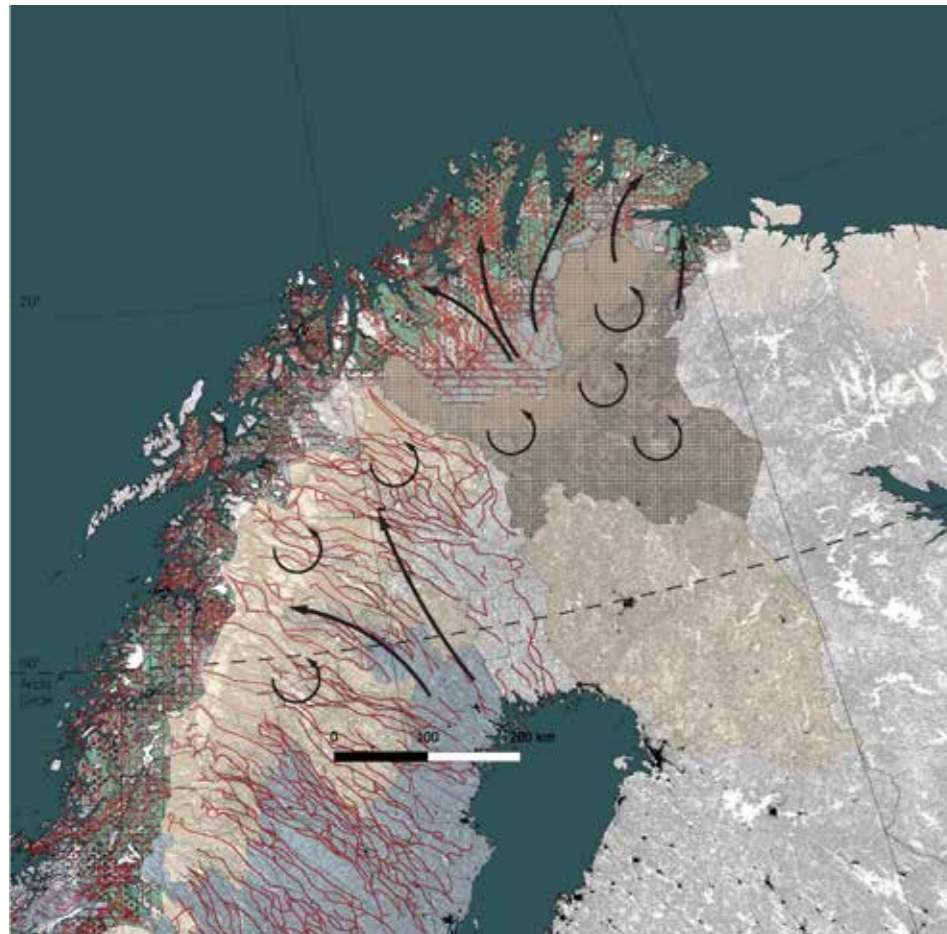
Global warming as main-driver for increasing economic developments

- Barents Region rich on raw materials and minerals
- **Extraction industry** as strong economic player
- Increasing **touristic activities** spreading from the south of Finland towards Northern Regions
- Large **forestry activities** in the southern boreal regions of Finland, Sweden and Russia
- Development of new **oil/gas-fields** in the Norwegian Sea and in **Hammerfest** along the Barents Sea
- **Remote and sparse population** inbetween **densely populated** areas like Narvik and Murmansk





▼ Photo/03 Norterminal Floating Oil/Gas Storage



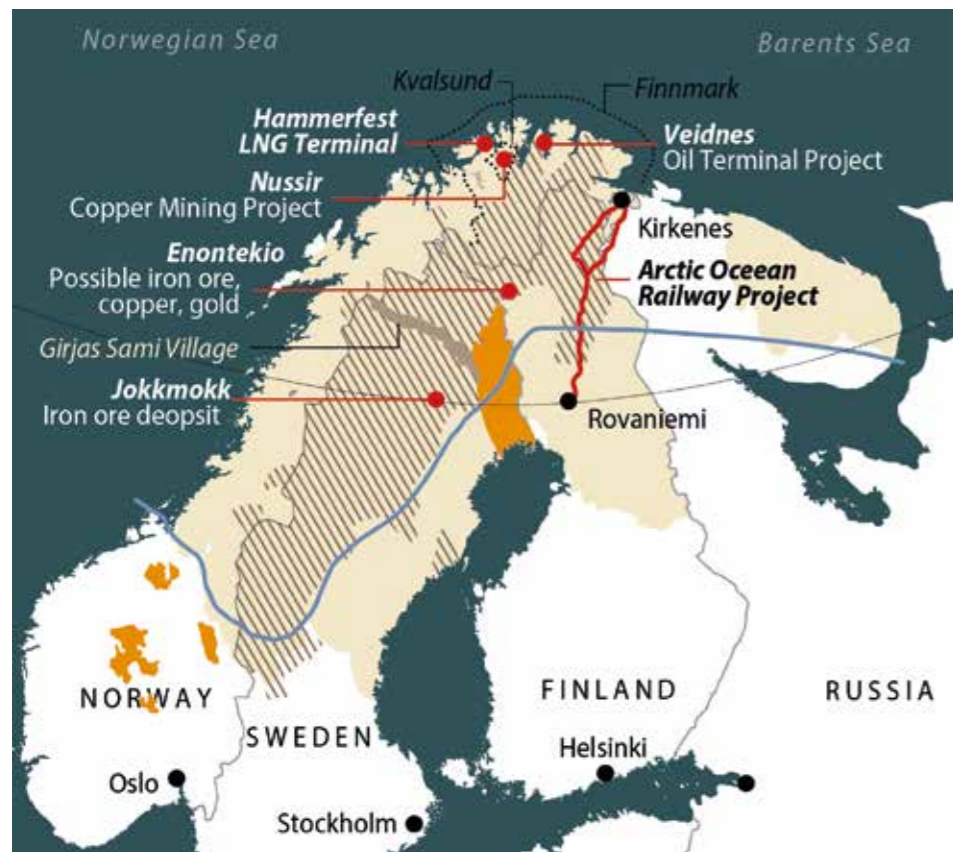
HIGH NORTH CONTEXT SOCIETY + ECOLOGY







◀ Map/08 **Traditional Reindeer Herding** / Lukas Höller

-  Finnish border of the Sámi Homeland
-  Pasture / Winter grazing
-  Pasture / Summer grazing
-  Pasture / Spring grazing
-  Pasture / Autumn grazing
-  Pasture / Autumn-Winter grazing
-  Reindeer migration route
-  Reindeer spring-migration routes
-  Reindeer year-round migration routes
-  Southern border of Sapmi (Sámi territory)

- **Northernmost indigenous people of Europe**
- **Sapmi, Sámi-Homeland** situated in today's territory of **Norway, Sweden, Finland and Russia**
- **Reindeer herding** as important cultural and economic livelihood
- **Growing impact** on indigenous lifestyles, due to **economic developments causing land-use conflicts, pollution and deterioration of the remote, untouched nature**



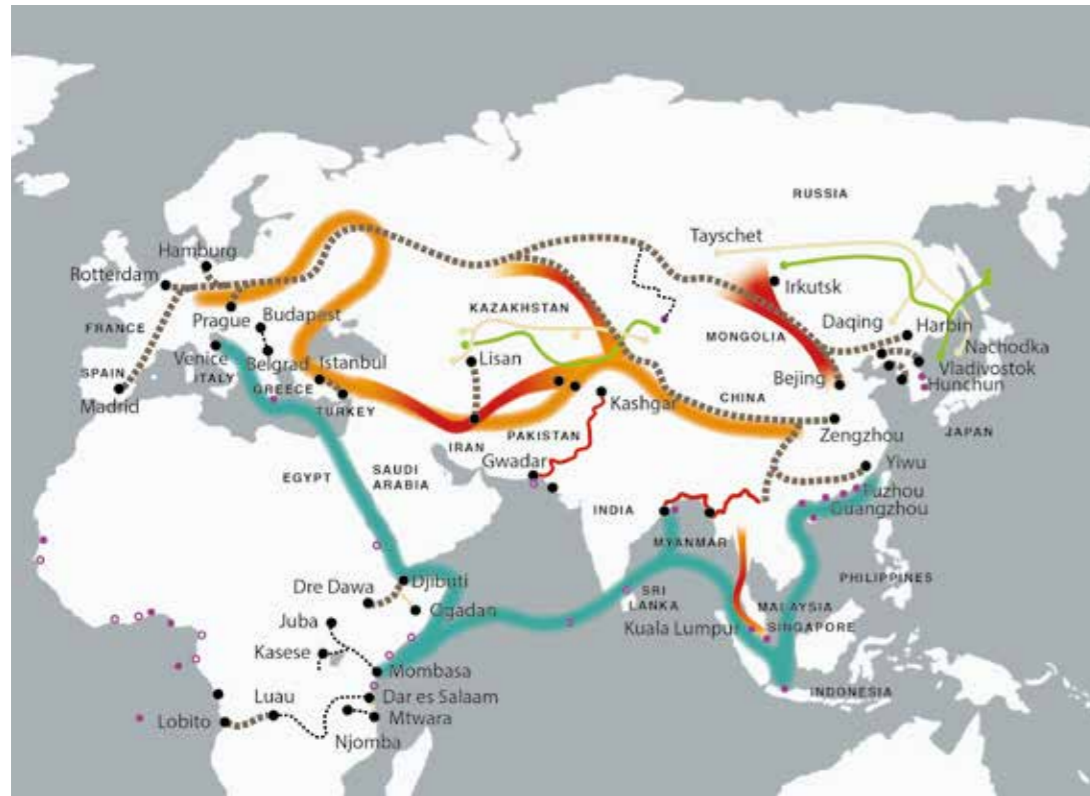
◀ Map/09 **New industries planned around the Barents Region**
Sources: Nordregio; Finnish Transport Agency; Sámi Parliament

-  Projects in development
-  Reindeer herding area
-  Concession reindeer herding area
-  Municipalities that recognize the Sámi languages as official languages

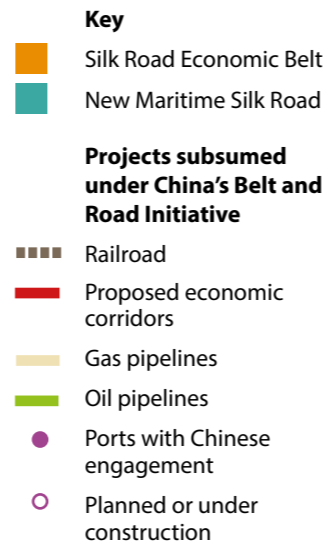
▼ Photo/04 **Traditional Reindeer Herding**



GLOBAL CONTEXT SILK ROAD URBANISM

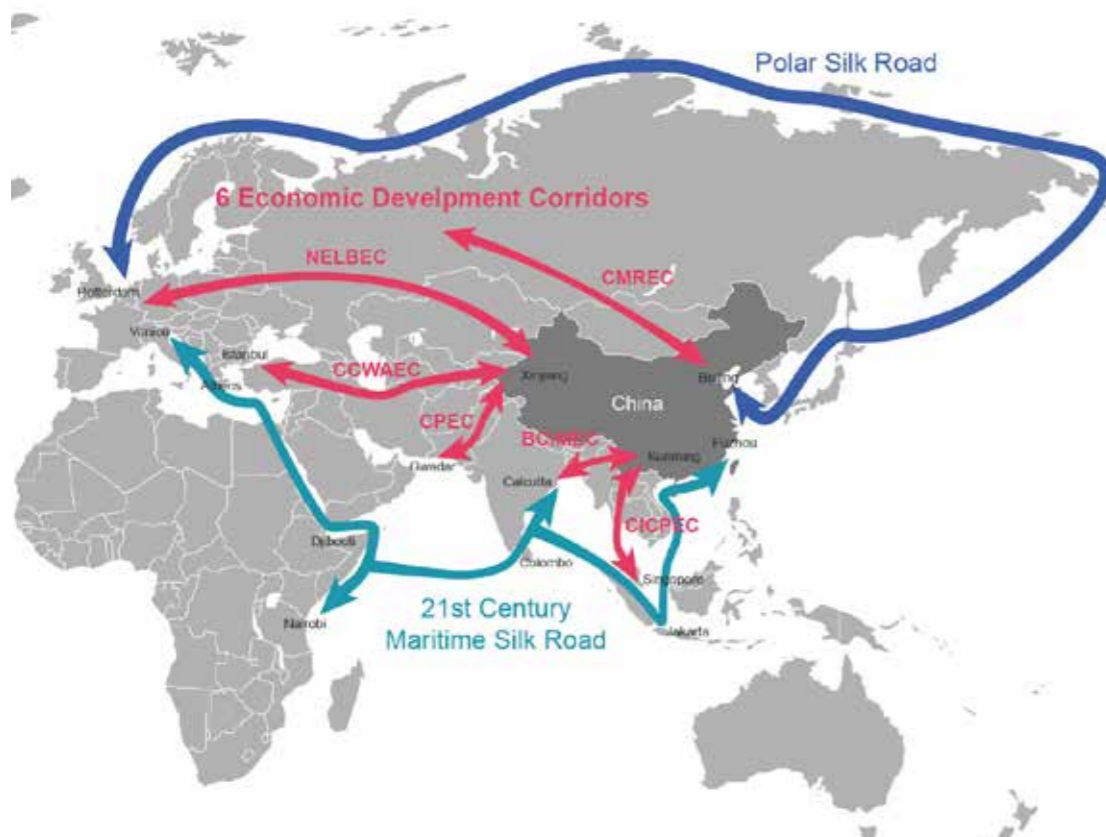


▼ Map / 10 showing the projects subsumed under One Belt, One Road



- Interest on Arctic territory reach an international scale
- **China** as main **keyplayer** in Arctic developments, **not** being a country with legal **Arctic territorial claim**
- **Global economy** creates **connections and opportunities** on a **planetary scale**

BUT creates also **frictions and conflicts** as well as **reshapes spaces, societies and natural environments** on a **regional and local scale**



▼ Map / 11 showing the Polar Silk Road under One Belt, One Road / retrieved from <https://thecsspoint.com/worldview-of-the-belt-and-road-initiative-by-dr-talat-shabbir/>

▼ Photo / 05 China has big ambitions

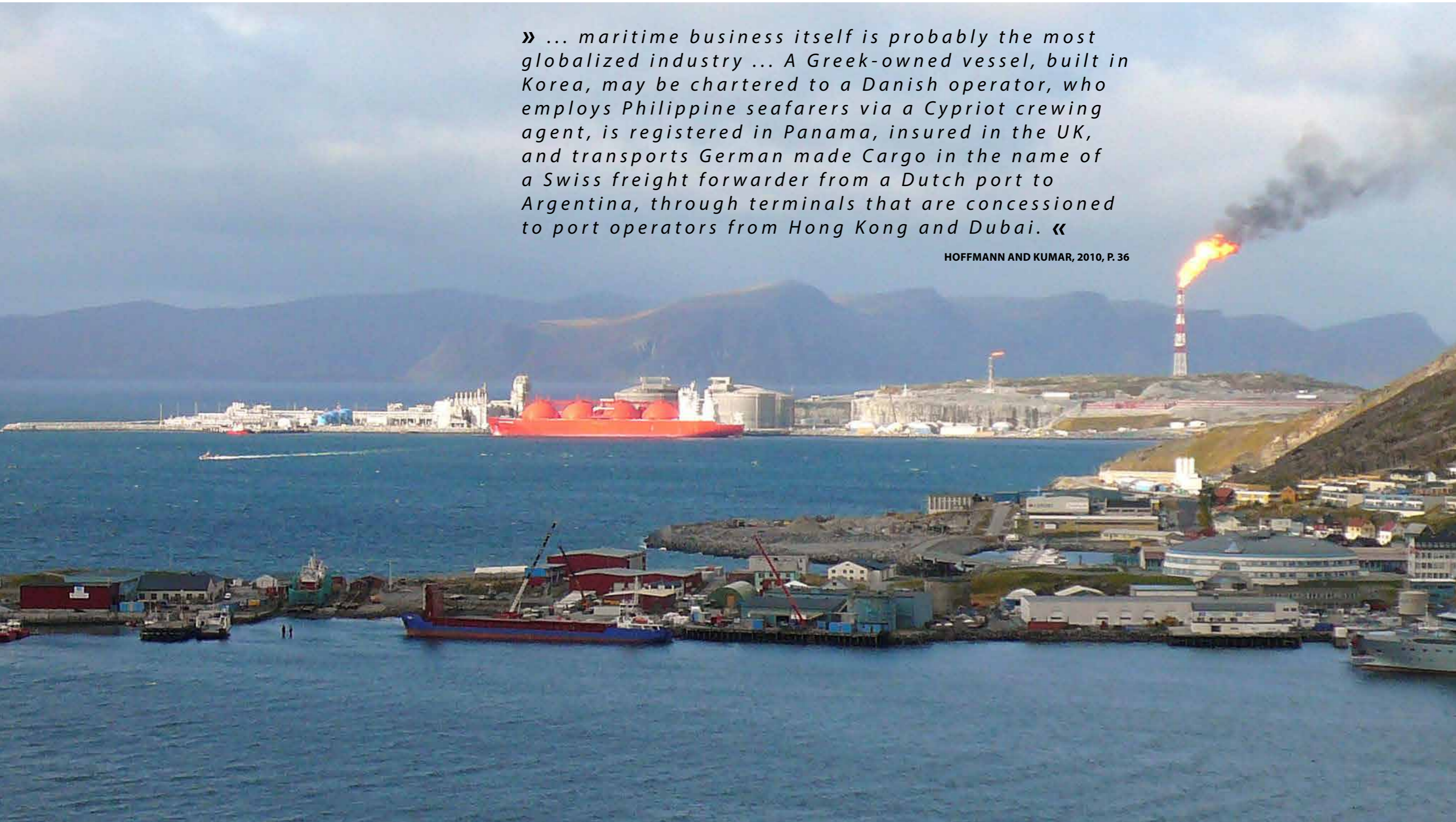


02 PROBLEM FIELD PORT-CITY

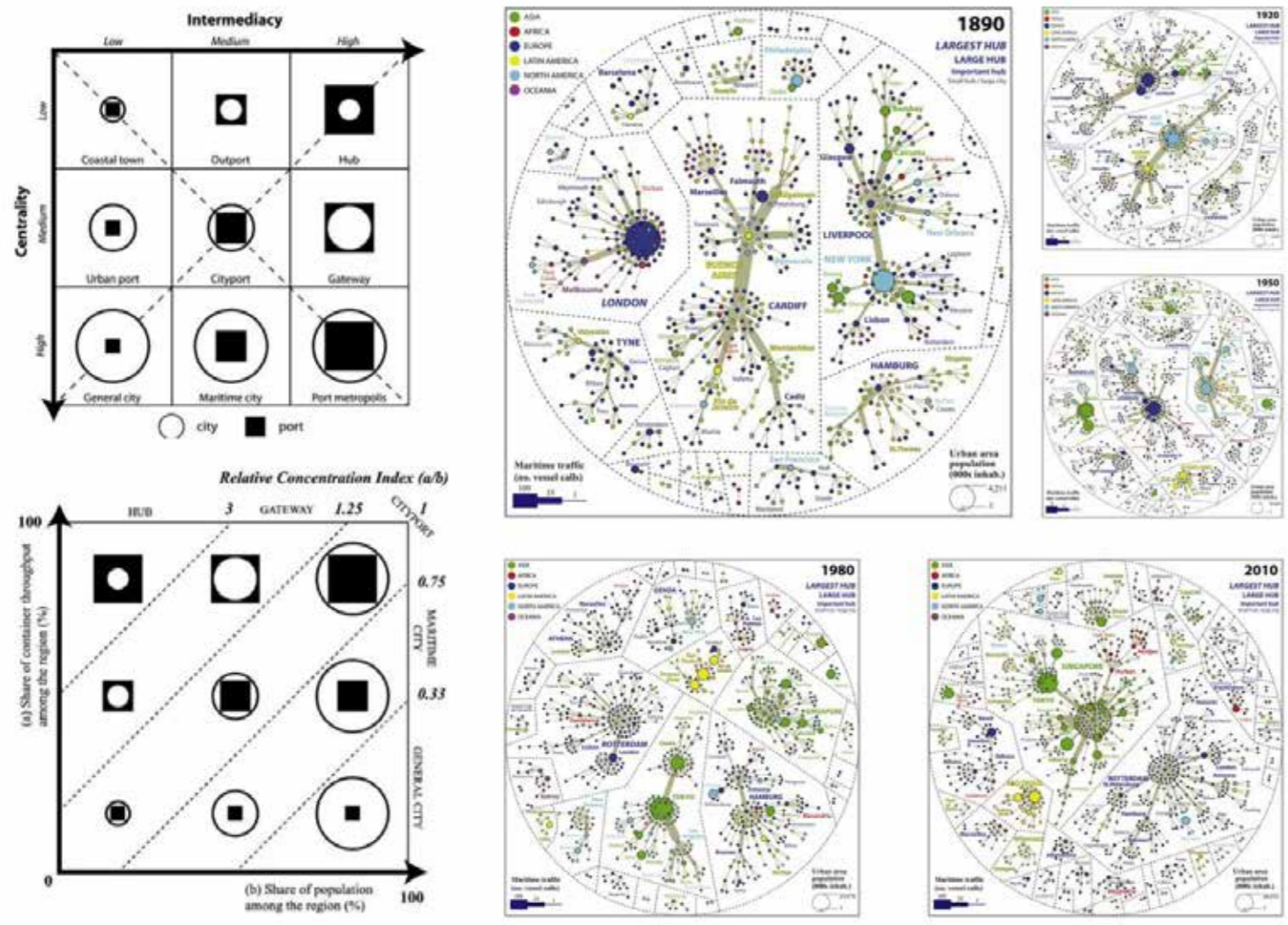
▼ Photo / 06 Port of Hammerfest, oil- and gas terminal

» ... maritime business itself is probably the most globalized industry ... A Greek-owned vessel, built in Korea, may be chartered to a Danish operator, who employs Philippine seafarers via a Cypriot crewing agent, is registered in Panama, insured in the UK, and transports German made Cargo in the name of a Swiss freight forwarder from a Dutch port to Argentina, through terminals that are concessioned to port operators from Hong Kong and Dubai. «

HOFFMANN AND KUMAR, 2010, P. 36



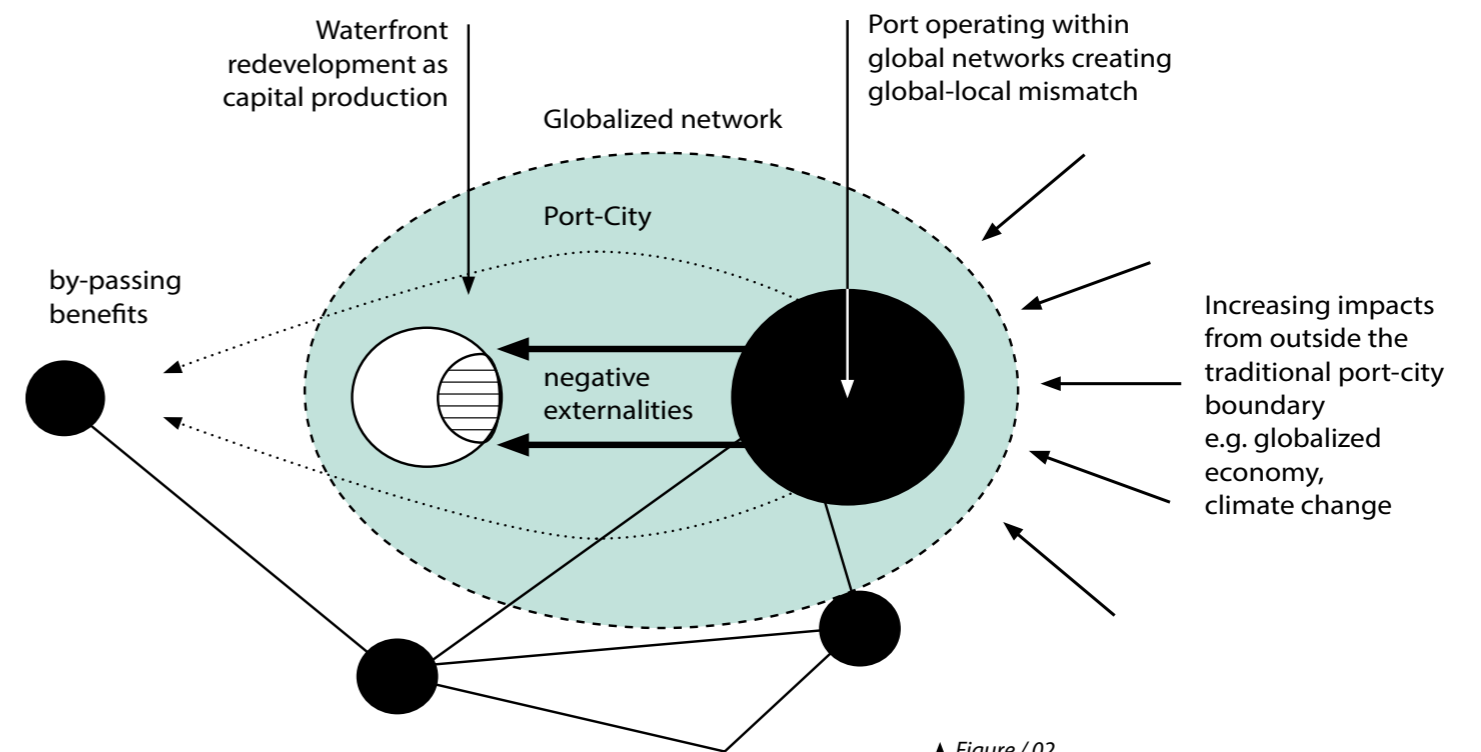
PORT-CITY RELATIONSHIP



▲ Figure / 01 Visualizations of the port-city relationship / (Ducret, 2005, Ducret and Lee, 2006 in Hein & Mil, 2019, p. 5) and shipping networks in relation to ports and city locations, 1890–2010 (Ducret et al 2018 in Hein & Mil, 2019, p. 5).

Away from the Port-City Interface

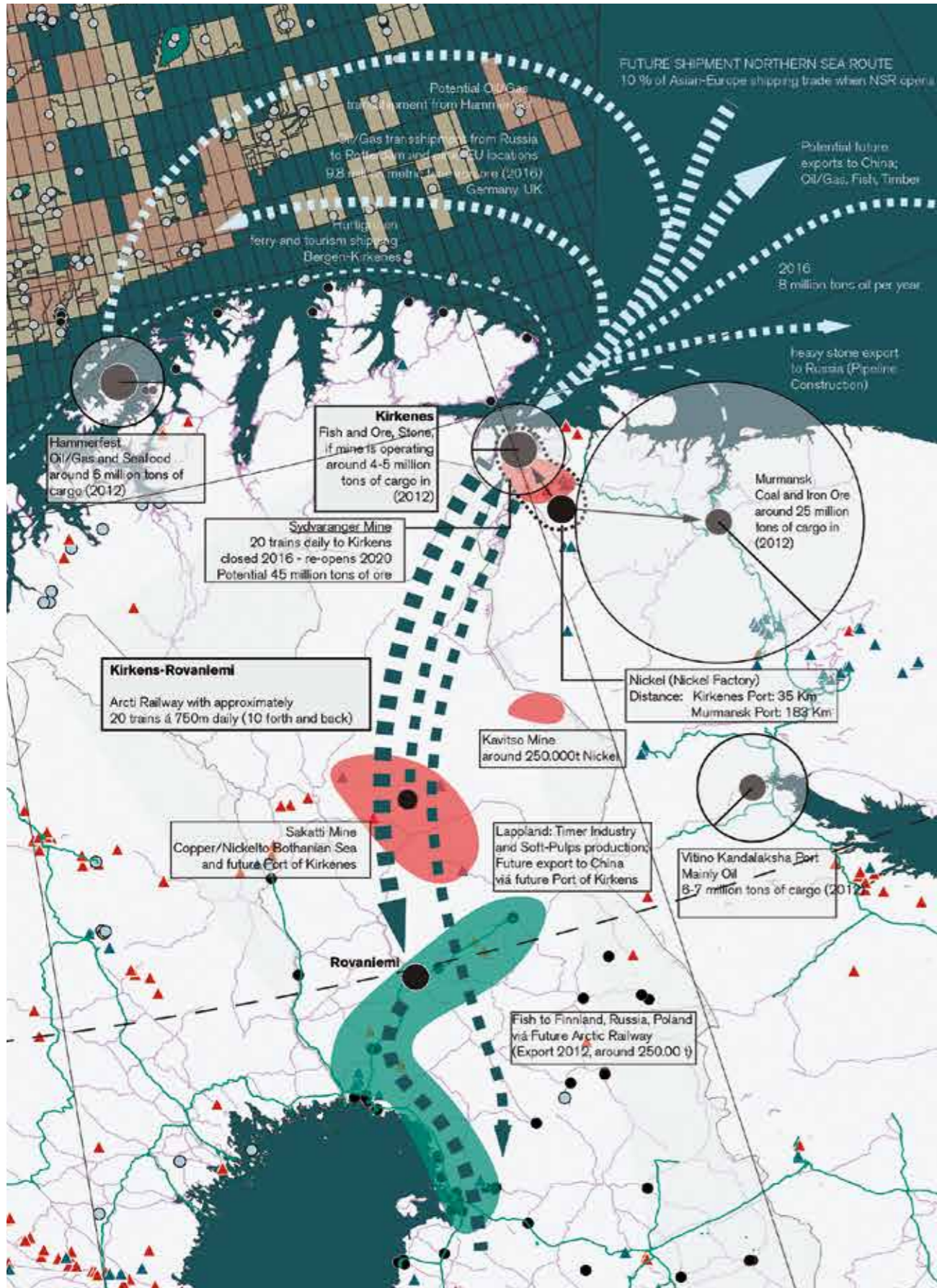
- Already far beyond the **transition models of the 1960s** where **containerization** reshaped the **waterfront** of Port-Cities world wide
- The **spatial, societal, economic and environmental** benefits and impacts **emerge outside** of the traditional **Port-City entities**
- **New approaches** from different fields of profession, such as for example the **modeling of Port-City relationships** by **economic geographers**
- Nonetheless **abstract modeling** approaches often focus on **flows of goods and economic values**



▲ Figure / 02 Current changes within Port-Cities / Höller

PORT-CITY KIRKENES VISION

Map / 12 Future shipment and logistic flows / Höller



10 % of Asian-Europe Shipping Import goods is transported on this railway line with a rail link to Finland continuing to Scandinavia, the Baltic countries and Western Europe:

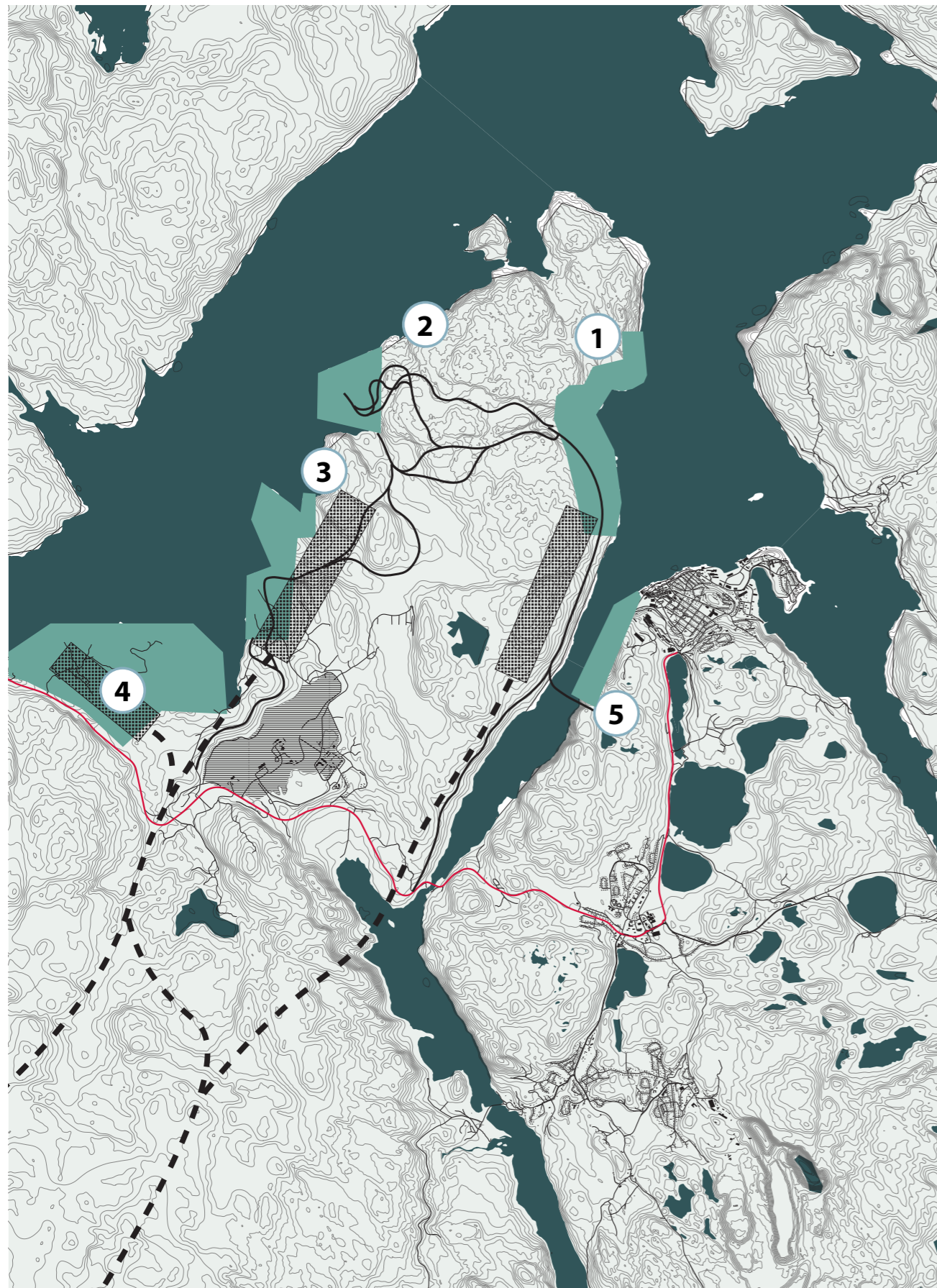
- 10 southbound container trains per day from Kirkenes to Finland and on to other destinations (20 trains daily forth and back)
- 550,000 containers transloaded per year – or 37,000 containers per month – from Asia via the Port of Kirkenes (74,000 containers TEU per month forth and back) during a 7.4-month navigation season
- Expected: 400-600 people direct employment in Kirkenes
- Terminal port in Kirkenes must have equivalent or greater capacity than the Port of Gothenburg.
- Projected container traffic between Asia and Europe may threefold in 2040: even a share of 3-4% of the combined container imports from China, Taiwan, South Korea and Japan to Northern Europe would generate comprehensive activity
- Connecting mining, timber and tourism industry in Finland as potential off-season sectors

Figure / 03 Kirkenes the Rotterdam of the North



PORT-CITY KIRKENES VISION

▼ Map/13 Port development / Höller



1 Leirpollen

Kirkenes together with Norterminal AS, is currently investigating, if and how suitable the location Leirpollen, north east located is. This area could function as a new main-terminal for an integrated Kirkenes port solution as well as reloading terminal for oil products or transport of large volumes.



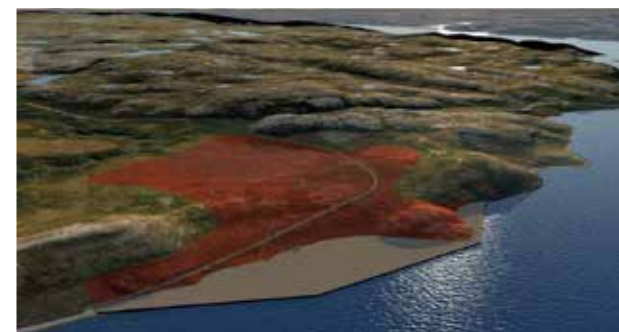
2 Gamnes

Gamnes could function as new oil and gas transshipment terminal. Norterminal AS currently has a floating and temporary solution for such transshipments close to the area.



3 Pulkneset

Pulkneset could become the new oil related base for future explorations in the Barents Sea.



4 Høybukta west

Nest to Leirpollen, also Høybukta west is in discussion as one suitable solution for a new Kirkenes Maritime Park. The filled in area on the illustration is approximately four square kilometer wide and would offer an industrial park next to the docks and quays.



5 KILA (Kirkenes Industrial Logistic Area)

A 1 million m² large area, proposed by Tschudi AS to increase the Companies maritime transport and logistic capacity. Furthermore it could include a combined solution for services for the oil and off-shore industry.

◀ Photos / 07-11 Port developments planned

PROBLEM STATEMENT

Port-City Regions at Risk

Port-City Regions need to accommodate a growing economy as well as **space and functions for the expanding city** and region

Ports are increasingly imprinting their 24/7 economic dynamics on cities, the transitional hinterland and the aquatic foreland

Soft Values such as societal/cultural values, environmental sustainability, nature inclusion as well as spatial characteristics **overshadowed by hard values such as the economic and technological development.**

New approaches on port-city regions increasingly need to **focus on renewed governance** between the multiple needs and wishes of the port-city's stakeholder

New approaches on port-cities therefore need to be **imaginative, instead of only technocratic approach** in designing and planning the port city (Hein, 2019)

Arctic at Risk

The often remote and **natural and cultural state** of those regions is **endangered by a dyadic impact of natural and anthropogenic activities.**

A growing **mismatch between local and global needs** sets the often fragile natural as well as societal system of the north under pressure.

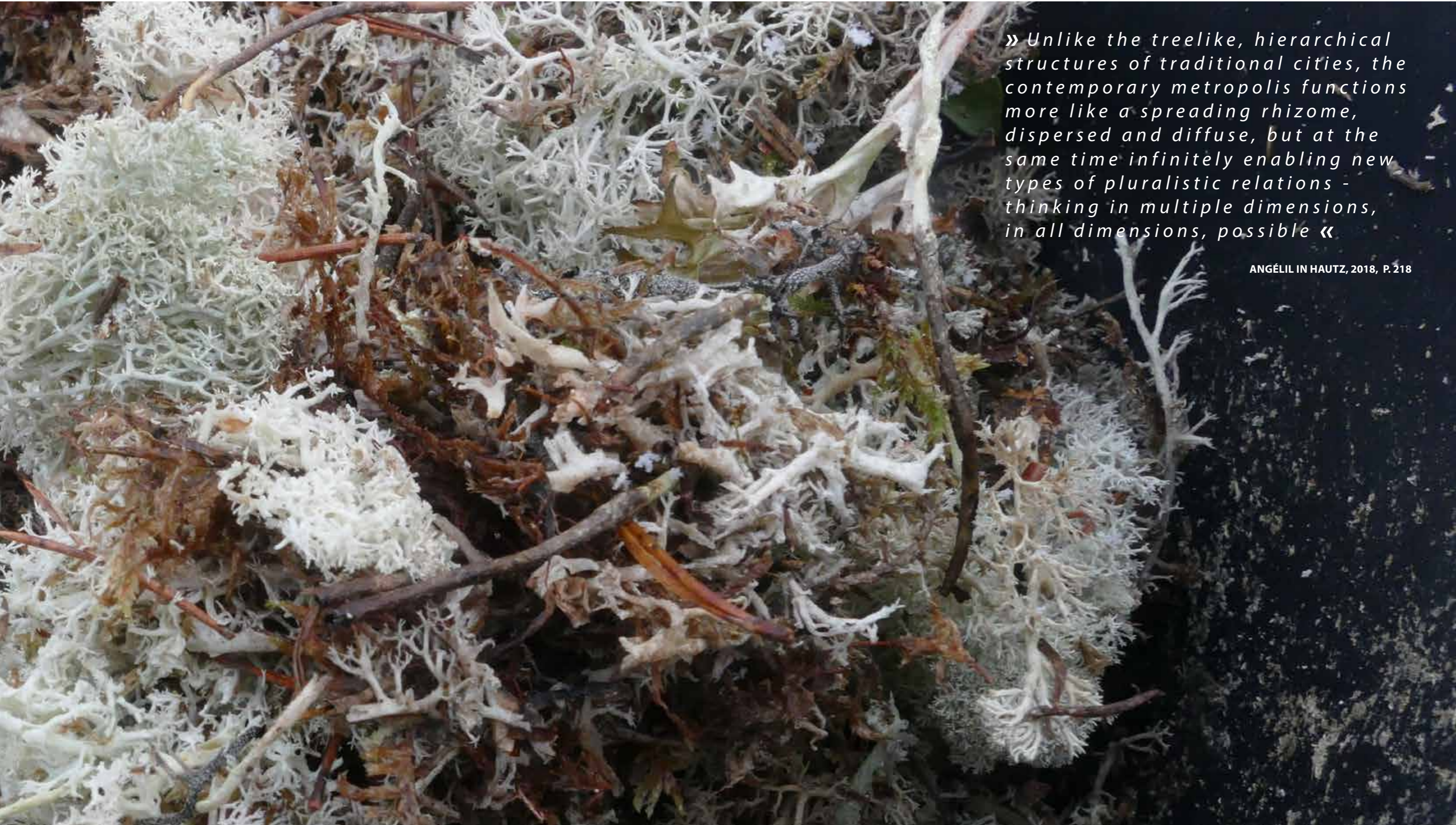
Many urban areas above the arctic circle are **trapped within a load of path-dependency** due to a long history of heavy industry, mining or forestry.

New perspectives for nature and humans need to be offered to **sustain the natural qualities on the one hand, and the societal/cultural well-being of its inhabitants on the other hand.**

Need for **rethinking of ongoing territorialisation and industrialization** processes

03 METHODOLOGICAL FRAMEWORK

▼ Photo / 12 Lichen / Höller



» Unlike the treelike, hierarchical structures of traditional cities, the contemporary metropolis functions more like a spreading rhizome, dispersed and diffuse, but at the same time infinitely enabling new types of pluralistic relations - thinking in multiple dimensions, in all dimensions, possible «

ANGÉLIL IN HAUTZ, 2018, P. 218

METHODOLOGY RESEARCH AIM



Focus on a spatial and local-specific, actors- and values-based approach to research and design sustainable and resilient port-cities

A renewed perception of old and **limiting concepts** like the static and line-like management **interface** between (in the meaning of separating) port and city and **away from the waterfront paradigm** as the only design concept

A **space-based** approach **focusing on social, cultural and environmental values** focusing on the integration of the territorial and economic logics of the port into the city and regional environment **complementing existing modelling approaches** of port-cities by Economic Geographers

Imaginative and experimental approaches, rather than technocratic ones, can have the possibility to perceive the **Port-City Scape** as a **dynamic space of flows** which is adding a new perspective beyond traditional approaches and widening the research into the “scapes” where the **physical reality of human and natural life takes place.**

A focus on the operational power of planning and design as a tool to **overcome the institutional separation** of port and city thus it can become the **mediator between all interrelated stakeholders**, their values and visions within the port-city region

METHODOLOGY RESILIENCE AND SUSTAINABILITY

RESEARCH STATEMENT:

In spatial planning and design the port, city and ecology should be considered agents within one ecosystem.

▼ Photo / 13 Reminder for the need for a resilient future in Kirkenes / Höller



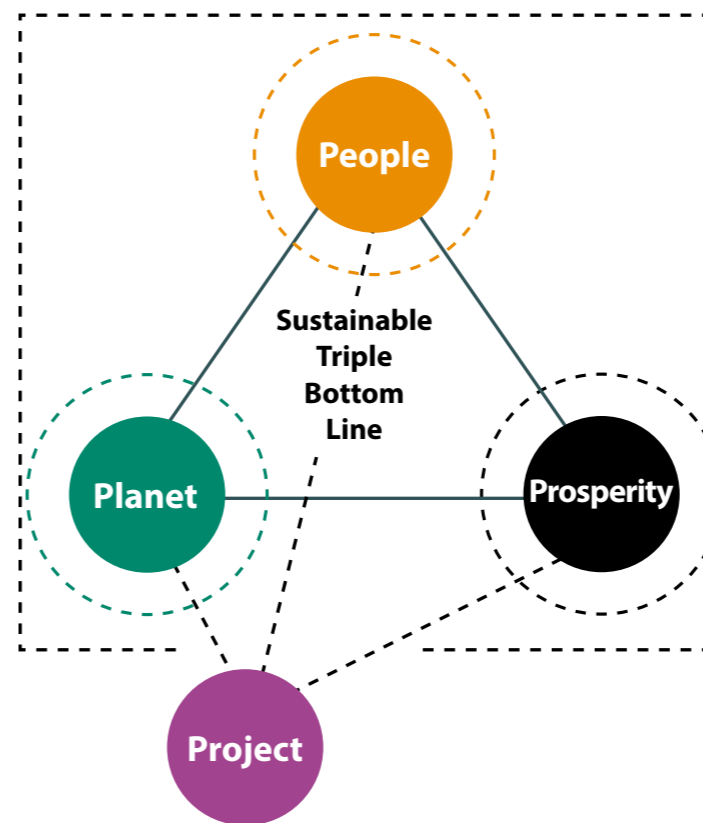
» (...) historical resilience of port cities is embedded in a maritime mindset or port city culture based on a strong and dedicated collaboration among diverse groups of public and private actors from different backgrounds around shared values. «

HEIN, 2020

RESEARCH QUESTION:

How to **re-integrate the currently not aligned systems** of people, planet and prosperity in a **Port-City Scope** to create an **adaptive and sustainable ecosystem?**

▼ Figure / 04 Triple Bottom Line / Höller



Sustainability through Synergy: Triple Bottom Line

People: The positive and negative impacts decisions and developments have on different stakeholders of the societal realm.

Planet: The positive and negative impacts decisions and developments have on the natural environment.

Prosperity: the positive and negative impacts decisions and developments have on the local, national and international economy.

METHODOLOGY SYNERGISTIC ADAPTIVE ECOSYSTEM

RESEARCH STATEMENT:

The Port-City Scape ecosystem is an synergistic and adaptive ecosystem in which needs of the port, city and ecology are united and together create synergies between multiple agents (global-local, economy-ecology-society) through their interrelated flows of values and needs.

▼ Photo / 14 Polarlights near Kirkenes / Höller

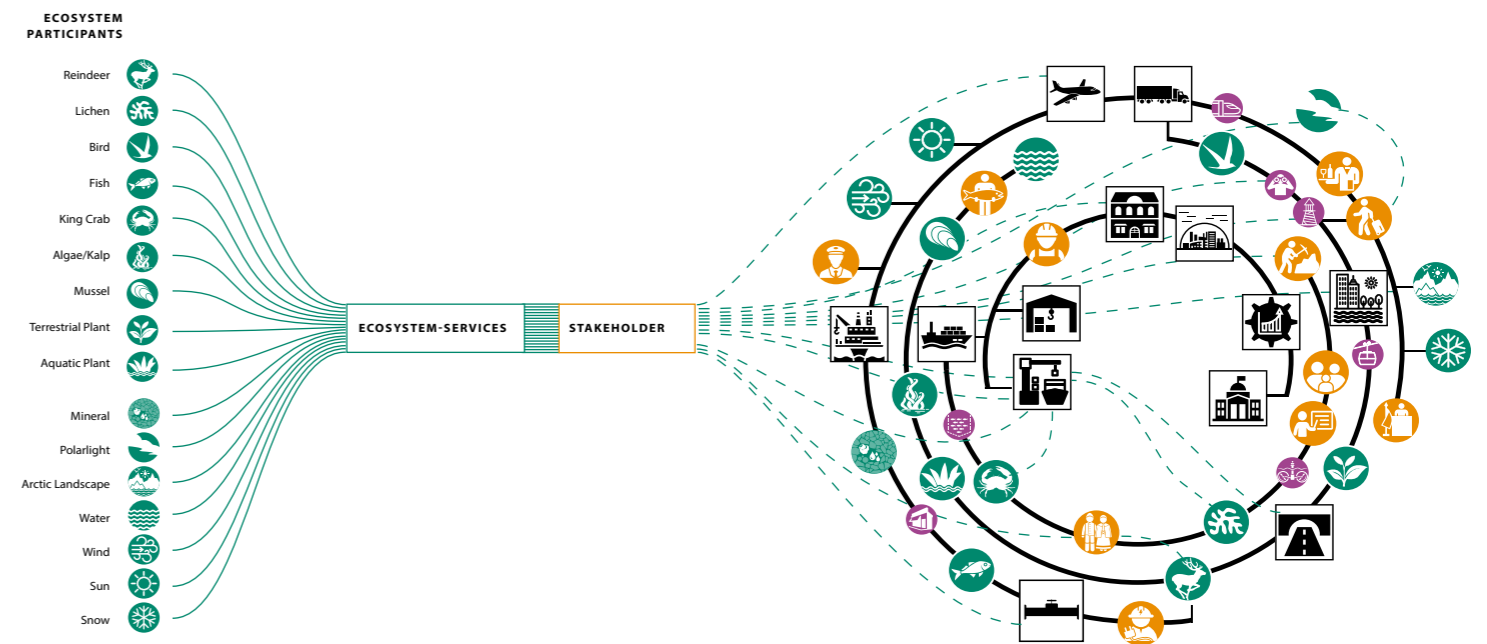


» Only a design project taking into account this bigger landscape picture is able to deliver a realistic fundament for a city development under the conditions of precariousness.«

L. DIEDRICH, 2013, P. 3

RESEARCH SUB-QUESTION 1:

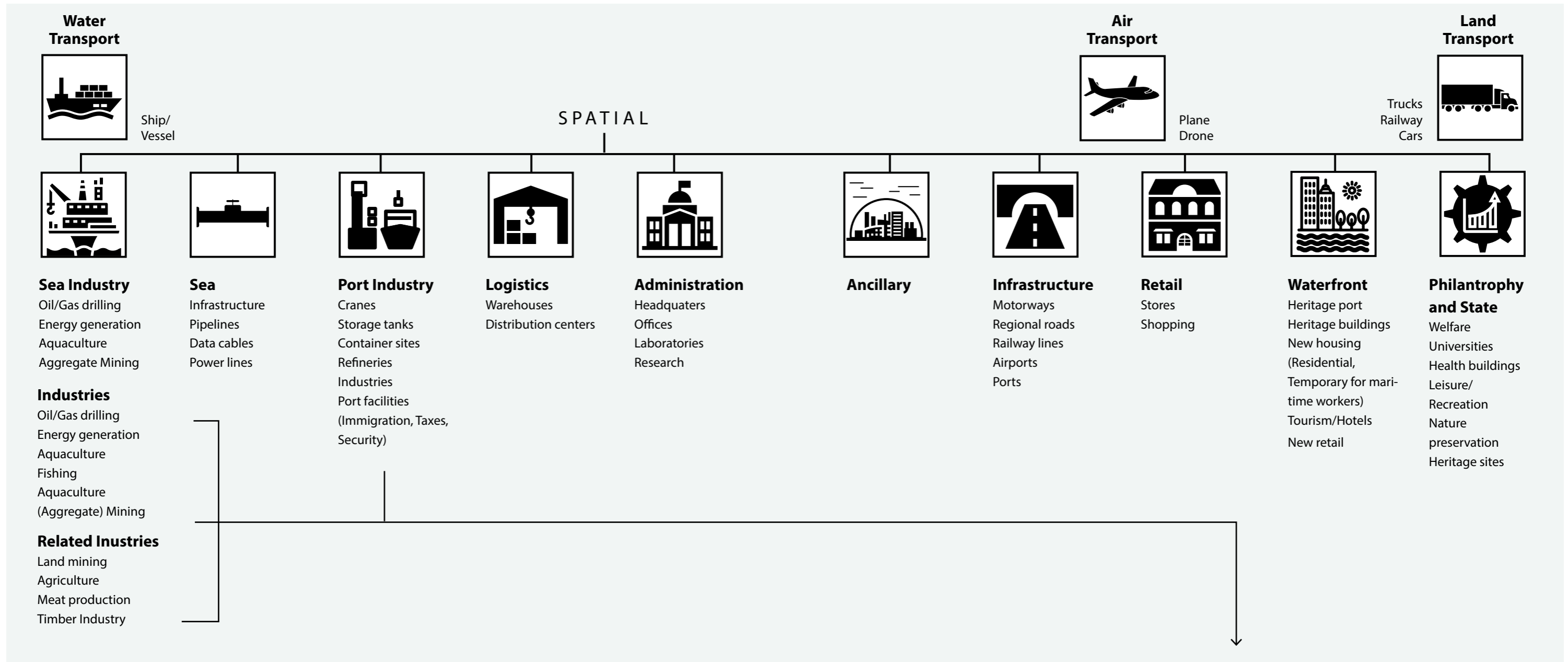
How to **conceptualize city and port as different but complementary realities** and how to make sense of the **inescapable liminality** of the port-city milieu being **inbetween local and territorial as well as inbetween contradictions and synergies?**



▲ Figure / 05 One Port-City Scape Ecosystem / Höller

METHODOLOGY PORT-CITY SCAPES

▼ Figure / 06 Hein, C., 2019, p.4, Port Cityscape / adapted by Höller



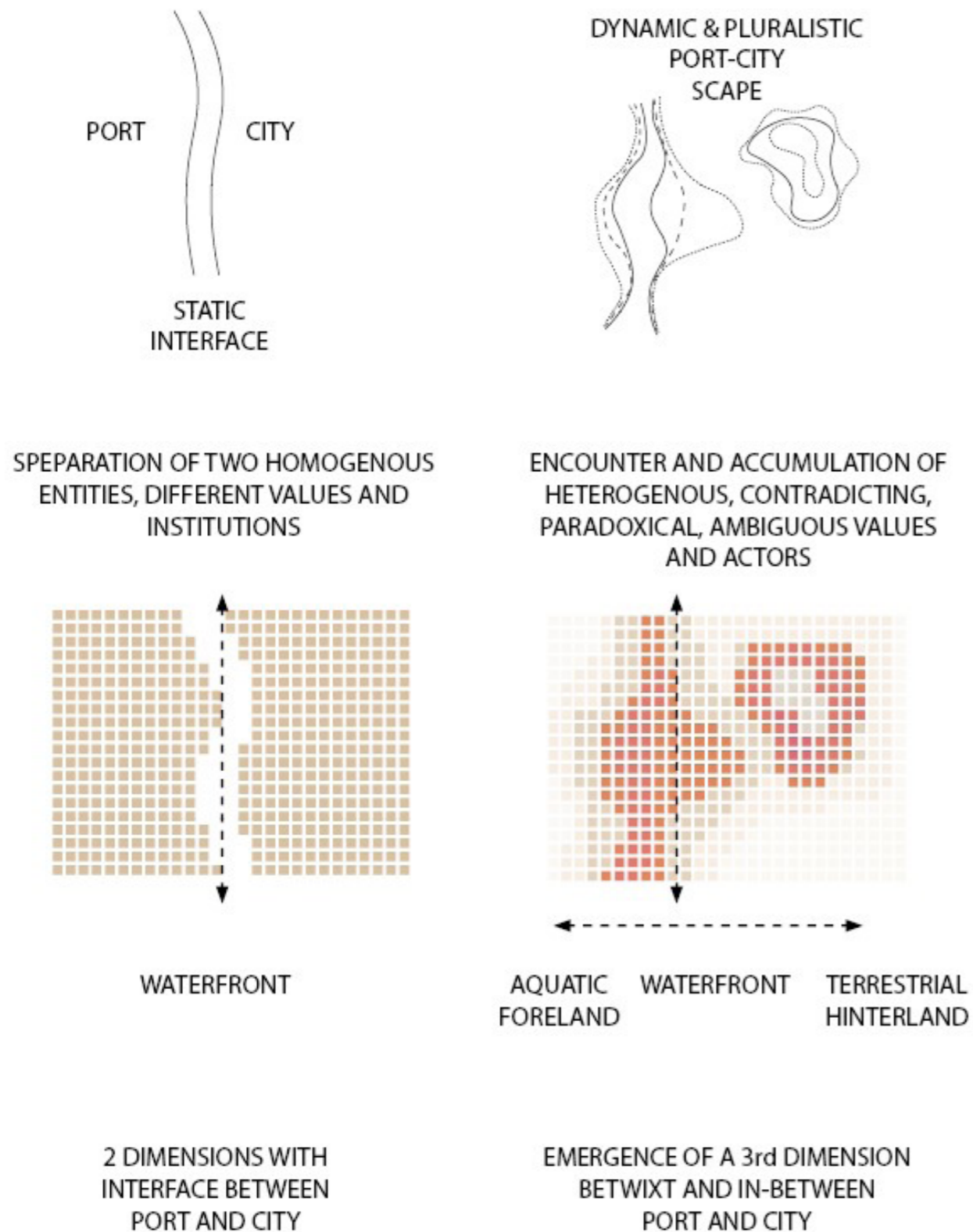
Negative Provisions

- Air emission
- Degrading water quality
- Soil pollution, erosion, dredging
- Waste production
- Loss of biodiversity
- Noise
- Health impact
- Aesthetic impact
- Spatial conflict

Positive Provisions

- Employment
- Urban Development
- Increased Mobility
- Increased Supply
- Regional Value
- New Markets

METHODOLOGY PARADO[$\frac{x}{s}$]YNERGY



Port-City Parado[$\frac{x}{s}$]ynergy



Shifting the perception of the port-city relationship **away from a static, line-like interface** of management between (in the meaning of separating) port and city **towards dynamic and pluralistic “scapes” betwixt** of in-between (in the meaning of belonging to both) **port and city**.

Focus on in-between scapes, where **port and city become intertwined and embedded** within each other.

Multiple liminalities emerges an **additional dimension** in-between the **territorial economic force of the port and the local urbanity and culture of the city**

This new dimension between port, city and region, the so called **“Paradoxsynergy Scape”**, is filled with the **heterogeneity and in-comparability of different interrelated values of the stakeholders and their often oppositional and competitive interactions**

Port-City Scapes as one **synergistic adaptive ecosystem**, in which needs of the port, city and ecology are united

▲ Figure / 07 Paradoxsynergy concept / Höller

METHODOLOGY SYNERGISTIC ADAPTIVE ECOSYSTEM

▼ Figure / 08 Theoretical Framework / Höller

Synergy as the science of “how things work together”

Cognitive ability to **accept the coexistence of contradictory elements** sets stage for **using the tensions** between those elements as an **opportunity for creativity**

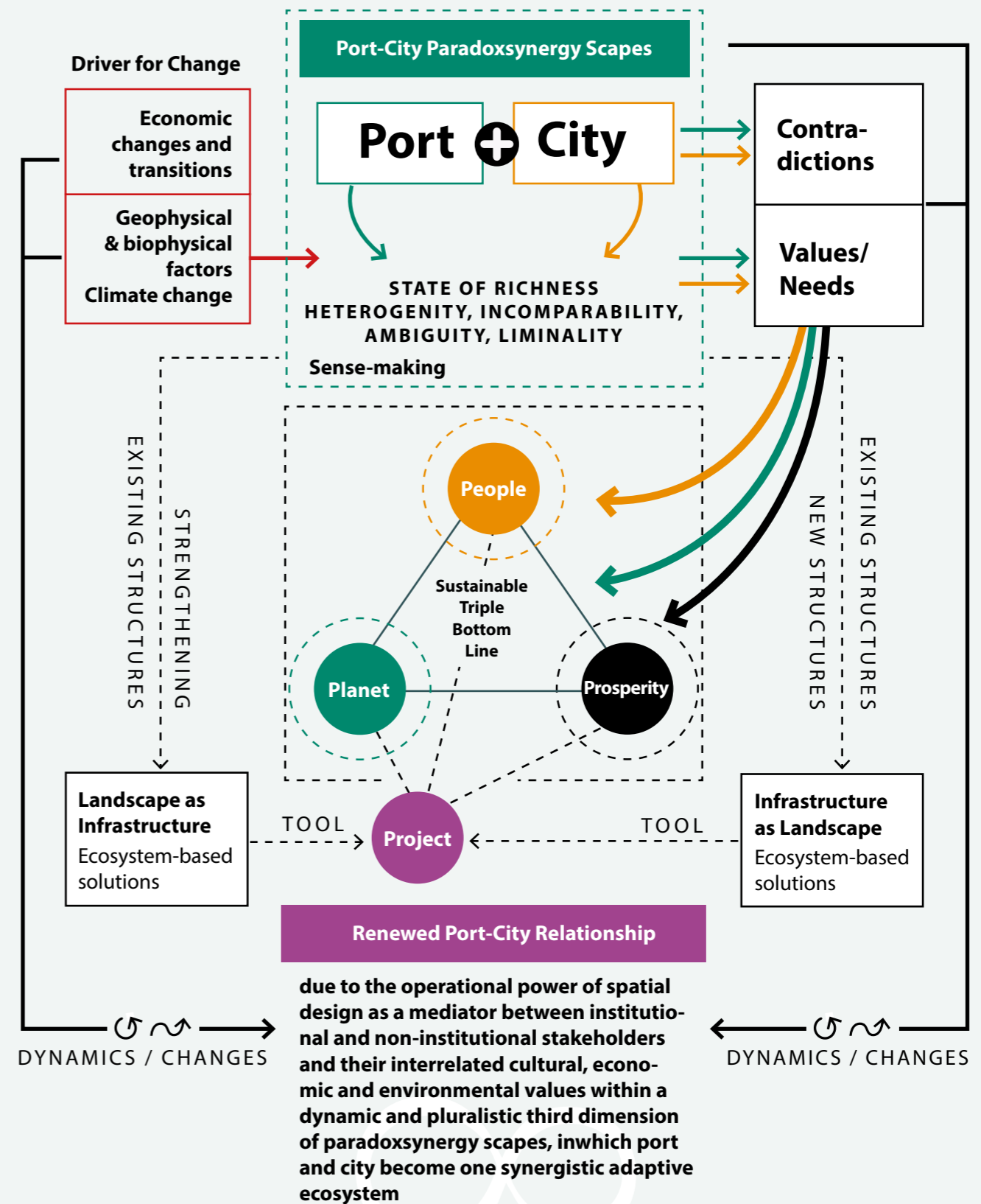
The **transition of the Paradox-Scape into a Synergy-Scape** through sense-making and by **finding combined and shared values**

Synergistic approach can help to understand interrelations within or in-between systems and can **aim to facilitate creative learning and anticipatory thinking.**

Important in high dynamic environments like Port-City Scapes, where many different stakeholders reach for addressing their needs and wishes.

Emergence of synergy creates a **Port-City Ecosystem as a whole, which is bigger than its single parts alone**

Third Dimension of Port-City Encounter



METHODOLOGY SYNERGISTIC LOOP

RESEARCH STATEMENT:

The Port-City Scape ecosystem is an synergistic and adaptive ecosystem in which needs of the port, city and ecology are united and together create synergies between multiple agents (global-local, economy-ecology-society) through their interrelated flows of values and needs.

▼ Photo / 19 Landscape around Kirkenes / Höller

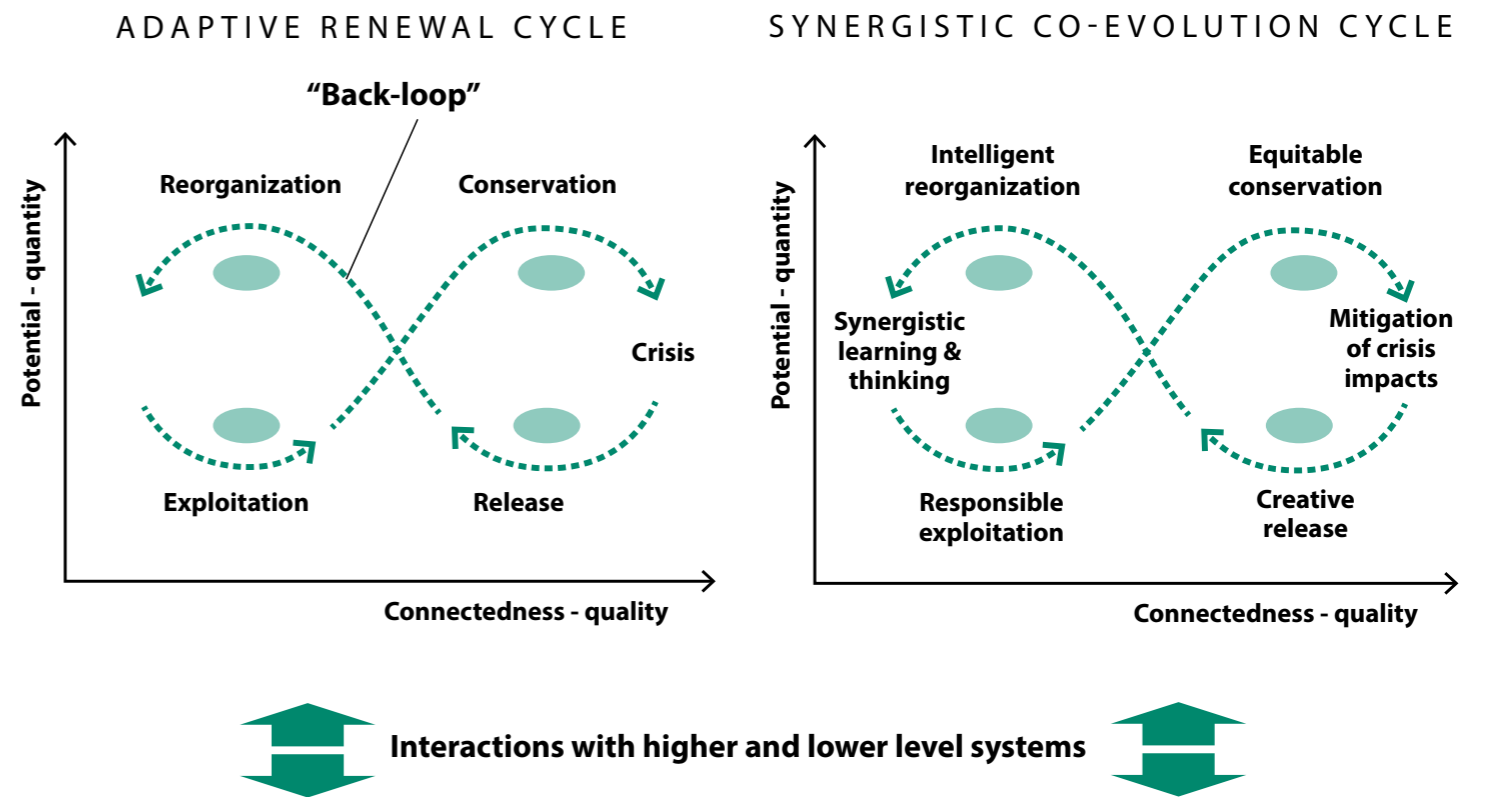


» Synergistics'-the science of synergy, or how things work together' «

J. RAVETZ, 2013, P. 5

RESEARCH SUB-QUESTION 2:

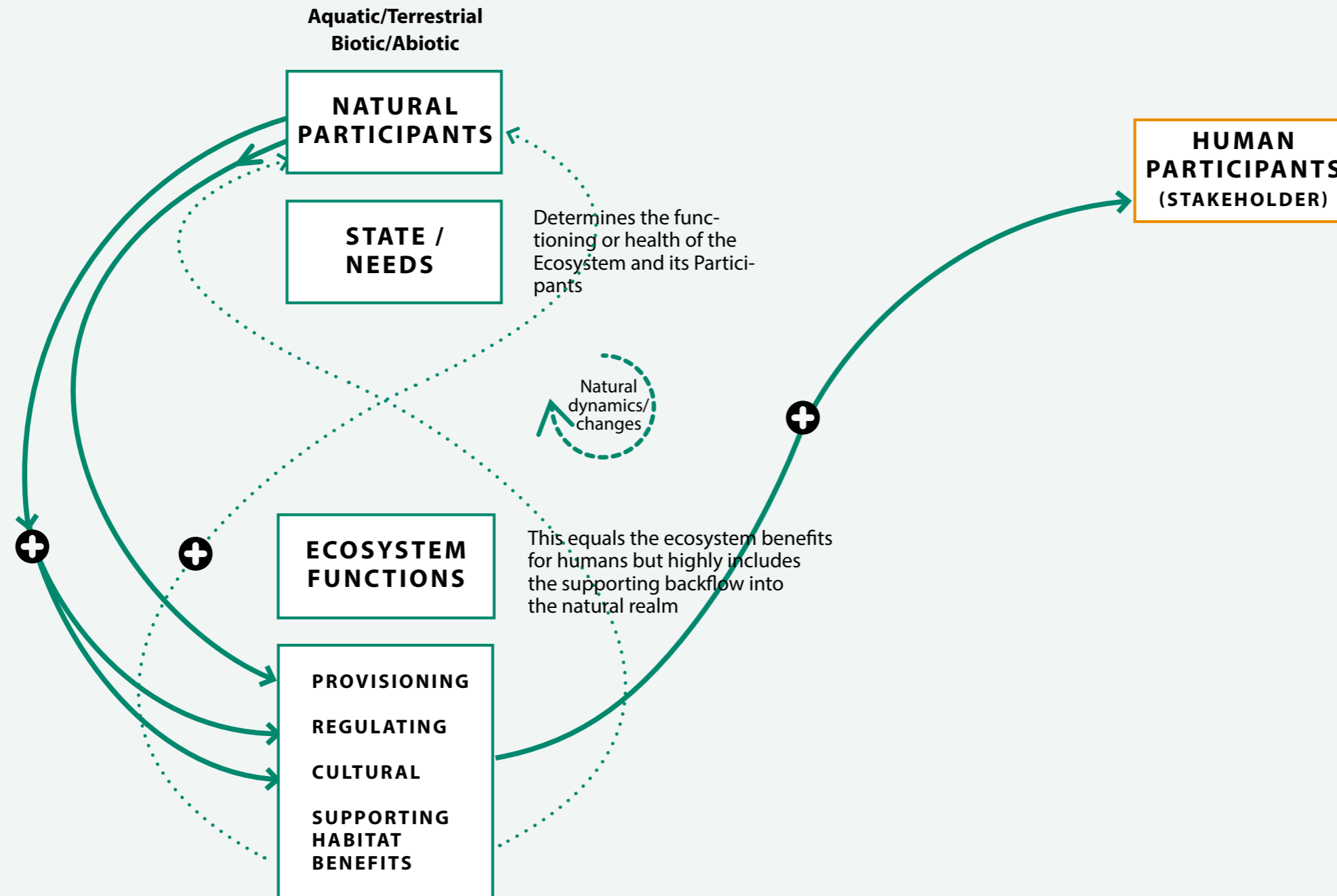
How can the concept of **ecosystem-participation** help to **research and design** the Port-City Scapes to be able to use it as a **strategic tool** to drive a **sustainable/resilient development** of the Port-City Scapes?



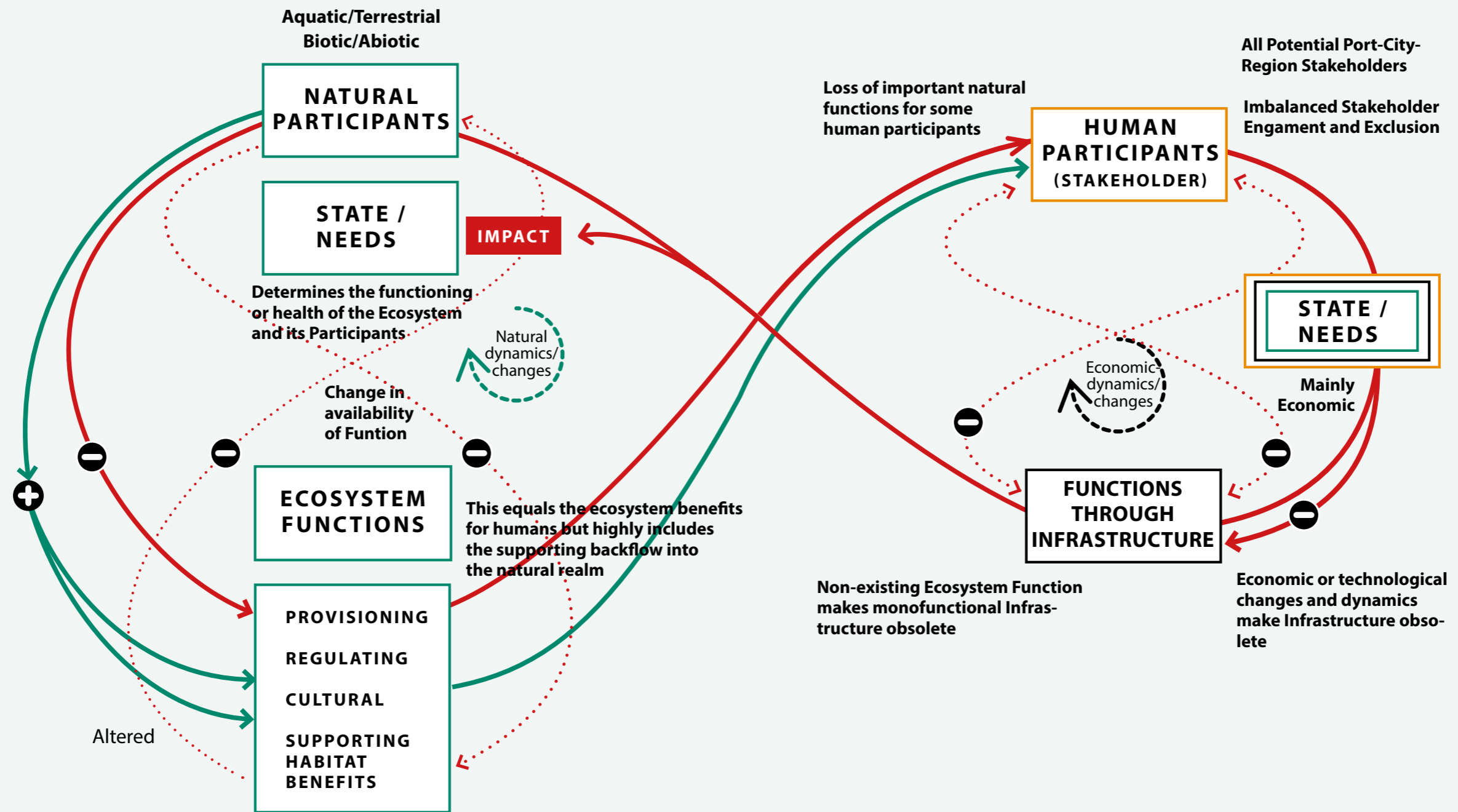
▲ Figure / 09 Adaptive and synergistic cycles

CONCEPTUAL FRAMEWORK PORT-CITY SCAPES AS SYNERGISTIC ADAPTIVE ECOSYSTEM

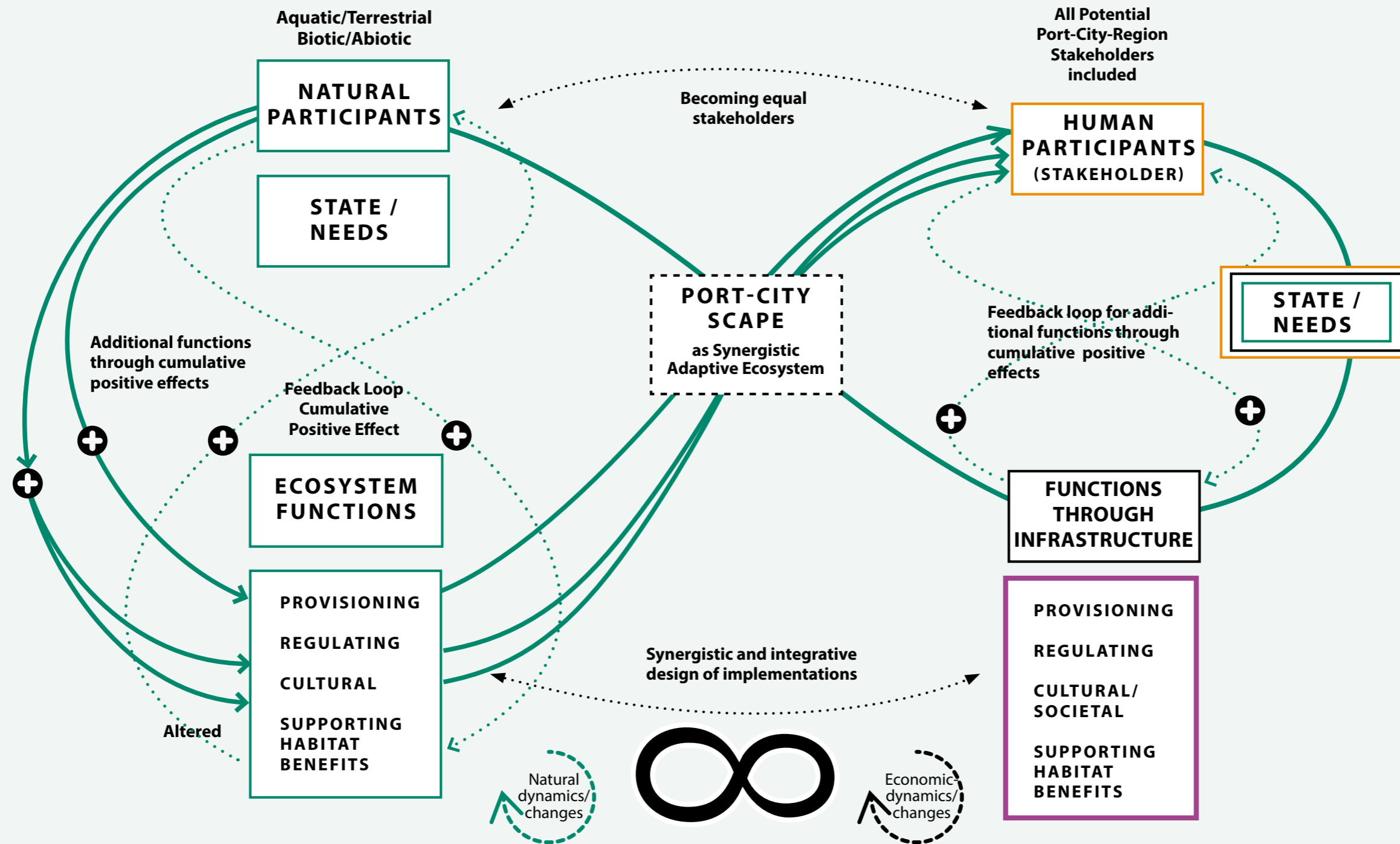
▼ Figure / 10 Synergistic Cycle I / Höller



▼ Figure / 11 Synergistic Cycle II / Höller

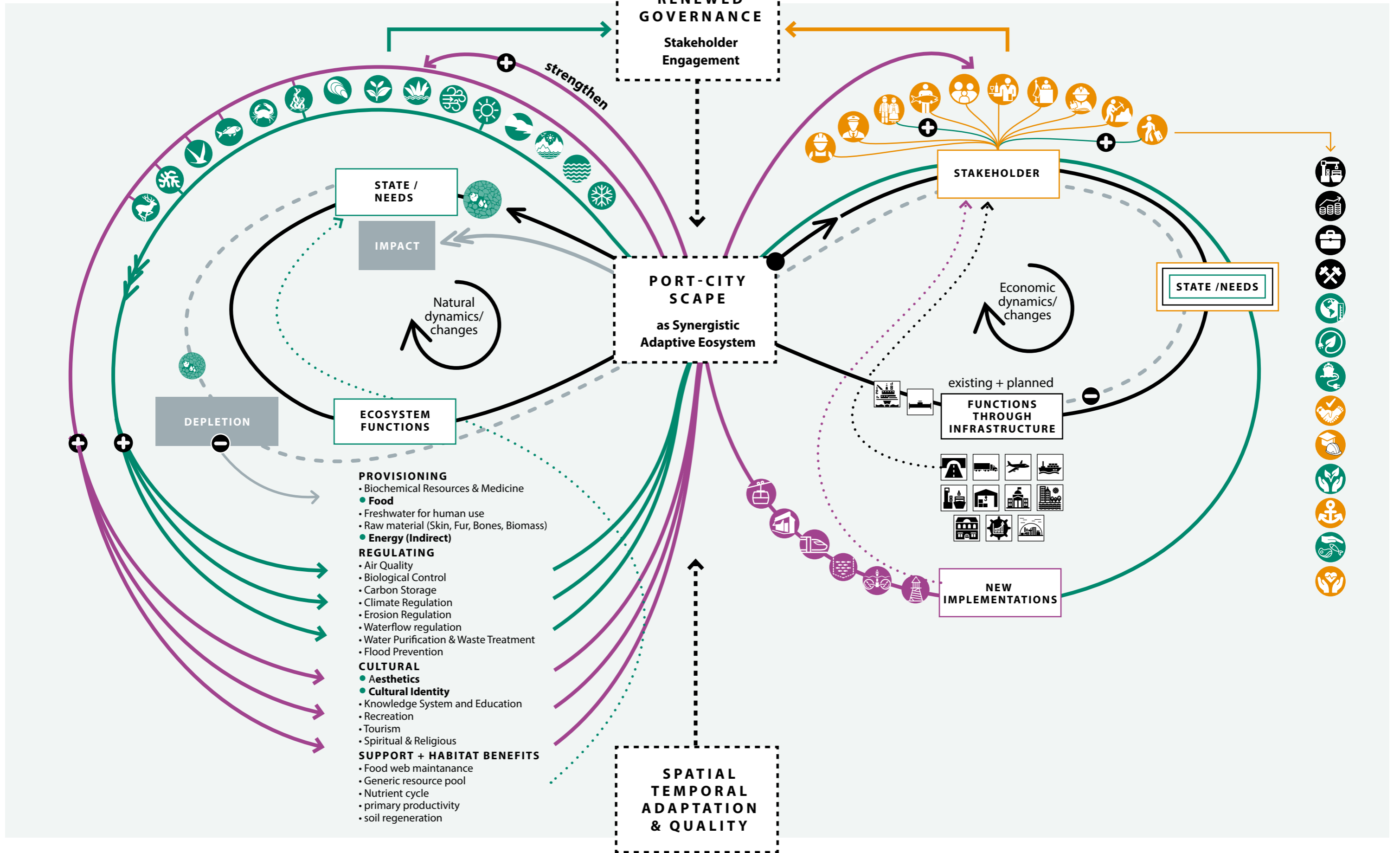


▼ Figure / 12 Synergistic Cycle III / Höller



Defined goals for sustainable and adaptive Port-City Region adapted from the AIVP Agenda 2030

▼ Figure / 13 Port-City Scope as Synergistic Adaptive Ecosystem / Höller



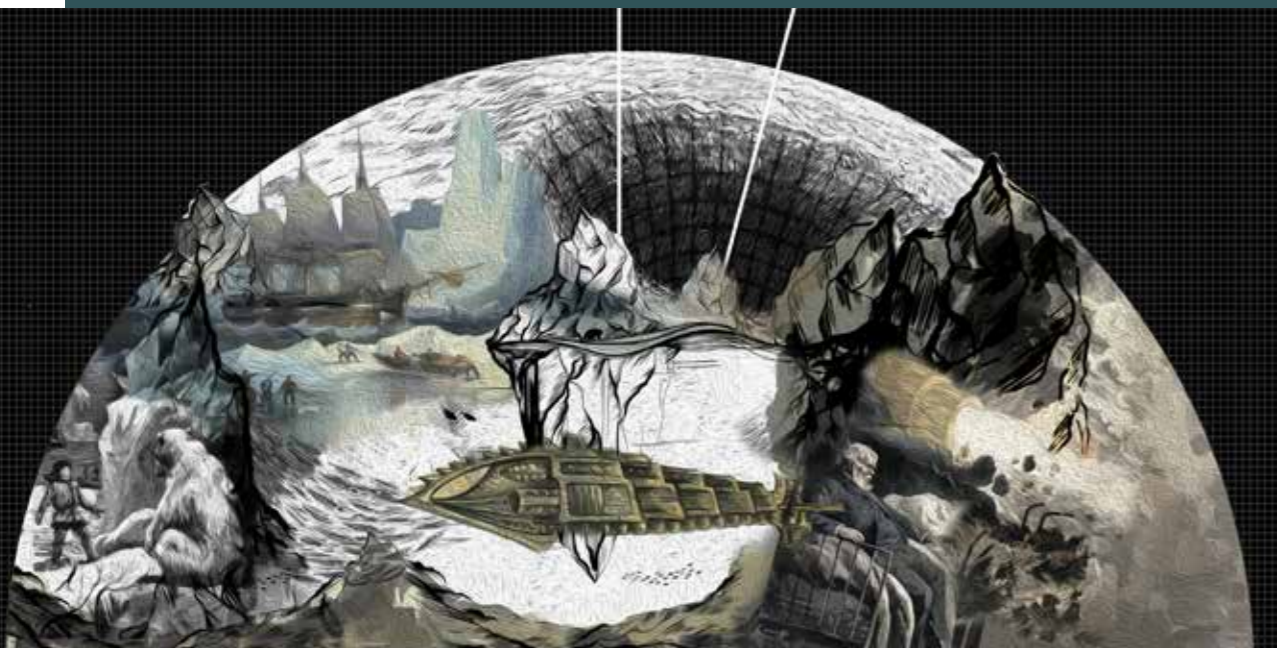
METHODOLOGY DESIGN FICTION

RESEARCH STATEMENT:

Spatial planning and its holistic concepts can help to complement the research and design of port-cities and can function as a mediator between the two institutions as well as between the multiple and often contradicting values and needs.

Thus spatial planning can create the stage for potential coexistence of local specificities of the city and territorial generics of the port, which turn into synergies, creating a whole (Port-City Ecosystem), which is bigger than the sum of its single parts.

▼ Figure / 01 Arctic as Science Fiction / Höller

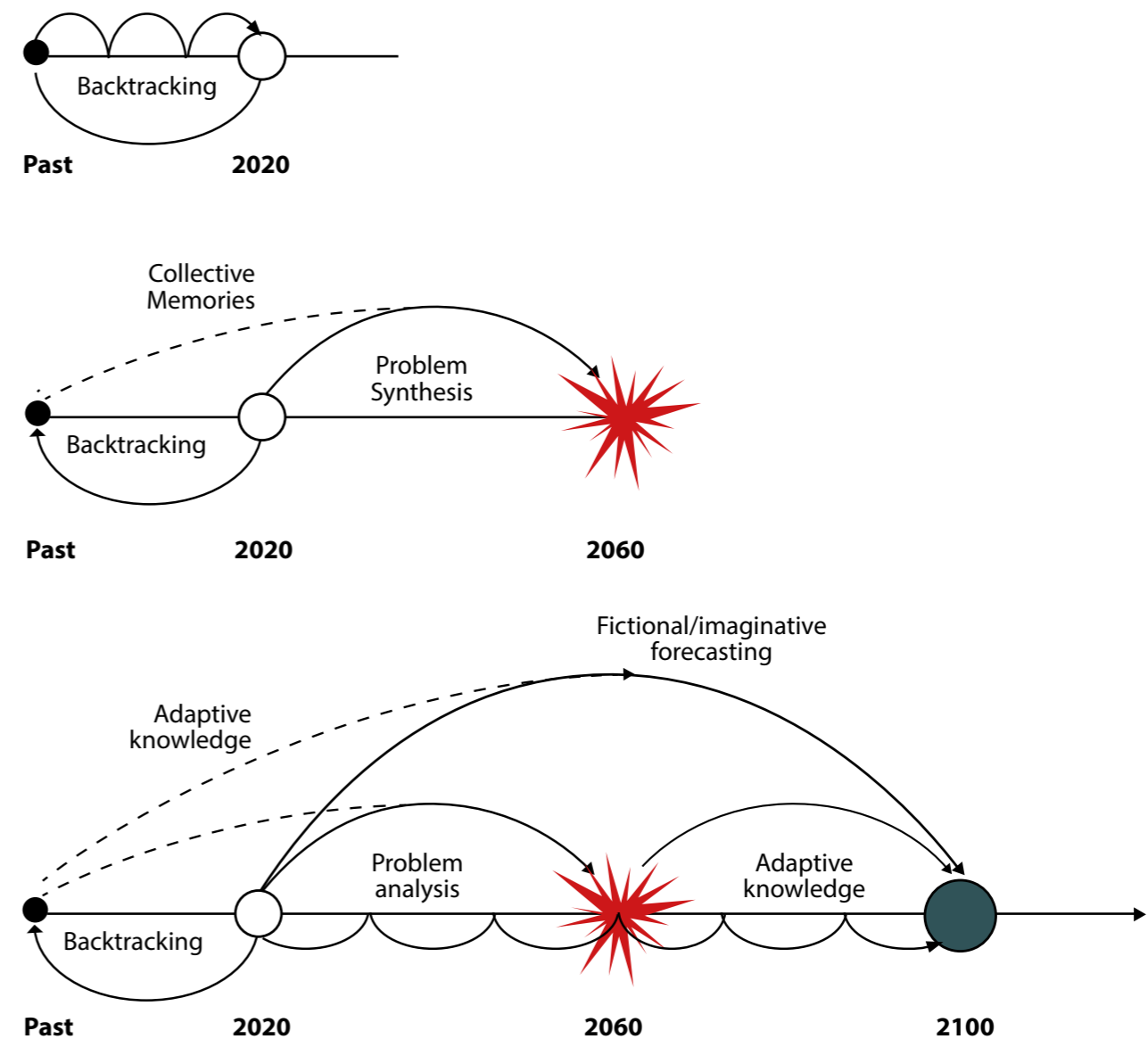


» It is unknown, thus science fiction provides opportunities for an epistemological vision of a future in which it is known. «

KAMPEVOLD & HEMMERSAM, 2018, P.45

RESEARCH SUB-QUESTION 3:

How can the **concept of Design Fiction** help to research on the **performance** of Port-City Scapes and what **forms of synergy and coexistence** those Port-City Scapes can emerge to be able to **create overall social, economic, environmental and institutional** sustainability/resilience?



▲ Figure / 15 Forecasting, Backtracking, Backcasting

04 ANALYSIS KIRKENES PORT-CITY SCAPE

▼ Photo / 20 Kirkenes, Northnorway / Höller

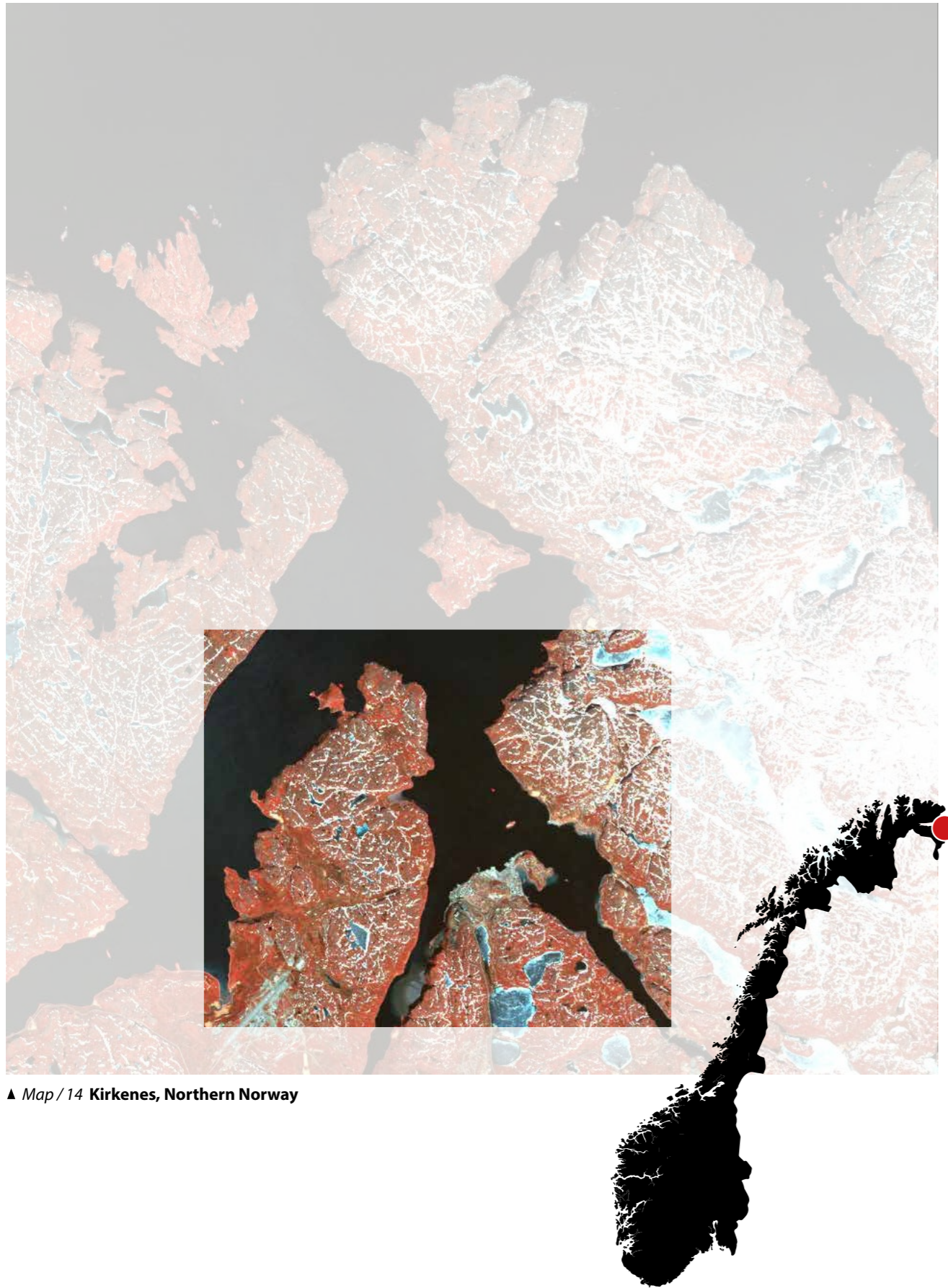


» ...to direct and realize the transformation of CityPorts as a sustainable combination of port functions, city functions and living functions... «

and » ...to interrelate the actors, not only the port and city, but also private companies, knowledge institutes and inhabitants... «

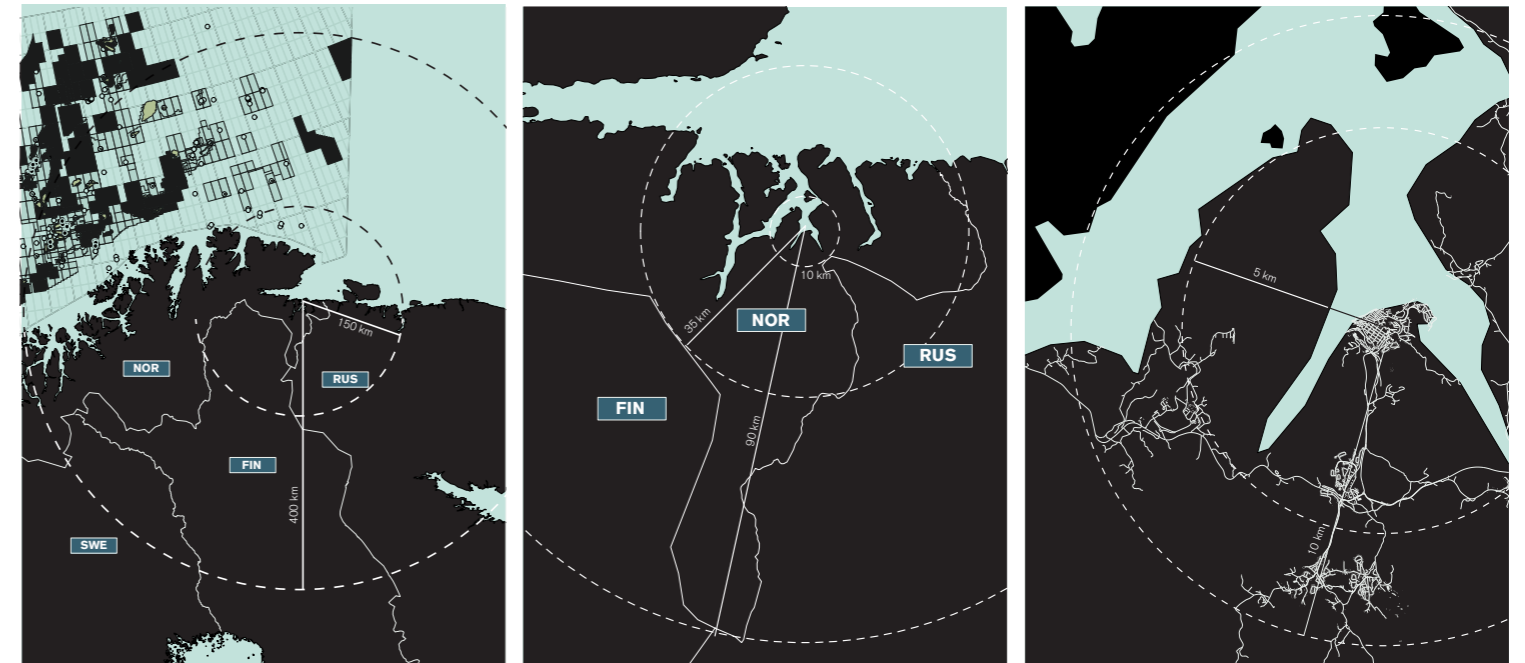
VAN GILS AND DAAMEN IN DESFOR, LAIDLEY, STEVENS & SCHUBERT, 2011, P. 88

KIRKENES PORT - CITY?



▲ Map / 14 Kirkenes, Northern Norway

- **Kirkenes and the municipality Sør-Varanger** (around 10.000 inhabitants) located around 400km above the Arctic circle in Northern Norway, Finmark
- Known as the **capital of the Barents Region** and the **gateway to the East**
- Located around 15km away from the Norwegian-Russian border
- Strategic importance as one of the main areas expected to change due to **increased navigability and new reachability** of resources within the European Arctic
- Foreseen to become **Europe's gate and new logistic node** towards the **soon-to-be ice-free Northern Sea-Route**, creating a 40% faster trading-route between Asia and Europe as part of China's "Polar Silk Road" Initiative



▲ Maps / 15-17 Setting / Höller

KIRKENES

PATH DEPENDENCY

▼ Photo/21 First Settlements, Kirkenes 1898



Pre-mining territory

- Before the big iron exploitation in 1906, land was used by the Sami for reindeer herding, fishing and living

Connection to nature

- Indigenous life-style has structured their worldview around elements and phenomena of the natural environment

Permeable Marshland

- Inter-territorial migration between the different states Russia, Norway and Finland
- Skolt Sami traditionally migrated within the territory between the location of today's Murmansk in Russia and Lake Inari in Northern Finland.

▼ Photo/22 Bird's Eye View Kirkenes Pre-WWII



Kirkenes As Mining Town

- Kirkenes founded in 1866, after iron ore was found in the close-by region around Bjørnevatn around 8 km away from the town
- Kirkenes as harbour town for the logistics of the extracted minerals
- Sydvaranger Mining Company was found in 1906 and depicts Kirkenes urban as well as societal characteristics until today
- Mining enterprise took care of many of the urban, economic, social and cultural needs and functions within the area, eg. electrification of company owned areas for over 80 years

▼ Photo/23 Mining Workers Losing Jobs



From Boom to Bust

- After several ups and downs of the unstable mining activities in Sor-Varanger, mining company goes bankrupt and mining gets abolished for almost 10 years
- Public amenities and infrastructure now owned by municipality
- Reopening attempt from 2009-2015 under new owner but failed due to unprofitable market conditions
- Large amounts of the restructuring funds used to keep mine alive (40 Million NOK)

KIRKENES

PATH DEPENDENCY

▼ Photo / 24 Welcome to Kirkenes



Reinveting Kirkenes

- Since 1980 Kirkenes and municipality of Sør-Varanger constantly receive state support for restructuring the economy
- From around 5300 employed people almost 48% work in public/municipal service
- Port and maritime industry profited from the abolished mining activities
- City and municipality trying to reinvent the city
- Kirkenes Border City
- Kirkenes as Political Place
- Kirkenes as Integrative City

▼ Photo / 25 Iron miners set for a restart in Kirkenes



The Sydvaranger processing plant in Kirkenes. Photo: Atle Staalesen

Iron miners set for a restart in Kirkenes

The Sydvaranger mine gets a long awaited permission for renewed mining along Norway's border to Russia.

Collective Memory ...

- Despite restructuring efforts: mining as well as manufacturing and industrial development never stopped being an important topic in Kirkenes
- Currently Kirkenes seems to drive even more towards the development of new and the reopening of old industrial structures
- Now, the reopening of the mine in 2021 is a fixed decision

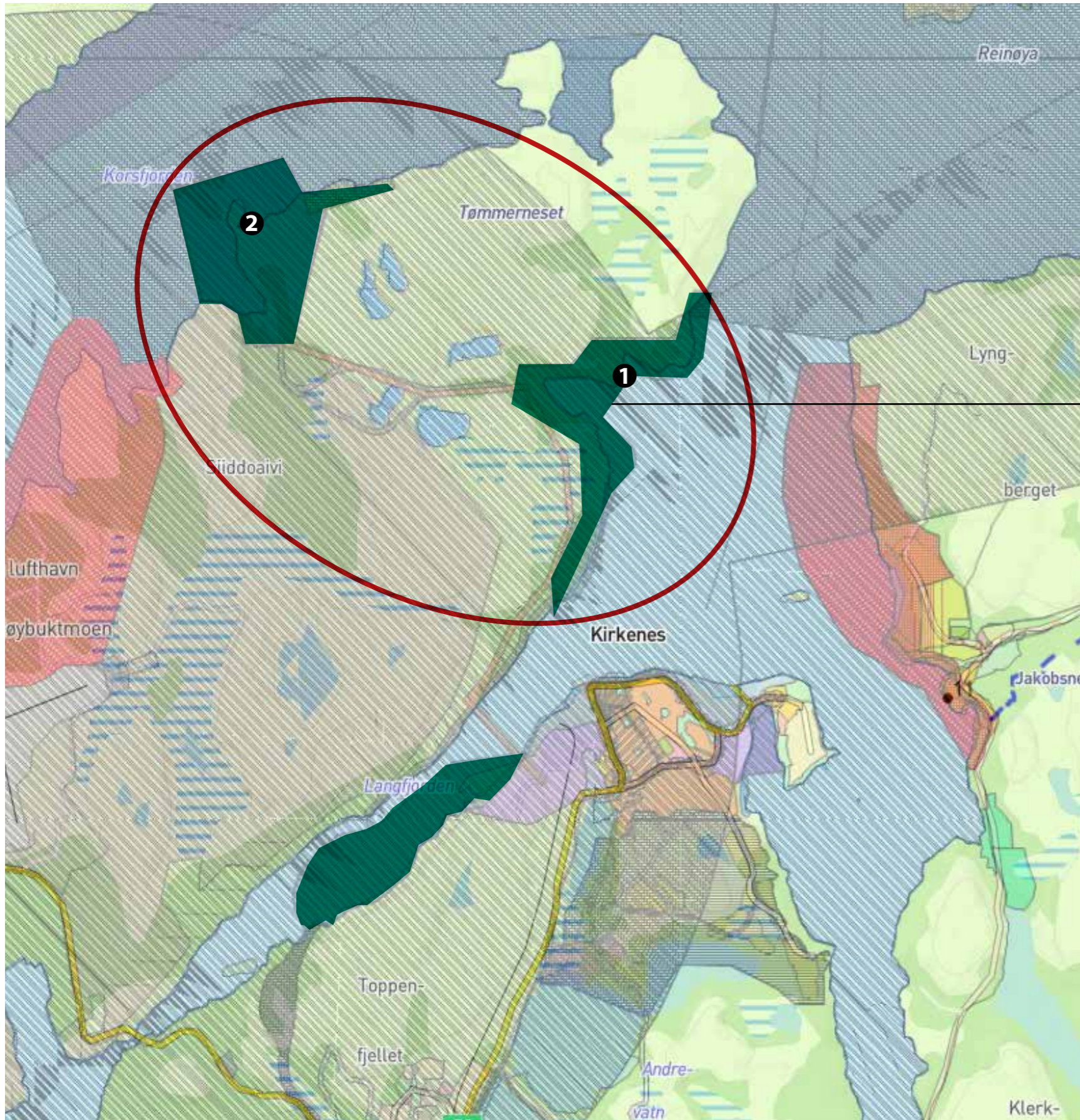
▼ Photo / 26 China has big Arctic ambitions



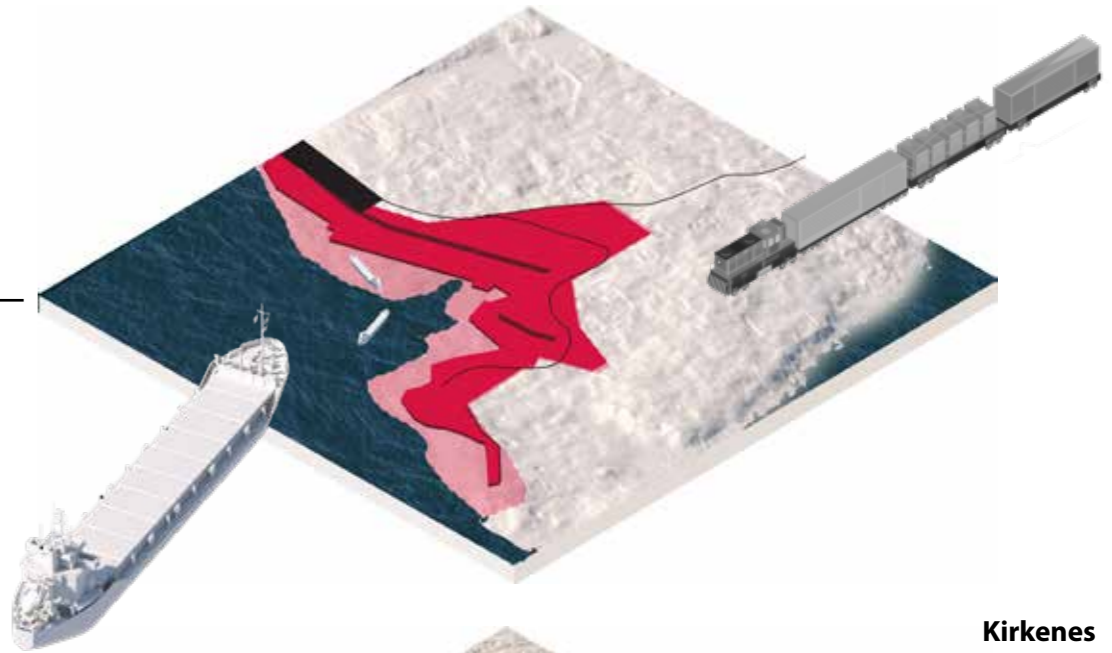
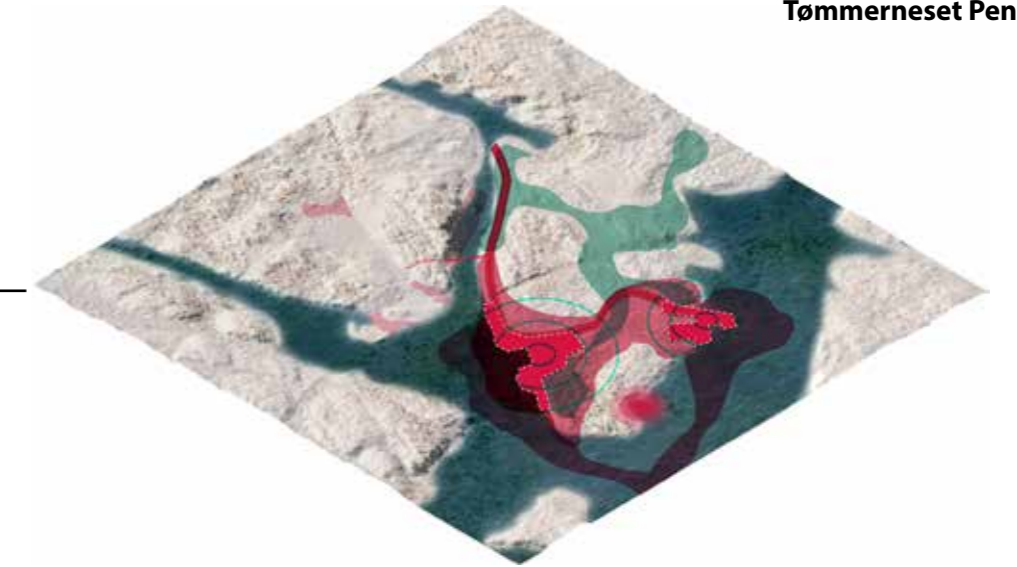
... And Uncertain Future

- Furthermore, Kirkenes has several plans to become a main player in Europe-Asian trade via the Northern Sea Route
- Different port-plans have been released
- Kirkenes representation as future cargo, oil, mining and transport hub, shows the collective memory of the manufacturing city

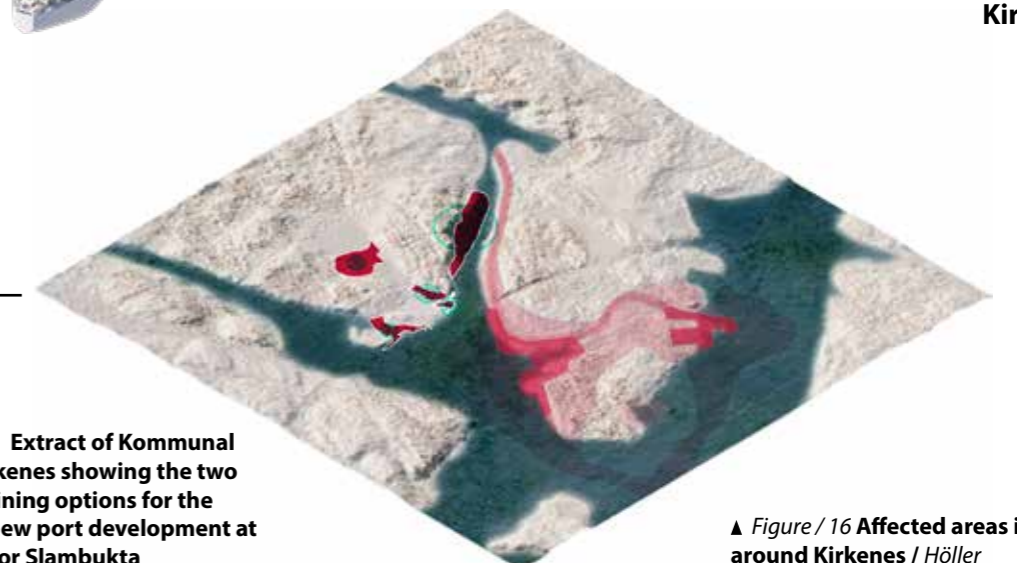
KIRKENES TRAPPED IN PATH DEPENDENCY



Tømmerneset Peninsula



Kirkenes



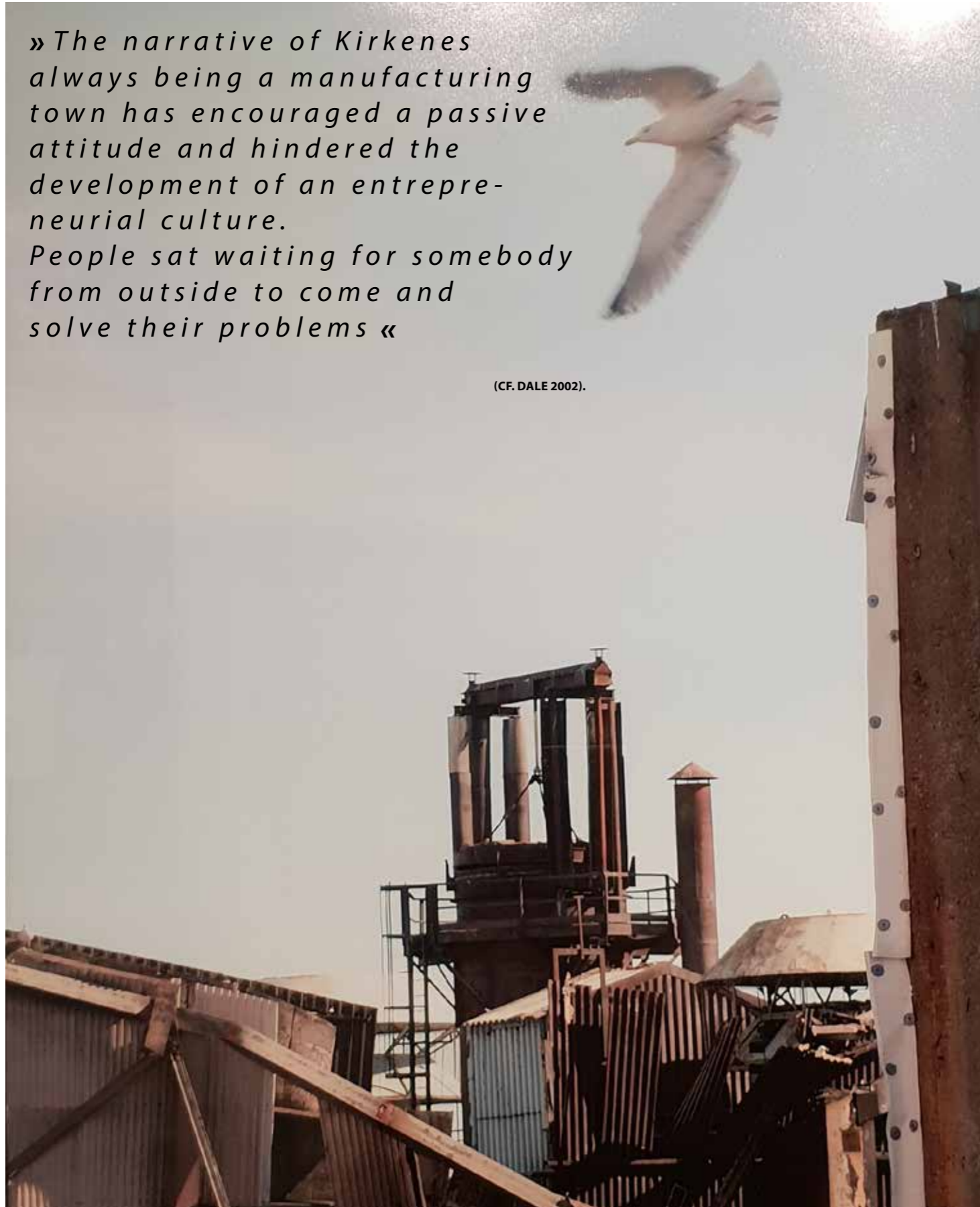
◀ Map / 18 Extract of Kommunal Map of Kirkenes showing the two last remaining options for the potential new port development at Leirpollen or Slambukta

▲ Figure / 16 Affected areas in and around Kirkenes / Höller

KIRKENES ALWAYS BEING A MANUFACTURING TOWN?

» *The narrative of Kirkenes always being a manufacturing town has encouraged a passive attitude and hindered the development of an entrepreneurial culture. People sat waiting for somebody from outside to come and solve their problems* «

(CF. DALE 2002).



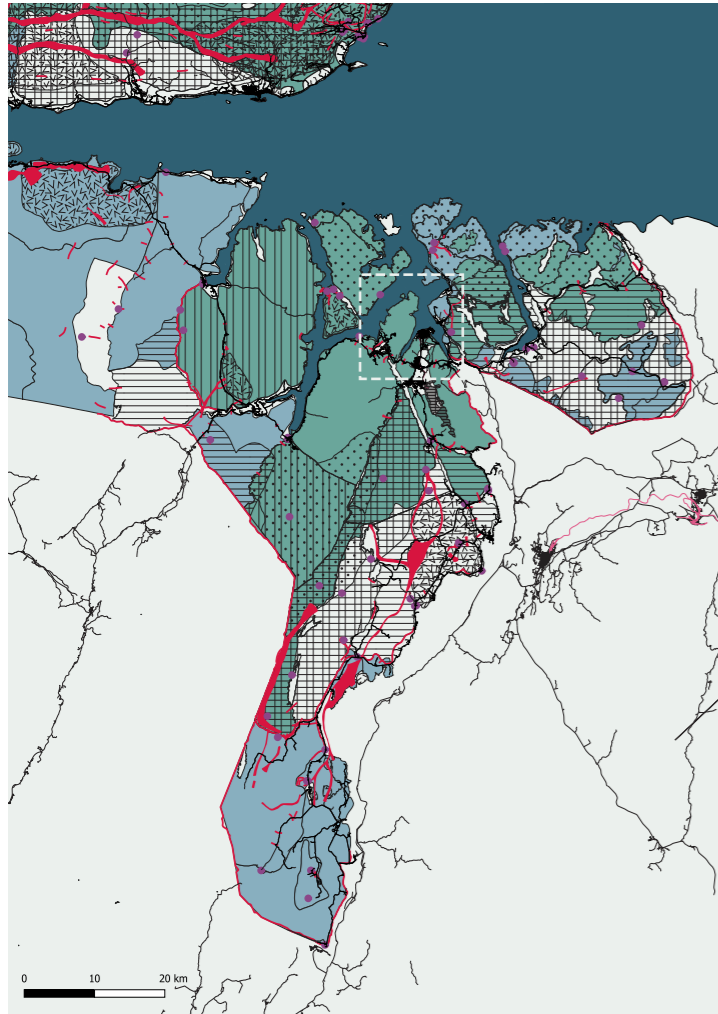
- The **path dependency** of Kirkenes as **mining and industry town** but also current narratives of „Kirkenes as Border City“ or „Kirkenes as political place“ restrain the city of defining legitimate scenarios for a sustainable future.
- The proposed port-development works as a **new narrative** for City of Kirkenes and Municipality of Sør-Varanger to stay politically important within the decision-making process between the South (Oslo) and Northern Norway
- The danger of driving this new narrative can end in a new **boom-bust chapter** for the region
- Regional/global entrepreneurs see **opportunistic/economic chance for fast profit** and short-term development, even though global players are critical
- The **step backwards into old industrial patterns** as well as the missed opportunities of this critical juncture will have negative impacts on all participants (natural, societal and economic realm) within the region

▼ Photo / 28 Cree leaders join anti-railway demonstrations in Finland

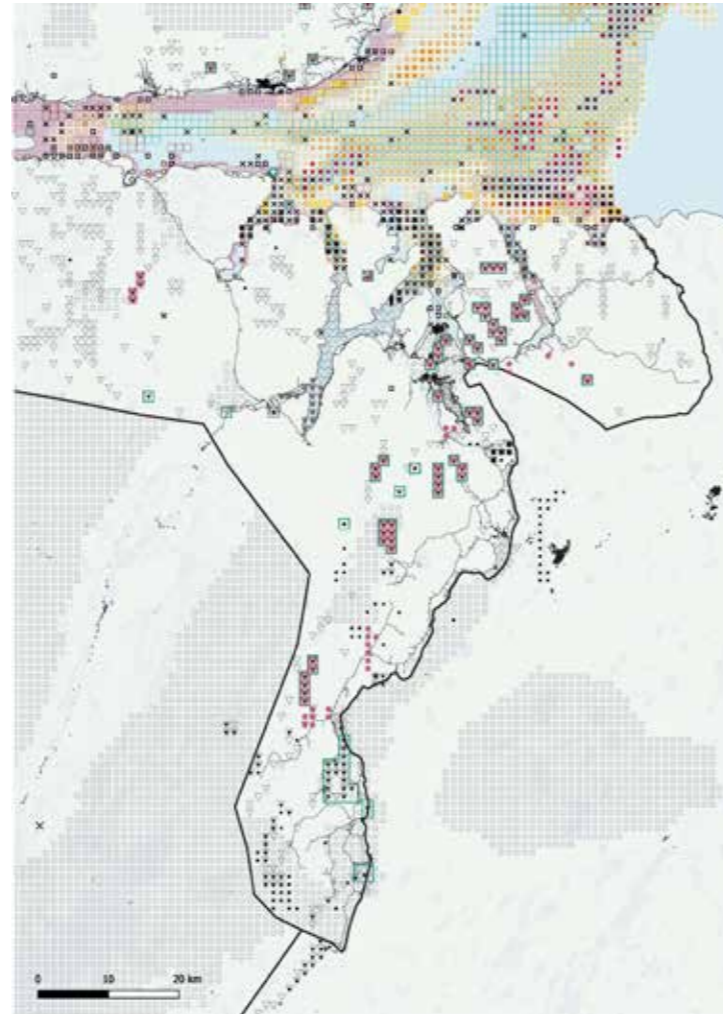


◀ Photo / 27 Abolished Mining Infrastructure in Kirkenes / Grenslund Museum Kirkenes

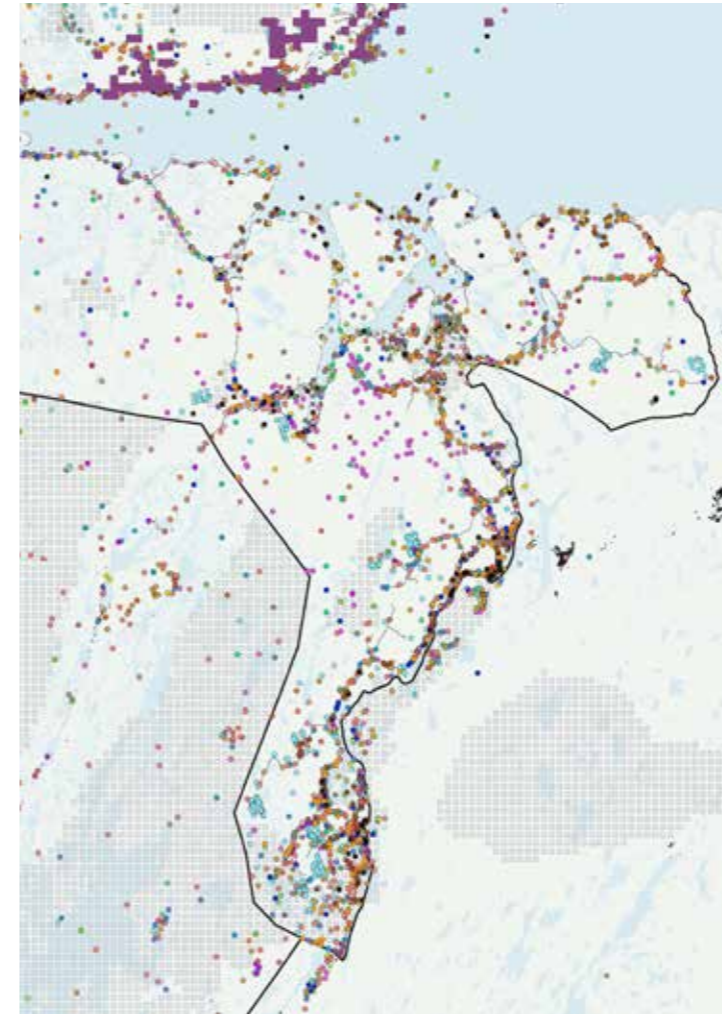
SOR-VARANER NATURAL PARTICIPANTS REINDEER, FISH, BIRD + MAMMALS



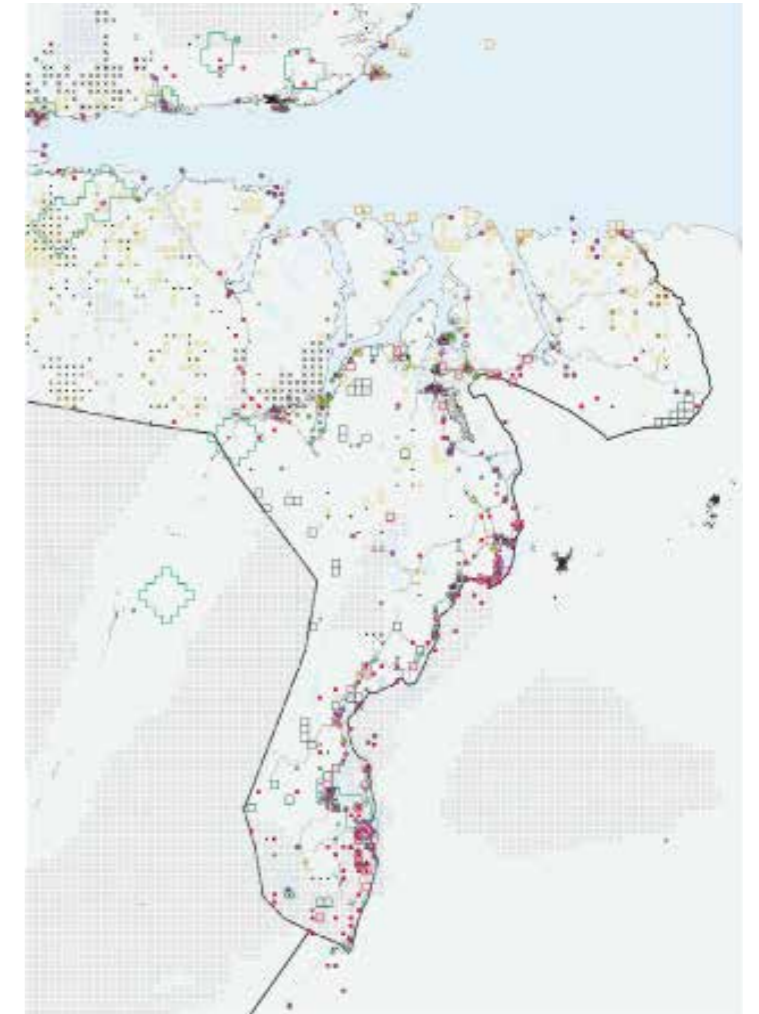
▲ Map / 19 Reindeer migration Sør-Varanger / Höller | Data: geonorge.no



▲ Map / 20 Fish stocks / Höller | Data: Norwegian Directorate of Fisheries



▲ Map / 21 Birds Kirkenes / Höller



▲ Map / 22 Mammals Sør-Varanger / Höller

▼ Photo / 29 Sámi reindeer herding with snowmobil



▼ Photo / 30 Port Kirkenes / Höller



▼ Photo / 31 Touristship / Höller

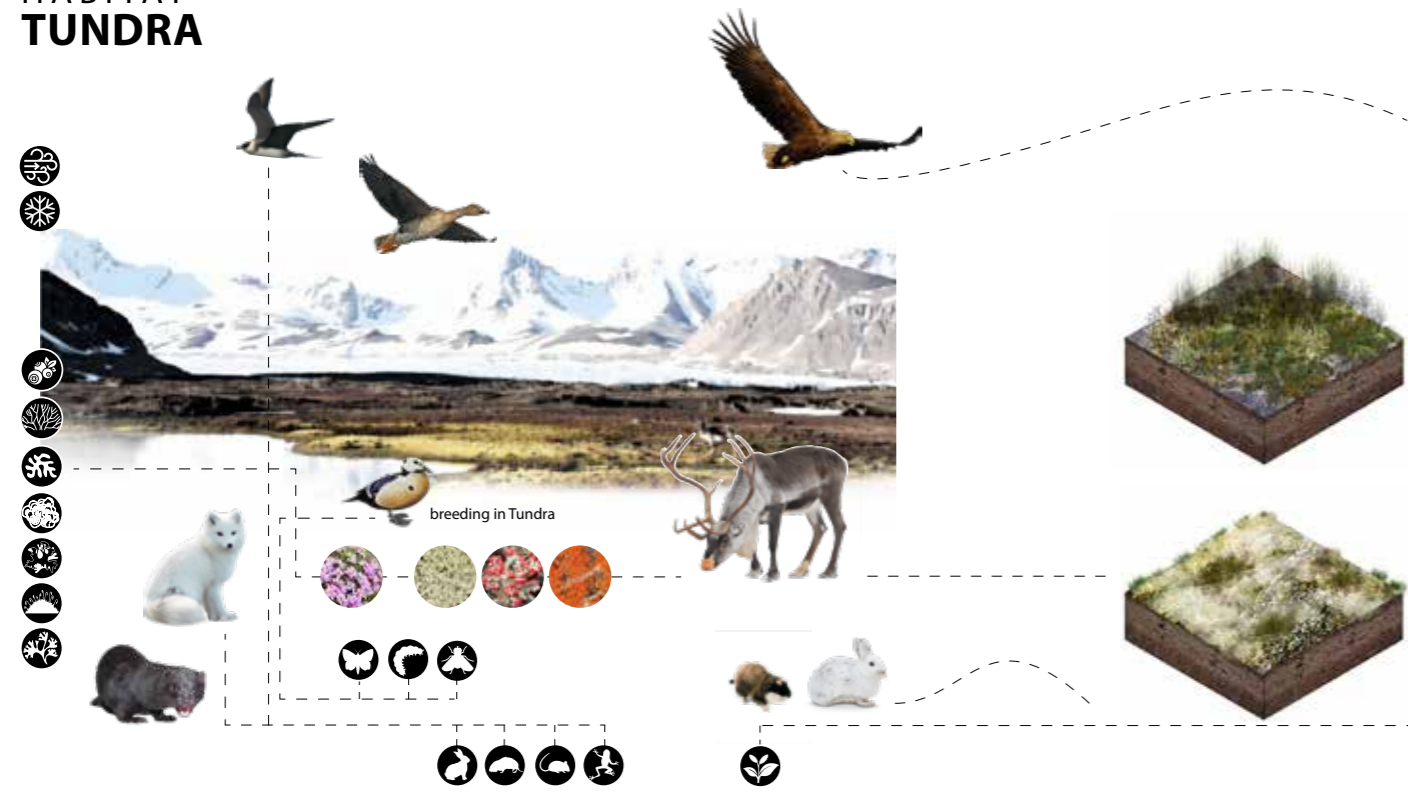


▼ Photo / 32 Husky / Höller

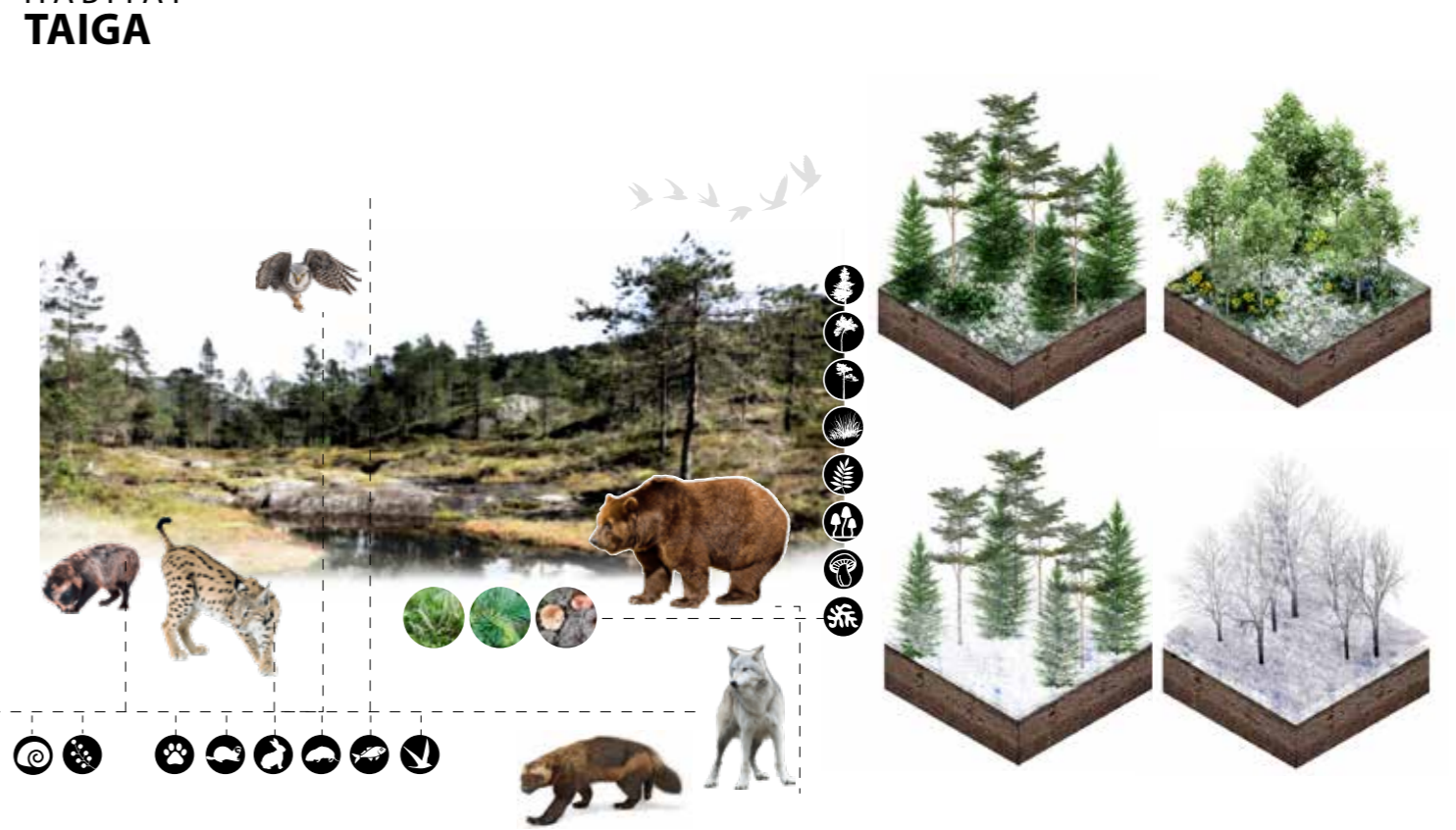


SYNERGISTIC ADAPTIVE ECOSYSTEM SCAPE

HABITAT TUNDRA

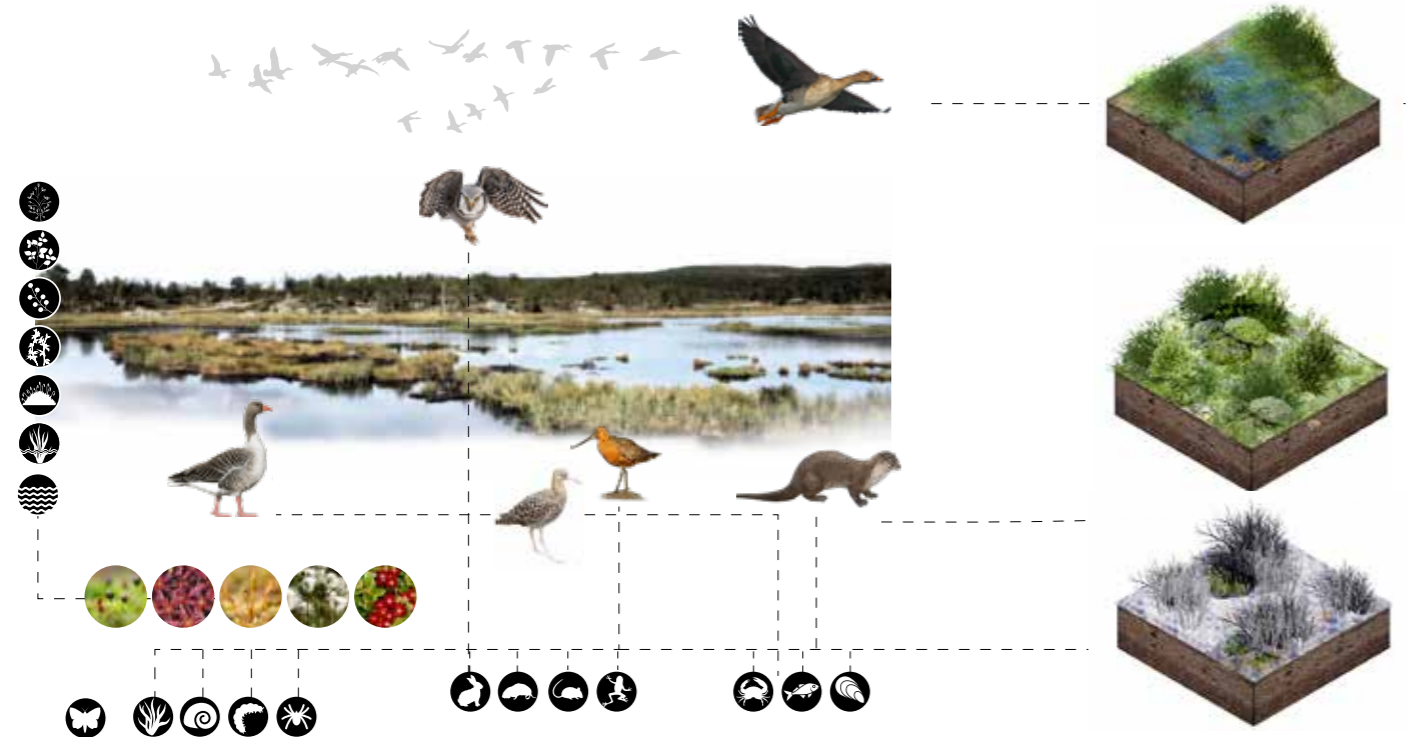


HABITAT TAIGA



▼ Figure / 17 Habitate Tundra / Taiga / Peat bog / Coast / Höller

HABITAT PEAT BOG

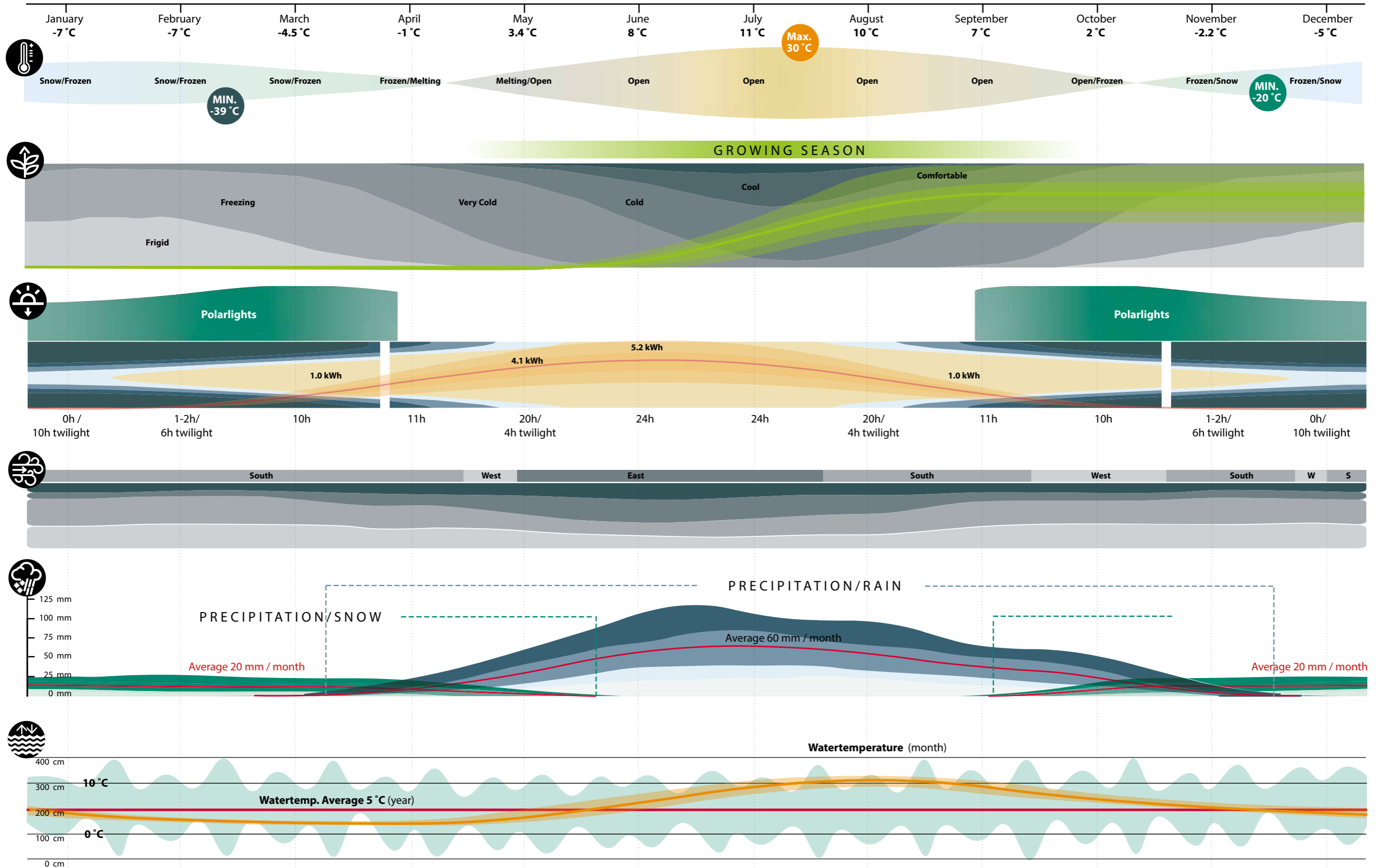


HABITAT COAST



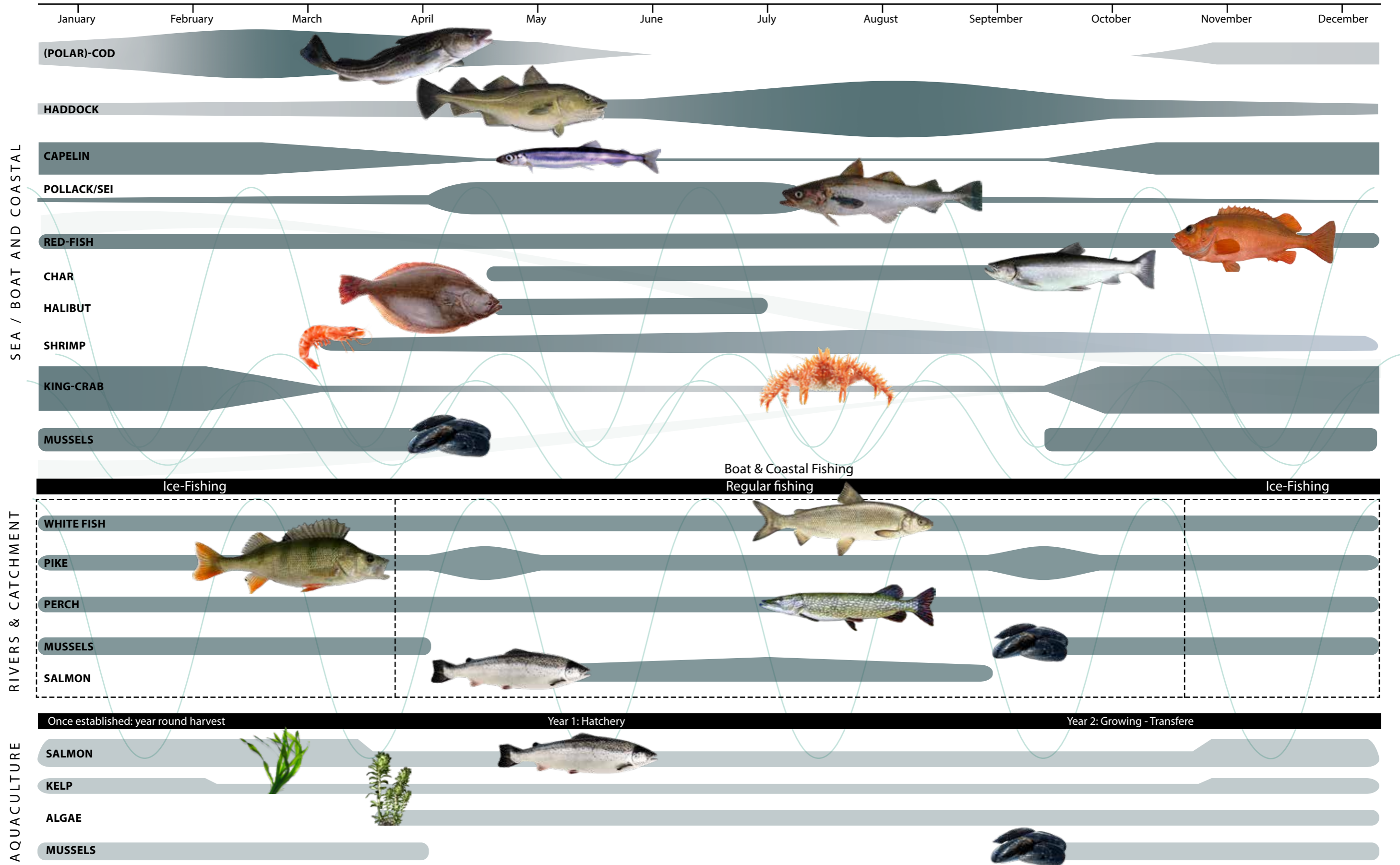
SYNERGISTIC ADAPTIVE ECOSYSTEM NATURAL DYNAMICS

▼ Figure / 18 Biophysical factors / Höller



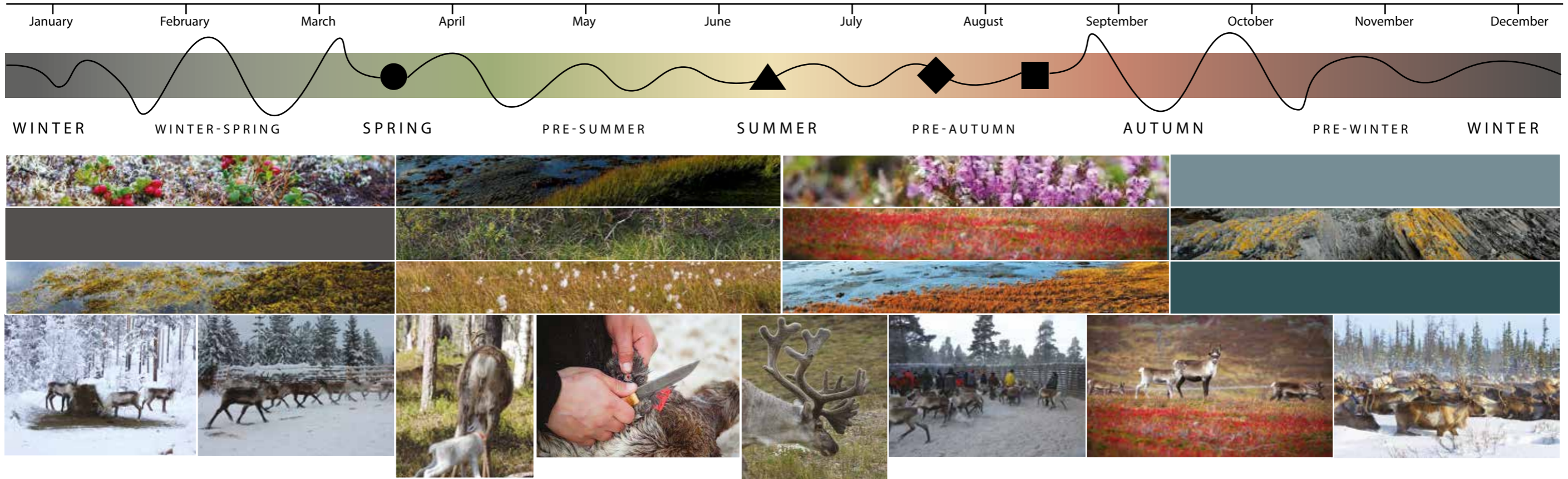
SYNERGISTIC ADAPTIVE ECOSYSTEM DYNAMICS FISHING

▼ Figure / 19 Dynamics fishing / Höller

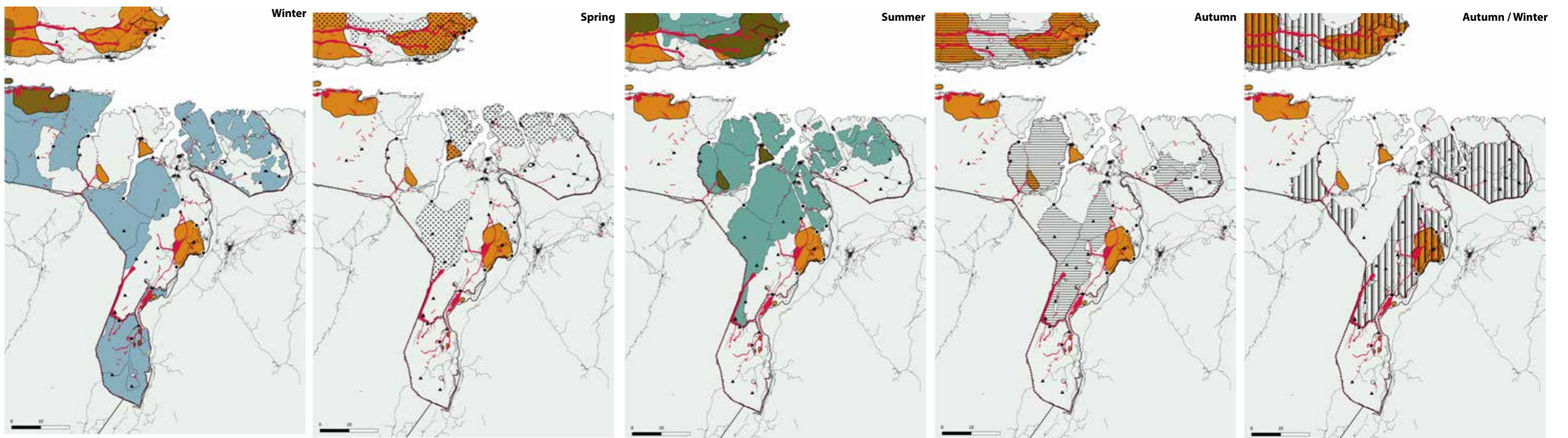


SYNERGISTIC ADAPTIVE ECOSYSTEM HERDING SEASONALITY

▼ Figure / 20 Reindeer Husbandry / Höller



▼ Maps / 23-27 Reindeer migration seasonal / Lukas Höller



05 FROM FRICTION TO FICTION PORT - CITY PARADO[X]YNERGY SCAPES

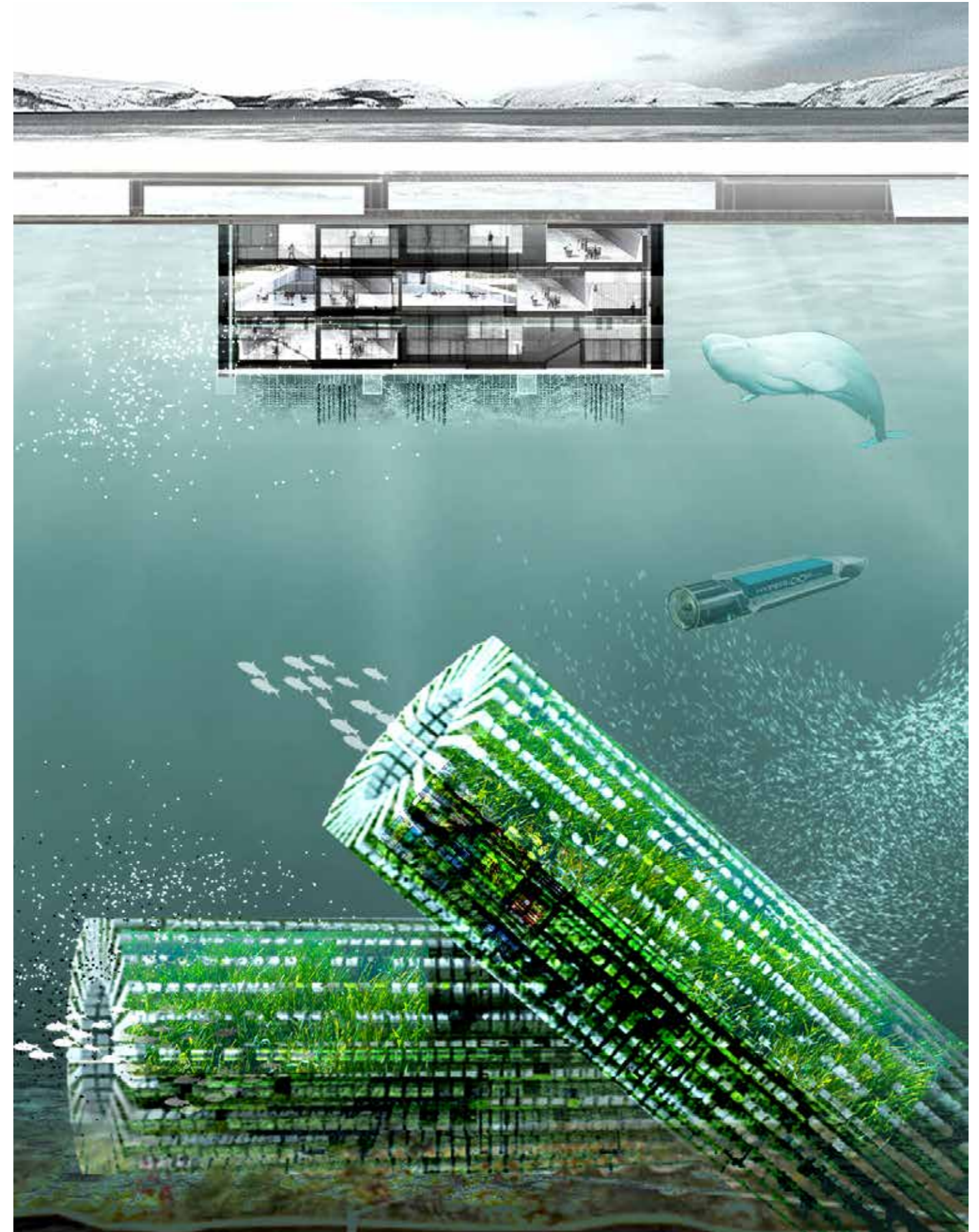
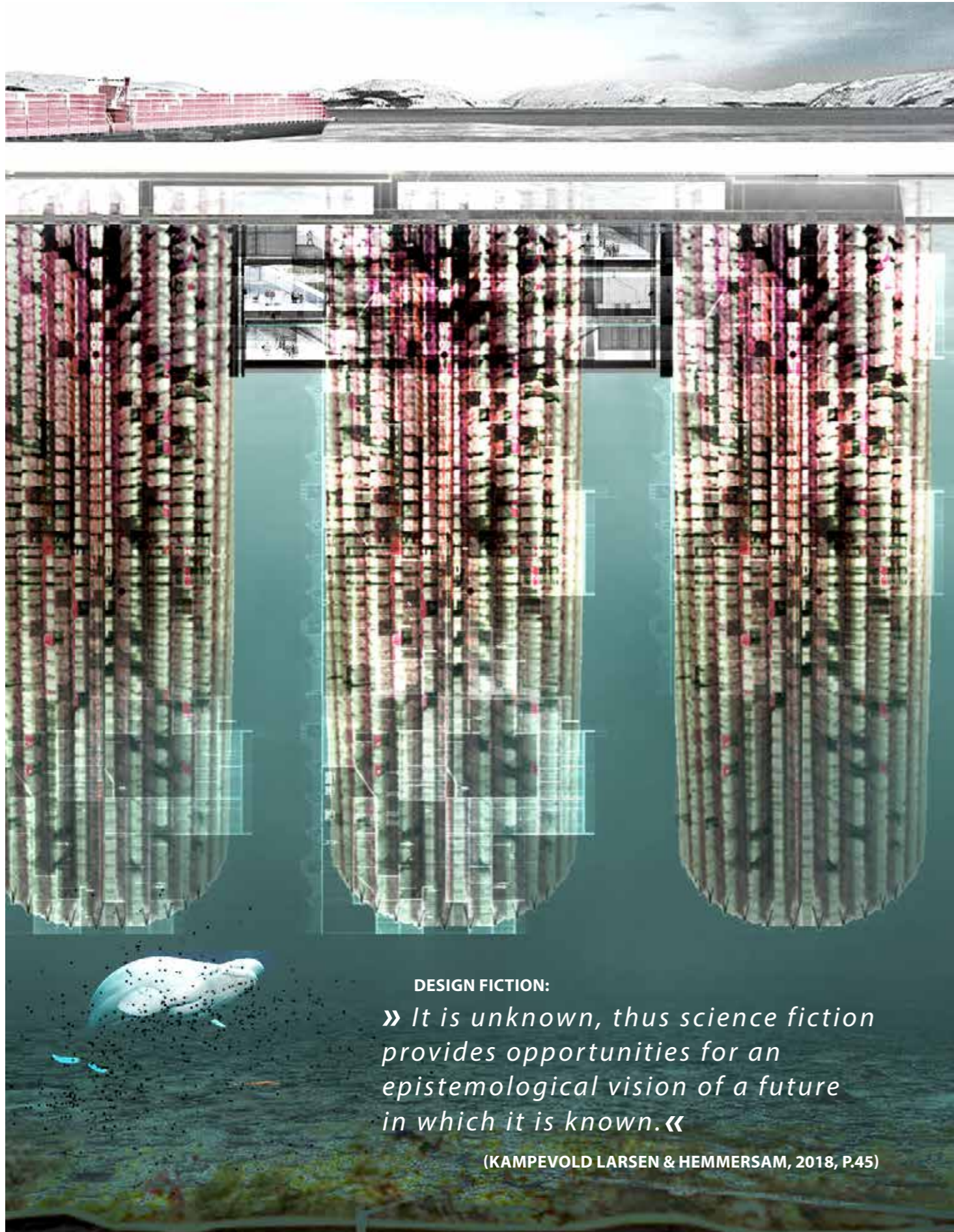


»The Sámi way of telling a story is to tell a lot of stories simultaneously – one digression leading into another into another and so on. «

GASKI, 1997



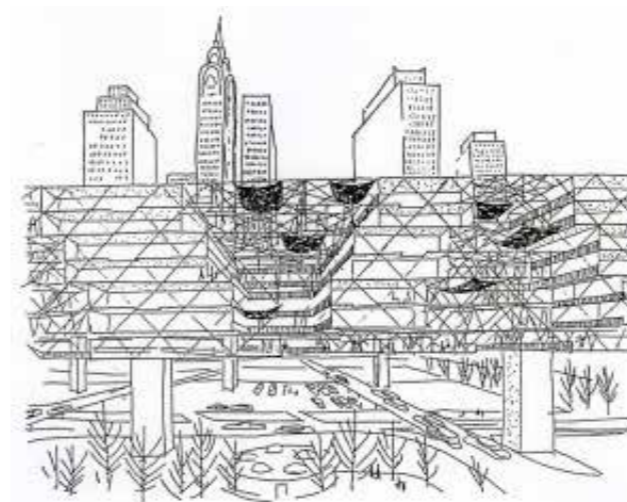
▼ Figure / 21 Floating Port Design Fiction / Höller



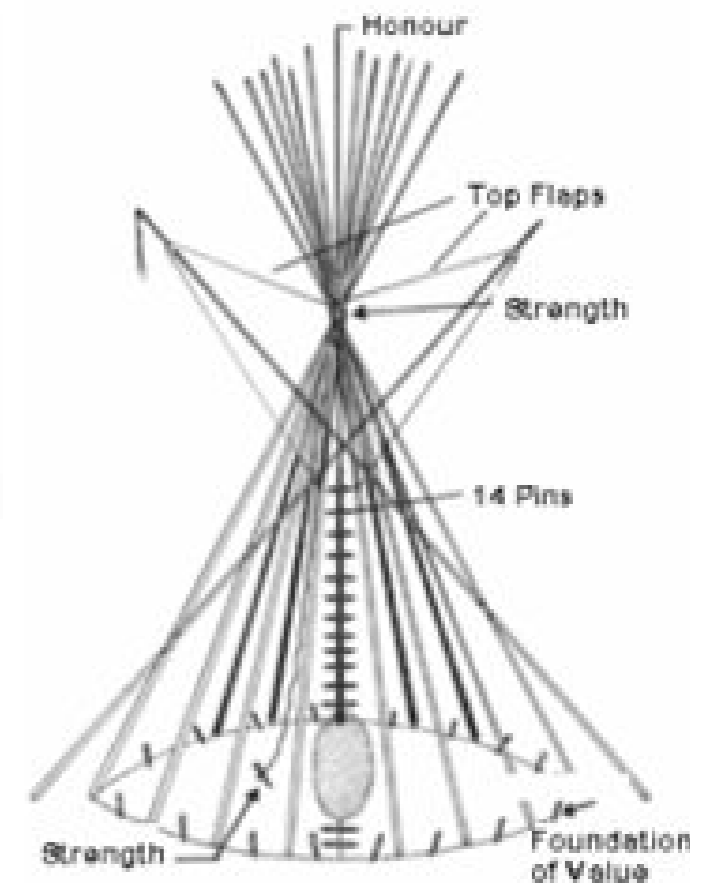
DESIGN INSPIRATION



- **Sámi Architecture**
Usually there are five spatio temporal types of build structures in Sámi culture: the ephemeral/transient, the episodal, the periodical, the seasonal and the semi permanent
- **L`Architecture Mobile**
expresses the need for flexibility but also compactness, the role of the individual in the overall design and planning processes as well as the importance of nature inclusion.
- **Floating Urbanism**



▲ Figure / 22 **Ville Spatiale** over the city of New Yor / Photo: k, Yona Friedman, 1964



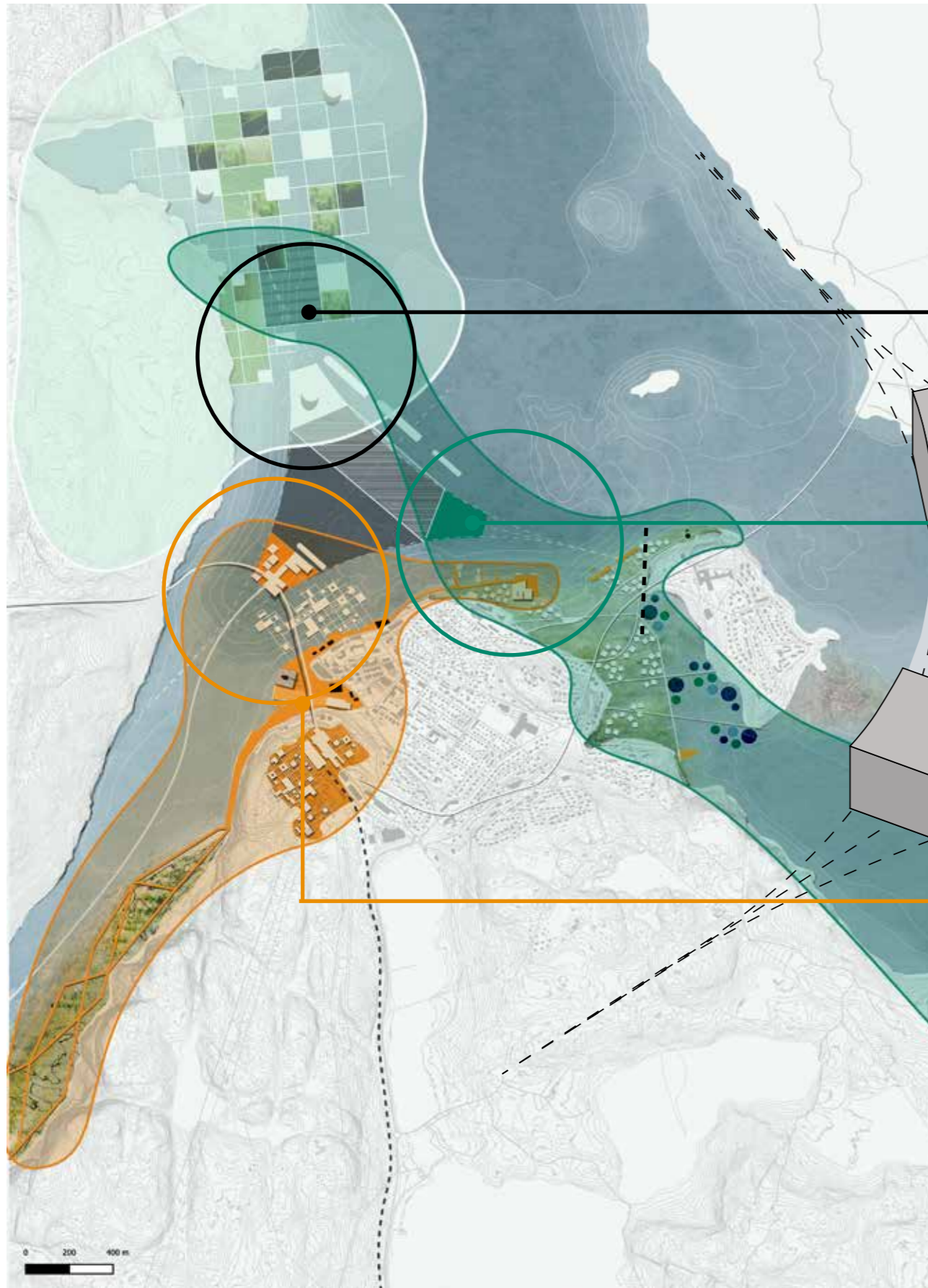
▲ Figure / 23 **Sketch of a Lavvu** / retrieved from <https://www.laits.utexas.edu/Sámi/dieda/anthro/architecture.htm>

◀ Photo / 51 **Image of a Goathe or earth house**

◀ Photo / 52 **TANGE'S 1960 TOKYO BAY PLAN.** Tange attempted to impose a new physical cross-bay order on Tokyo which would accommodate the city's continued expansion and internal regeneration.

FLOATING PORT AS SYNERGISTIC CONCEPT

▼ Figure / 24 Floating Port Design Fiction / Höller



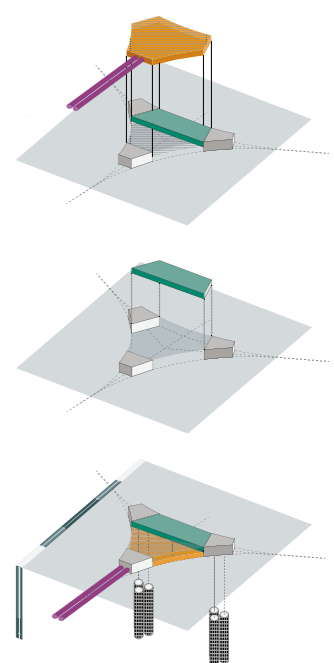
The Floating Port as a Concept-Space

- Floating port as a concept to achieve a synergistic adaptive Port-City Scape where **people, planet, prosperity** are aligned
- Goal is not to elaborate on the economic or technical feasibility of the floating structure
- **Create a Design Fiction** to integrate a new port-development to interconnect possible synergistic opportunities

ENERGY PORT

WETLAND PORT

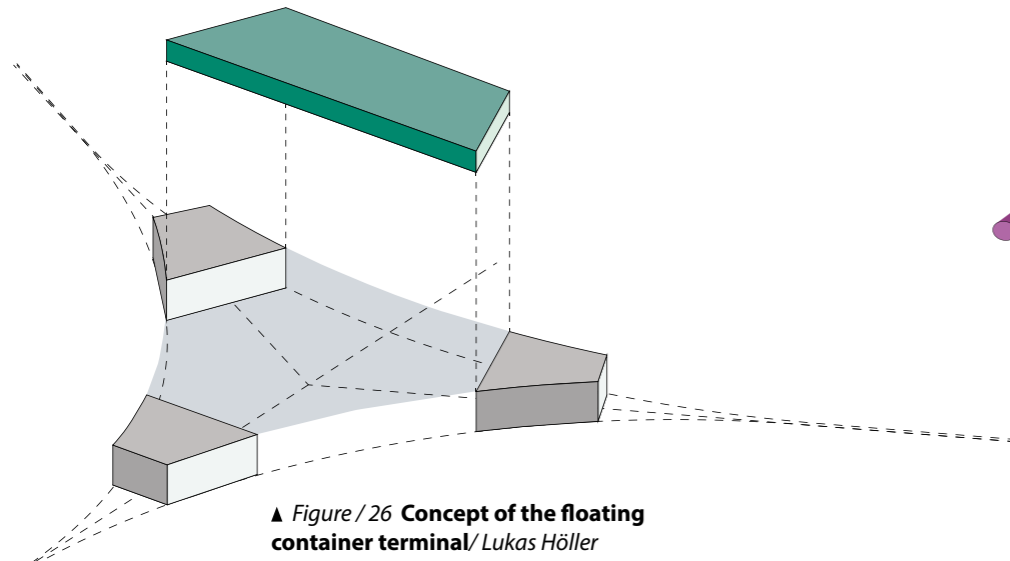
URBAN PORT



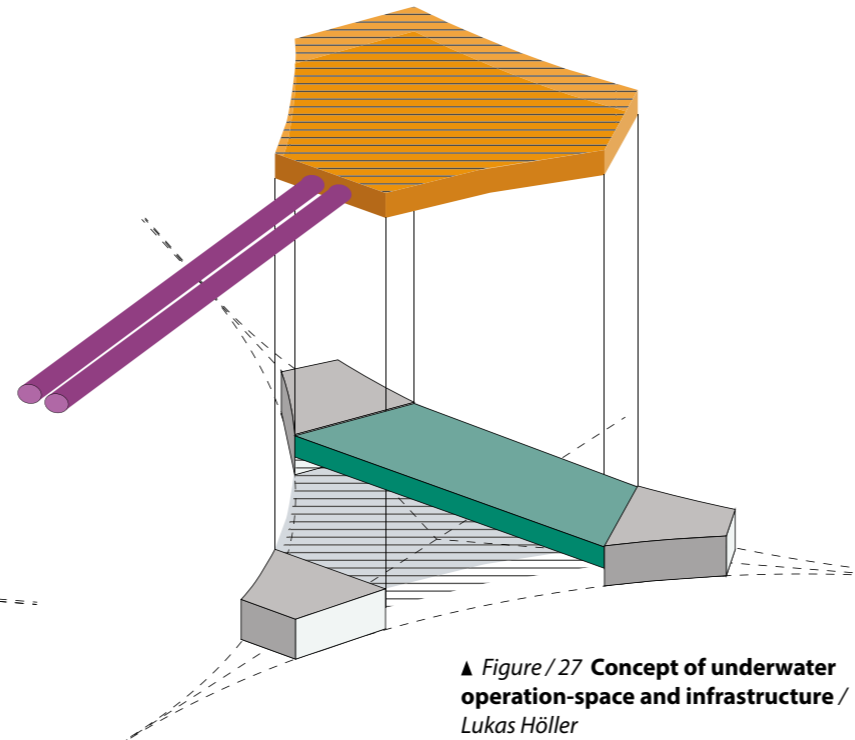
▲ Figure / 25 Floating Port as a Concept-Space / Höller

FLOATING PORT

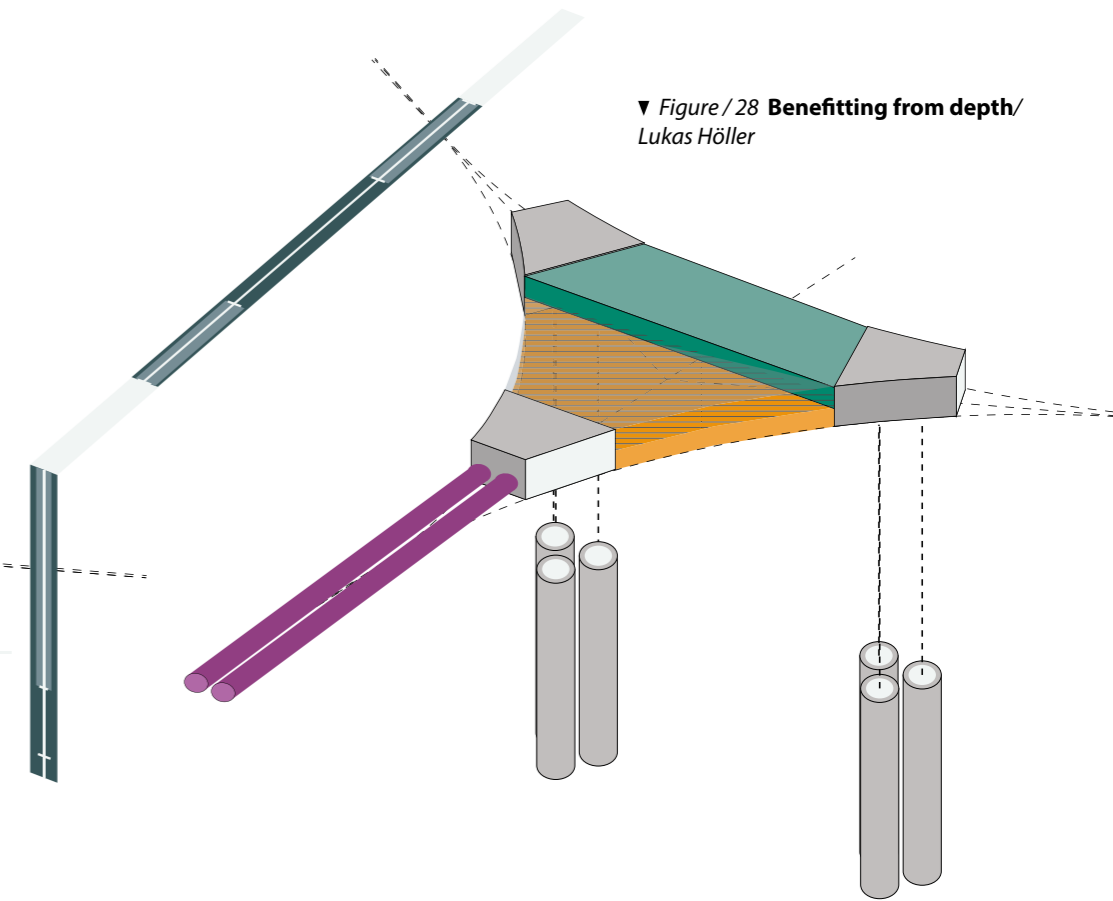
AS ADAPTABILITY CONCEPT



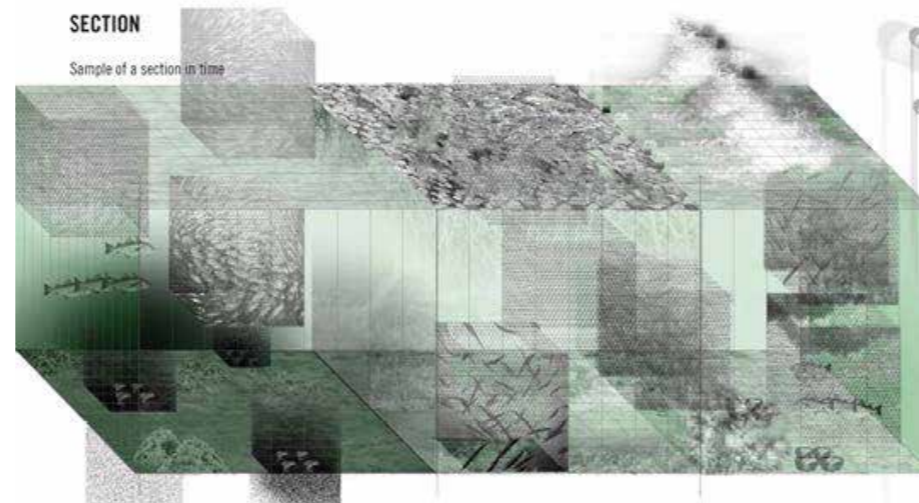
AS ADAPTIVE CONCEPT



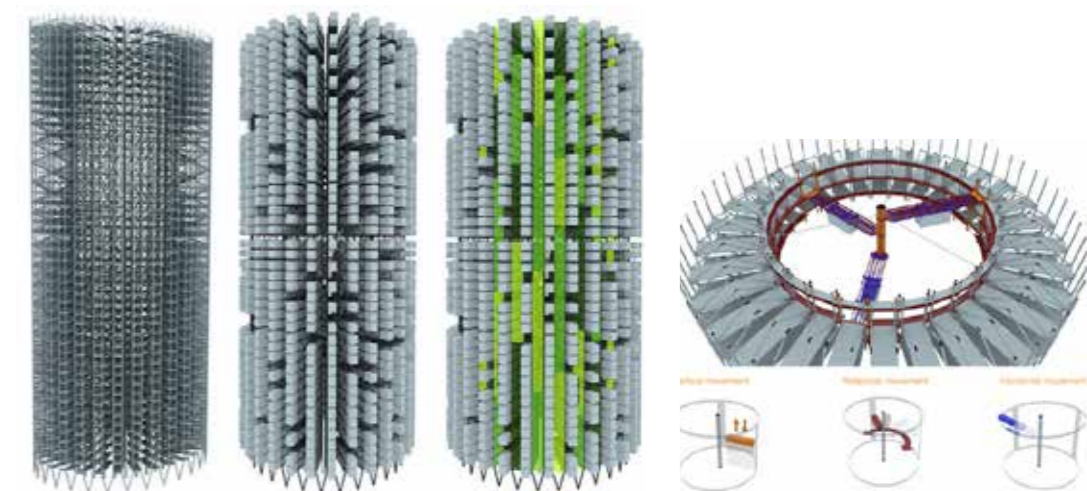
AS SUSTAINABLE CONCEPT



▲ Figure / 29 Submerged Baltic route. The Finnish government is also working with engineers Ramboll to establish a test track section that would run from Salo towards Turku. – / HyperloopOner



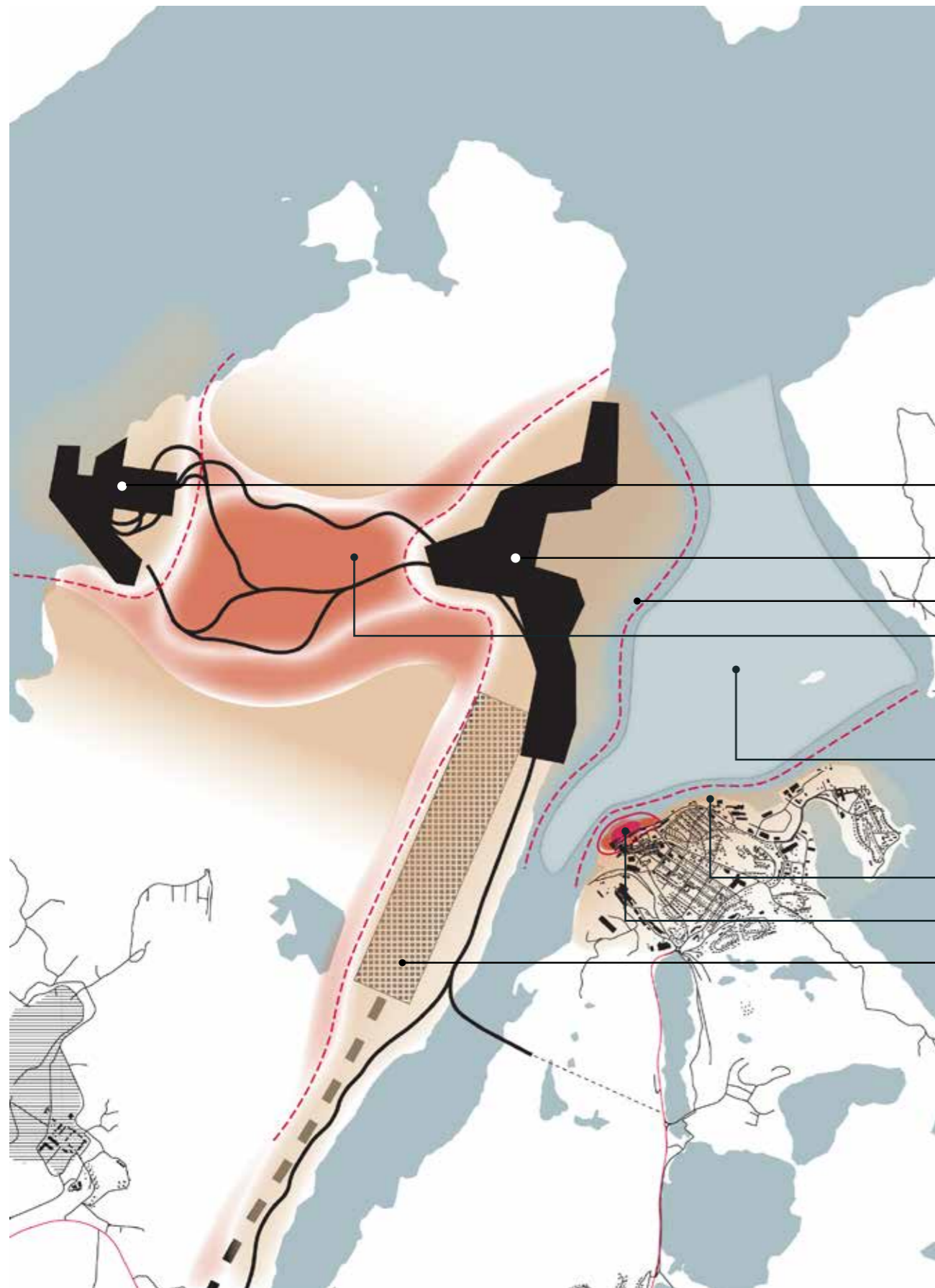
▲ Figure / 30 Section: Barents Sea water-masses / in Laba, EPFL. in Couling & Hein, 2018, p. 99flux.



▲ Figure / 31 Compact Container Port / casanova+hernandez architects

DESIGN CURRENT STATE

▼ Figure / 32 Current Port-City Scapes / Höller



Current port-proposal focuses on the **layout of an operating port** within the context of **territorial and positivistic logics** of transport and logistics

Envisioned port and its infrastructural connection towards the fore- and hinterland transforms the **cultural and natural landscape into an industrial and operational one.**

Three counter-productive spatial configurations emerge:

1. The Separation of Port and City due to Waterfront Redevelopment
2. The Creation of a Port-City Interface
3. The Emergence of a Port-City Vacuum

• **Homogenous Port-Scape**

• **Static Port or City Border**

• **Liminal Encounter Scape Port-City with low Quality for Mutual Coexistence**

• **Port-City Vacuum**

• **Urbanization of the former Port-City Scape**

• **Liminal Port-City Scape Cruise Ship Terminal**

• **Territorial Infrastructure Overlay**

Port-City Paradox [x/y]nergy

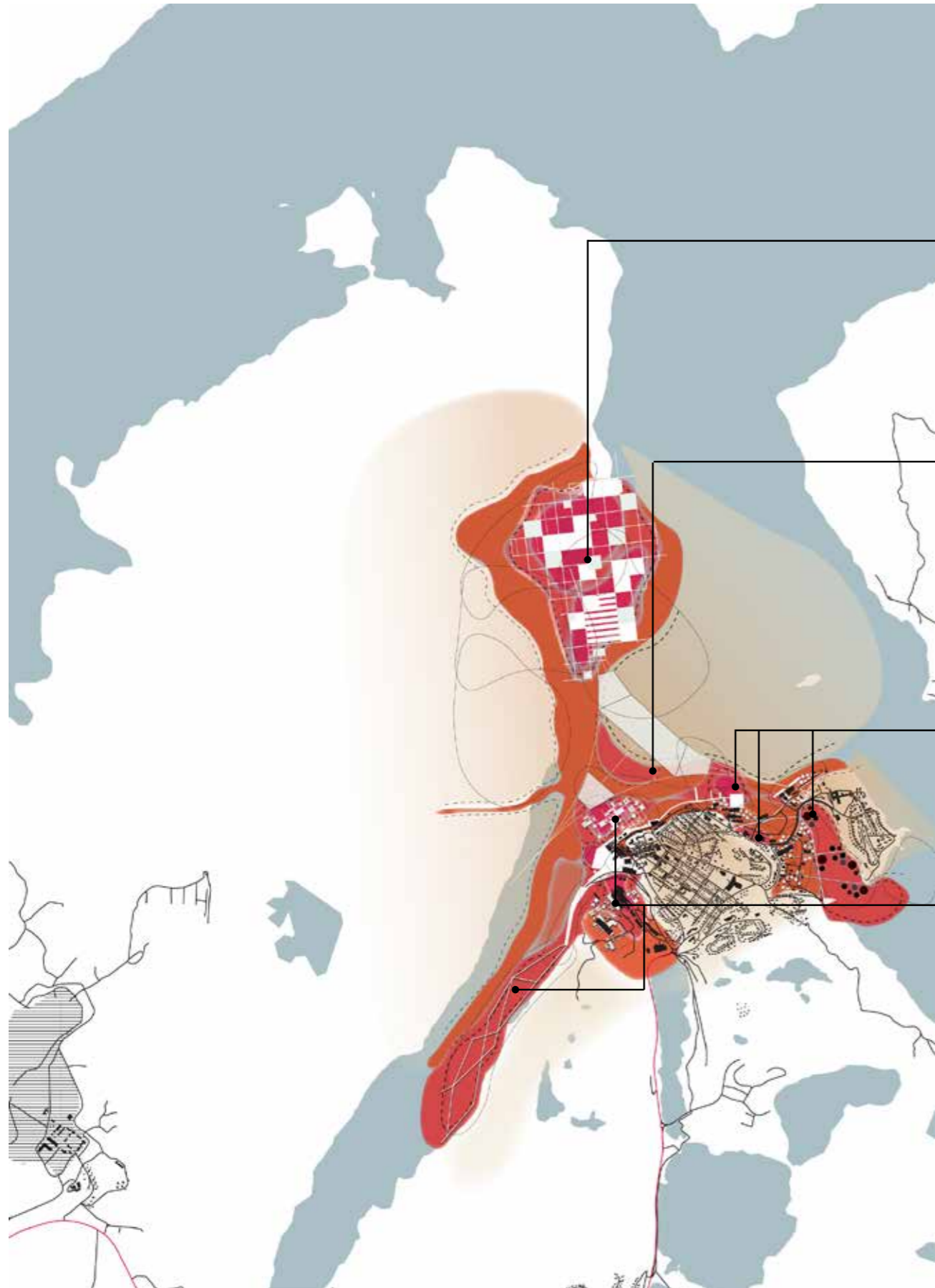


Low

High

DESIGN PORT-CITY PARADO[$\frac{x}{y}$]YNERGY

▼ Figure /33 Evolving Paradoxsynergy Scapes / Höller



- Flexibilize for open-endings
- Global - Local Countering
- Isoligrating - Filtered Sharing

- Flexibilize for open-endings
- Isoligrating - Planned Metamorphoses
- Global - Local Countering

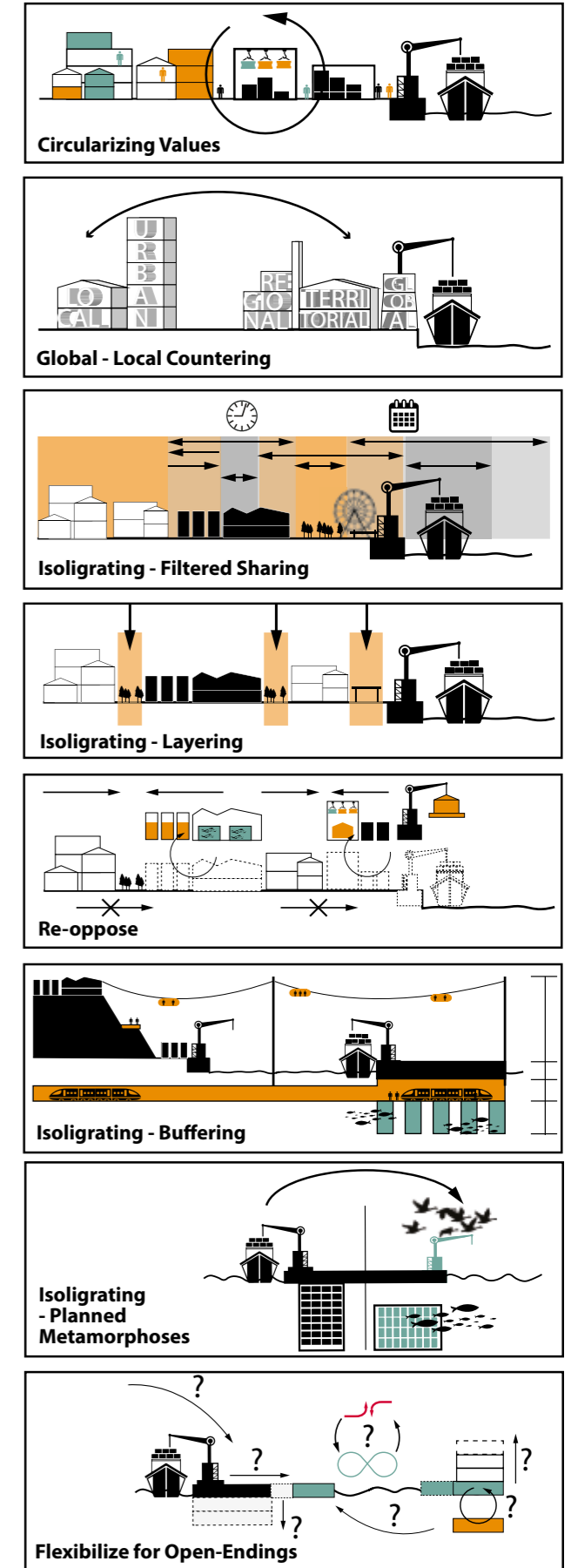
- Circularizing of Values
- Global - Local Countering
- Isoligrating - Buffering
- Isoligrating - Filtered Sharing
- Re-opposing

- Circularizing of Values
- Global - Local Countering
- Flexibilize for Open-Endings
- Re-opposing
- Isoligrating - Buffering
- Isoligrating - Layering

Port-City Parado[$\frac{x}{y}$]ynergy



▼ Figure /34 Strategic and planning tools / Höller

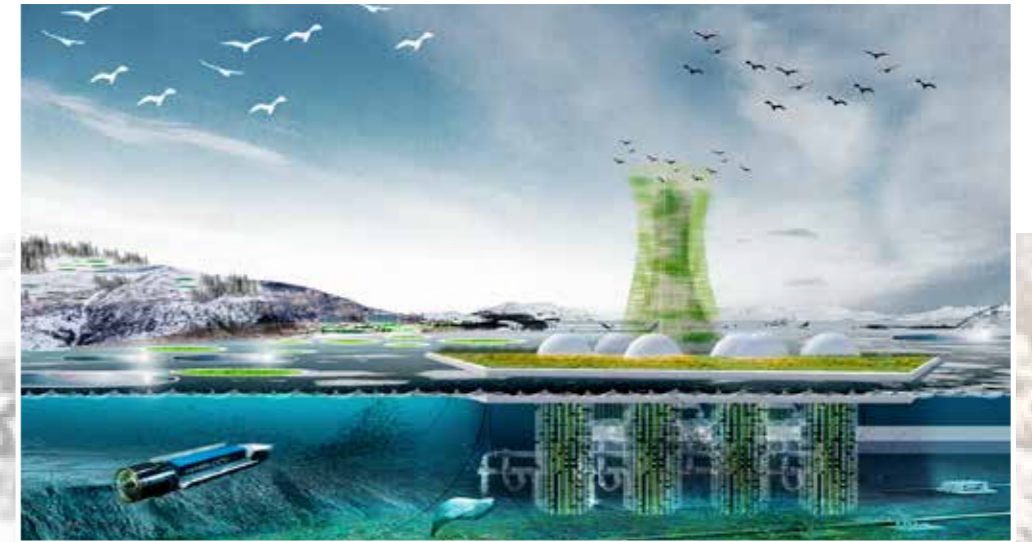


ENERGY PORT FROM FRICTION TO FICTION

▼ Photo/53 Aerial view on Tømmerneset Peninsula

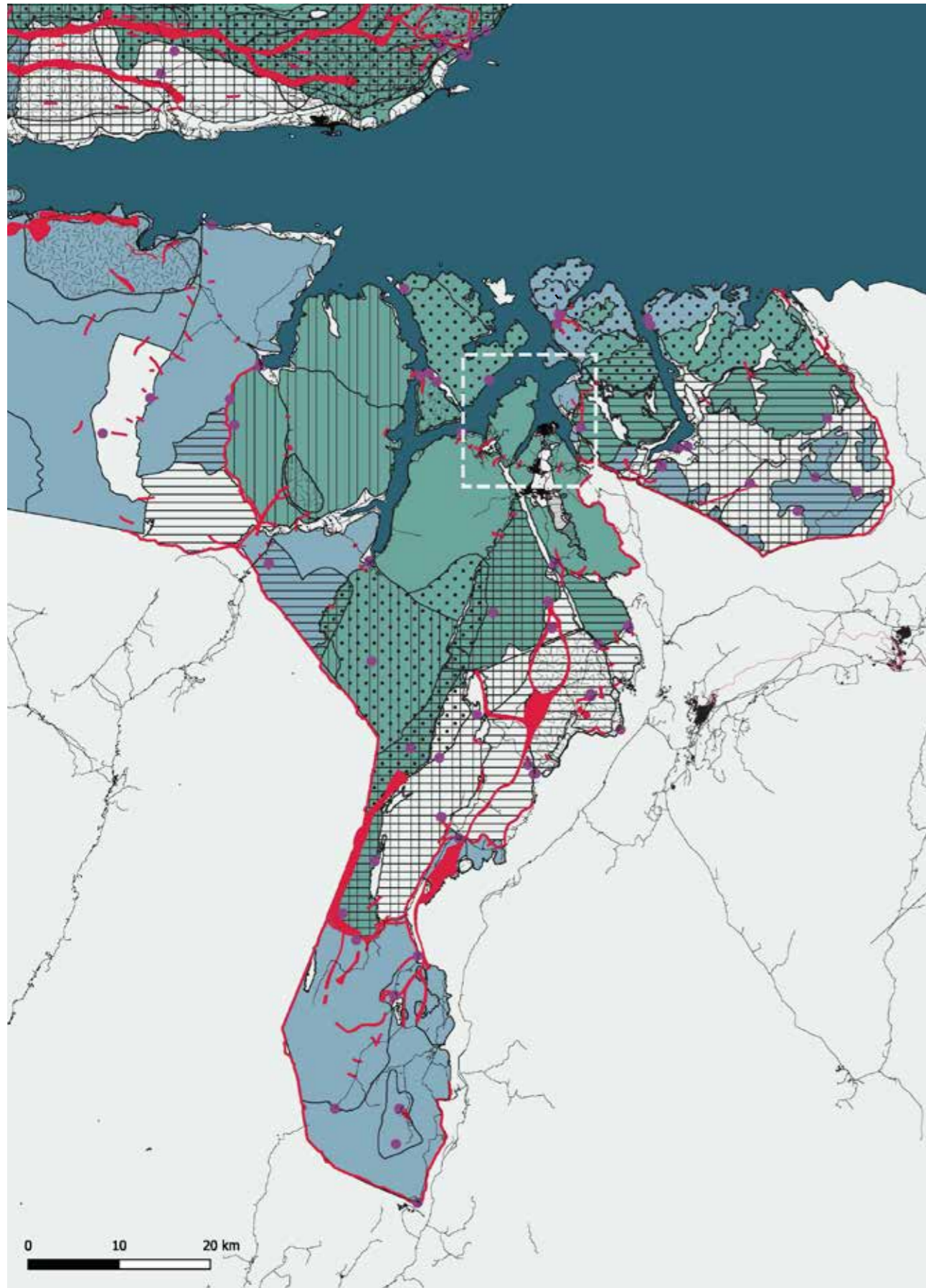


▼ Figure/35 Illustration of the possible Floating Energy Port / Höller



ENERGY PORT REINDEER HERDING

▼ Map / 23 Reindeer migration Sør-Varanger / Höller

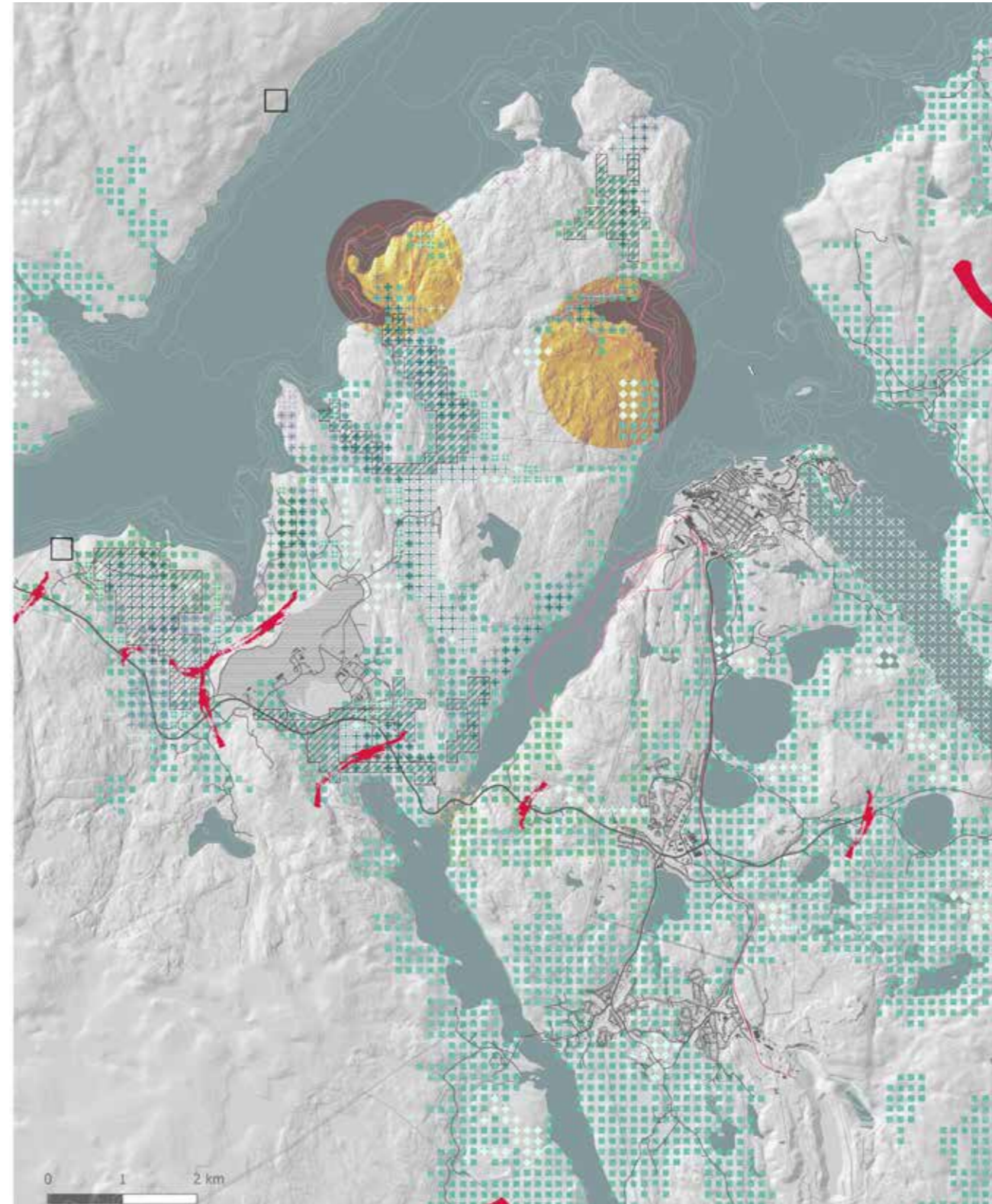


- Reindeer heerding is a **long tradition within the culture of the Sámi**
- The area of Sør-Varanger is devided into **three different Siidas**, the Østre Sør-Varanger, the Vestre Sør-Varanger and the Pasvik Siida
- Reindeer herding closely linked to **natural dynamics, seasons and climatic conditions**
- Today, **economic and climatic changes impact** the livelihood of the Sámi



▲ Photo / 54 Transportation of goods, and distinguished persons, occurred with reindeer and sleds in winter
 ▲ Photo / 55 A Sámi family in Norway around 1900
 ▲ Photo / 56 Sámi reindeer herding with helicopter

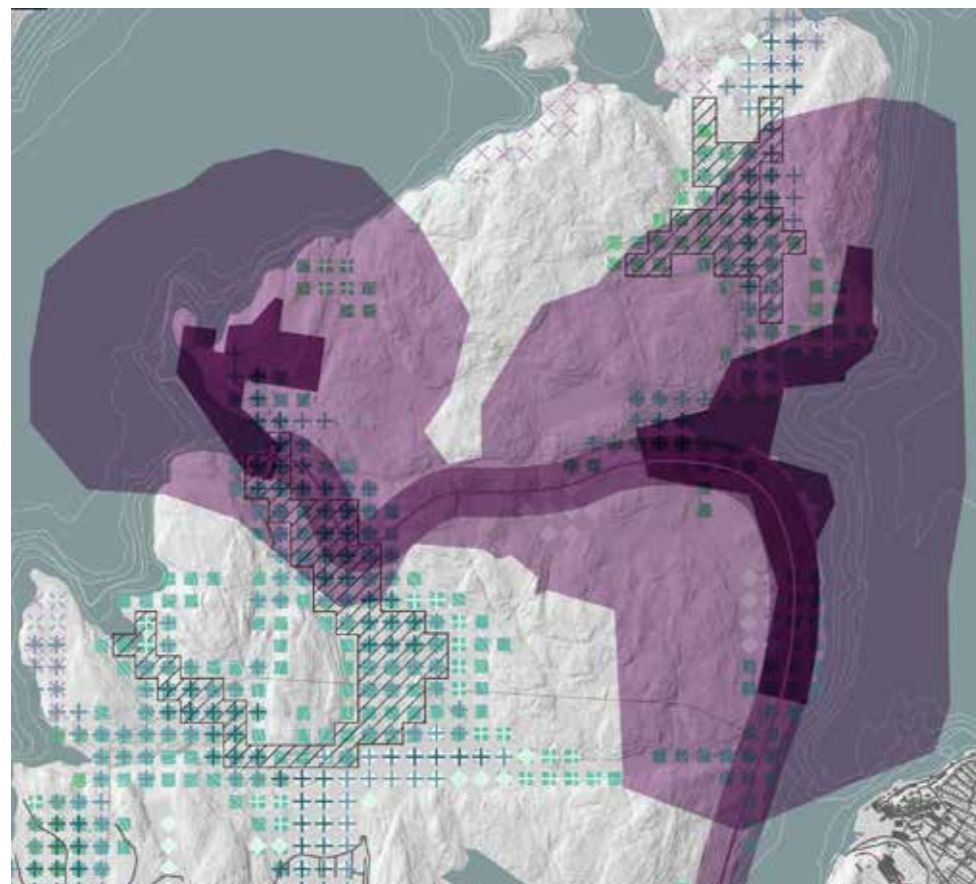
ENERGY PORT IMPACTS ON REINDEER



- Port activity summer
- Port activity winter
- Mixed forest
- Conifer forest
- Wetland
- Port development outline
- Reindeer migration route
- Reindeer location summer
- Reindeer location winter
- Streets

▲ Map / 30 Potential route of the Arctic Railway segregation large areas of the migratory routes of the Reindeer and Sámi / Höller

ENERGY PORT IMPACTS ON REINDEER

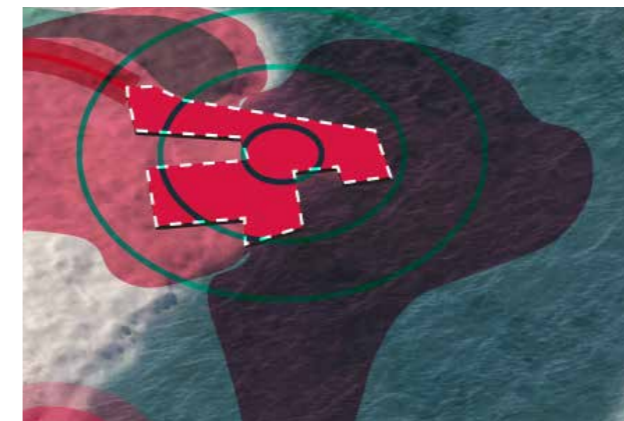


◀ Map/31 Zoom-in Tømmerneset: Land-use and spatial impact of the port on grazing reindeers/ Summer-Winter / Höller

- Port activity summer
- Port activity winter
- Mixed forest
- Conifer forest
- Wetland
- Port development outline
- Reindeer migration route
- × Reindeer location summer
- × Reindeer location winter
- Streets



◀ Figures /36-37 Aerial view on Tømmerneset
Sources: Nemkova & Fyta, 2016, p. 137, retrieved from https://issuu.com/aalandscapeurbanism/docs/shifting_arctic_boundaries_opt

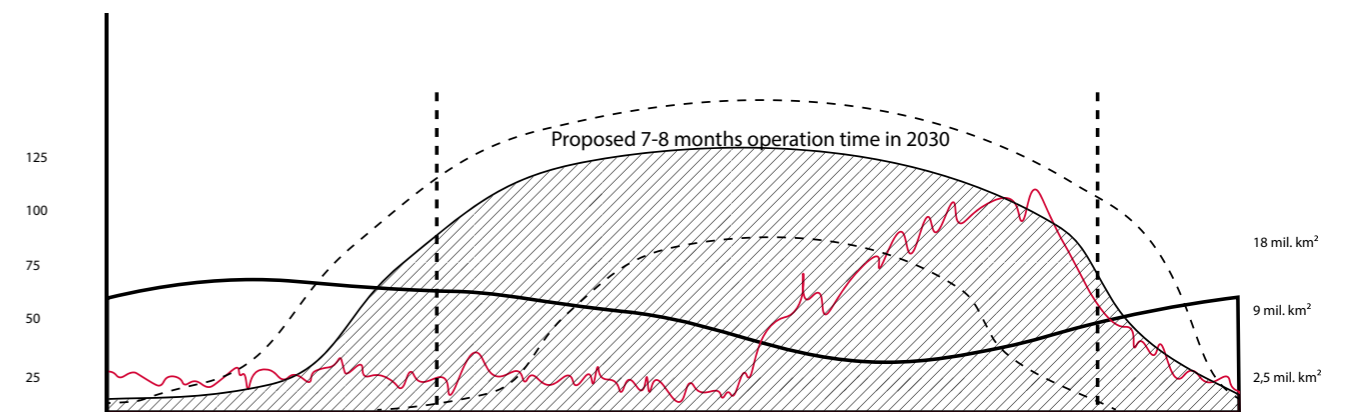


◀ Figure /38-39 Spatial model of Leirpollen / Tømmerneset Peninsula / Höller

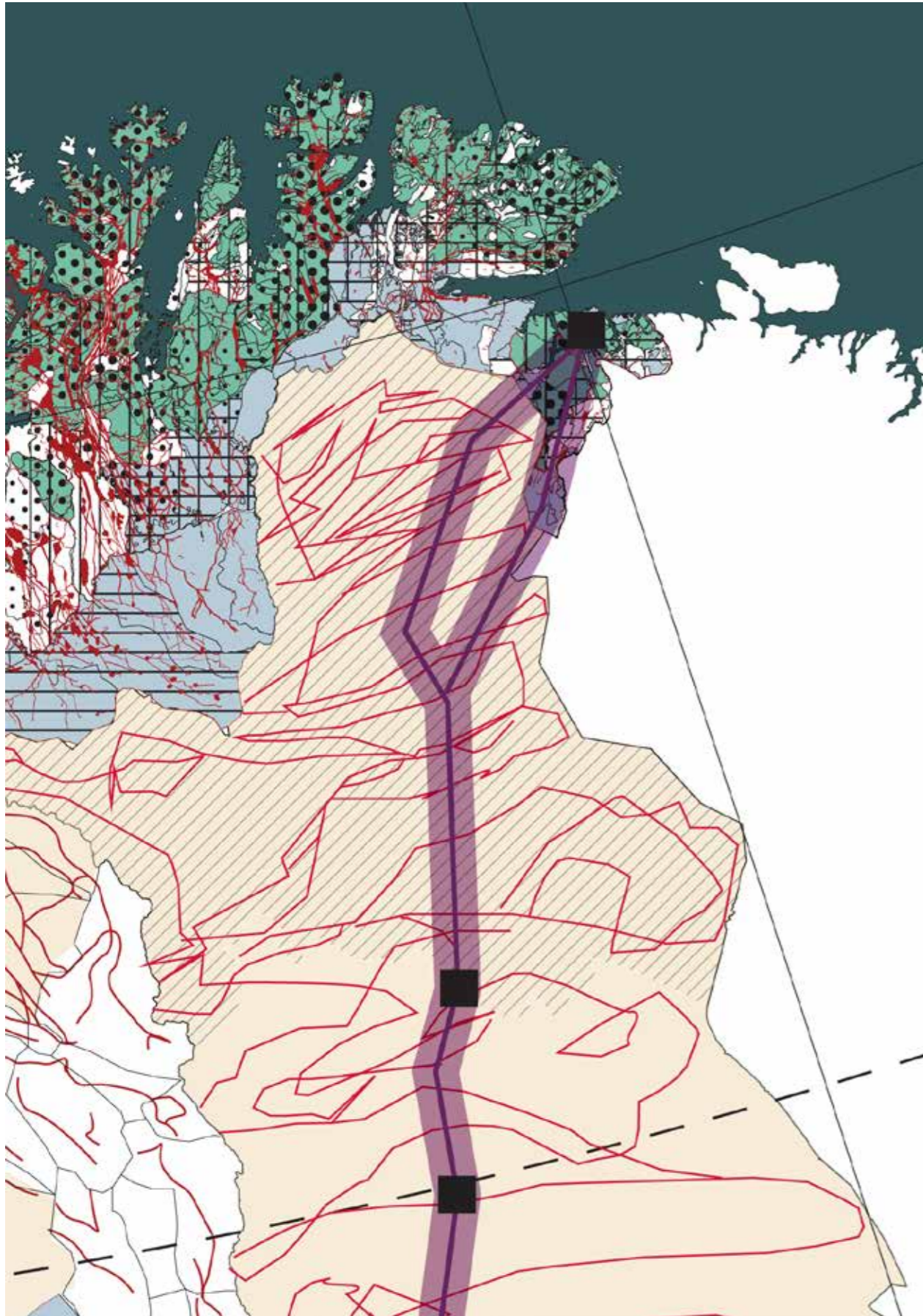


◀ Figure /40-41 Sør-Varanger Utvikling, Municipal intern restructuring company/ <http://sorvarangerutvikling.no/> retrieved from: vikling.no/

▼ Figure /42 Overlapp Arctic sea-ice extend over the year, amount of ships using the Northern Sea Route over the year and the planned 7-8 months operation phase of the new port in Kirkenes / Lukas Höller



ENERGY PORT IMPACTS ON REINDEER



◀ Map / 32 Potential route of the Arctic Railway segregation large areas of the migratory routes of the Reindeer and Sámi / Höller

Arctic Railway Impact on the Hinterland

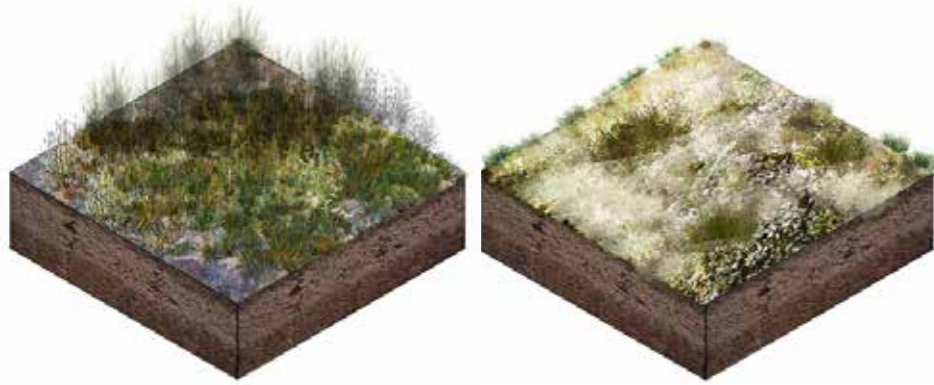
- Cross-border project between FIN and NOR, to connect Finland to the potential arctic logisti hub
- Segregating several migration routes along a 400 KM distance between Kirkenes (NOR) and Rovaniemi (FIN)
- Existing railways, e.g. Nordlandsbanen a 729 kilometer railway line between Trondheim and Bodø, Norway, show the impact on reindeer and the uselessness of fenced of areas
- Huge concerns and protests by the Sámi Community

▼ Photo / 57 Reindeer killed by railway between Helgeland region, Northern Norway



ENERGY PORT LICHEN AS IMPORTANT PLAYER

▼ Map/33 Pollution / Höller



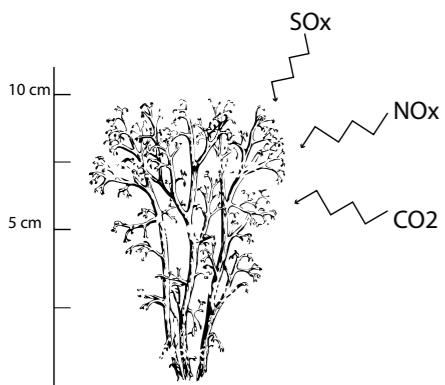
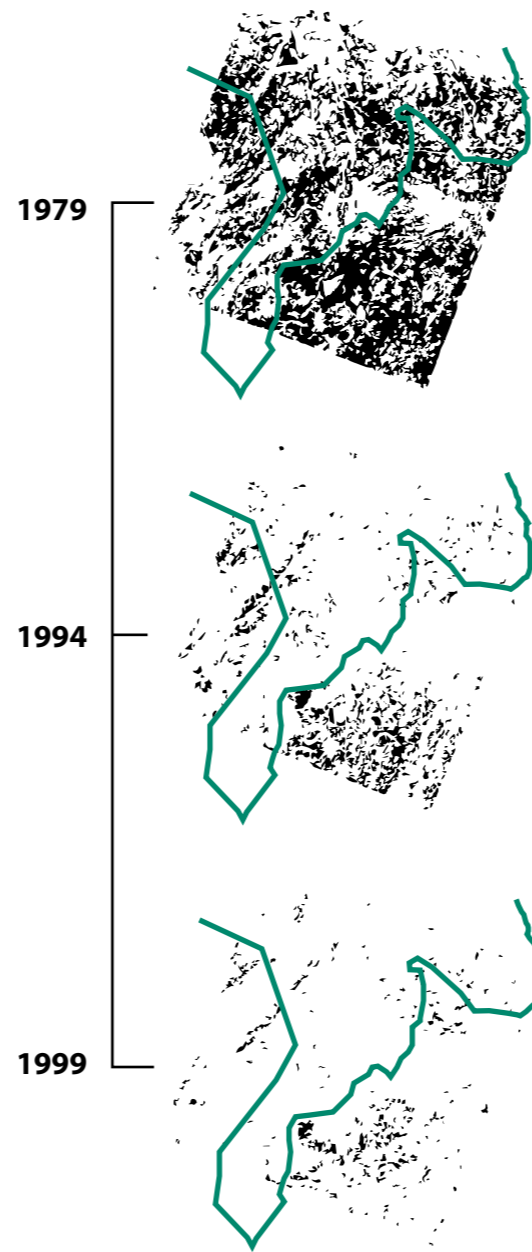
▲ Figure / 43 Sparsley Vegetated Area / Lichen Heath / Höller



▲ Photo / 58 Lichen



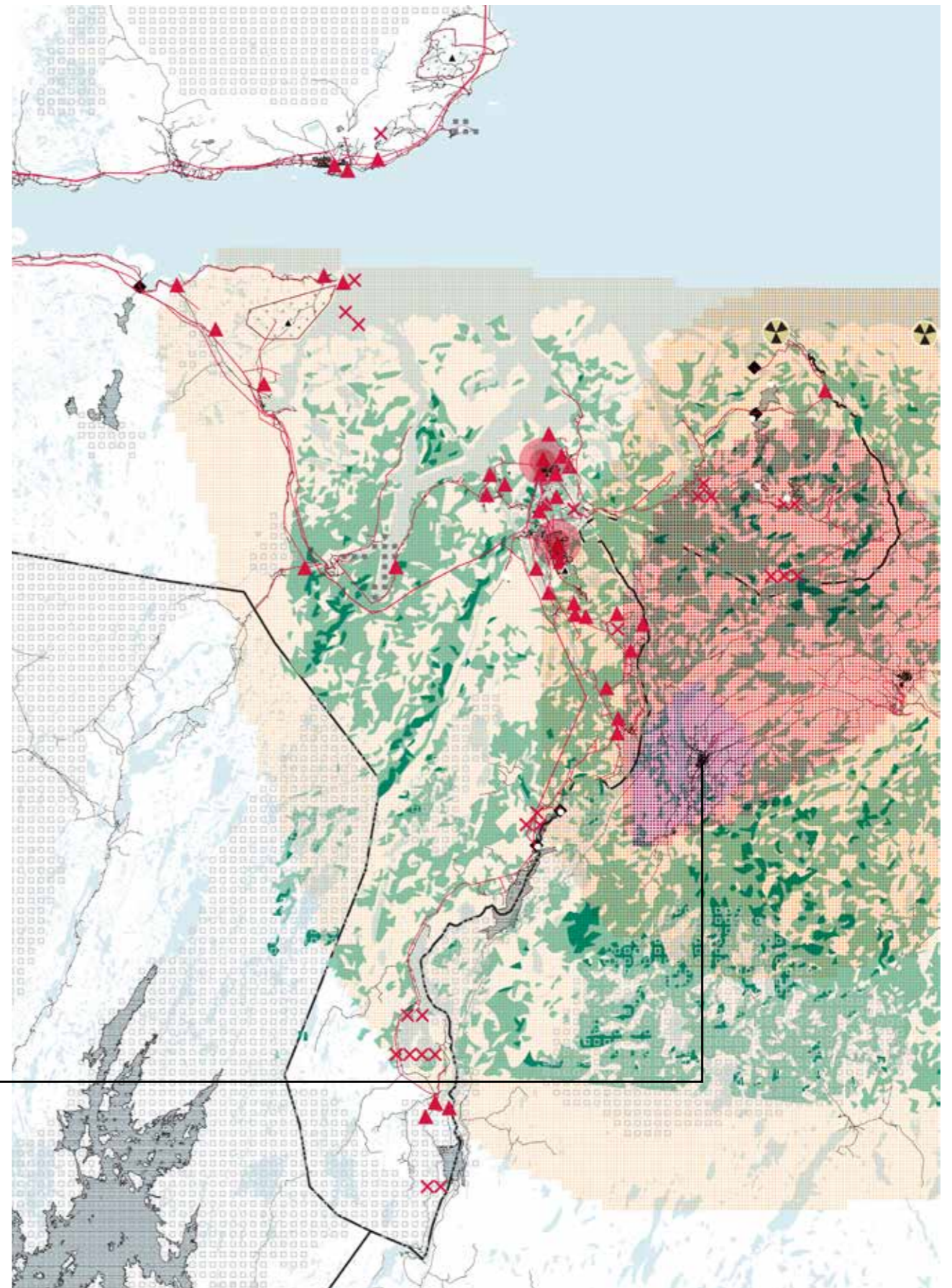
▲ Photo / 59 Reindeer eating lichen as winterfood



▲ Figure/ 44 Lichen



▲ Photo / 60 Kola Mining Company's nickel melter in Nickel on the Kola Peninsula.



ENERGY PORT CLIMATE IMPACT ON REINDEER

Ice-accumulation



Earlier ice-melting



Harassment and disturbance caused by insects



Winter Birch Moth



▲ Figure / 45 Illustration Climate Change Impact on Reindeer / Höller

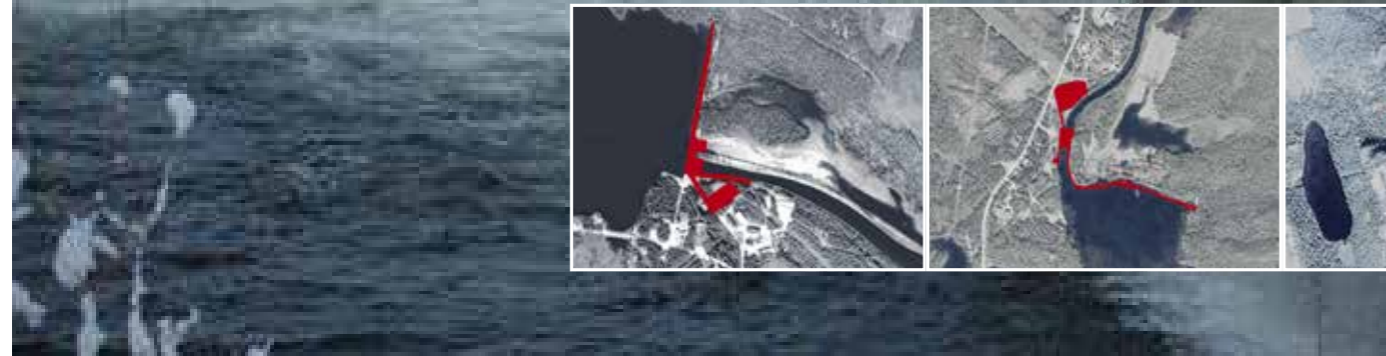


▲ Photo / 61 Ecologist Ashild Onvik Pedersen examines a reindeer cadaver Svalbard, where more than 200 have been found dead (Norwegian Polar Institute)

▲ Photo / 62 The timing of the spring hatching is critical for moth larvae populations in the north. Pictured here are autumnal moth larvae, which survive the winter as eggs deposited in birch trees. Extreme larval outbreaks can occur when hatching coincides with bud burst. Credit: Moritz Klinghardt

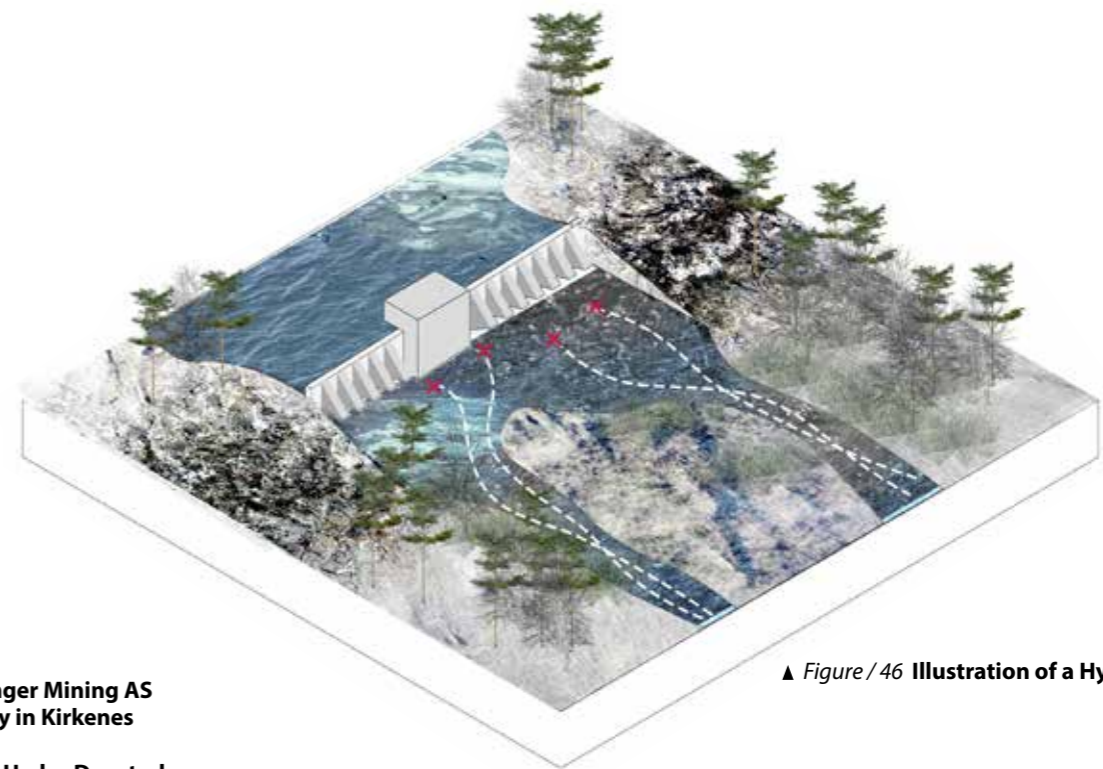
▲ Photo / 63 Mountain birch trees that have been killed by a moth outbreak in Eastern Finnmark, northern Norway, Photo: Jacob Iglhaut

ENERGY PORT INDUSTRY AND ENERGY



Hydropower Dams Pasvik River

- Pasvik River and Ovre Pasvik one of the **most important natural and protected ecosystems** in the region, including parts in Russia, Norway and Finland
- Since WWII **construction of 7 hydropower dams**, regulating, damming the **natural waterflow and impacting large parts of the biotic and abiotic natural participants**



◀ Photo /64 Sydvaranger Mining AS implements electricity in Kirkenes

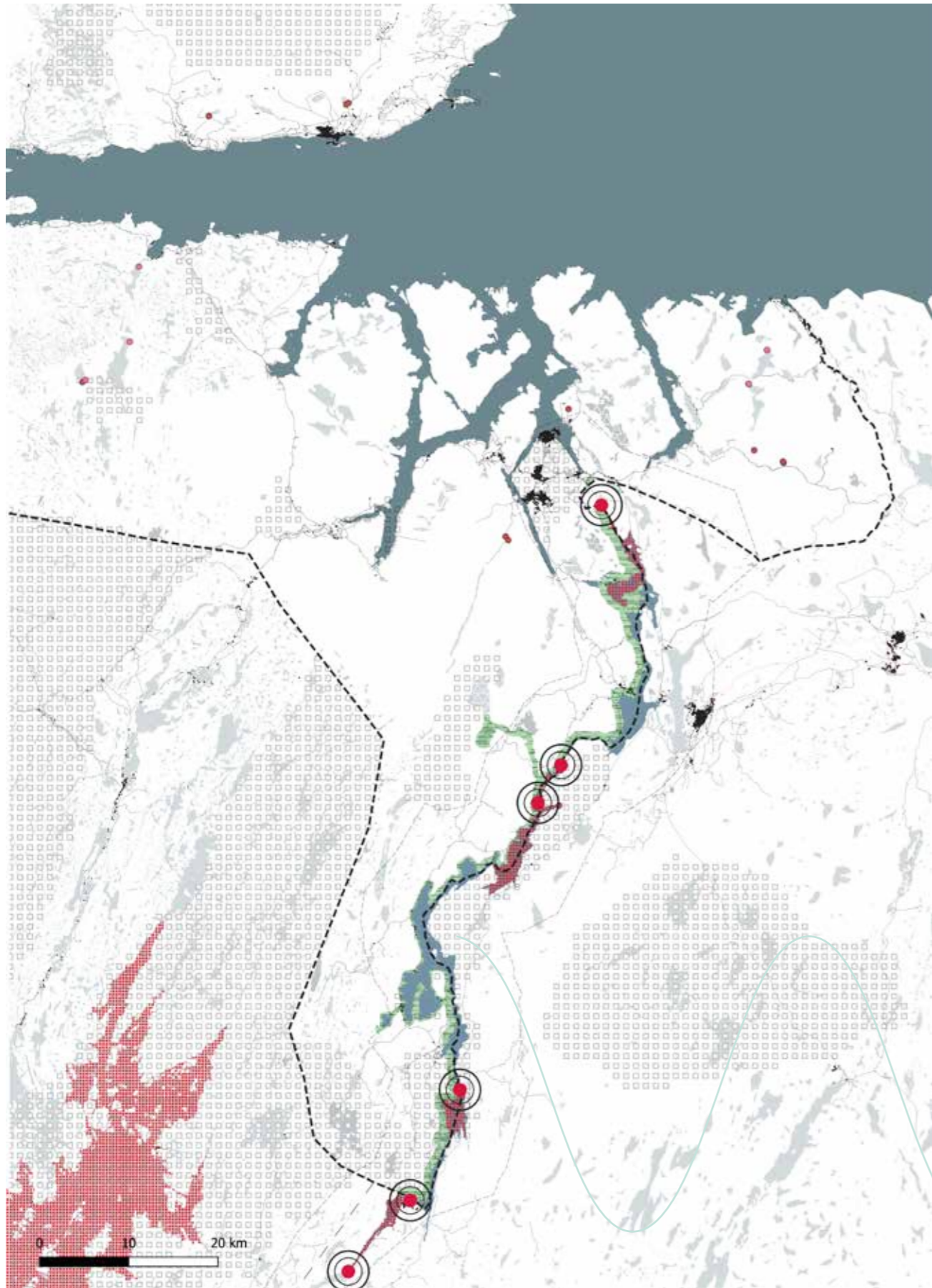
◀ Photo /65 Melkfoss Hydro Dam today

▲ Figure /46 Illustration of a Hydropower Dam / Höller

▲ Photos /66-72 Pasvik Hydropower Dams / Google Earth, adapted by Höller

ENERGY PORT INDUSTRY AND ENERGY

▼ Map / 34 Pasvik Hydropower Dams / Höller



Lesser White-fronted Goose / Goosebirds

- **Migratory bird:** Winter → southern regions
- **Habitat:** variety of Arctic open habitats, particularly scrub-covered and lightly wooded tundra near taiga zone;
- **Breeding Season:** 05 - 06
- **Nesting:** Swamp Marsh Land, free from snow, covered by grass and plants
- **Food:** Gras, herbs, moss and seeds
- **Risks:** Hunting
- **Endangered:** only few breedings in Skandinavia



Sea Eagle / Bird of prey

- **Migration:** Winter → short routes, southern regions
- **Habitat:** Lakes, rivers, coastline
- **Breeding Season:** Beginning spring - 06
- **Nesting:** very large, positioned in trees, sometimes on cliffs
- **Food:** Fish, aquatic birds and small mammals
- **Risks:** Insecticides, pollution
- **Protected species:** around 40 % of all breeding couples in Norway



Bean Goose / Goosebirds

- **Migratory bird:** Winter → southern regions
- **Habitat:**
- **Breeding Season:** 05 - 06
- **Nesting:** Swamp Marsh Land, free from snow, covered by grass and plants
- **Food:** Gras, herbs
- **Risk:** Hunting
- **Endangered:** only few breedings in Skandinavia



Hawk Owl

- **Partial migrant:** only if condition become to extreme; day and night active;
- **Habitat:** Taiga, in boreal forests half open landscapes
- **Breeding Season:** 03 - 06
- **Nesting:** hollow/dead trees
- **Food:** mouses, small mammals, birds
- **Preditors:** Eagle owl, wolverin
- **Risks:** Climate change, human disturbance by breeding;



Mew Gull / Seabird

- **Circumpolar**
- **Migratory bird:** Moves to icefree aquatic areas
- **Breeding Season:** 04 in small/big colonies on land; 05 - 07
- **Habitat:** Peat bogs/lakes, aquatic coast
- **Nesting:** above Arctic treeline
- **Food:** Crabs, small fish, mussels, waterplants
- **Risks:** many predators, climate change



Ruff / Snipe bird

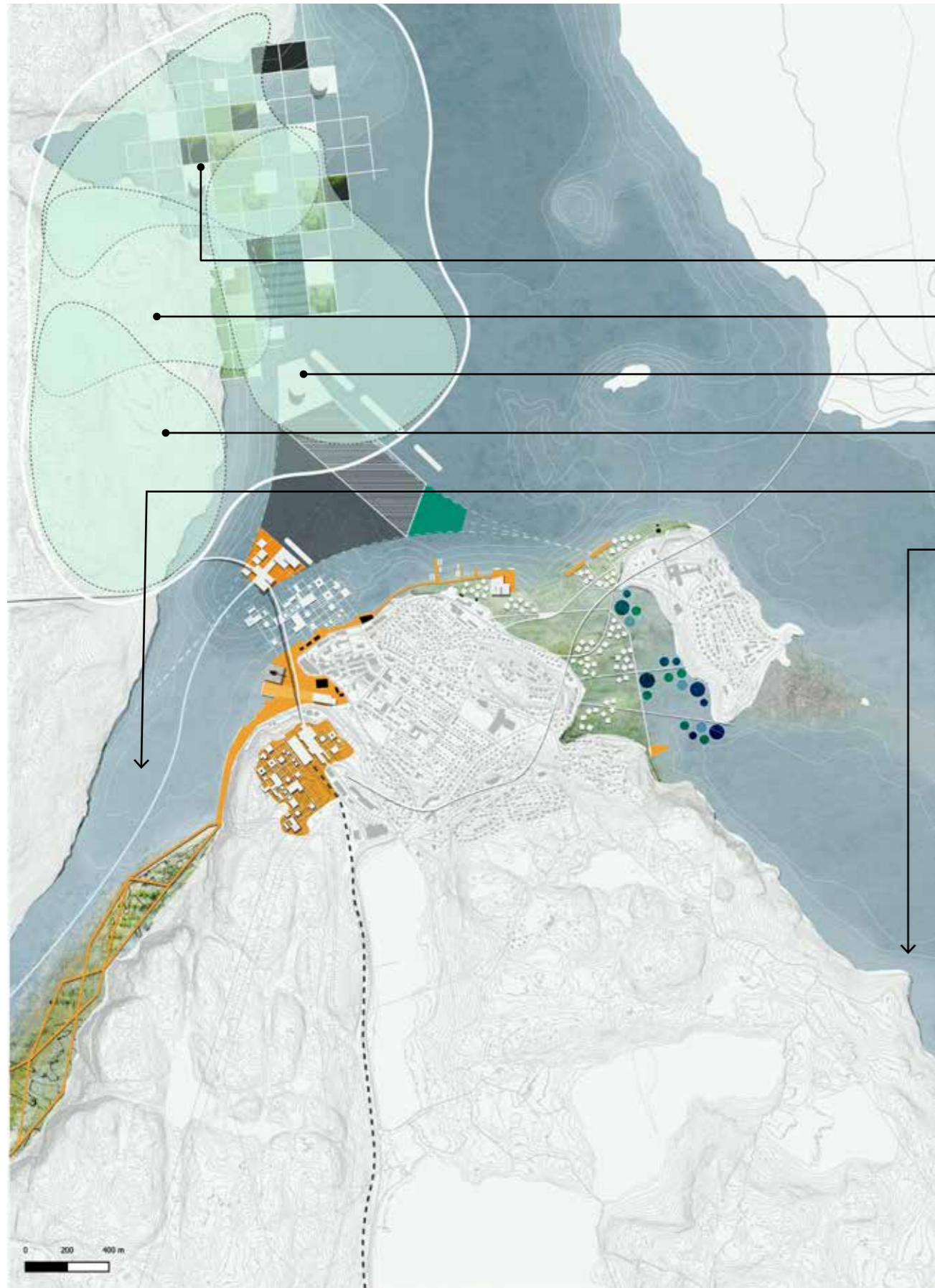
- **Migratory bird:** Winters to S-Africa, S-Asia and Australia
- **Habitat:** scrubland, wetlands;
- **Breeding Season:** End 05 - 08
- **Nesting:** Peat bogs, in marshes and wet meadows
- **Food:** omnivores, seeds or berries, flies, frogs, small fish, beetles, snails, spiders, worms,
- **Risks:** Climate change, habitat loss, strongly protected;



▲ Figure / 47 Impact on several natural participants by the Hydropower Dam Pasvik / Höller

ENERGY PORT MAIN GOALS AND CONCEPT

▼ Figure / 48 Design Fiction Energy Port / Höller



• Reindeer-Lichen Area

• Observation Port

• Floating Hydrogen Port

• Sámi Cultural Center

• Hyperloop Hinterland

• Pasvik Hydropower Dam

Norway is making its fjords 'the world's first zero emission zone at sea'



PLOS ONE

RESEARCH ARTICLE

Lichen Symbiosis: Nature's High Yielding Machines for Induced Hydrogen Production

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* kotzab@biology.uoc.gr

Main Goals and Concept

Integration of reindeer herding, Sámi culture/society and port activity and port-city culture/society

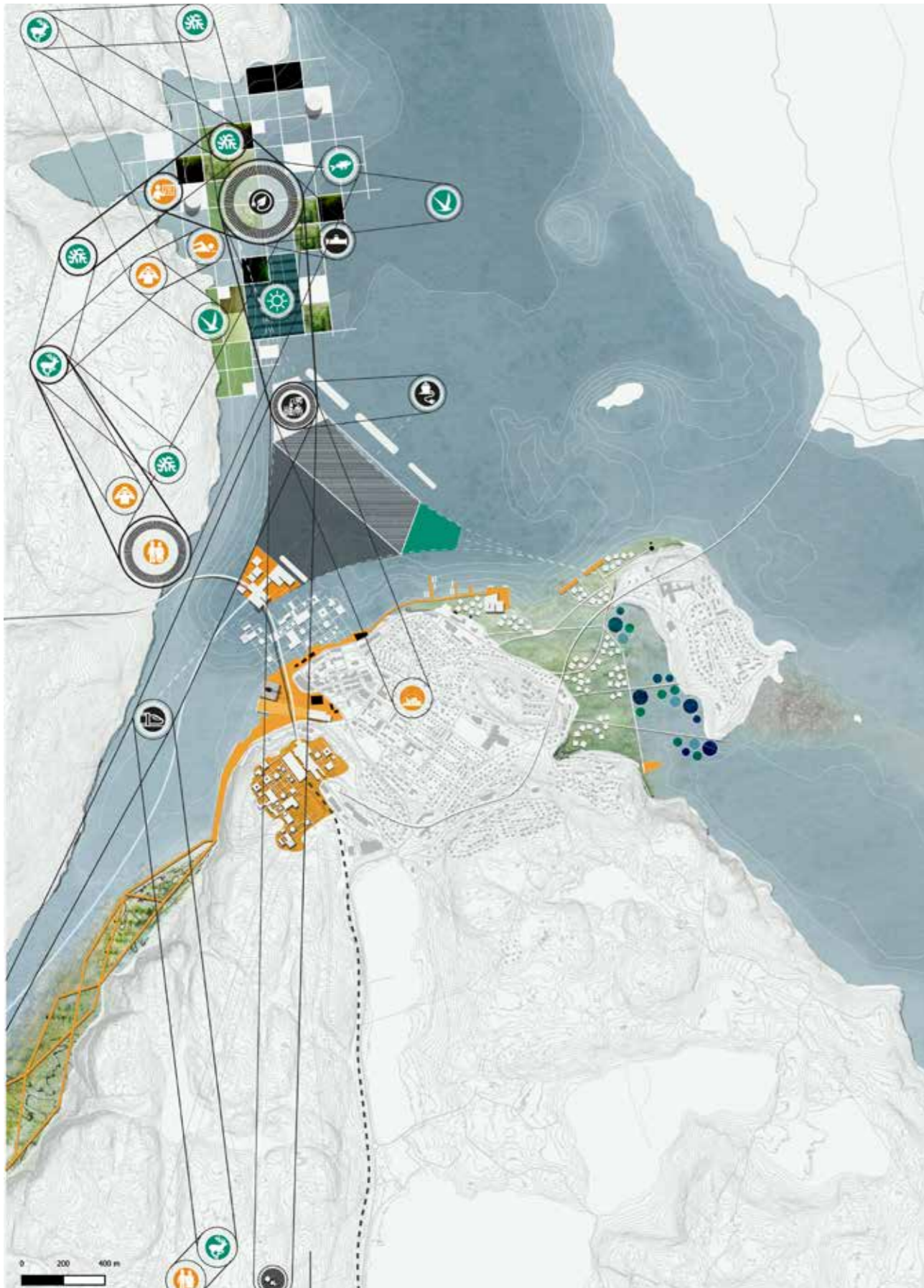
Synergistic Players

Lichen as potential **energy producer** and the transition of the proposed **oil/gas transshipment terminal** into a **hydrogen powerplant** to create an unique opportunity for **Kirkenes** as a **pioneer in hydrogen production/availability** for shipping and logistics in **Arctic** territories



ENERGY PORT FICTION-SYNERGIES

▼ Figure / 49 Synergistic Adaptive Energy Port - Design Fiction / Höller



Floating Algae and Lichen Farm
Synergistic Abstraction with its three different sub-areas

- 1. Renatured Recreational and Touristic Area (Summer)**
- 2. Additional Reindeer Herding and Migration Area (Winter)**
- 3. Hydrogen Production Area**

Terrestrial Sámi Cultural Center and Lichen Research Center:
Synergistic Abstraction with its two different sub-areas

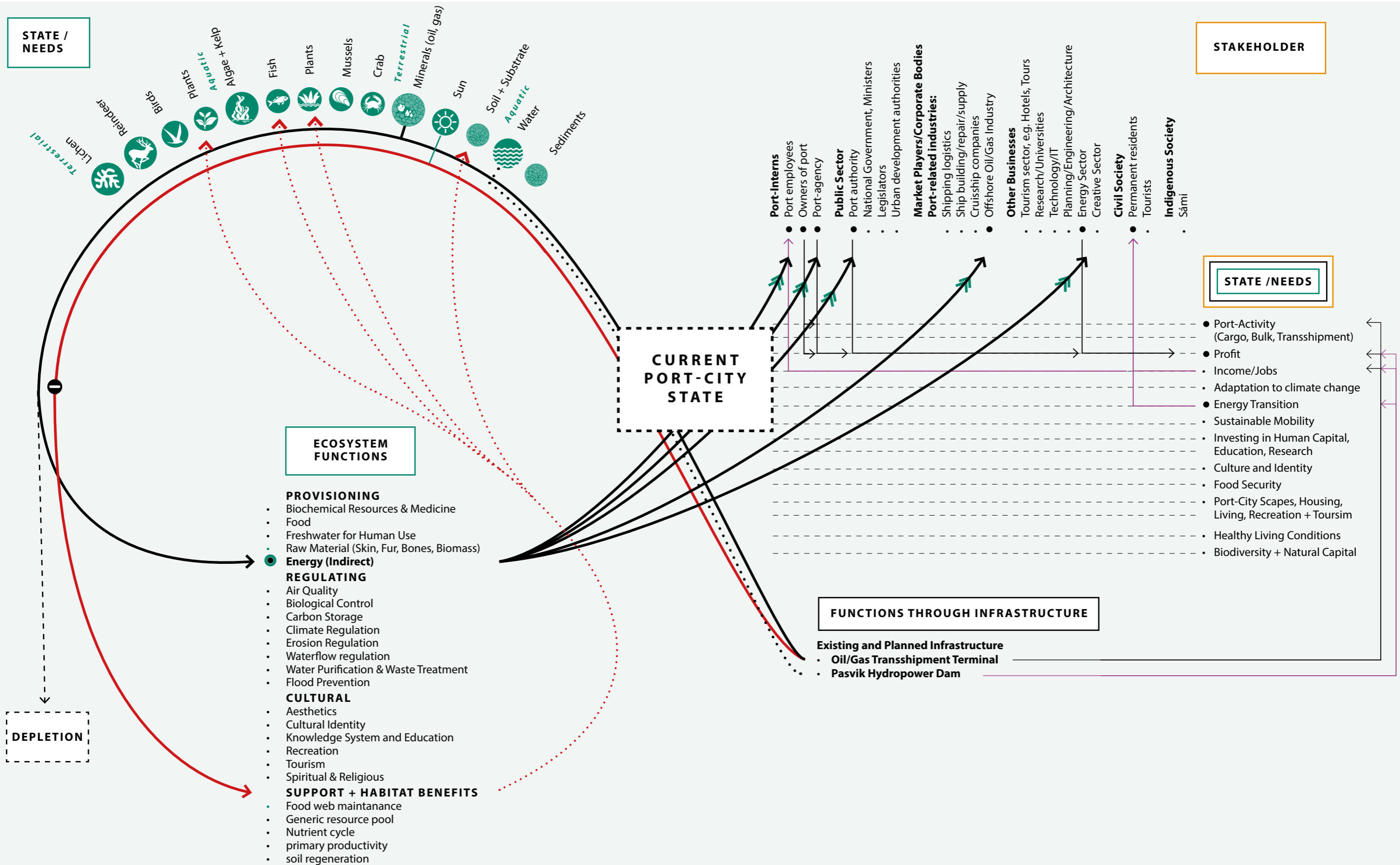
- 1. Sámi Cultural Center**
- 2. Lichen Research and Observation Center with integrated Reindeer Grazing Spots (Summer)**

Hydrogen Transport- and Use-Infrastructure
Synergistic Abstraction with its two different sub-areas

- 1. Transport Infrastructure Port and City**
- 2. Hyperloop as Transport Infrastructure into Hinterland with Integrated Reindeer-Herding Implementations**

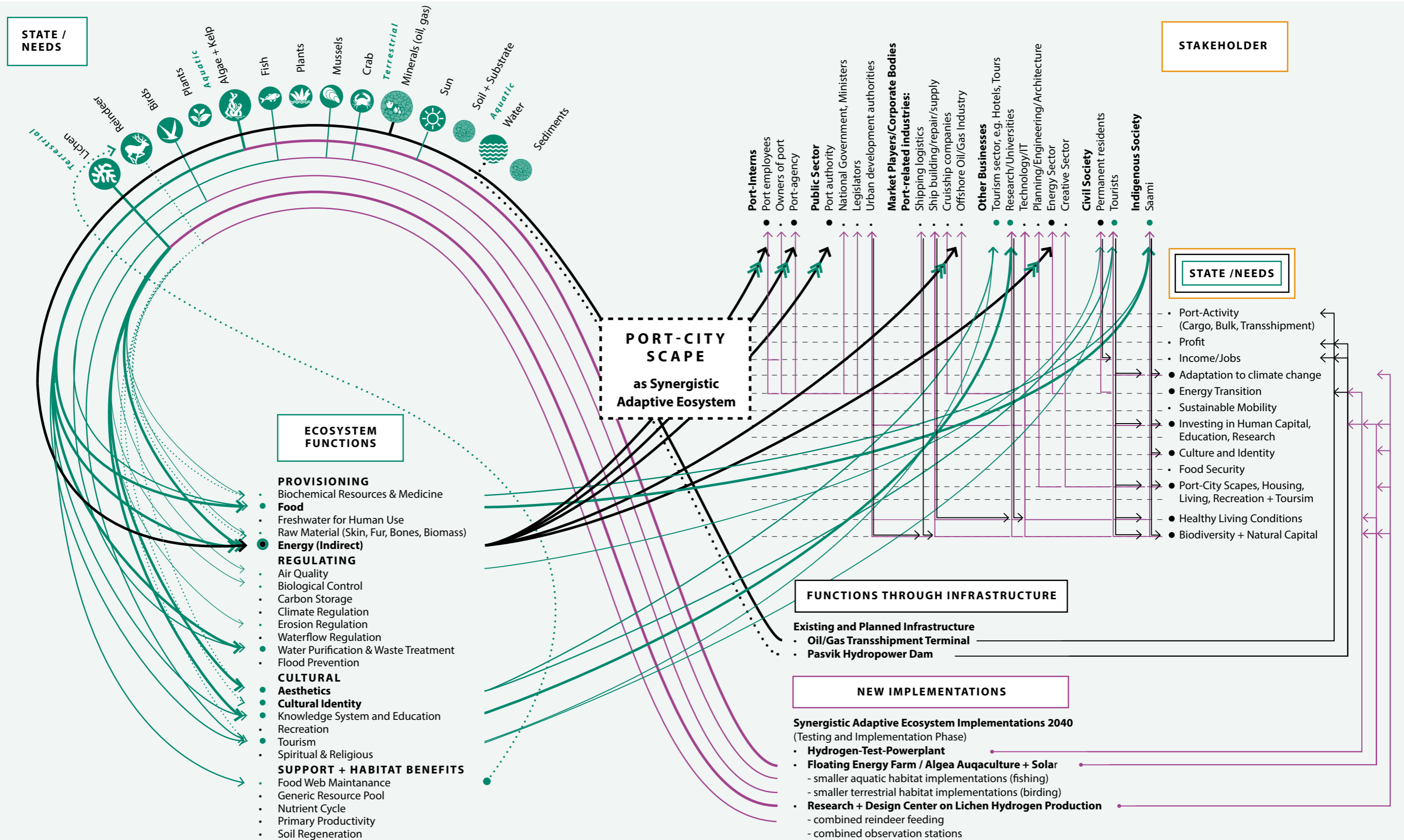
ENERGY PORT SYNERGISTIC LOOP

▼ Figure / 50 Current Port-City State / Höller



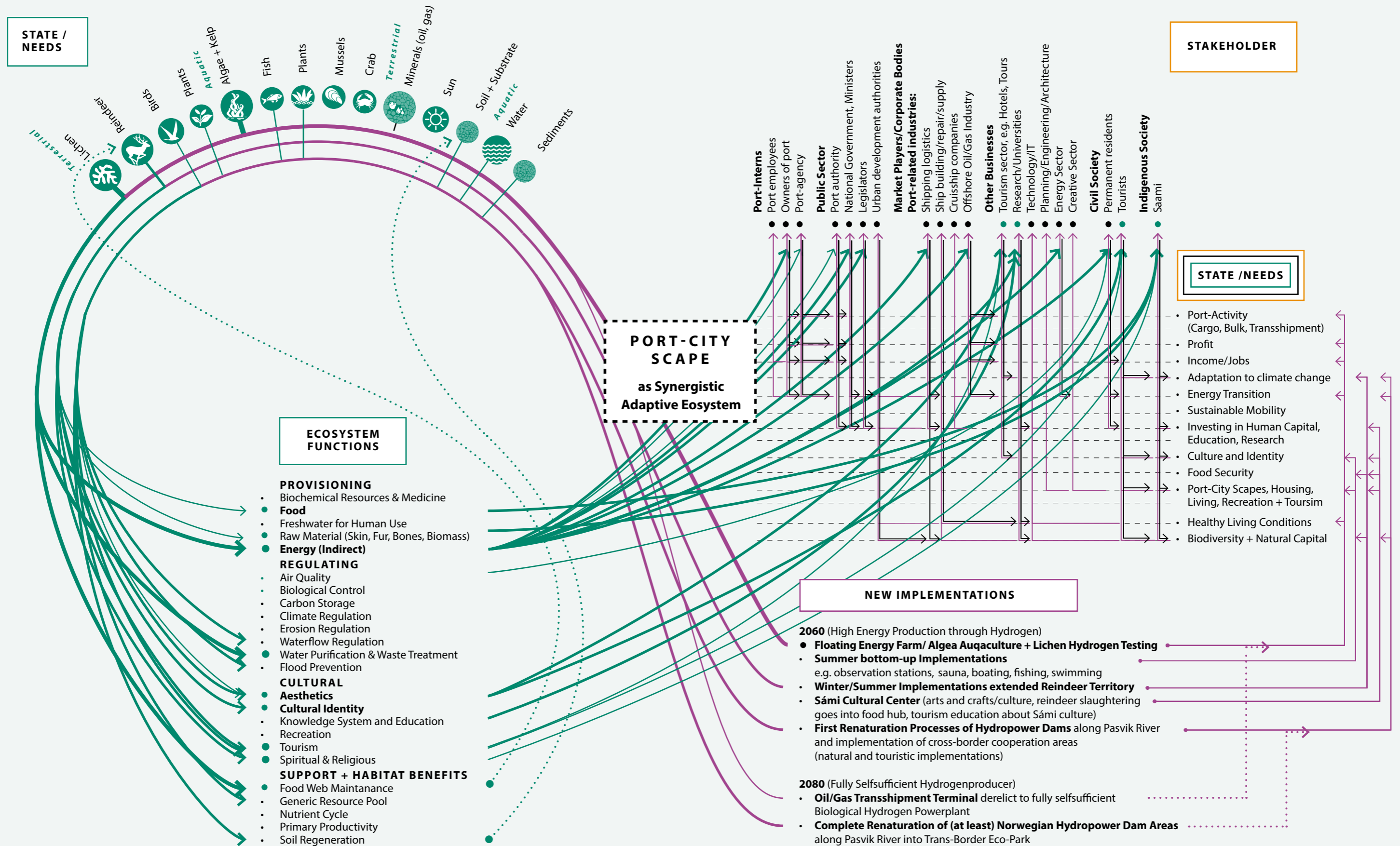
ENERGY PORT 2040 SYNERGISTIC LOOP

▼ Figure / 51 Synergistic-Loop 2040 Energy Port / Höller



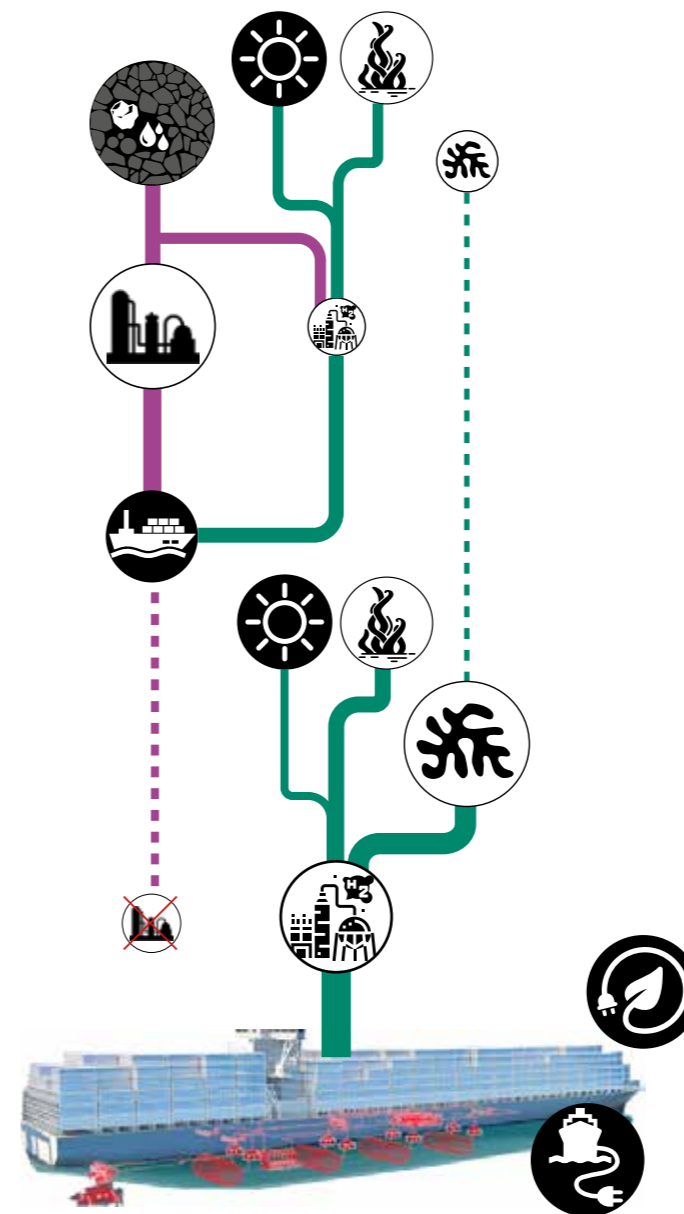
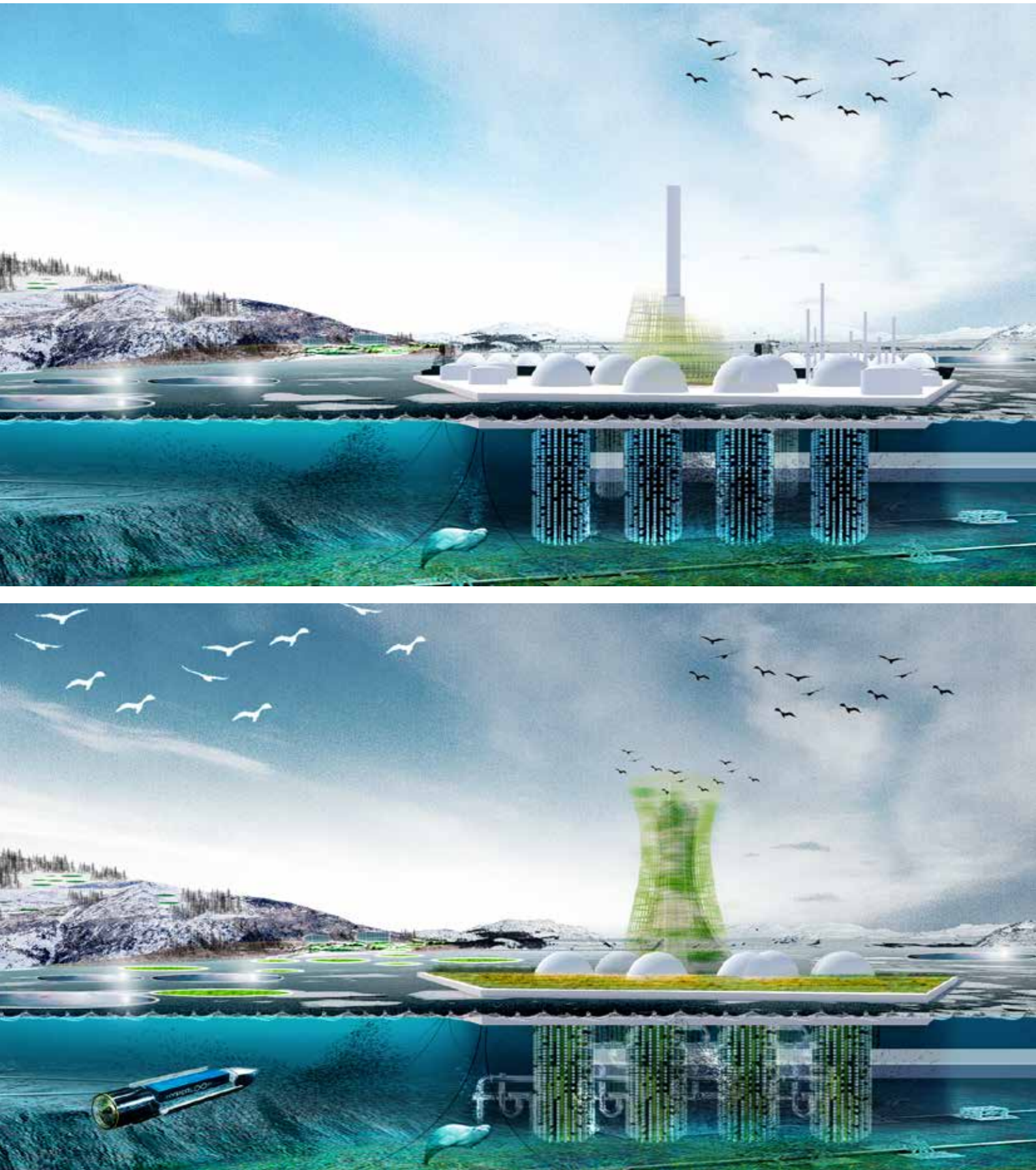
ENERGY PORT 2060/2080 SYNERGISTIC LOOP

▼ Figure / 52 Synergistic-Loop 2060 and 2080 Energy Port / Höller



ENERGY PORT FICTION

▼ Figure / 53 Illustration of the possible Floating Energy Port / Höller



Hydrogen Energy potentials:

Step 1 (start-2040)

- Through **oil/gas** which is already available and planned within the new proposed port-infrastructure
- Through the conversion of **solar energy** to hydrogen by means of water splitting process (if this process is assisted by photocatalysts suspended directly in water instead of using photovoltaic and an electrolytic system the reaction is in just one step, it can be made more efficient)

Step 2 (post 2040)

- **Algae** as biomass for biohydrogen gasification, steam reforming, biocatalysed electrolysis or **biological hydrogen production**
- **Lichen** was identified as a potential future biotechnological hydrogen producer through **biological hydrogen production**

◀ Figure / 54 Schema of the Transformation of the Oil/Gas Transshipment terminal towards a Hydrogen Powerplant / Höller

ENERGY PORT FICTION

▼ Figure / 55 Illustration Floating Lichen/Algae Plattform / Höller

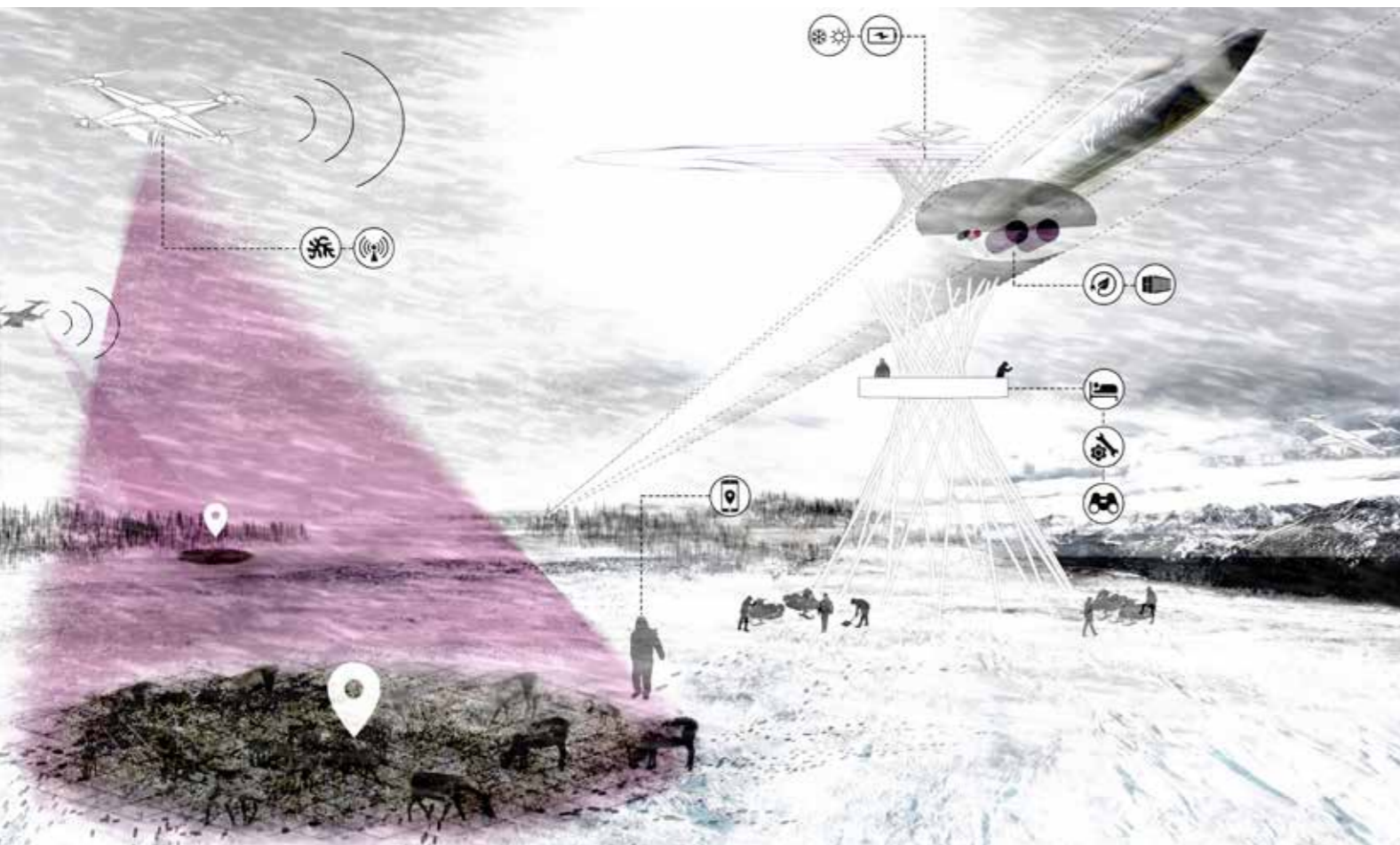


Floating Lichen/Algae Plattform:

- Connect the space of the **reindeer with the economic need of sustainable energy** production of the port.
- **Prefabricated structure** of the plattform in drydock of the KIMEK Company
- **Upcycling of scrap materials** from ship repairs or mining infrastructures to reach the goal of a resource saving and circular society.
- **Summer:** Plattform accommodates different opportunities for **recreational and torusitic activities**
 - **Inhabitants are involved in the decision making** and distribution of the implementations.
 - The floating structure **allows to change implementations** if needs are chaning
- **Winter:** Plattfrom used as **extension of the grazing territory for reindeers**
 - Selected **lichen-farms opened as food sources**
 - Water segments inbetween structure freeze and can provide opportunities for **ice-fishing**
 - **Reduced recreational and touristic activites**, only the observation stations on land and on sea are open for visitors

ENERGY PORT FICTION

▼ Figure / 56 Hyperloop following the tracks of the reindeer / Höller

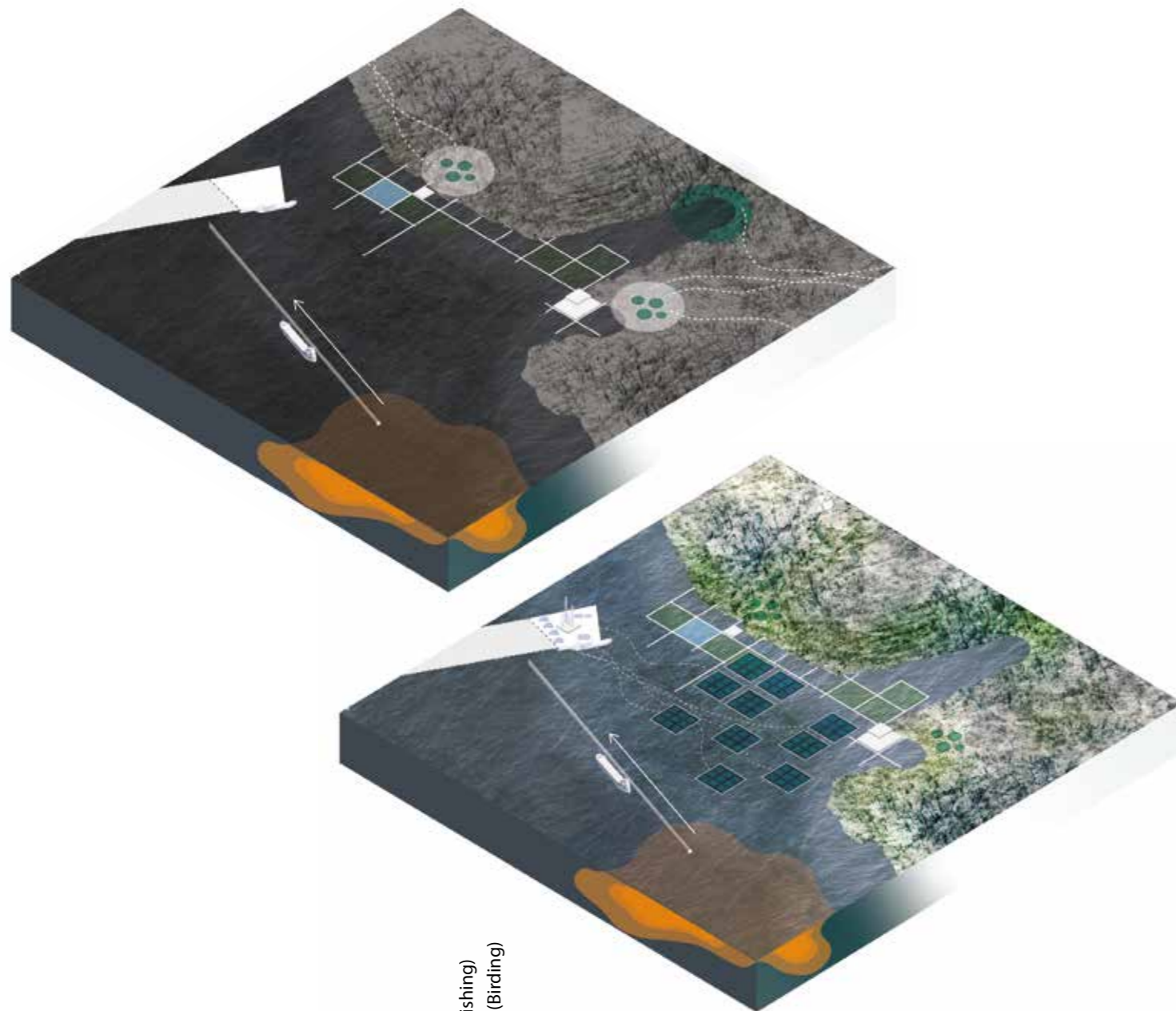


Hyperloop - An Adaptive Measure for Reindeer Herding

- Arctic Railway from Kirkenes to Rovaniemie, Finland, as perfect example of **hinterland-impacts** of ports **outside port-city entity**.
- Design Fiction proposes an **alternative mode of transport** to move goods and people to their wished destination.
- Instead of segregating the migratory routes along the 400 km of railway track, the new structure can be build on pillars to **allow movement inbetween the grazing areas**.
- Structure can accomodate the **infrastructure for transporting** the produced **hydrogen** into the hinterland and provides the large and harsh territory with an **constant energy flow**
- Hyperloop has integrated **herding-accommodations**, where the herder can take **rest, restock their supply and recharge** their hydrogen-powered snow-mobiles.
- **Drones**, connected to climate-measurement stations ontop of the structure **collect climate data** and can be used to track either the reindeer or suitable, **non-frozen grazing spots**.

ENERGY PORT 2040 DESIGN STEPS

▼ Figure / 57 Energy Port Design Steps / Höller



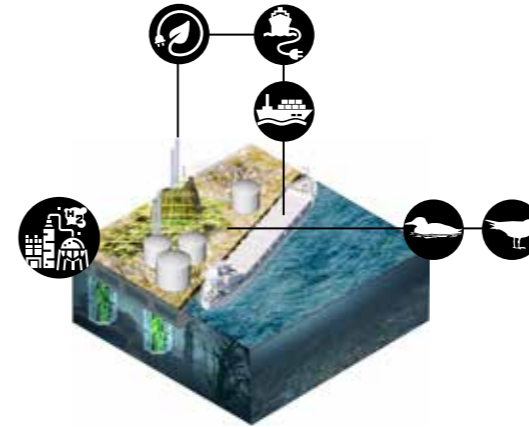
Synergistic Adaptive Ecosystem Implementations
2040 (Testing and Implementation Phase)

- 1 Hydrogen-test-powerplant**
- 2 Floating Energy Farm / Algae Auqaculture**
- 3 + Solar**
smaller aquatic habitat implementations (Fishing)
smaller terrestrial habitat implementations (Birding)
- 4 Research + Design Center on Lichen Hydrogen Production**
combined Reindeer feeding
combined observation stations
- 5**
- 6 Re-mining Iron Ore Tailingsre**
reusing existing Pipeline

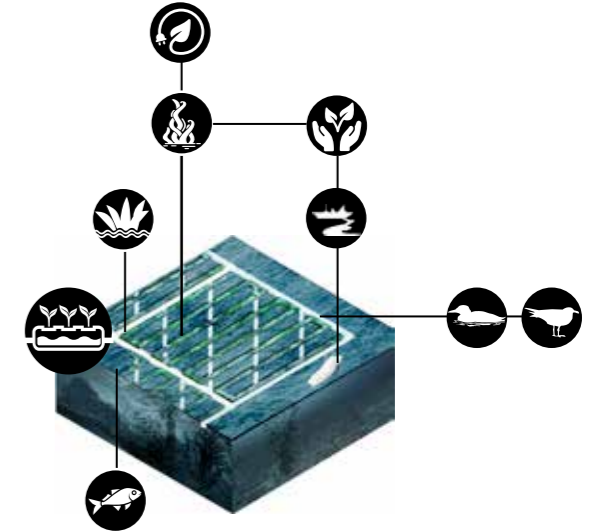
2020

2040

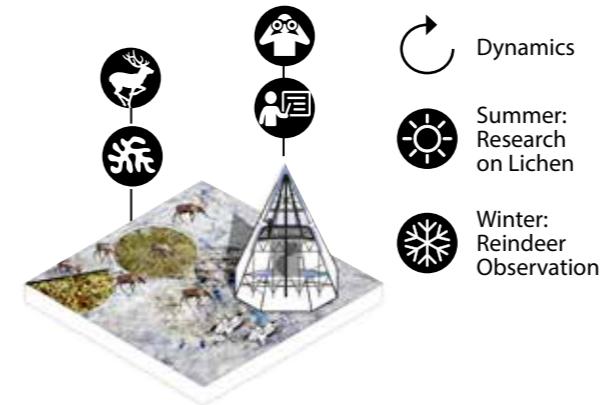
1 Hydrogen-Test-Powerplant in Oil/Gas Transhipment Terminal



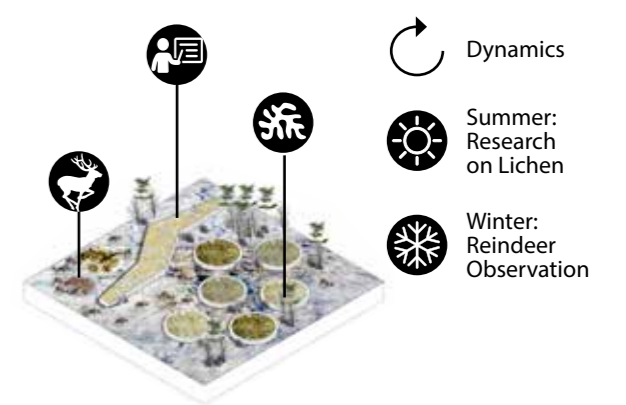
2 Floating Energy Farm / Algae Auqaculture



4 Research + Design Center on Lichen Hydrogen Production
combined observation stations



5 Research + Design Center on Lichen Hydrogen Production
combined Reindeer feeding

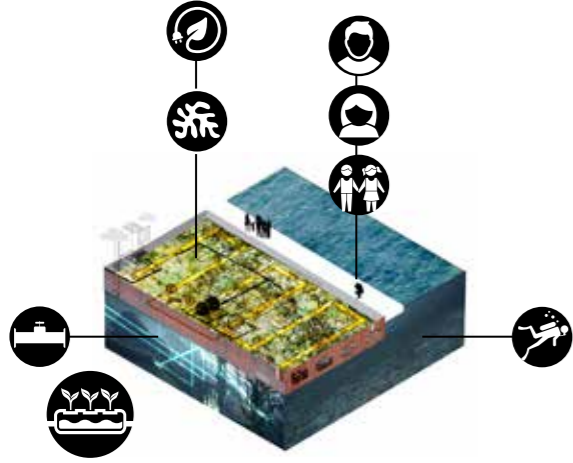


2060

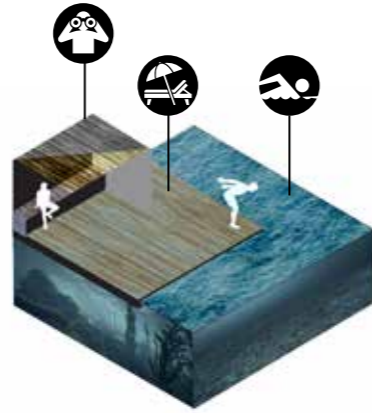
2080

ENERGY PORT 2060 DESIGN STEPS

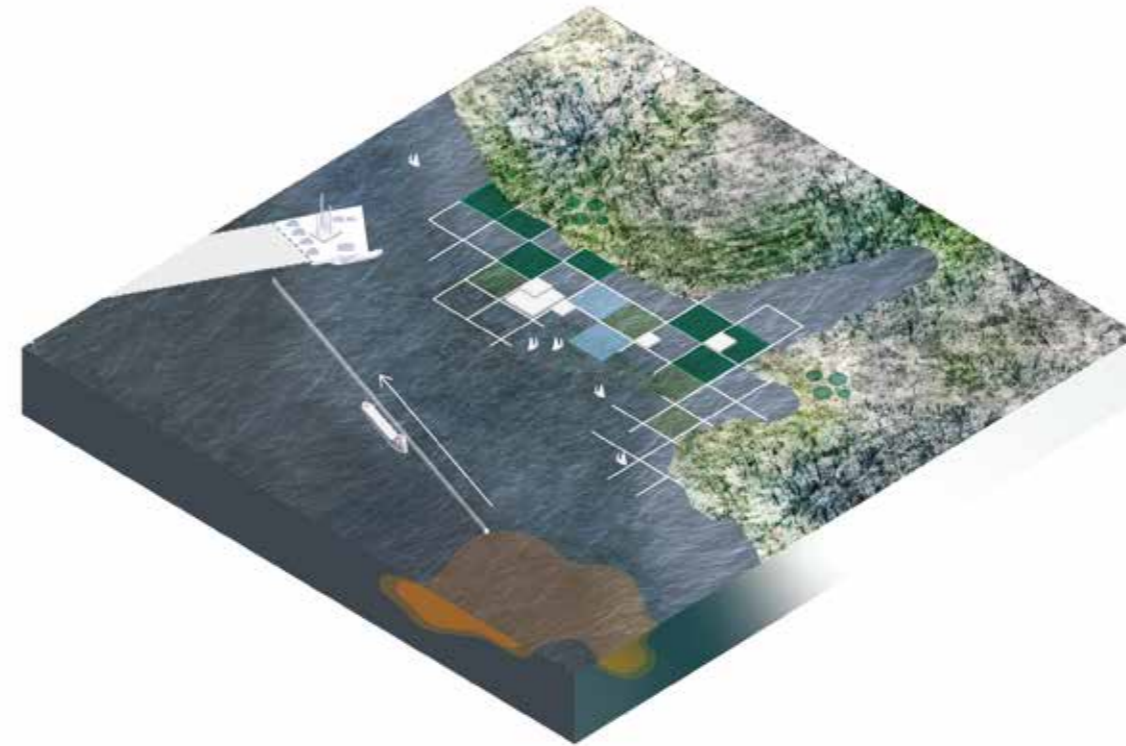
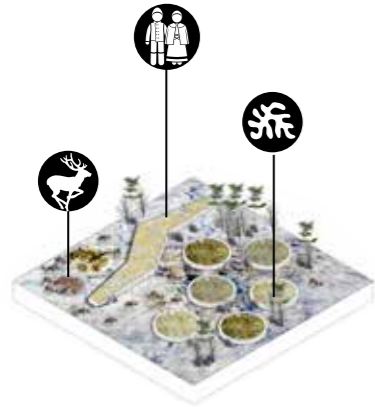
1 Floating Lichen Hydrogen Test- Modul



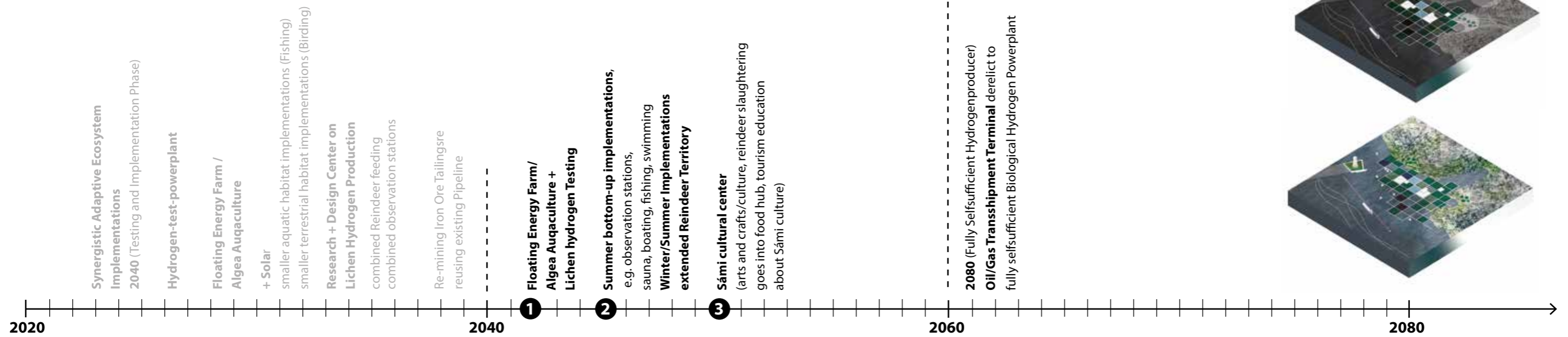
2 Recreational/Cultural Implementations (Bottom up, Residents Engagement)



3 Sámi Cultural Center



▼ Figure / 58 Energy Port Design Steps / Höller



URBAN PORT FROM FRICTION TO FICTION

▼ Photo / 73 Langfjorden, filled up with tailings from the iron-ore processing plant.



▼ Figure / 59 Illustration of the Re-Mining Process along Langfjorden / Höller



URBAN PORT CURRENT PORT-CITY



▲ Figure / 60 Kirkenes Port Structure / Höller

Total Waterfront: est. 6700 m
Accessible Waterfront: est. 1600 m or 25%
Inaccessible Waterfront: est. 5100 m or 75%

Missing Connection between City and the Sea

- Almost 75% inaccessible waterfront due to industrial and manufacturing activities
- Unstructures or privatized use of along the waterfront
- Kirkenes home of the Barents House, where UiT, Barents Secretary and Center of High North Logistics have their seat



► Photo / 74 Prominent hotspot in Kirkenes for taking pictures of the Fjord / Höller

► Photo / 75 Same hotspot a few meters away from the waterfront

► Photo / 76 Proposed, but never realized design of a new Barents House / Höller

► Photo / 77 Barents House in Kirkenes

► Photo / 78 View on the beautiful Northern Lights from a rare dark spot along the waterfront

► Photo / 79 Attempt to capture the Northern Lights through the light pollution along the waterfront in Kirkenes / Höller

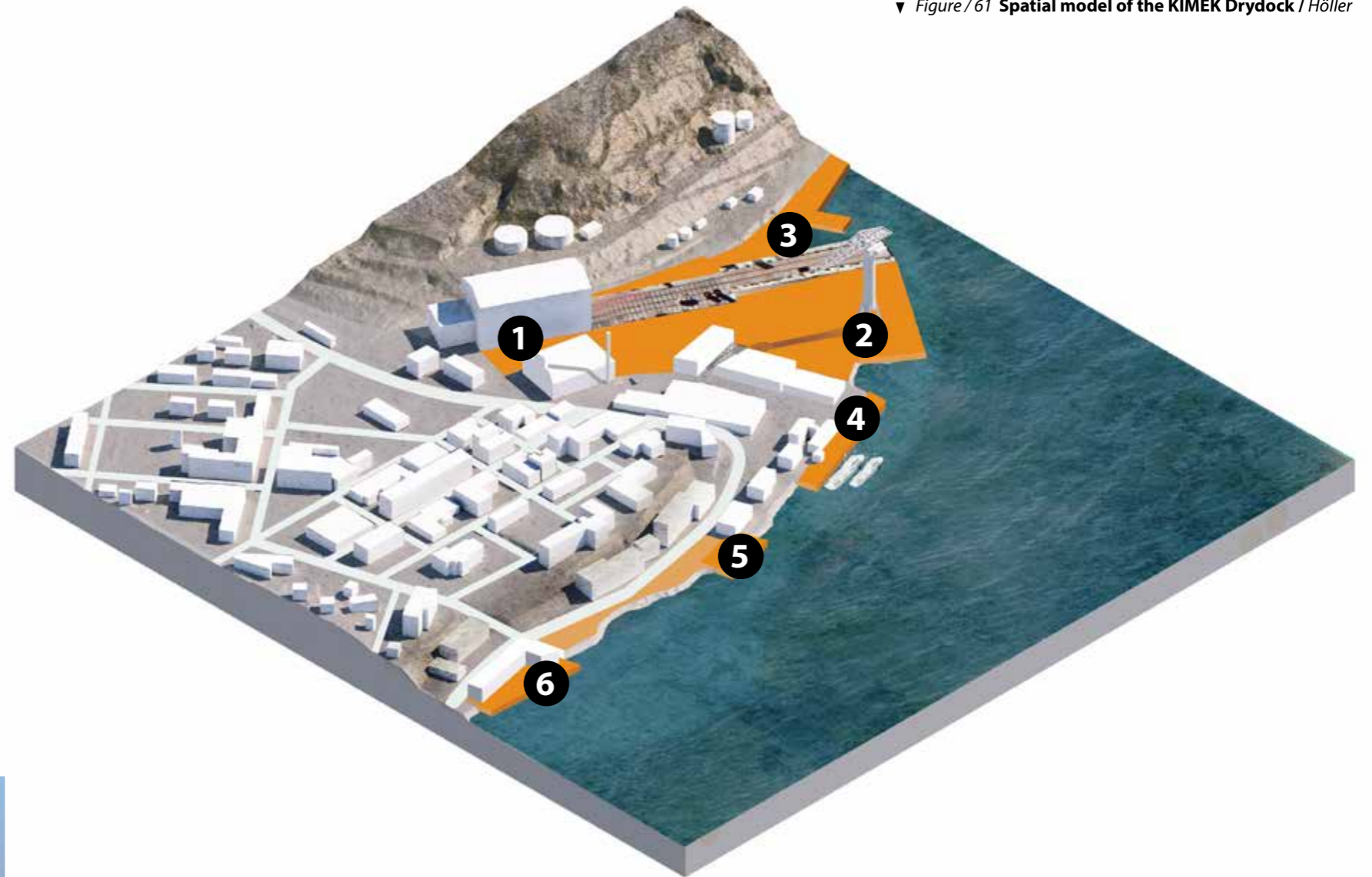
URBAN PORT CURRENT WATERFRONT

- Shipping and maritime industry profited most since the closure of the mine
- KIMEK, former supply and service company for mining, shifted skills for shipping supply and repair services esp. for the Russian fishing sector
- KIMEK drydock, biggest shipyard north of Trondheim, new "maritime landmark" of Kirkenes

BUT:

- Potential restructuring of the area due to the moving of the repair activities towards new port
- Potential loss of "cultural" built environment
- Potential privatization/occupation of the waterfront by proposed cruiship terminal closer to urban center

▼ Figure / 61 Spatial model of the KIMEK Drydock / Höller



- ① KIMEK Drydock, Shipwarft
- ② Heavy Load Crane
- ③ Drydock mechanism to put ships from water to land
- ④ Coast Guard and Maritime Security
- ⑤ Additional Quay
- ⑥ Thon Hotel, "Privatized" Waterfront



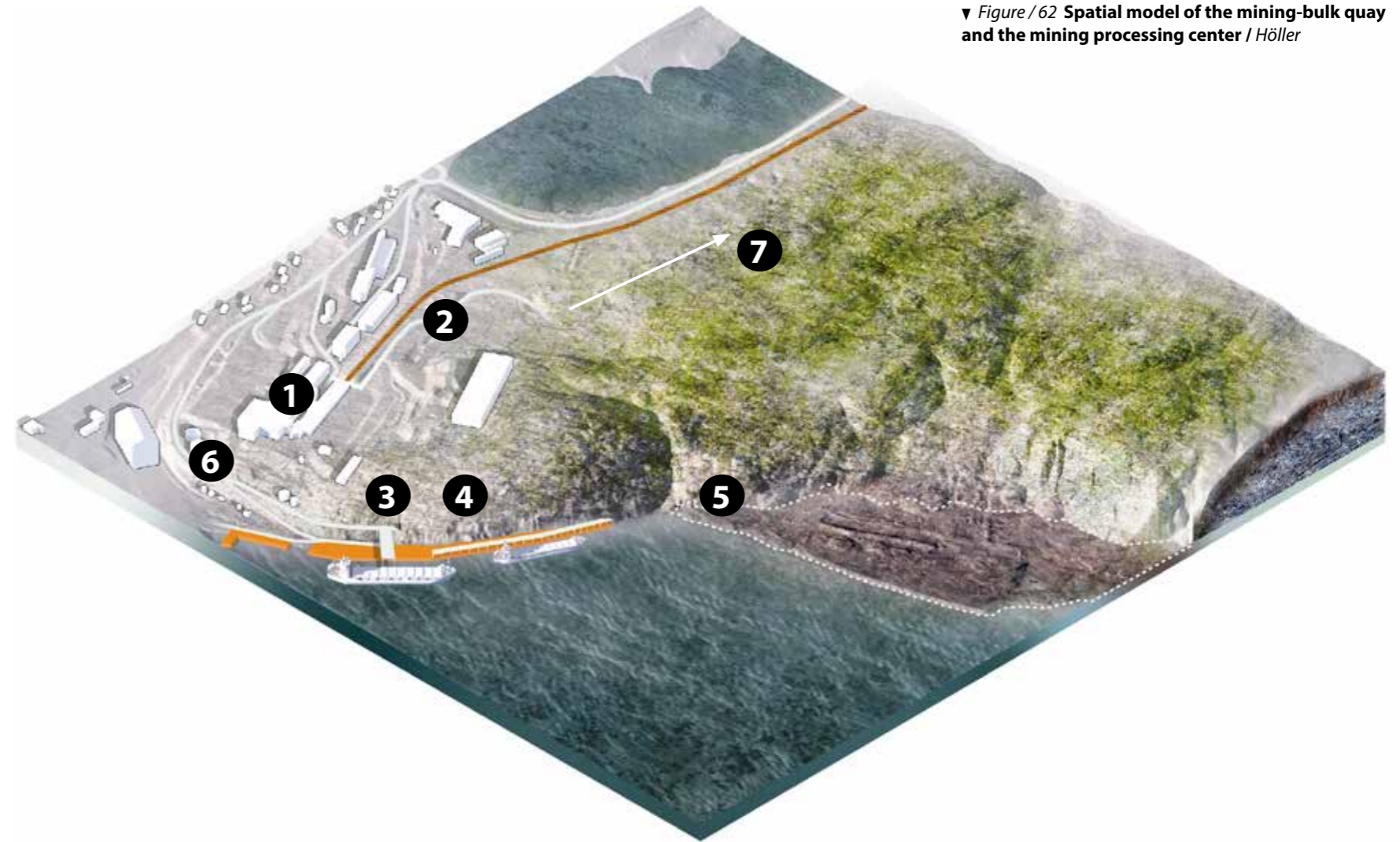
◀ Photo / 80 The KIMEK Drydock as new "landmark" of Kirkenes / Höller

◀ Photo / 81 Bird's Eye View on the KIMEK Company Area

◀ Photo / 82 KIMEK heavy-load crane marking the waterfront of Kirkenes

URBAN PORT IRON PROCESSING AREA

- Area of the mining porcessing center currently not in use, besides export/import quay used by Tschudi Northen Logistics
- Railway for tranpsort of mining material currently not in use
- Reopening process already in action
- High pollution on land and sea due to iron-ore processing and tailing dumping into Langfjordem
- Langfjorden now clogged (former 60m deep and 400m wide, today 1m deep and 30-40m wide) and new mining tailings being dumped in Bokfjorden



▼ Figure / 62 Spatial model of the mining-bulk quay and the mining processing center / Höller

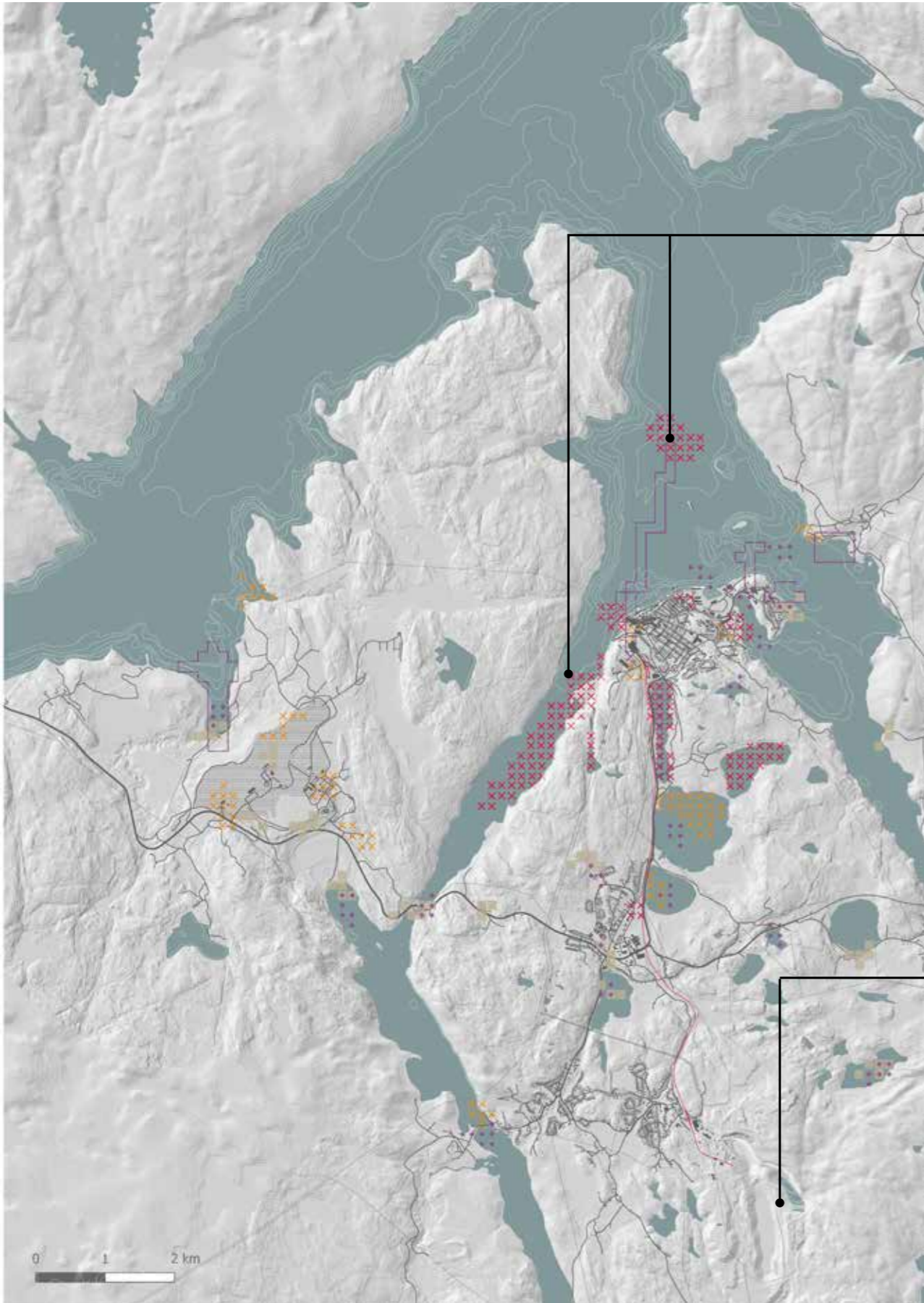


◀ Photo / 83 View on Sydvaranger Processing Center from the center of Kirkenes / Höller

- ① Iron/Copper Ore Processing Center
- ② Railway to Bjernevatn Mine
- ③ Importkaia/Import Quay
- ④ Eksportkaia/Export Quay, Dry Bulk Dock
- ⑤ Deep Sea Mining Tailings
- ⑥ Oil/Gas Service, Refueling Station
- ⑦ Sydvaranger Mine, around 8 km away in Bjernevatn

URBAN PORT MINING TAILING DUMPING

▼ Map / 35 Pollution Kirkenes/Sør-Varanger: Mining and Tailing-Dumping / Höller



▼ Photo / 84 Langfjorden, filled up with tailings from the iron-ore processing plant.



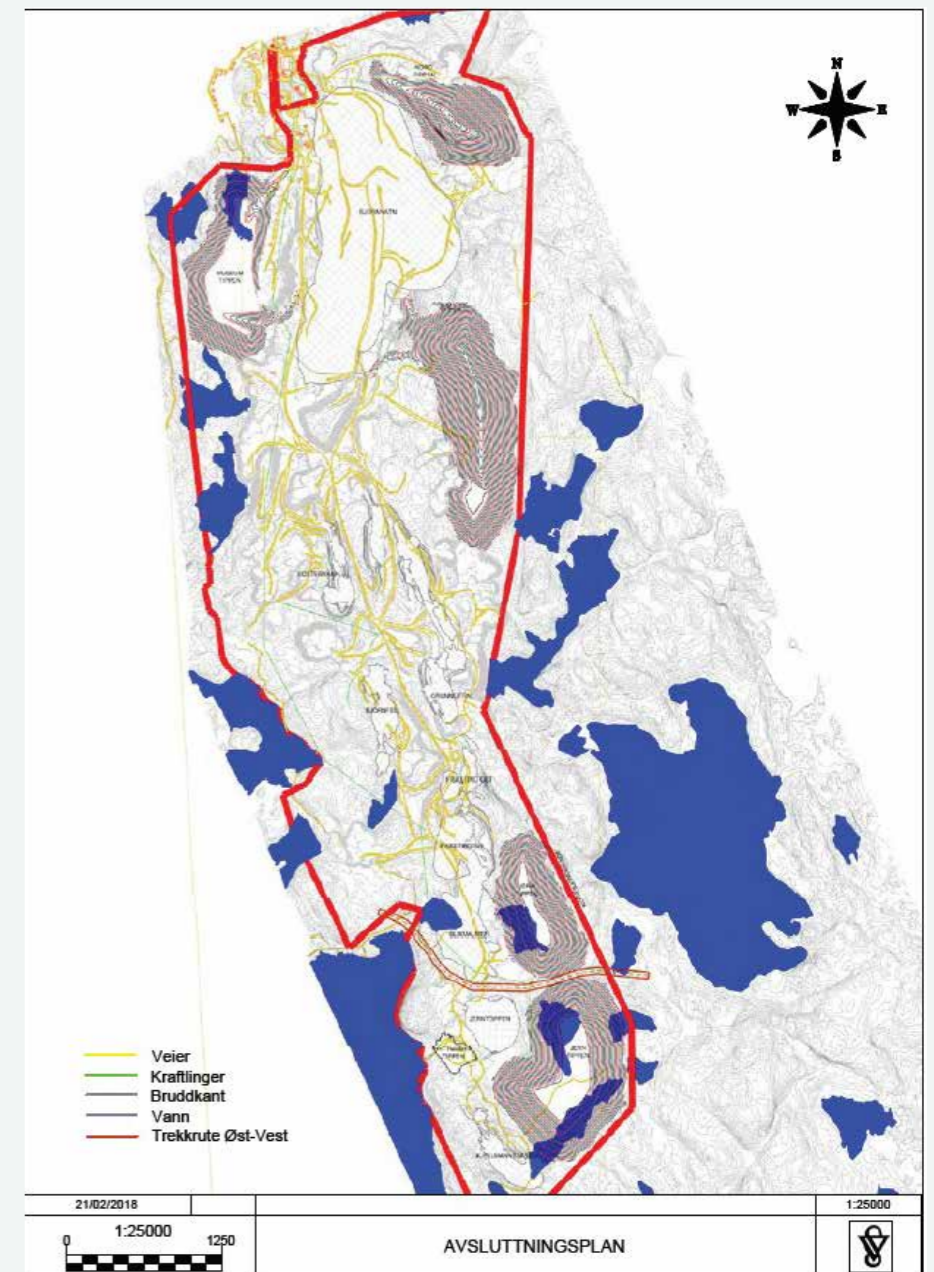
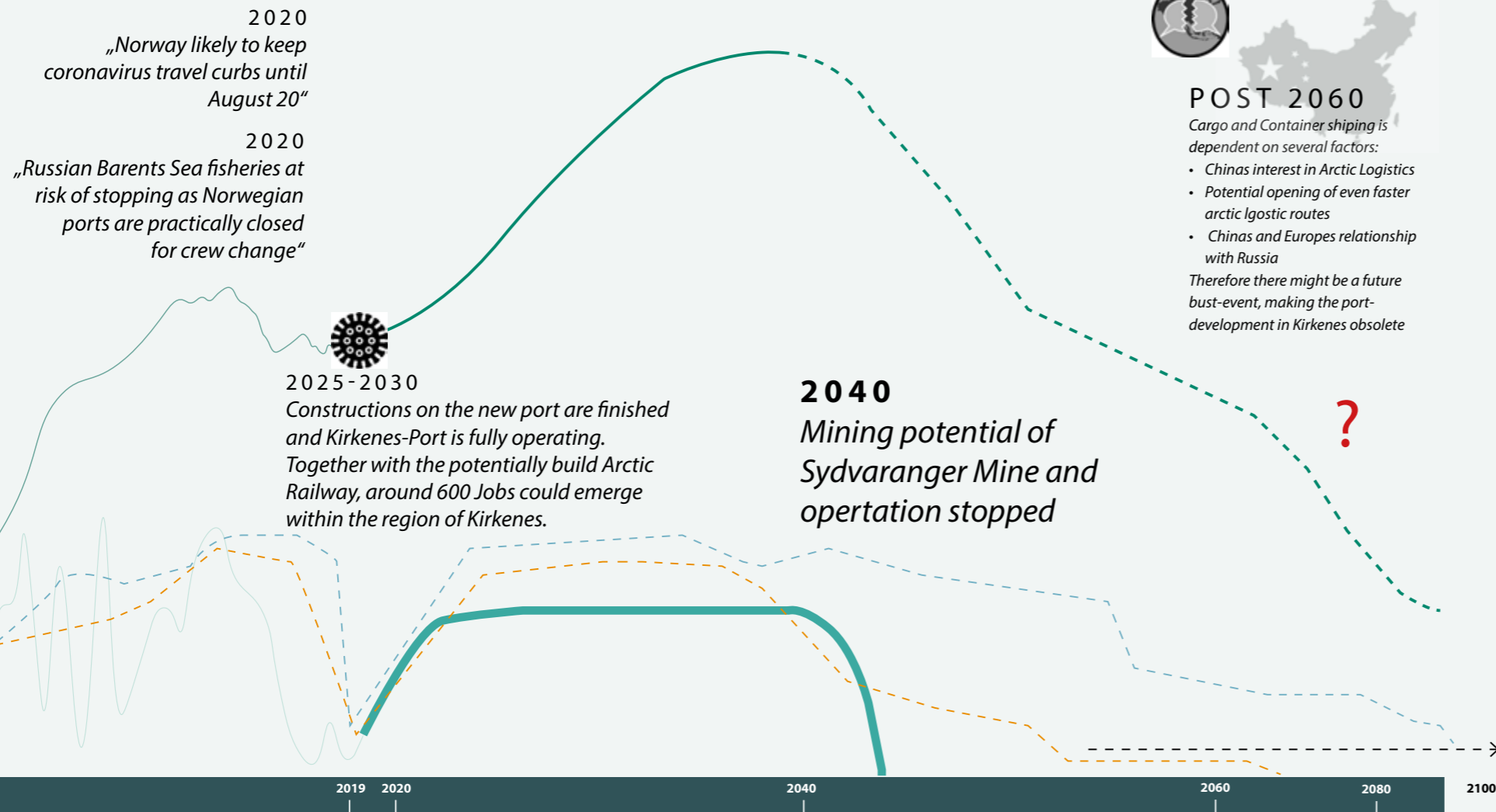
▲ Photo / 85 A bird's-eye view of the Sydvaranger mining operation.

URBAN PORT ECONOMIC INSTABILITY

▼ Figure / 63 Potential Future Problem of the Re-Industrialization of Kirkenes / Höller

2021
 TSCHUDI Group restarts mining operation in Sydvaranger Mine: In full operation mode, the mine will emerge around 400 new jobs. Additionally a job multiplier on the City and Region of 1,7 is estimated, creating a total of around 700 new jobs. (80% local employment)

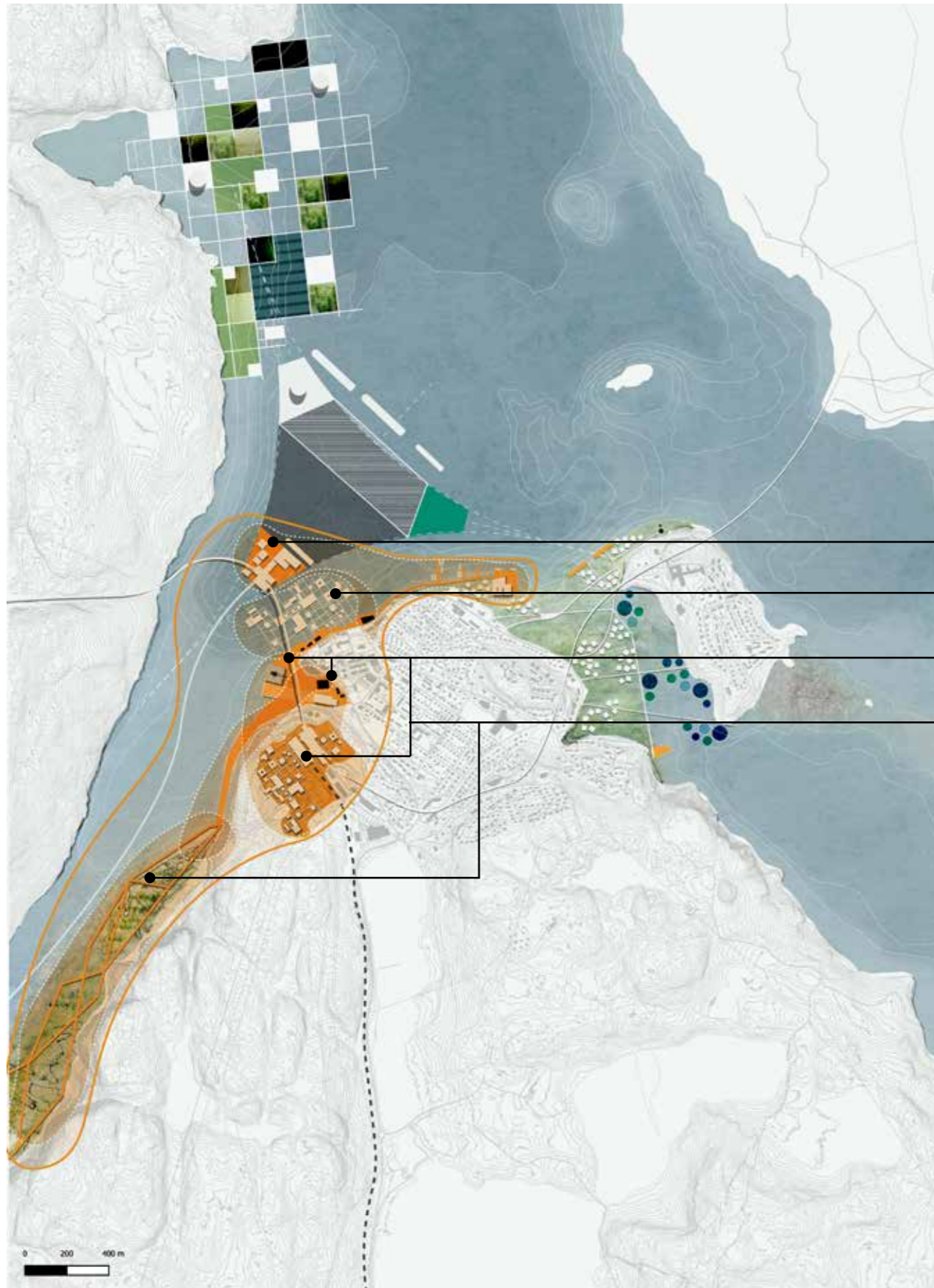
2030
 Based on the calculation of new employment due to industrial development (mining and port) of around 1200 new jobs and the 2,4 multiplication due to average household size in Sør-Varanger, a total of plus 2500 inhabitants within the next 10-20 years could be possible, almost doubling the size of today's Kirkenes



▲ Figure / 64 7.21 End of life situation Sydvaranger mine (2040), 5 new mountains reaching 100-140 meters above the current surface

URBAN PORT MAIN GOALS AND CONCEPT

▼ Figure /65 Design Fiction Urban Port /Höller



- Floating Cruise Ship Port
- Floating Urban Expansion
- Makers District/Repurposed Industrial Waterfront
- Mining Tailing Farming and Renatured Urban Beach

Main Goals and Concept

1. Floating Cruise Ship- and Mobility Port as urban connector between global and local residents of Kirkenes
2. Re-naturing/cleaning of Langfjorden
3. Flexible and adaptive floating urban extension to encounter uncertainty of future growth or shrinkage
4. Redevelopment of the waterfront to Makers District for alternative and circular businesses
5. Reuse and repurposing of existing infrastructures

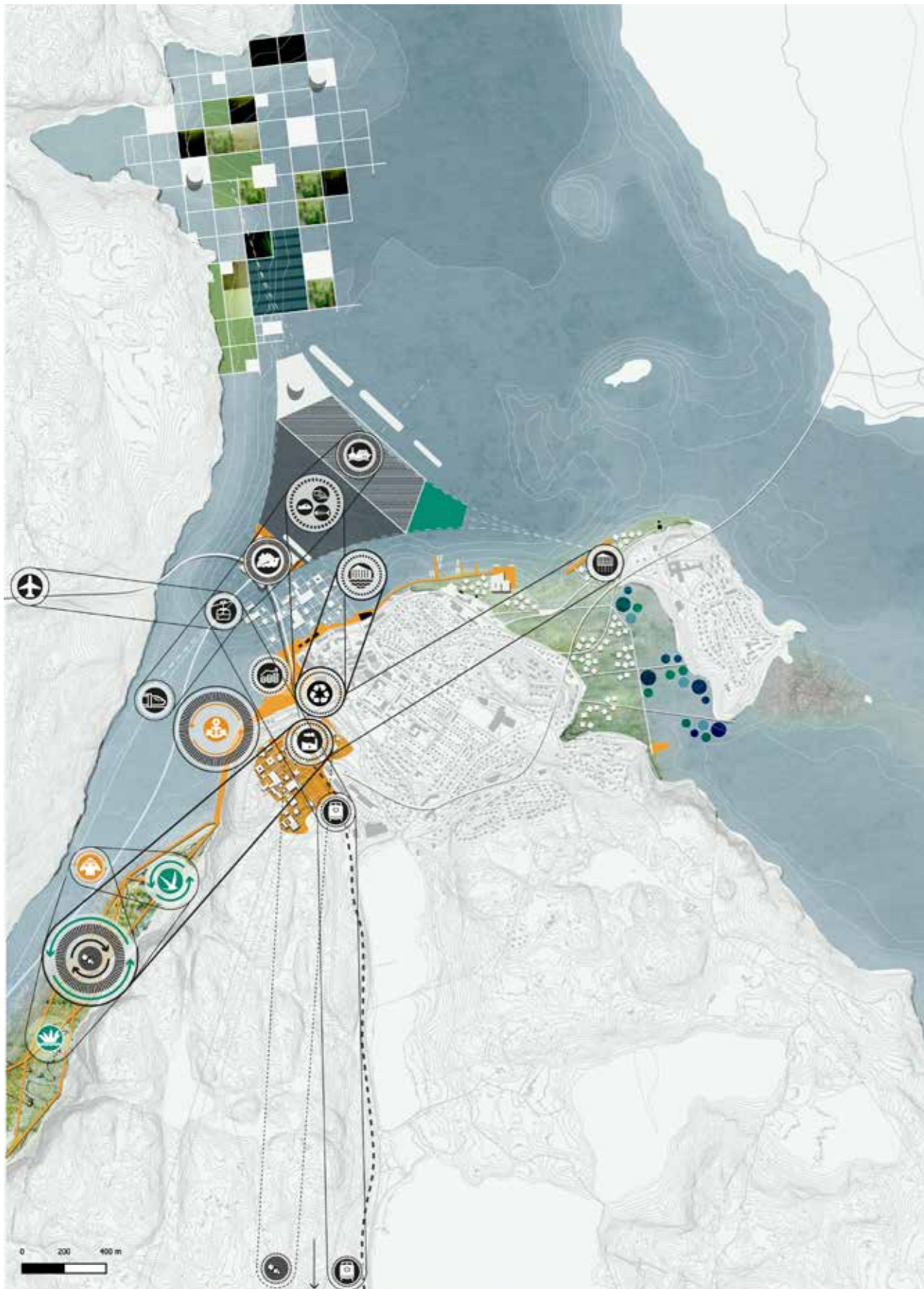
Synergistic Players

Mining tailings in Langfjorden can be **re-mined** and used for the production of **building material** for the new **urban development** and create **jobs** beyond the actual mining activity and to create **renatured** Langfjorden

Re-use of ship-scrap or mining scrap to pre-build **modular floating structures** in reused **KIMEK drydock**

URBAN PORT FICTION-SYNERGIES

▼ Figure / 66 Synergistic Adaptive Urban Port - Design Fiction / Höller



Recycling Dry Dock and Selfadapting Makers-Crane

Synergistic Abstraction with its two different sub-areas

1. Re-used Drydock for upcycled, modular and prefabricated floating structures
2. Adaptive, self-constructing Makers-District Crane

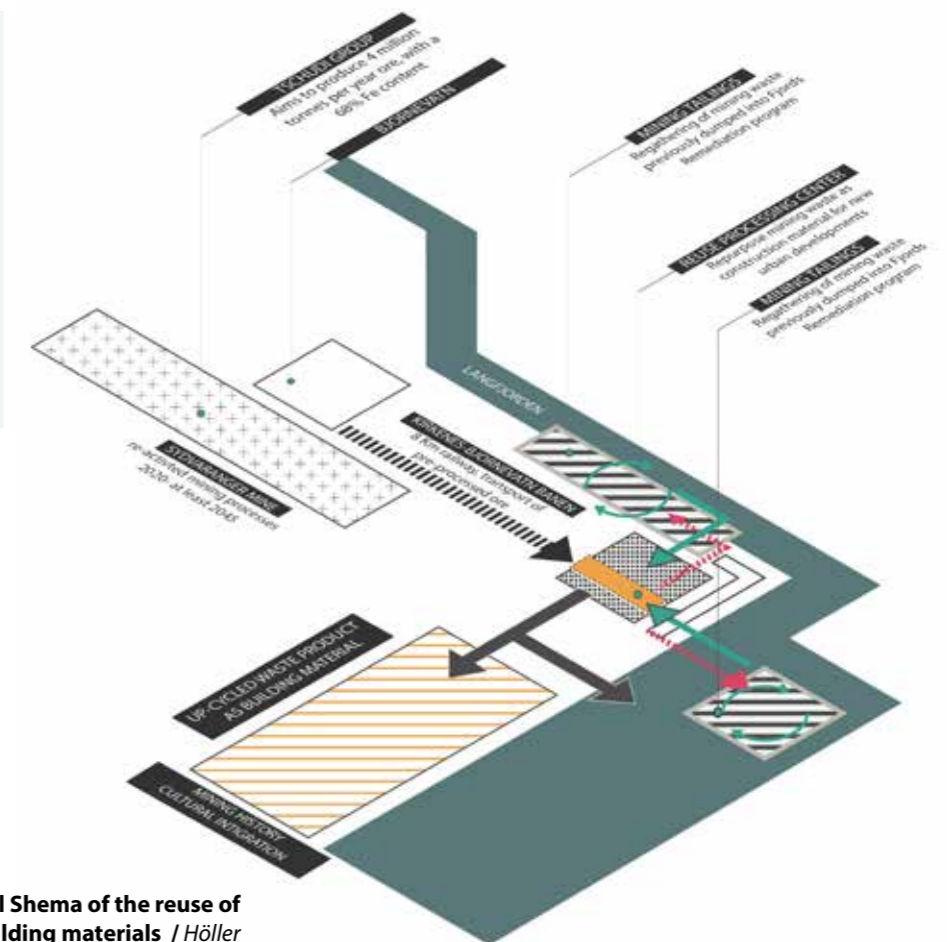
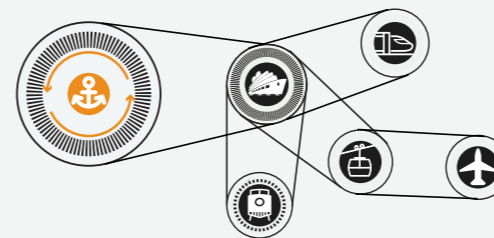


Iron Ore-Tailings Re-mining and Urban Waterfront Re-naturation

Synergistic Abstraction its two different sub-areas

1. Re-natured and re-cycled tailing-dumping, Urban Beach
2. New Re-mining center for job creation and further circular concepts

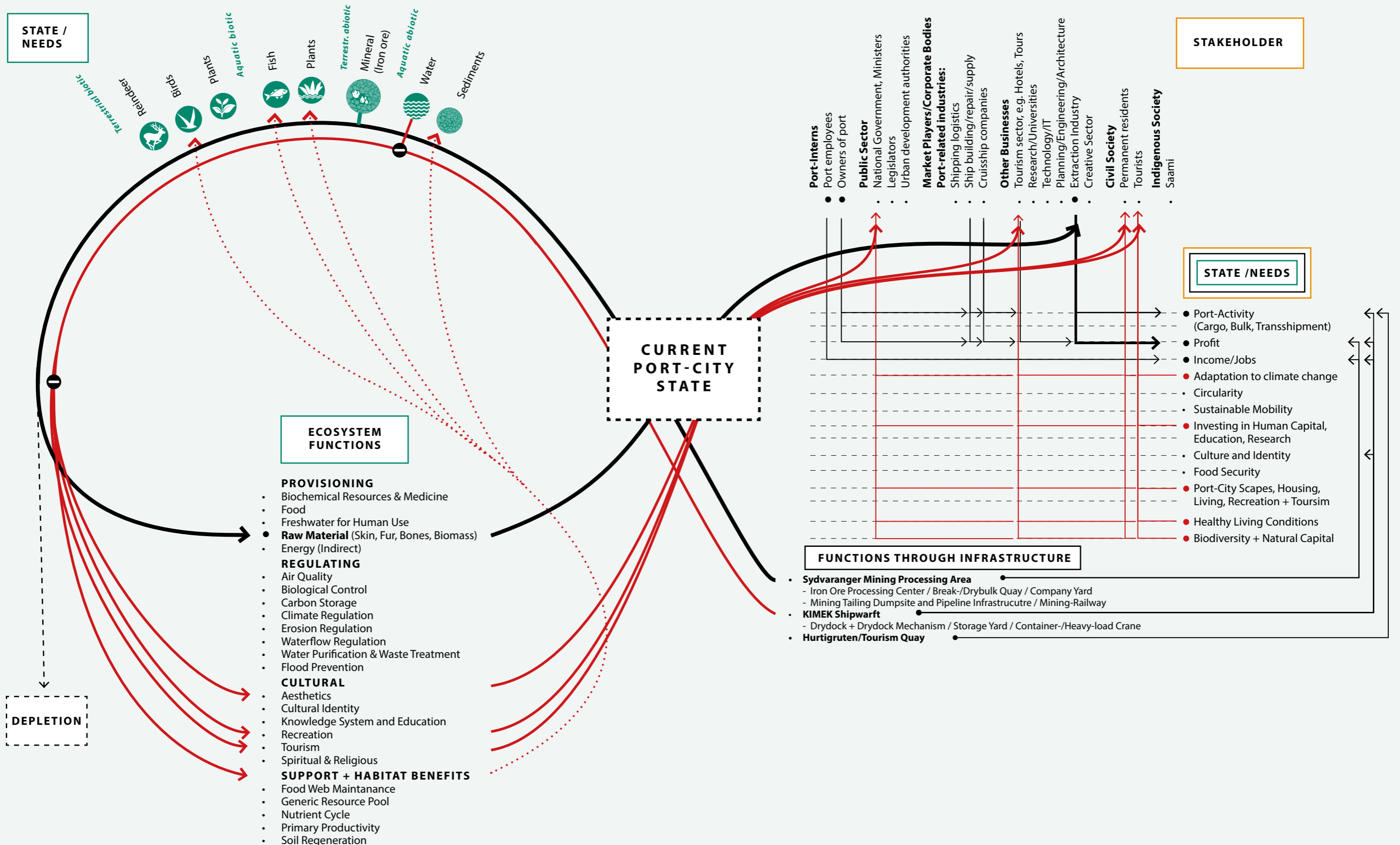
Mobility Port



▲ Figure / 67 Technical Shema of the reuse of mining tailings for building materials / Höller

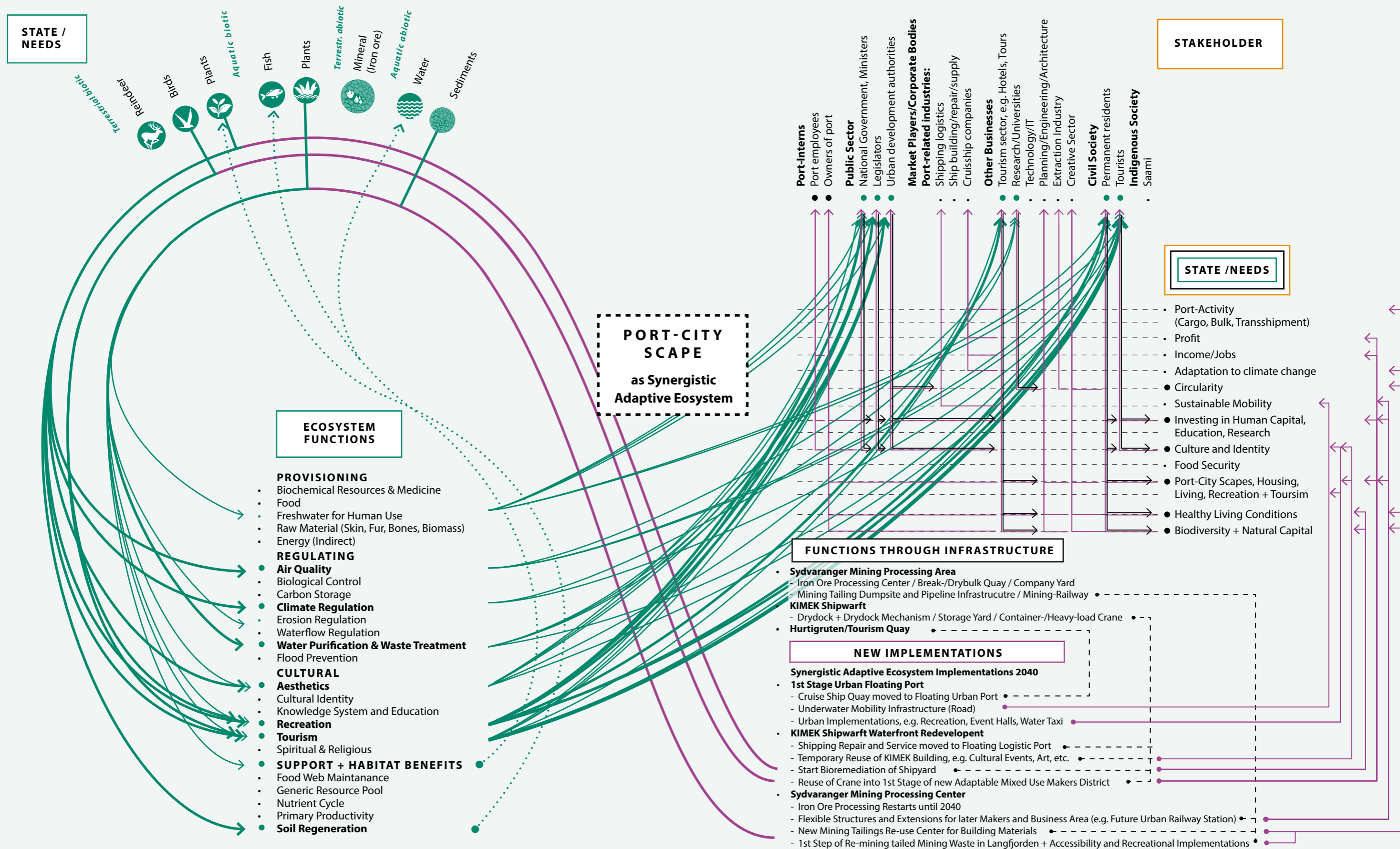
URBAN PORT SYNERGISTI LOOP

▼ Figure / 68 Current/Planned Port-City State / Höller



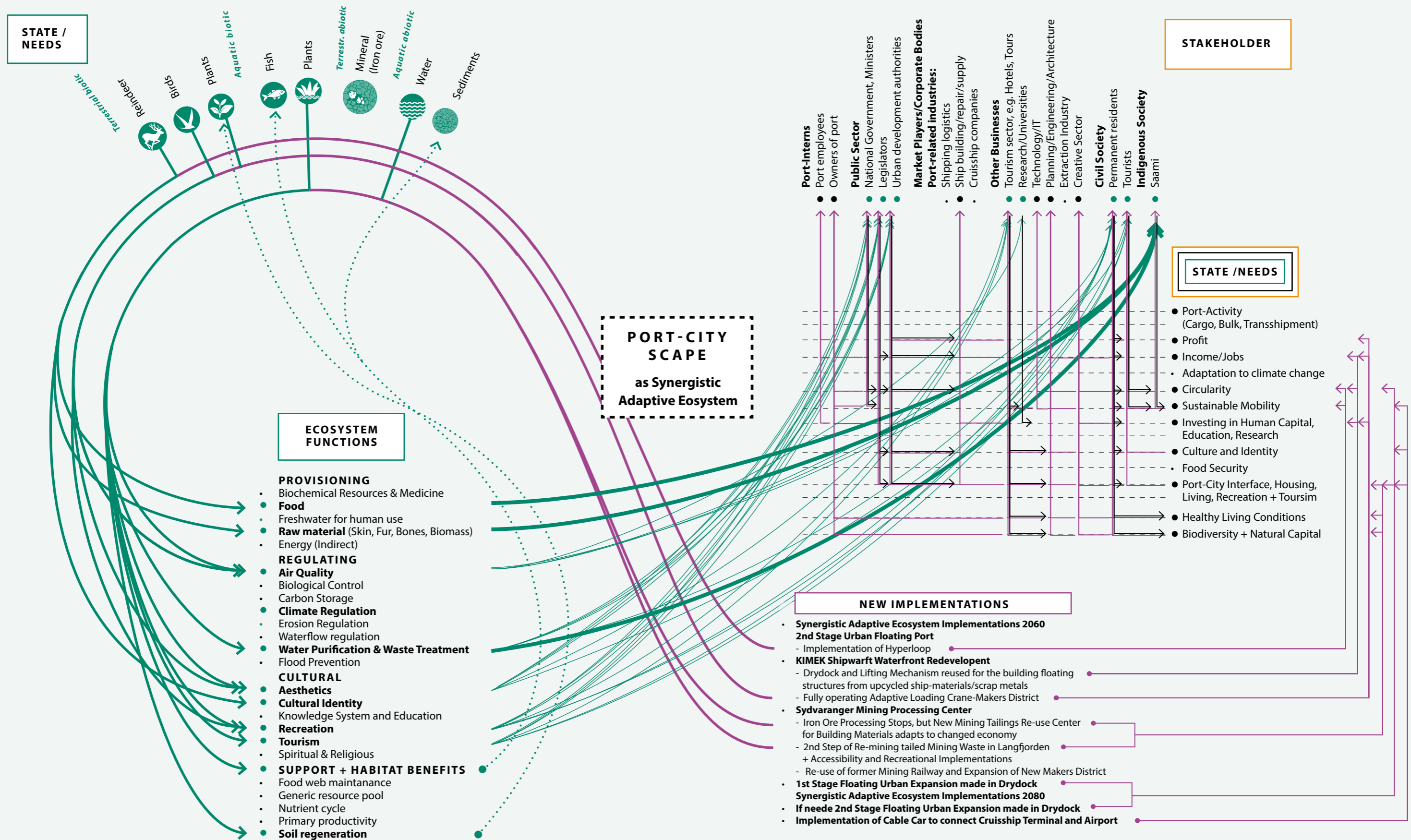
URBAN PORT 2040 SYNERGISTIC LOOP

▼ Figure / 69 Synergistic-Loop 2040 Urban Port / Höller



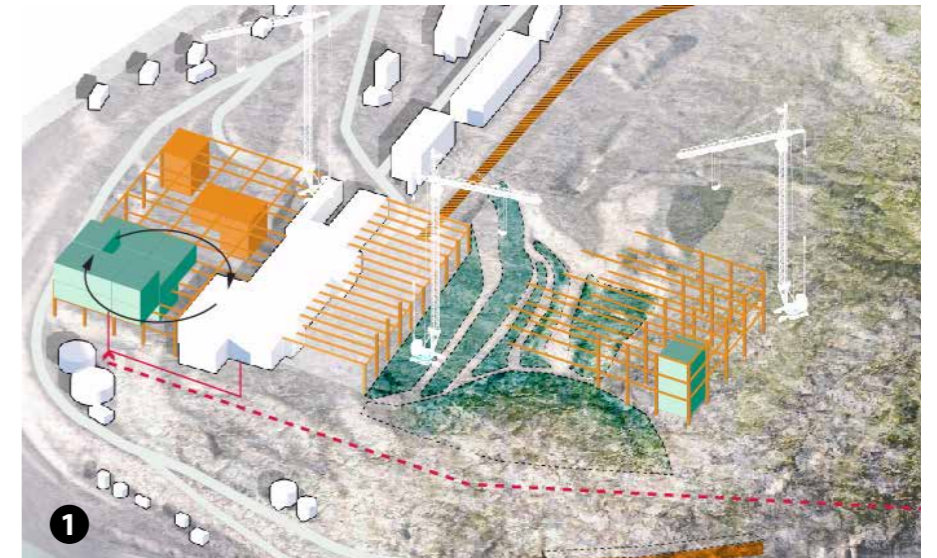
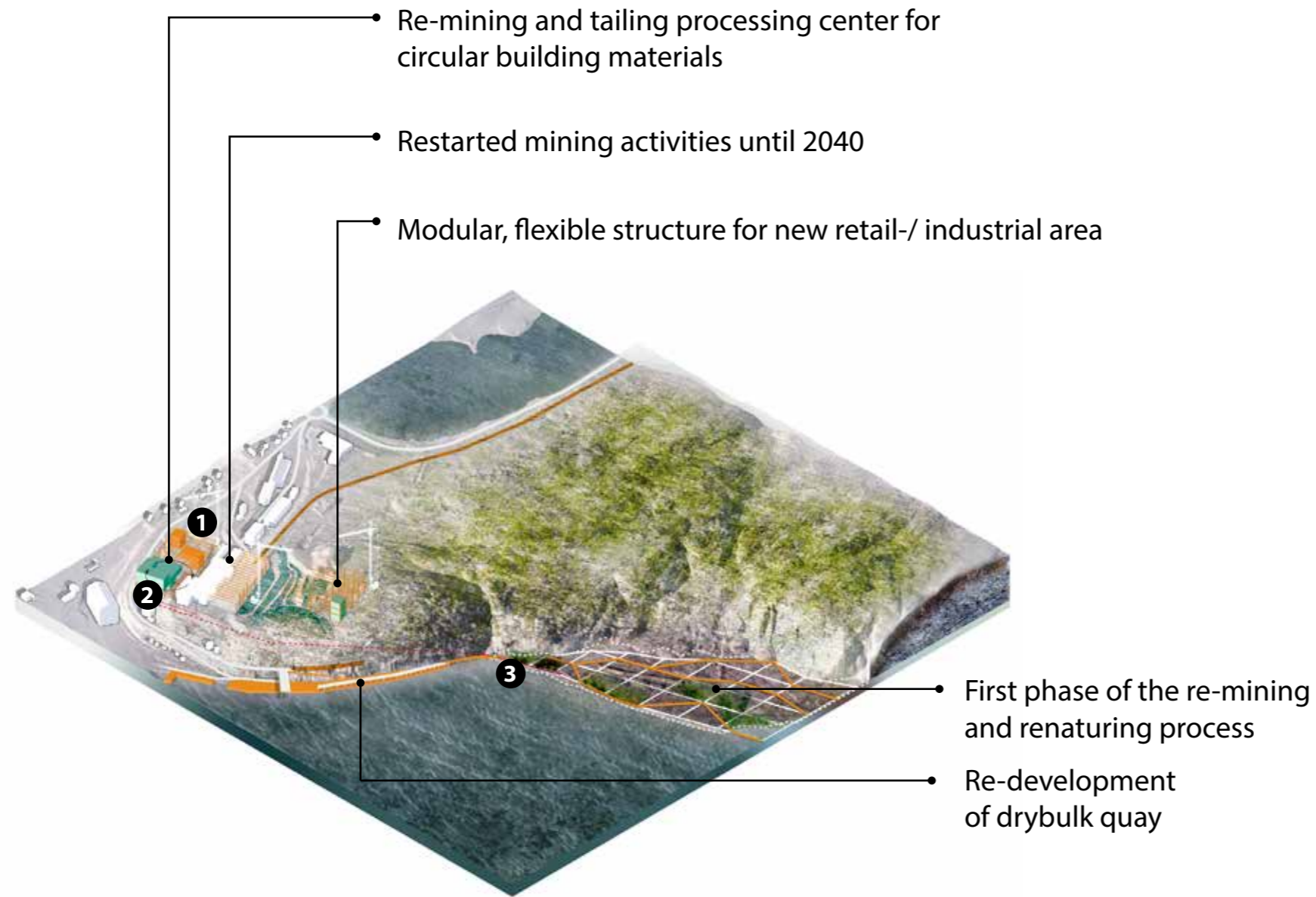
URBAN PORT 2060/2080 SYNERGISTIC LOOP

▼ Figure / 70 Synergistic-Loop 2060 and 2080 Urban Port / Höller



URBAN PORT 2040 DESIGN STEPS- MINING PROCESSING CENTER

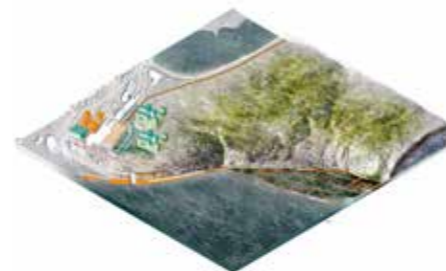
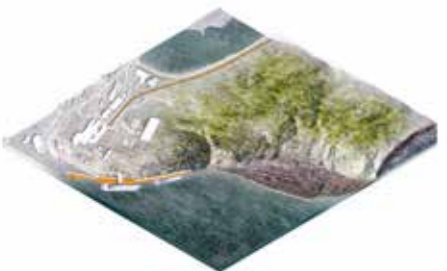
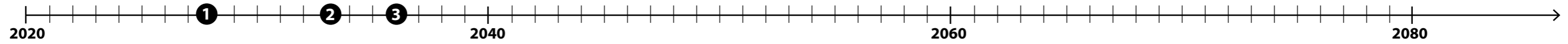
▼ Figure /71 Design Steps Sydvaranger Mining Processing Center / Höller



1 Sydvaranger Mining Processing Center
Iron Ore Processing Restarts until 2040
Flexible Structures and Extensions for later Makers and Business Area (e.g. Future Urban Railway Station)

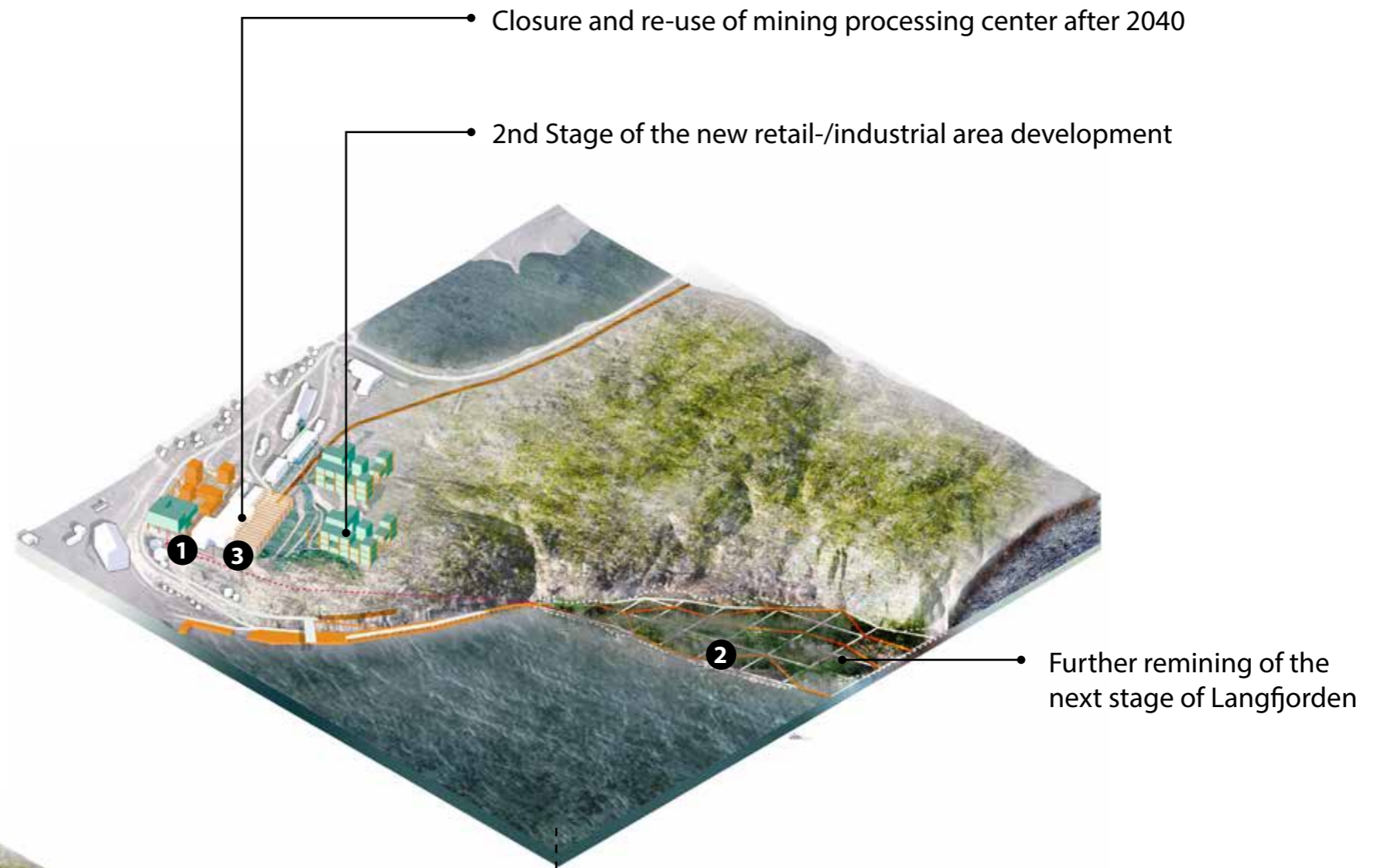
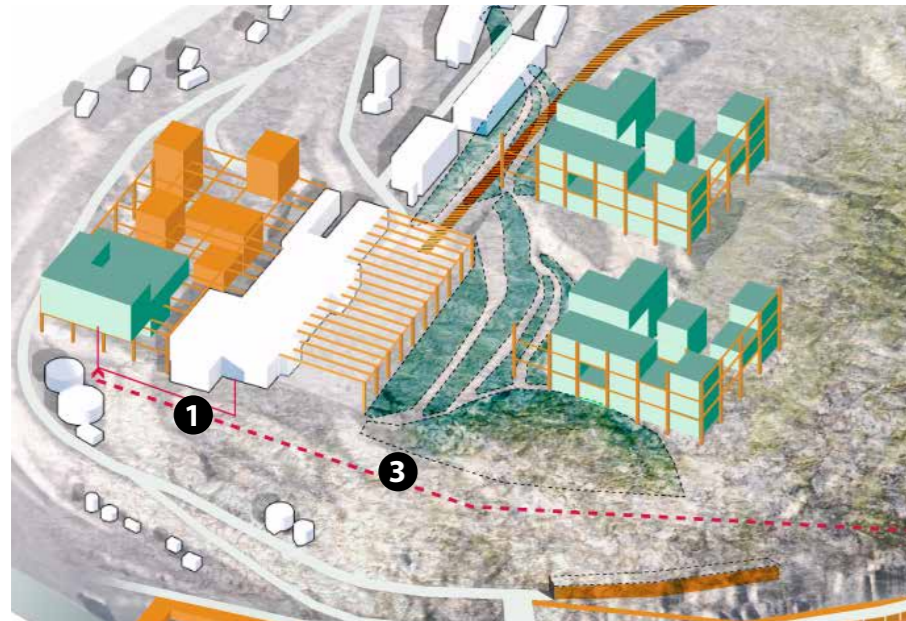
2 New Mining Tailings Re-use Center
for Building Materials

3 1st Step of Re-mining tailed Mining Waste
in Langfjorden
+ Accessibility and Recreational Implementations



URBAN PORT 2060 DESIGN STEPS - MINING PROCESSING CENTER

▼ Figure / 72 Design Steps Sydvaranger Mining Processing Center / Höller



Sydvaranger Mining Processing Center

- Iron Ore Processing Restarts until 2040
- Flexible Structures and Extensions for later Makers and Business Area (e.g. Future Urban Railway Station)
- New Mining Tailings Re-use Center for Building Materials
- 1st Step of Re-mining tailed Mining Waste in Langfjorden + Accessibility and Recreational Implementations

Sydvaranger Mining Processing Center

- Iron Ore Processing Stops, but New Mining Tailings Re-use Center for Building Materials adapts to changed economy
- 2nd Step of Re-mining tailed Mining Waste in Langfjorden + Accessibility and Recreational Implementations
- Re-use of former Mining Railway and Expansion of New Makers District

2020

2040

1

2

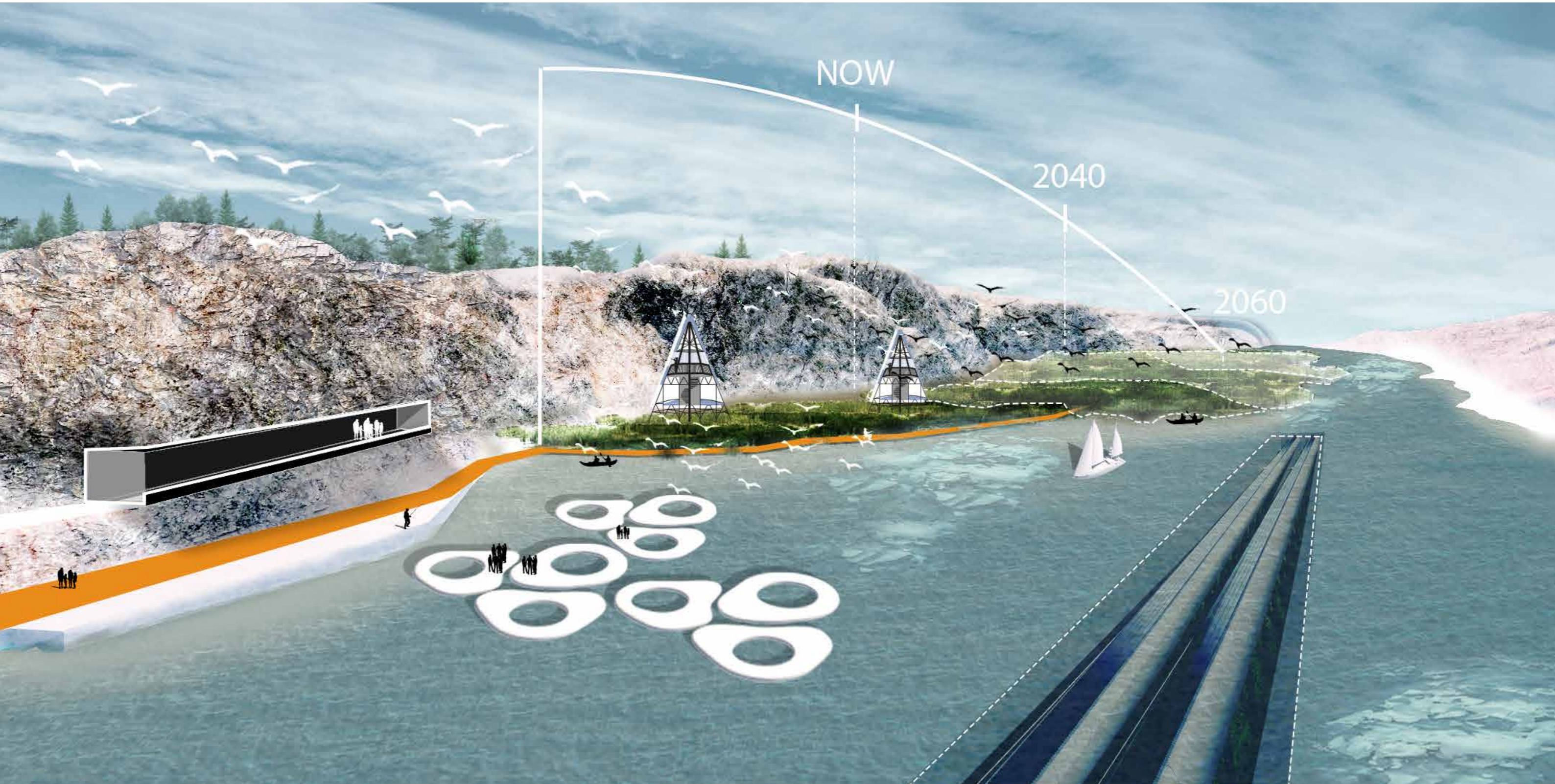
3

2060

2080

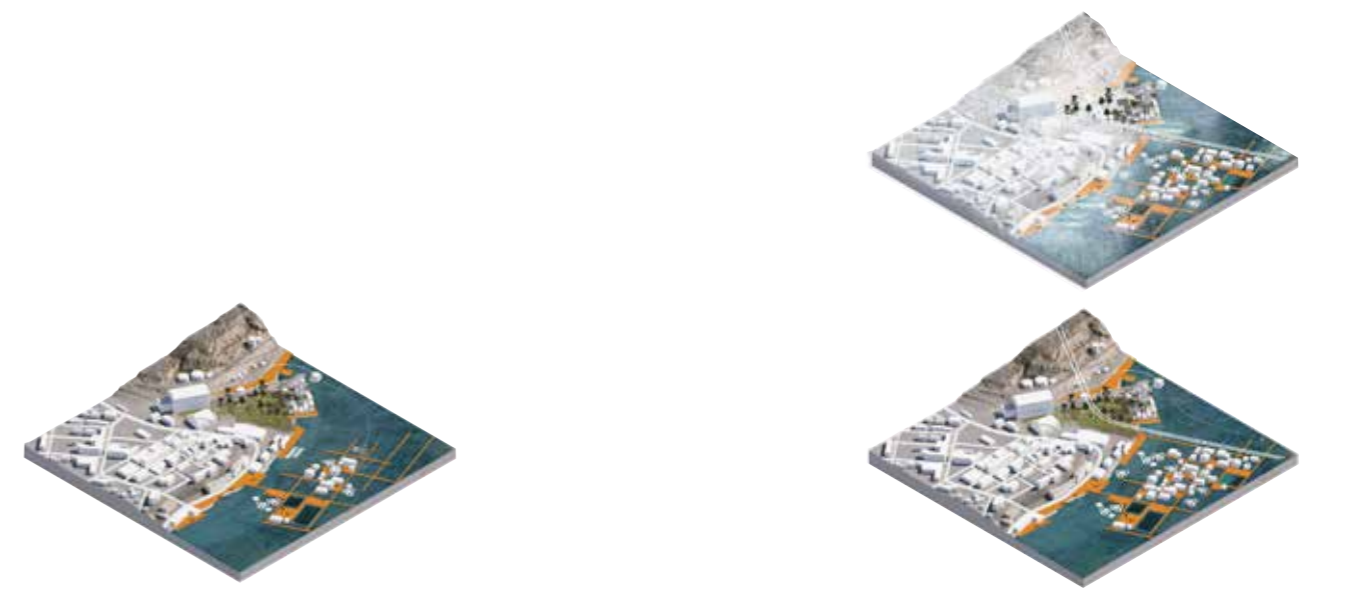
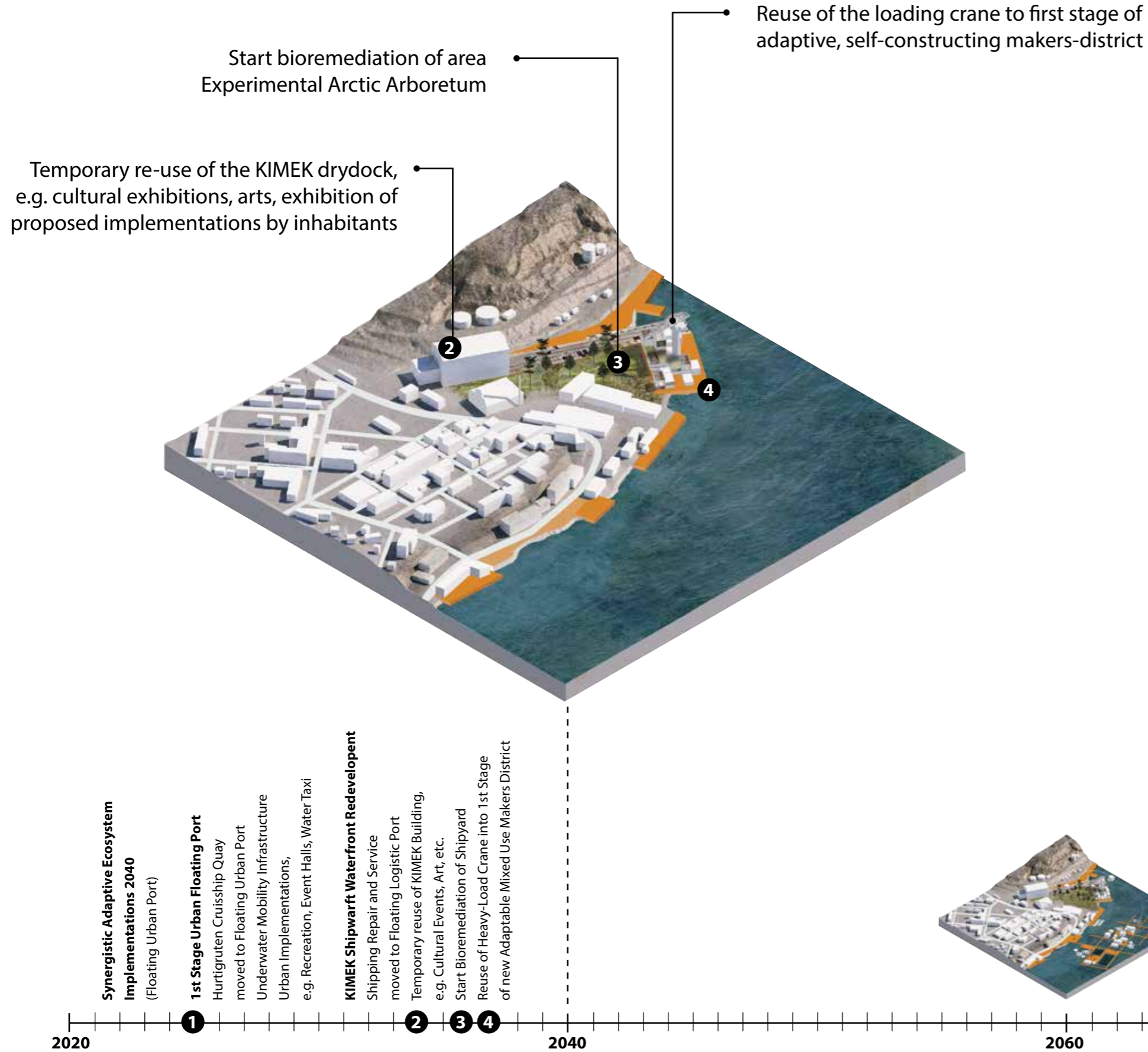
URBAN PORT 2060 FICTION

▼ Figure / 73 Illustration of the Re-Mining Process along Langfjorden / Höller



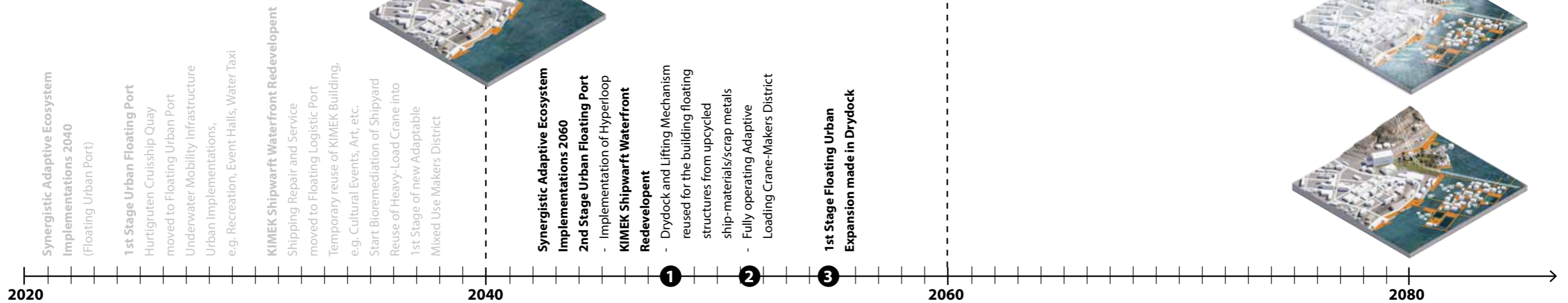
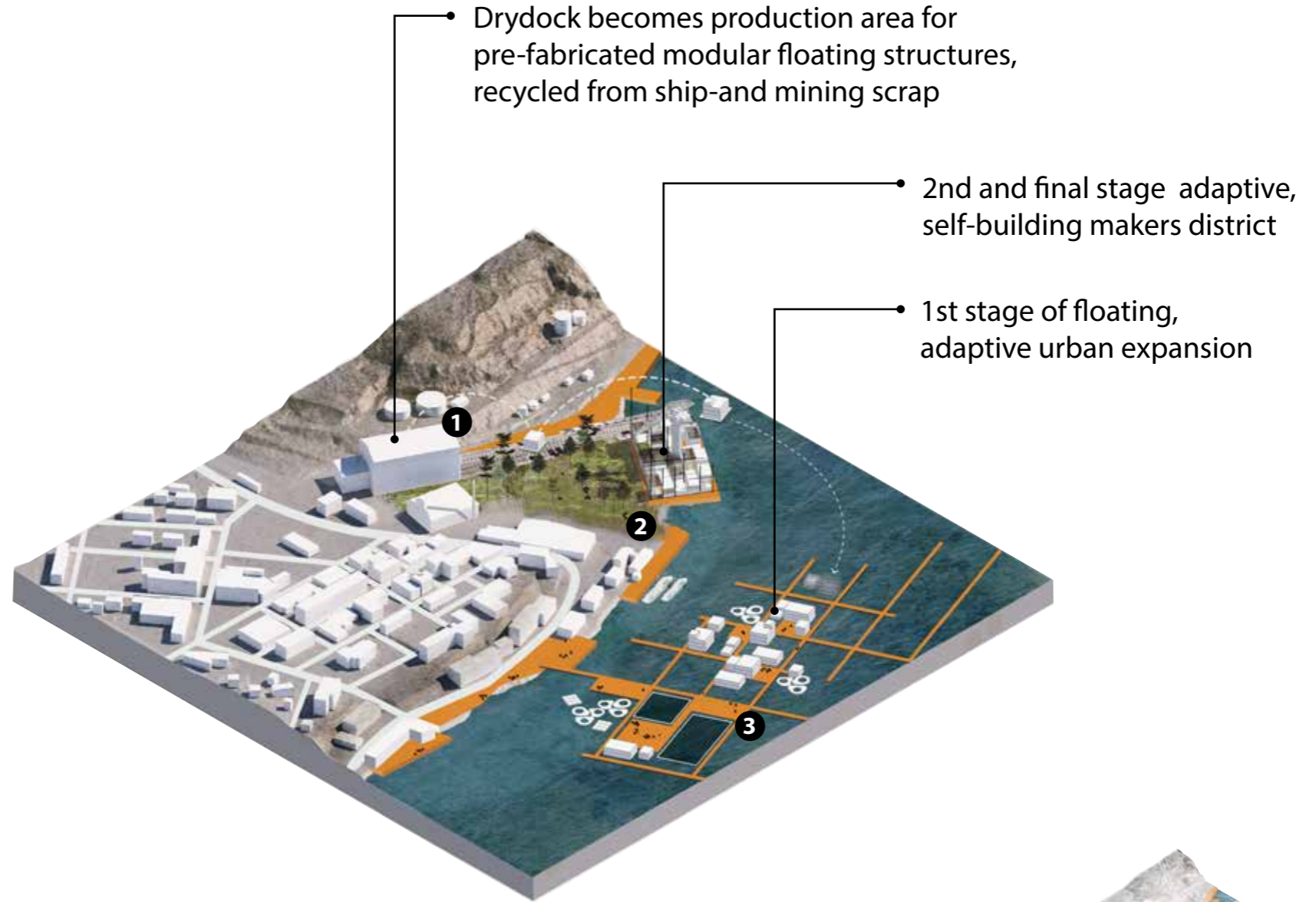
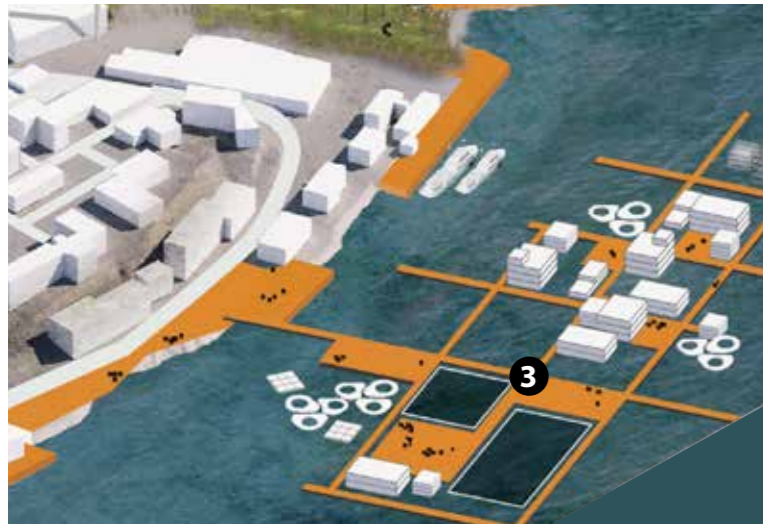
URBAN PORT 2040 DESIGN STEPS

▼ Figure / 74 Design Steps Urban Waterfront 2040 / Höller



URBAN PORT 2060 DESIGN STEPS

▼ Figure / 75 Design Steps Urban Waterfront 2060 / Höller



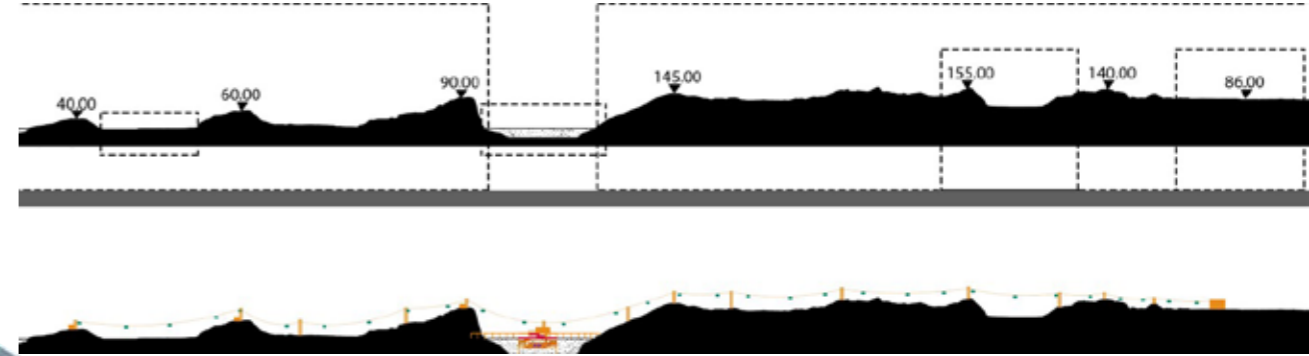
URBAN PORT 2080 DESIGN STEPS



▲ Figure / 76 Illustration of the transformation of the loading crane into a self-adapting-Makers District / Höller



▼ Figure / 77 Implementation of the Cable Car from the Airport to the New Floating Urban Port / Höller



▼ Figure / 78 Design Steps Urban Waterfront 2080 / Höller

Synergistic Adaptive Ecosystem Implementations 2040 (Floating Urban Port)

1st Stage Floating Port

Hurtigruten Cruiseship Quay moved to Floating Urban Port
Underwater Mobility Infrastructure Urban Implementations, e.g. Recreation, Event Halls, Water Taxi

KIMEK Shipwraft Waterfront Redevelopment

Shipping Repair and Service moved to Floating Logistic Port
Temporary reuse of KIMEK Building, e.g. Cultural Events, Art, etc.

Start Bioremediation of Shipyard

Reuse of Heavy-Load Crane into

1st Stage of new Adaptable

Mixed Use Makers District

Synergistic Adaptive Ecosystem Implementations 2060

2nd Stage Floating Port

- Implementation of Hyperloop

KIMEK Shipwraft Waterfront Redevelopment

- Drydock and Lifting Mechanism reused for the building floating

structures from upcycled

ship-materials/scrap metals

- Fully operating Adaptive

Loading Crane-Makers District

1st Stage Floating Urban

Expansion made in Drydock

Synergistic Adaptive Ecosystem Implementations 2080

If neede 2nd Stage Floating Urban

Expansion made in Drydock

Implementation of Cable Car to connect

Cruise Ship Terminal and Airport

WETLAND PORT FROM FRICTION TO FICTION

▼ Photo / 86 Bird's eye view on Soldata-Bukta and Prestøya Peninsula Kirkenes



▼ Figure / 79 Intertidal wetland and the connection between living and aquaculture / Höller



WETLAND PORT CURRENT PORT-CITY

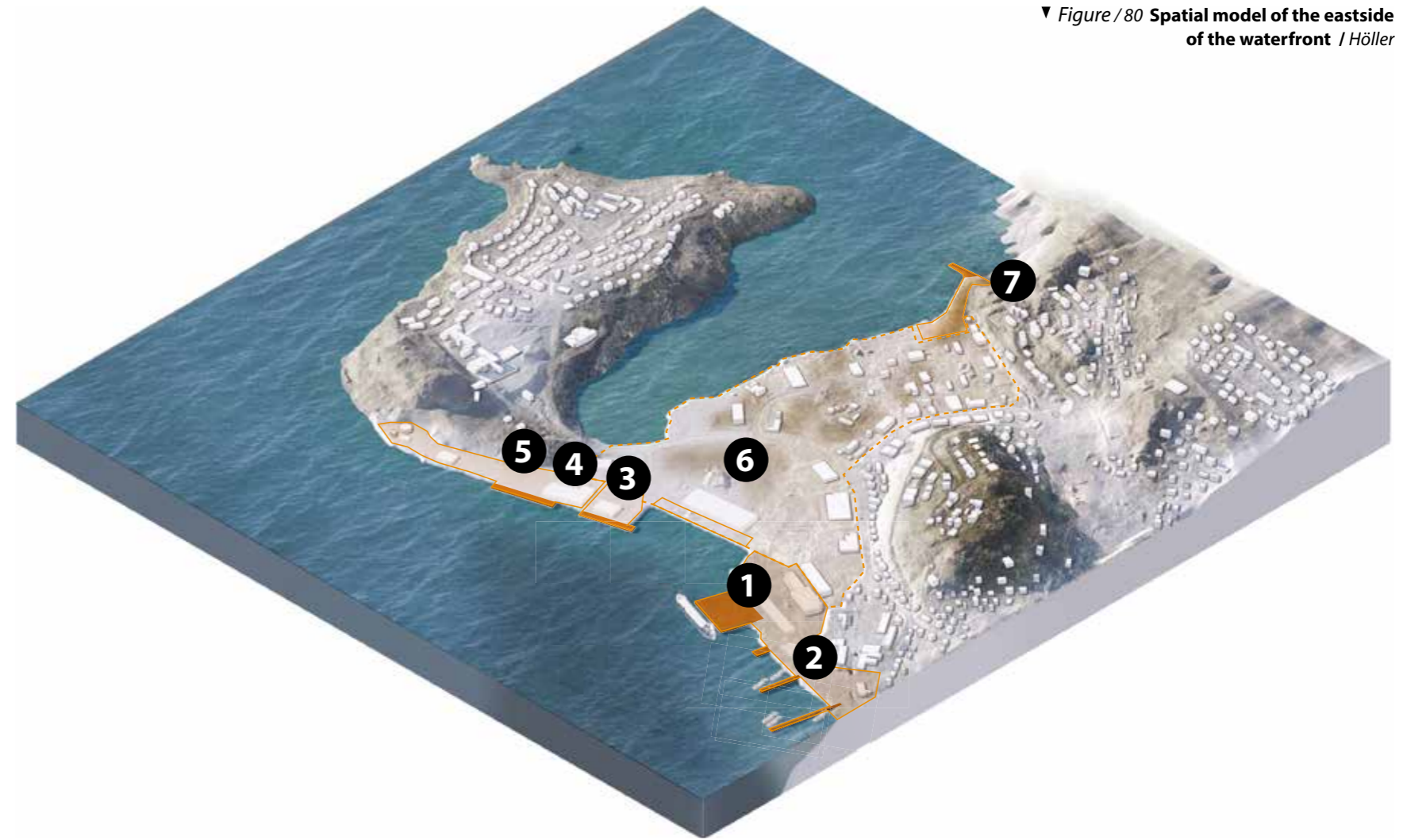
- **Port Base, Cruise Ship Port, Fishing Port and Industrial Area**
- Large parts of un-accessible port-/industrial areas
- Cruise ship Terminal 15 min/1,5km away from urban center
- Comparison between historic maps and current aerial pictures shows that area was reclaimed



◀ Photo / 87 Cargoship landing at Port of Kirkenes

◀ Photo / 88 Construction of the deep-sea quay in Kirkenes

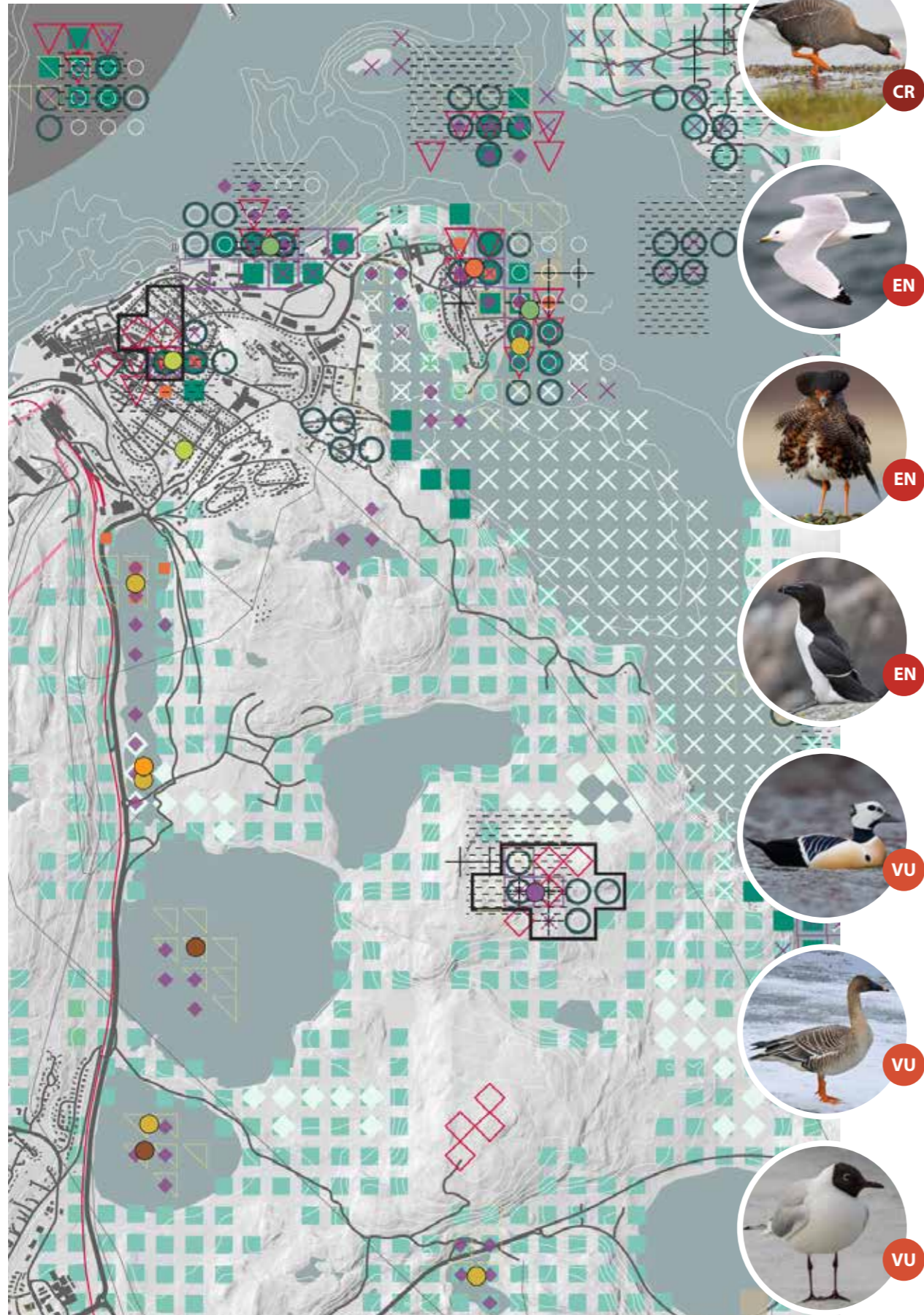
▼ Figure / 80 Spatial model of the eastside of the waterfront / Höller



- ① Deep-sea quay for logistic purposes
- ② Quay for fishing boats and fishing related services
- ③ Crusie ship quay (around 1,5 km away from city center)
- ④ Maritime logistics quay
- ⑤ Kirkenes Terminal, fish storage
- ⑥ Reclaimed industrial/retail area
- ⑦ Soldata Bukta, quay for private sailing boats

WETLAND PORT ECOSYSTEM

▼ Map / 57 Birds Kirkenes / Lukas Höller



▼ Photos / 89-95
Lesser White-fronted Goose
CR



Black-legged Kittiwake
EN



Ruff
EN



Razorbill
EN



Steller's Eider
VU



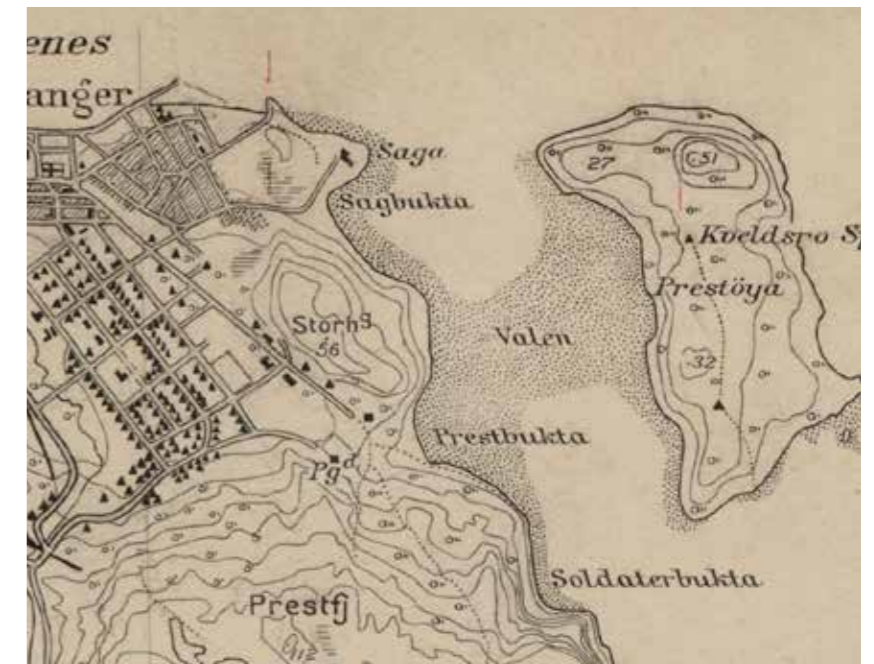
Bean Goose
VU



Black-headed Gull
VU

Prestøya peninsula and intertidal flat **important birding area**, with rich birch forest, herbal floor vegetation as well as important foraging grounds for birds to find fish, mussels, urchins and crabs.

A total of 120 different species, most of them migrating but also some nesting during the winter have been found along the area of Prestøya, Kirkenes



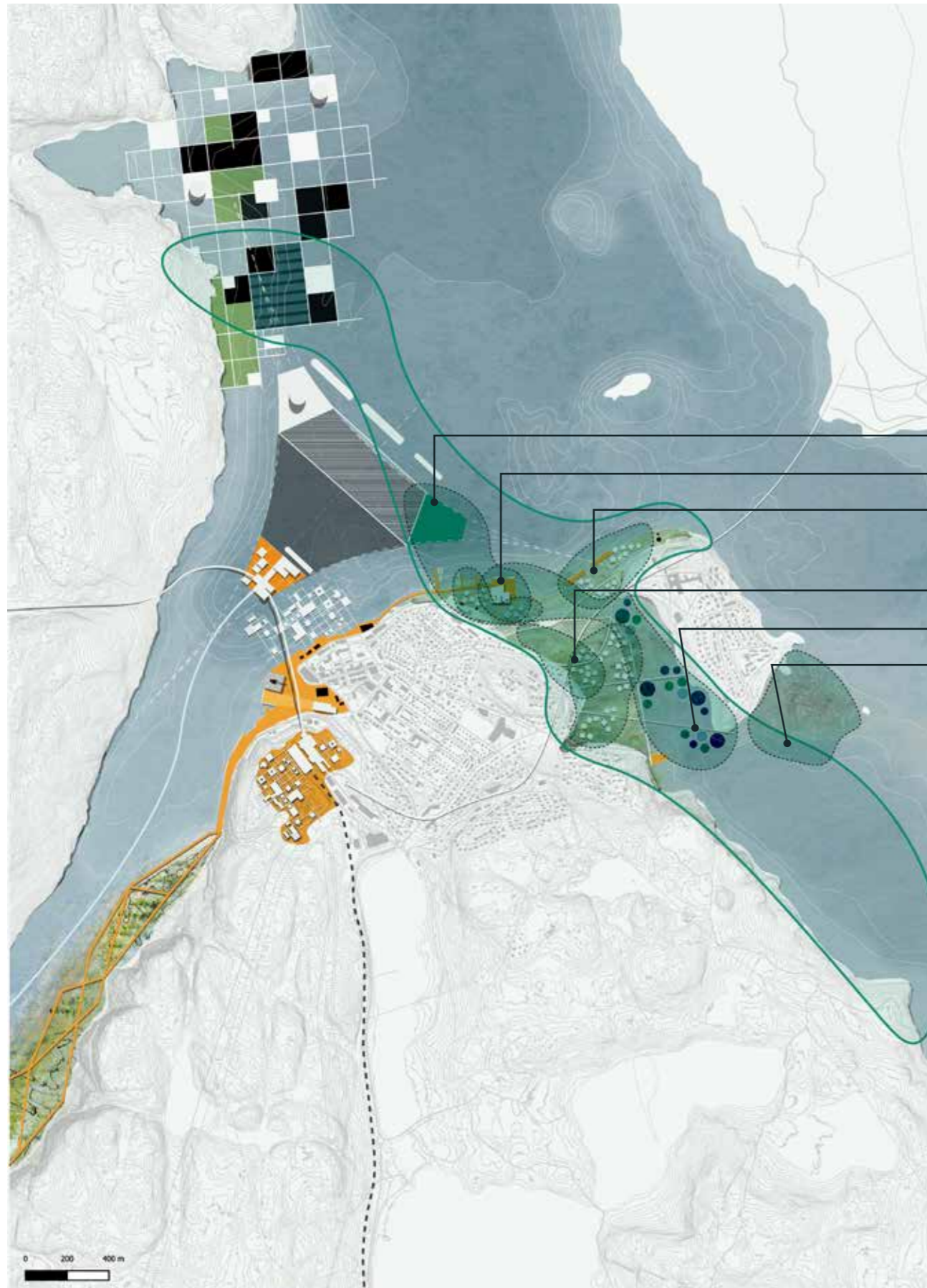
► Photo / 96
Historic map Sør-Varanger, 1938

► Photo / 97
One of the most polluted areas along the waterfront in Kirkenes



WETLAND PORT MAIN GOALS AND CONCEPT

▼ Figure / 81 Design Fiction Wetland Port / Höller



- Floating Fishing Port
- Food-Hub
- Wetland Living

- Wetland Water-Treatment
- Local Aquaculture
- Intertidal Birding Area

Main Goals and Concept

Integration of local food production and the re-use of waste-water and solid waste from shipping activities and urban activities

Renaturing of reclaimed industrial area into intertidal wetland to accommodate birding, aquaculture, living, recreation and water-purification

Development of local foodhub and local food production to encounter regional/global fishing industries

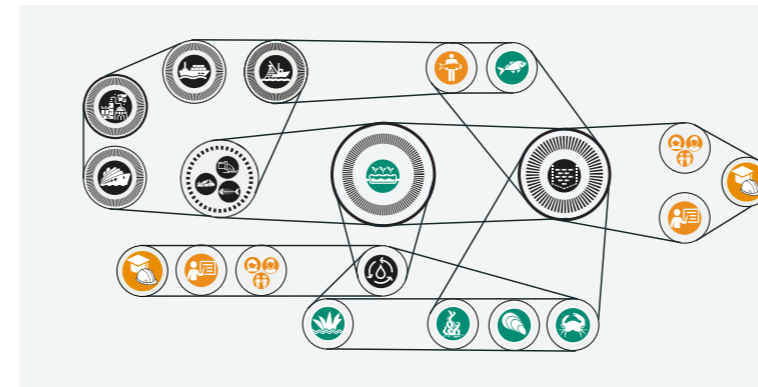
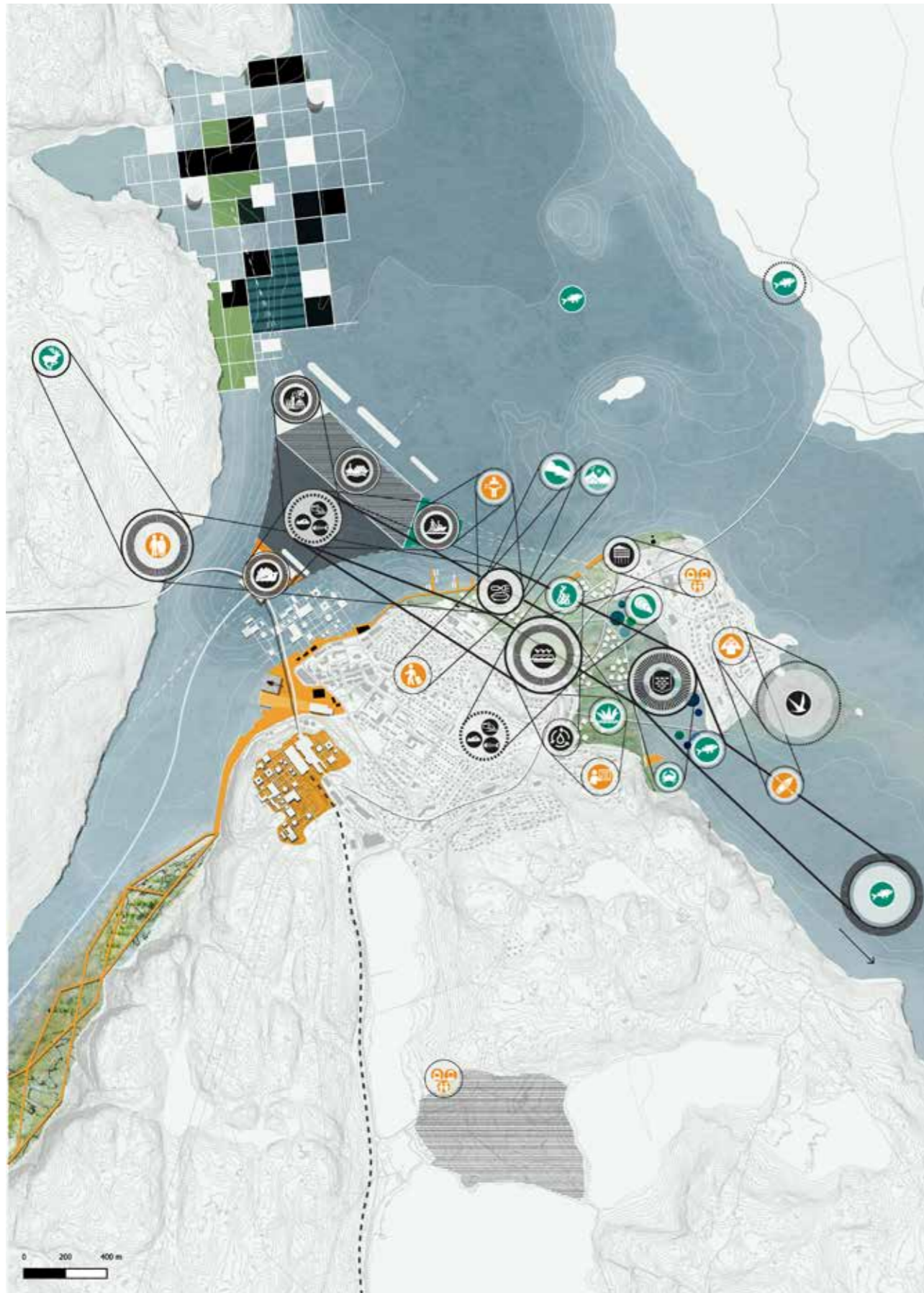
Floating fishingport with storage, freezing and supply activities

Synergistic Players

Renatured wetland used to clean **waste-water from shipping-, urban activities** by **algae- and fishing aquaculture** within a circular loop to develop a fair, local and unique food-products.

WETLAND PORT FICTION-SYNERGIES

▼ Figure / 82 Synergistic Adaptive Wetland Port - Design Fiction / Höller



Renatured Productive Wetland and Waste-Water Processing Cycle

Synergistic Abstraction with its three different sub-areas

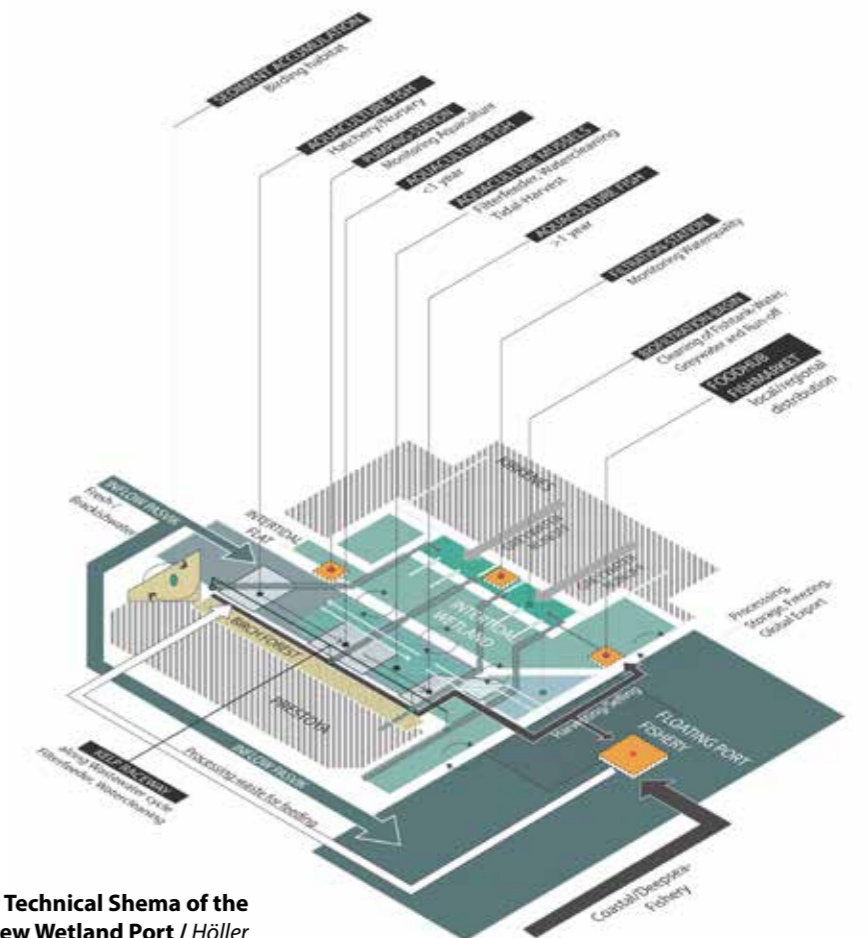
- 1. Floating Fishing Port and Processing Center
- 2. Urban Aquaculture
- 3. Wetland Cleaning - Living Machine



Urban Food-Hub as Local-Global Connector

Synergistic Abstraction with its two different sub-areas

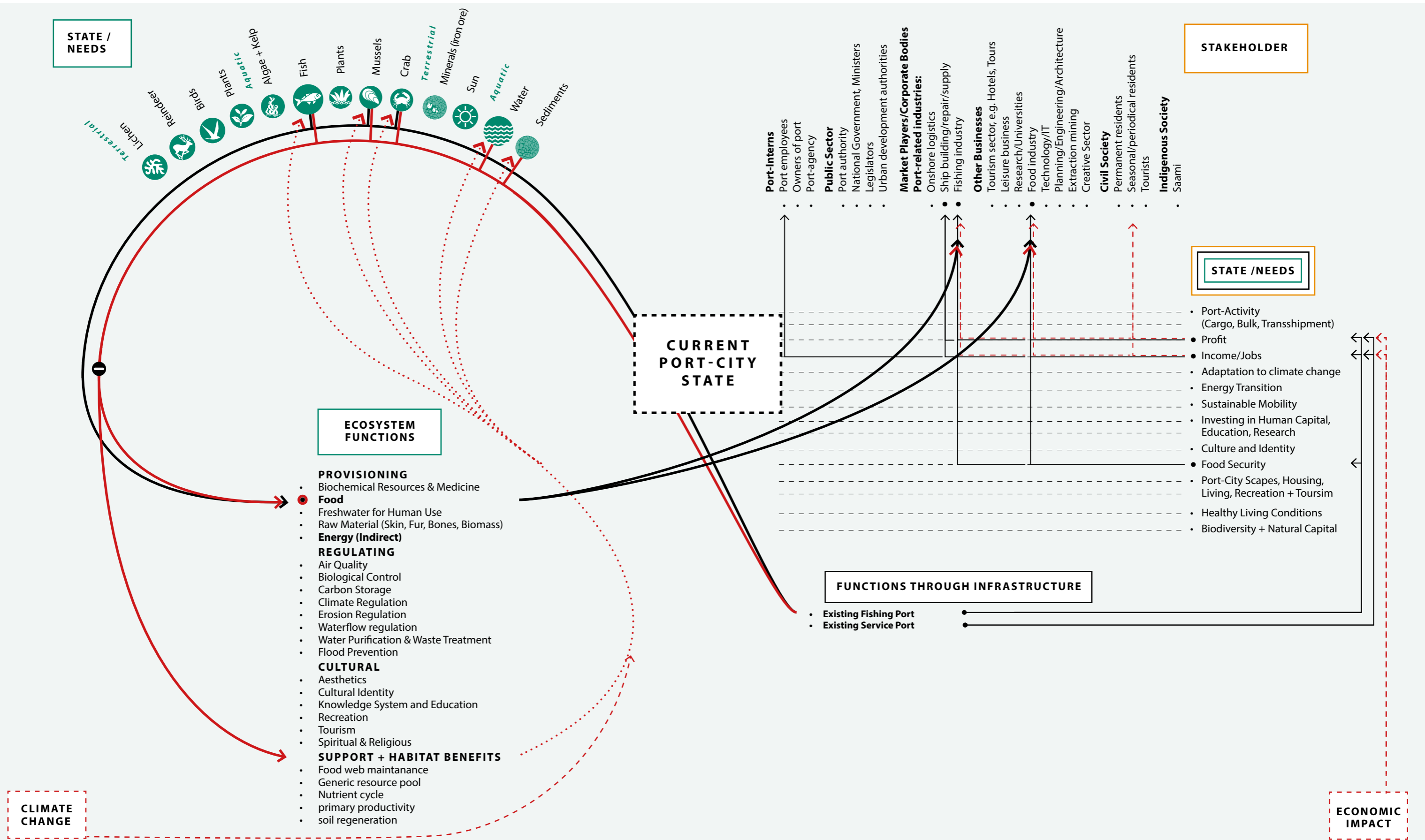
- 1. Arctic Food-Hub
- 2. Wetland Living



▲ Figure / 83 Technical Shema of the new Wetland Port / Höller

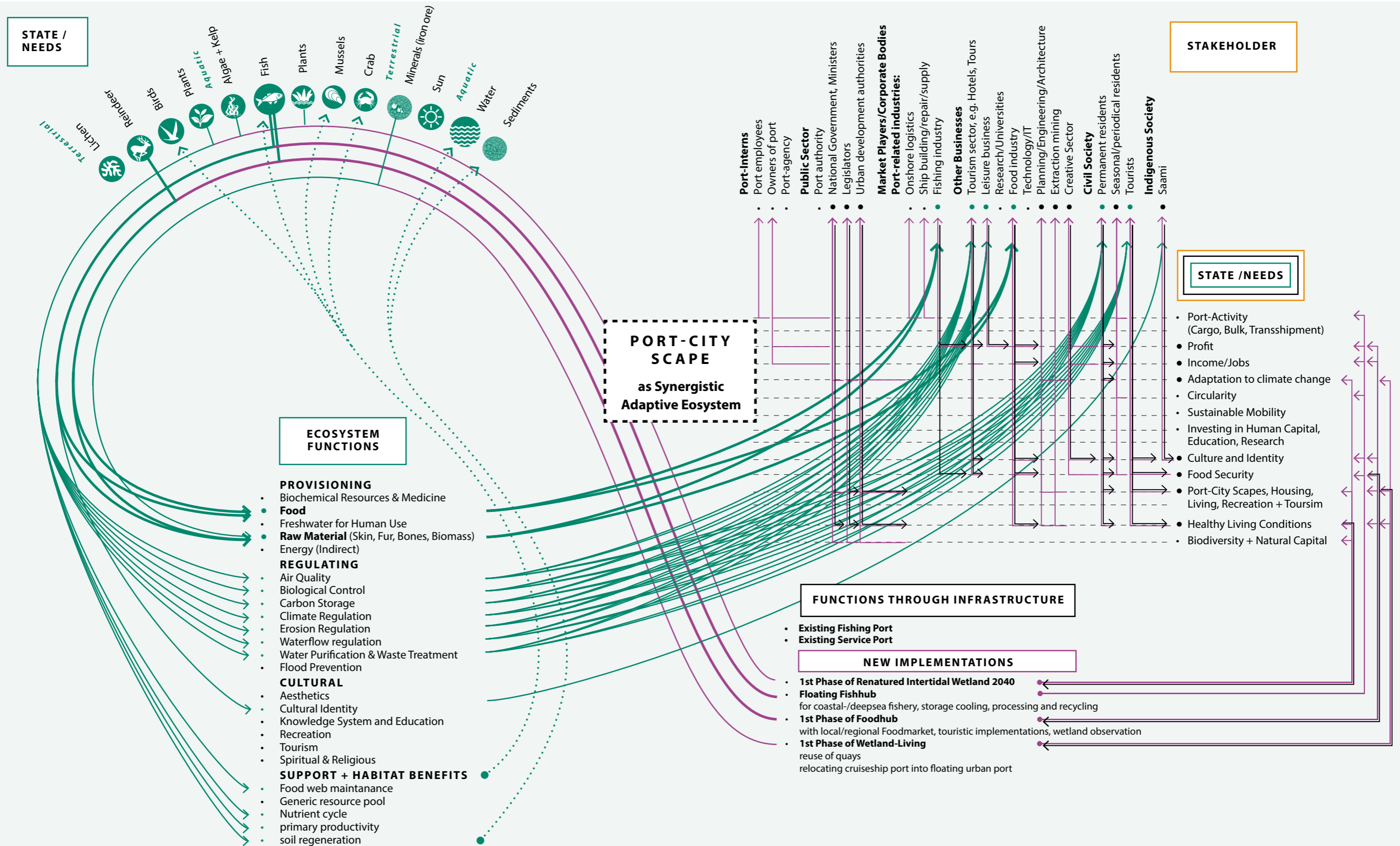
WETLAND PORT SYNERGISTIC LOOP

▼ Figure / 84 Current Port-City State / Höller



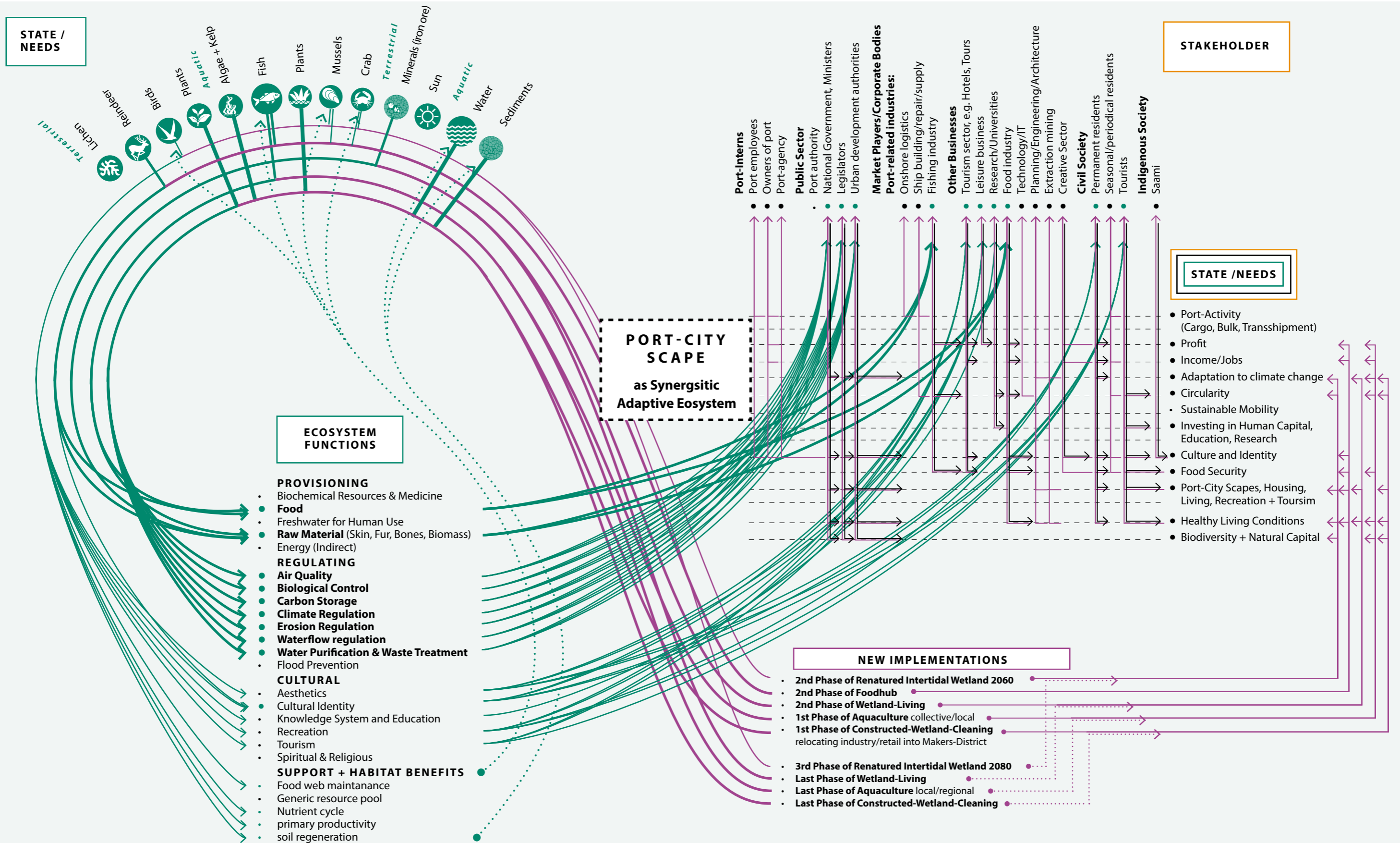
WETLAND PORT 2040 SYNERGISTIC LOOP

▼ Figure / 85 Synergistic-Loop 2040 Wetland Port / Höller



WETLAND PORT 2060/2080 SYNERGISTIC LOOP

▼ Figure / 86 Synergistic-Loop 2060 and 2080 Wetland Port / Höller



WETLAND PORT FICTION

▼ Figure / 87 Section wetland living and the reuse of mining waste as building material / Höller



Iron ore tailings

- Geopolymerization
→ Bricks for Construction

Utilization of mine tailings) to produce geopolymer masonry blocks is a novel way to meet the emerging needs.



Advantages of geopolymer over OPC (Cement)

- Abundant raw materials resources
- Energy saving and environment protection
- Good volume stability
- Reasonable strength gain in short time
- Ultra-excellent durability
- High fire resistance and low thermal conductivity
- Ability to immobilize toxic and hazardous wastes
- Superior resistance to chemical attack

The properties and durability of mine tailings-based geopolymeric masonry blocks

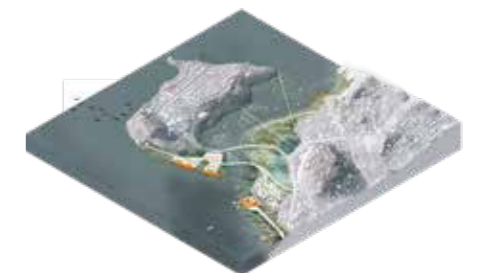
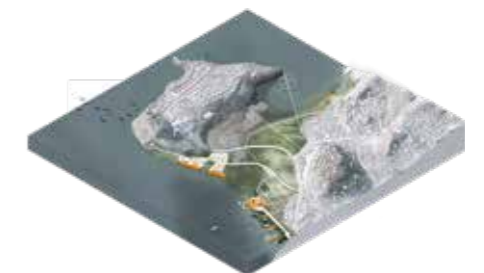
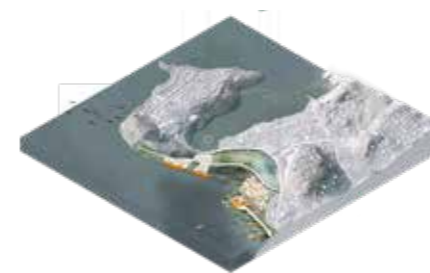
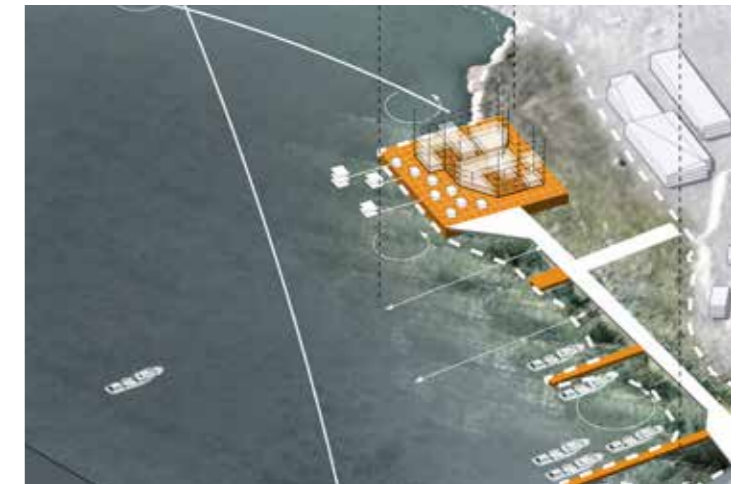
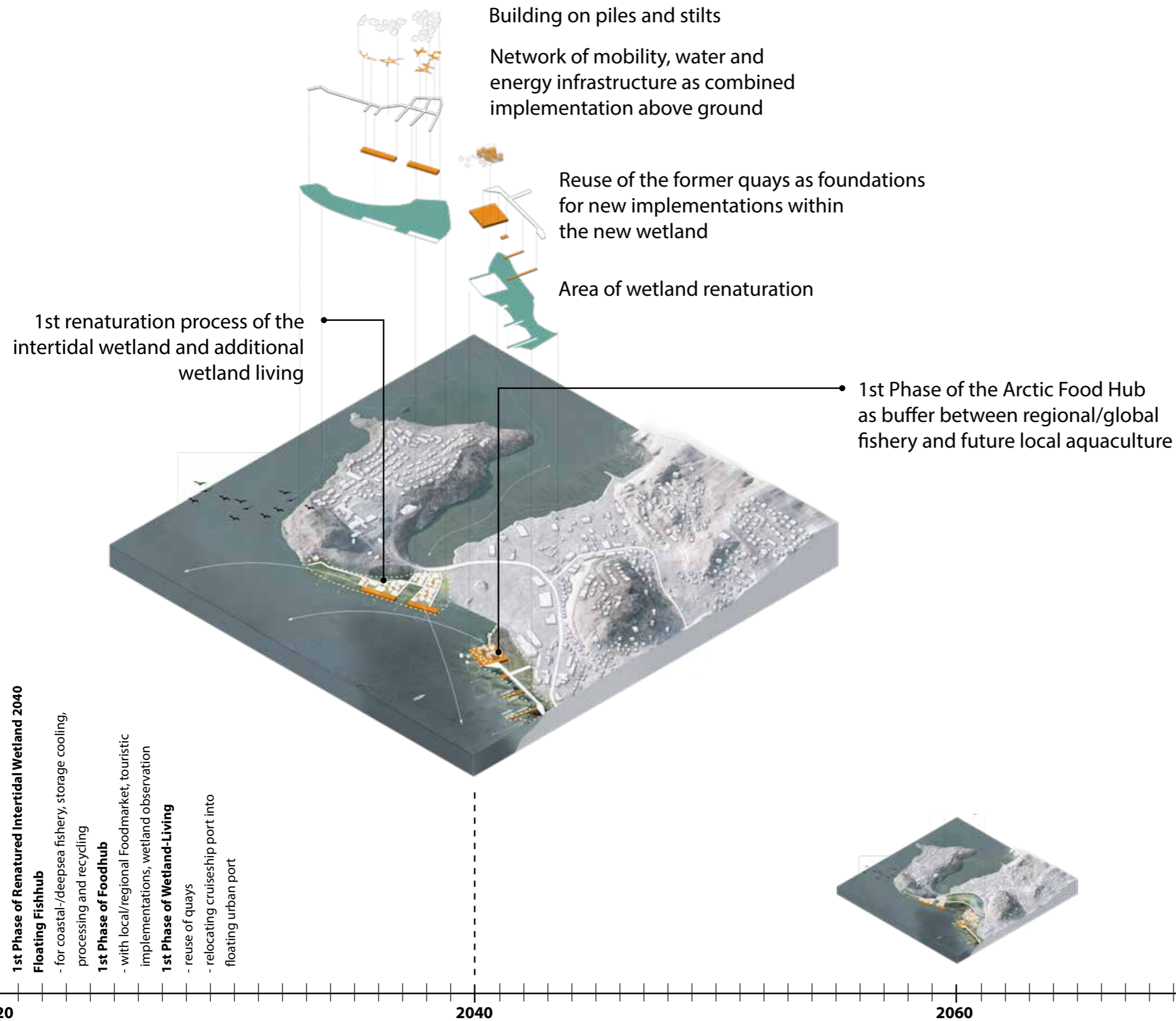
The major goal is to develop an environmentally friendly and cost effective method for recycling and utilizing mine tailings as construction materials:

Geopolymerization is a relatively new technology that transforms aluminosilicate materials into useful products called geopolymers

- Bricks
- Concrete for pavement
- Concrete for structures, e.g. bridges
- Highway base material
- Highway embankment material

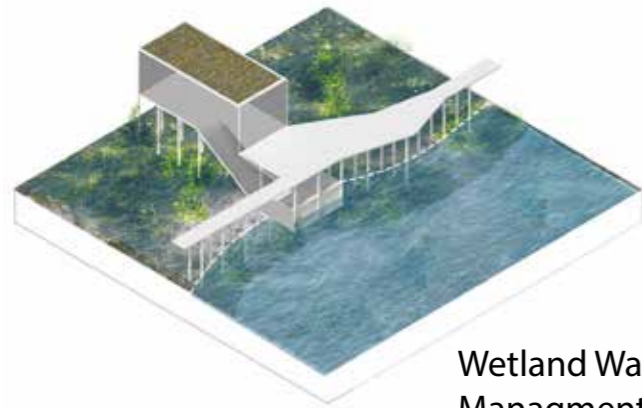
WETLAND PORT 2040 DESIGN STEPS

▼ Figure / 88 Wetland Port Design Steps 2040 / Höller

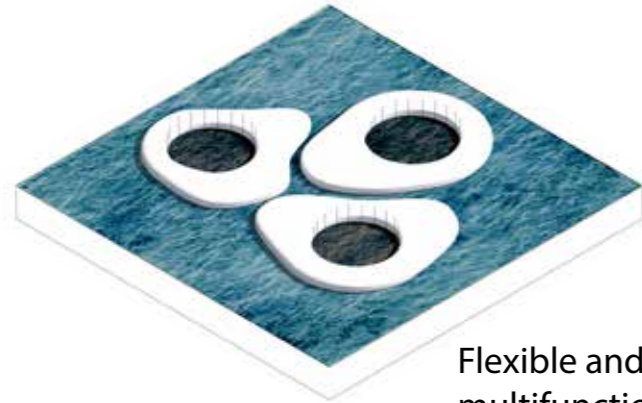


WETLAND PORT 2060 DESIGN STEPS

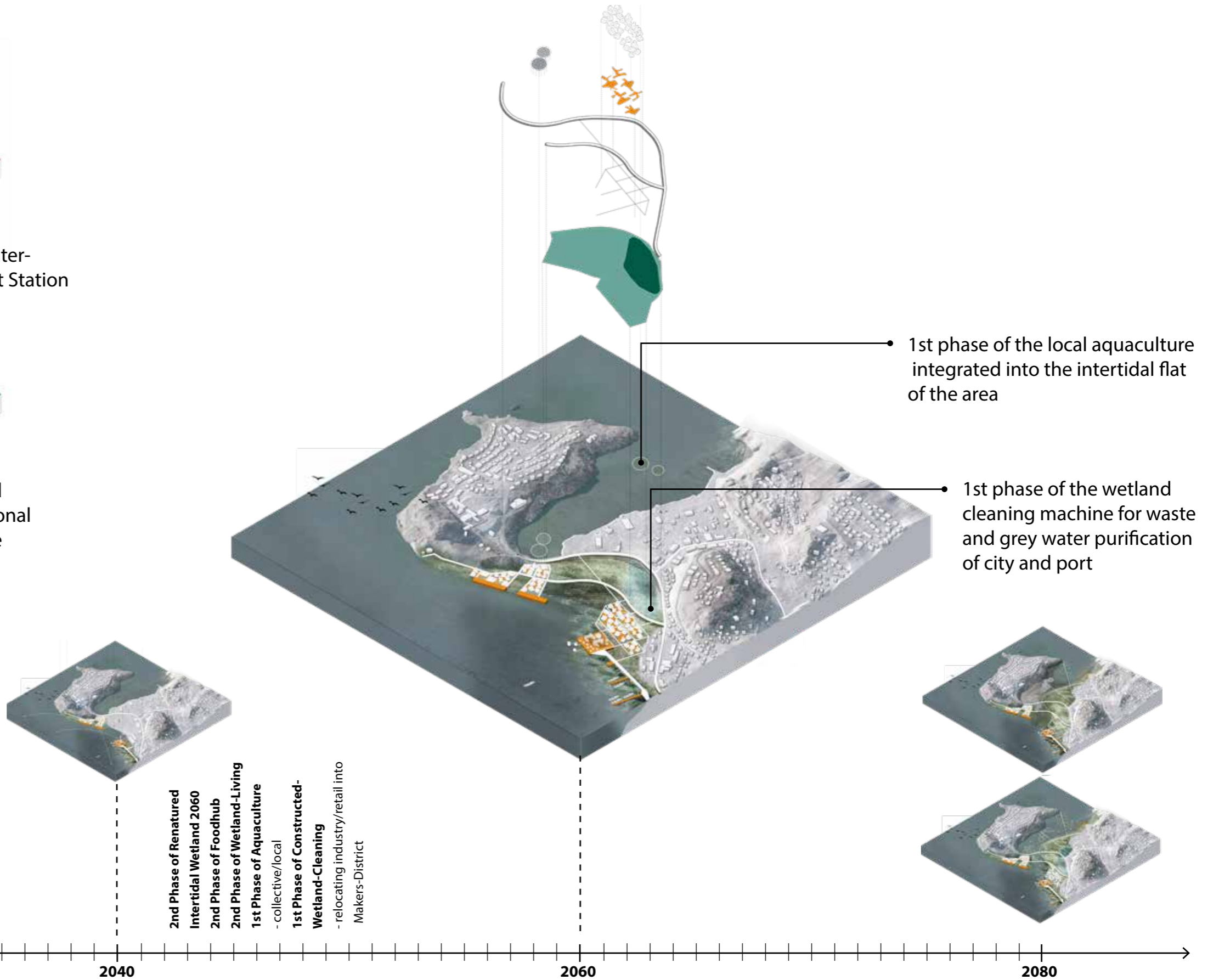
▼ Figure / 89 Wetland Port Design Steps 2060 / Höller



Wetland Water-
Managment Station



Flexible and
multifunctional
aquaculture



1st Phase of Renatured Intertidal Wetland 2040
Floating Fishhub
 - for coastal-/deepsea fishery, storage cooling, processing and recycling
1st Phase of Foodhub
 - with local/regional Foodmarket, touristic implementations, wetland observation
1st Phase of Wetland-Living
 - reuse of quays
 - relocating cruiseship port into floating urban port

2nd Phase of Renatured Intertidal Wetland 2060
2nd Phase of Foodhub
2nd Phase of Wetland-Living
1st Phase of Aquaculture
 - collective/local
1st Phase of Constructed-Wetland-Cleaning
 - relocating industry/retail into Makers-District

1st phase of the local aquaculture integrated into the intertidal flat of the area

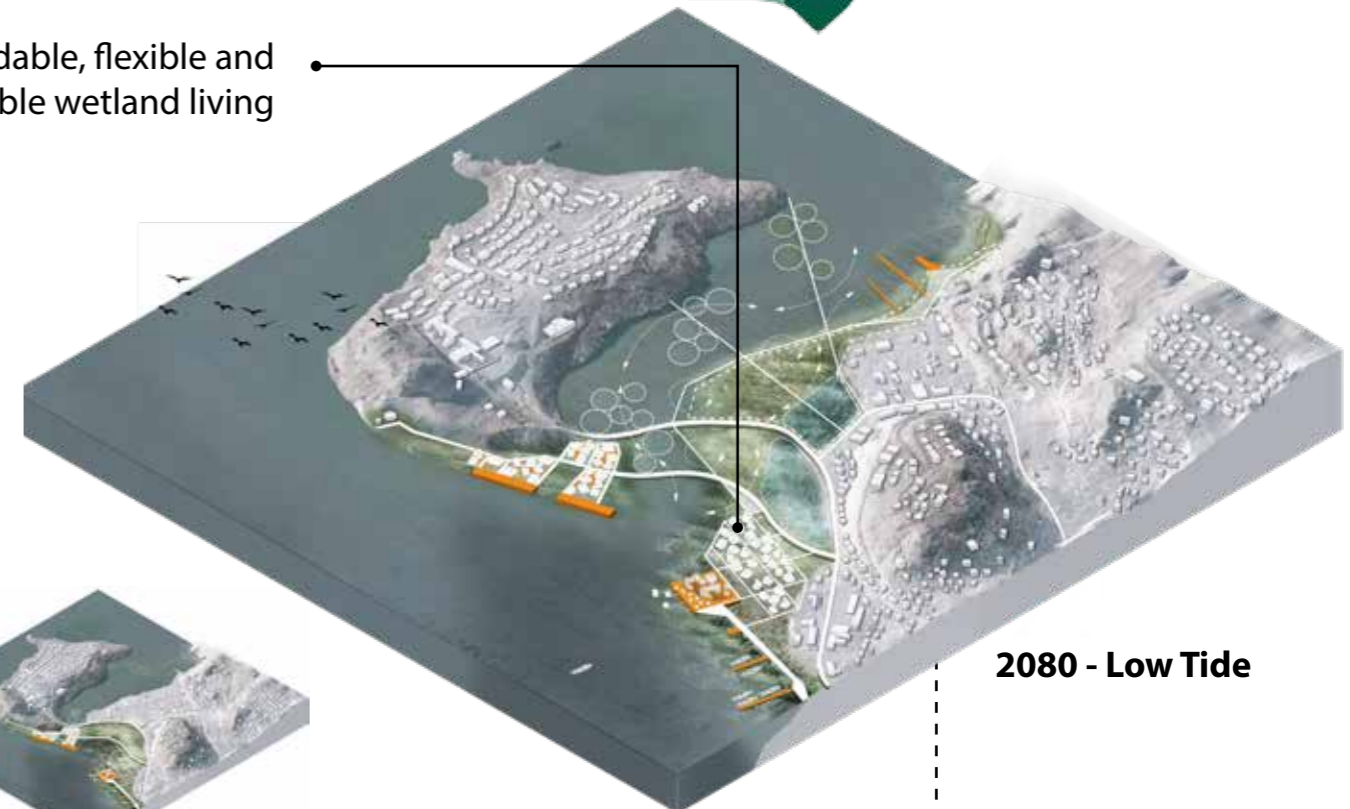
1st phase of the wetland cleaning machine for waste and grey water purification of city and port

WETLAND PORT 2080 DESIGN STEPS

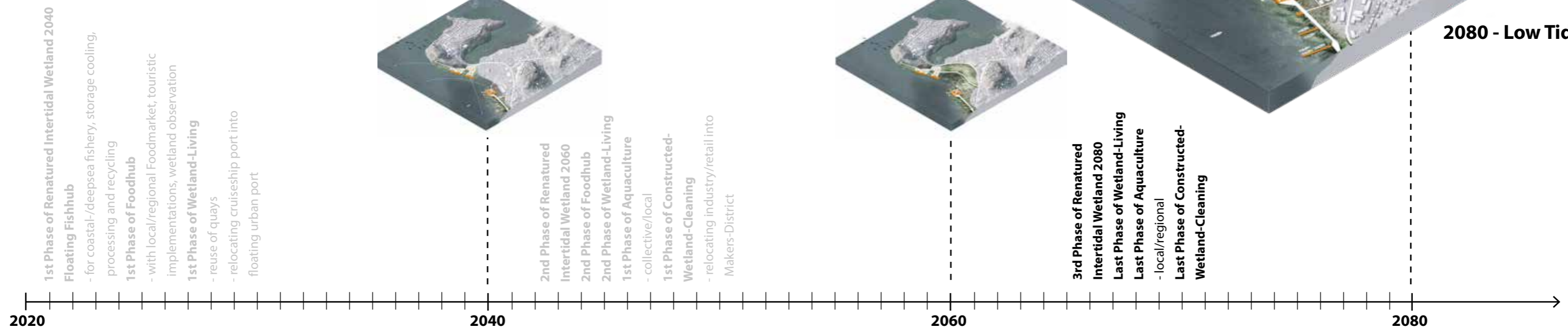


Figure / 90 Wetland Port Design Steps / Höller

Extendable, flexible and adaptable wetland living



2080 - Low Tide



WETLAND PORT 2080 FICTION

▼ Figure/91 Impression of the intertidal wetland and the connection between living and aquaculture /Höller



CONCLUSION

▼ Photo / 98 Impression Kirkenes / Höller

The idea of **rethinking Port-City Scapes** as **liminal spaces in-between paradox and synergy**, holds the answer in its name.

Port-City Scapes will always **pend in-between a state of contradiction and a state of collaborative synergy**.

Instead of imprinting a “new” generic port-city culture, e.g. through waterfront redevelopment of obsolete port-milieus, on top of Kirkenes, which is most often only reconnecting the city with its maritime environment, the **aim of the project was to emerge real synergistic interaction** between the already **existing cultural, mental, infra-structural and built assets** with the new port-development.

Even though the outcomes might be fictional and sometimes a “pie in the sky”, the design of the **three new Port-City Scapes in Kirkenes** show, how a **creative and imaginative spatial-design approach** has the **ability and power to communicate the needs but also possibilities** for a **renewed governance and cooperation between the port and city institutions** and their stakeholders.

It was not the highest goal to propose realistic and ready-to-build concepts, but to rather **start a negotiation- and rethinking-process about an alternative vision for the future port-city**, where the **spatial, technological implementations and institutional configurations** allow for a **constant reinvention of the Port-City Scapes** and for an **ongoing emergence of new, potential synergistic relationships** within the **Paradoxsynergy-Continuum**.

» Szenarien sind Zukunftsbilder, die unter Beachtung zentraler Variablen alternative Entwicklungspfade hypothetisch (nicht prognostisch!) beschreiben, um Zukunftsmöglichkeiten zu identifizieren ...«

BOCK UND LIBBE, 2005, P. 85



» Thank You. «

FIGURES

- ▶ *Figure / 01 Visualizations of the port-city relationship* / (Ducruet, 2005, Ducruet and Lee, 2006 in Hein & Mil, 2019, p. 5) **and shipping networks in relation to ports and city locations, 1890–2010** / (Ducruet et al 2018 in Hein & Mil, 2019, p. 5).
- ▶ *Figure / 02 Current changes within Port-Cities* / Höller
- ▶ *Figure / 03 Kirkenes the Rotterdam of the North* / Source: Hanne Johnsrud, *Perforated Iron Ore*, retrieved from https://issuu.com/hannjohn/docs/perforated_iron_ore
- ▶ *Figure / 04 Triple Bottom Line* / Höller
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- ▶ *Figure / 29 Submerged Baltic route. The Finnish government is also working with engineers Ramboll to establish a test track section that would run from Salo towards Turku* / HyperloopOner
- ▶ *Figure / 30 Section: Barents Sea water-masses* / in Laba, EPFL. in Couling & Hein, 2018, p. 99flux.
- ▶ *Figure / 31 Compact Container Port* / casanova+hernandez architects
- ▶ *Figure / 32 Current Port-City Scapes* / Höller
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Sources: Nemkova & Fyta, 2016, p. 137, retrieved from https://issuu.com/aalandscapeurbanism/docs/shifting_arctic_boundaries_opt
- ▶ *Figure / 38-39 Spatial model of Leirpollen* / Tømmerneset Peninsula / Höller
- ▶ *Figure / 40-41 Sør-Varanger Utvikling, Municipal intern restrcuturing company* / <http://sorvarangerut> retrieved from: vikling.no/
- ▶ *Figure / 42 Overlapp Arctic sea-ice extend over the year, amount of ships using the Northern Sea Route over the year and the planned 7-8 months operation phase of the new port in Kirkenes* / Höller
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- ▶ *Figure / 45 Illustration Climate Change Impact on Reindeer* / Höller
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- ▶ *Figure / 65 Design Fiction Urban Port* / Höller
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- ▶ *Figure / 72 Design Steps Sydvaranger Mining Processing Center* / Höller
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- ▶ *Figure / 91 Impression of the intertidal wetland and the connection between living and aquaculture* / Höller

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- ▶ *Map / 02-03 Projected change in annual and summer precipitation, 2071 - 2100 / retrieved from <https://www.eea.europa.eu/data-and-maps/figures/projected-changes-in-annual-and-5>*
- ▶ *Map / 04-05 Projected change in annual, summer and winter temperature for the forcing scenarios RCP 8.5 / retrieved from: <https://www.eea.europa.eu/data-and-maps/figures/projected-changes-in-annual-summer-1>*
- ▶ *Map/ 06 Rough illustration of raw materials and main industries in different parts of the Barents Region / adapted by Lukas Höller, Source: Joint Barents Transport Plan (2013, p. 25)*
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- ▶ *Map / 19 Reindeer migration Sør-Varanger / Höller Data: geonorge.no*
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