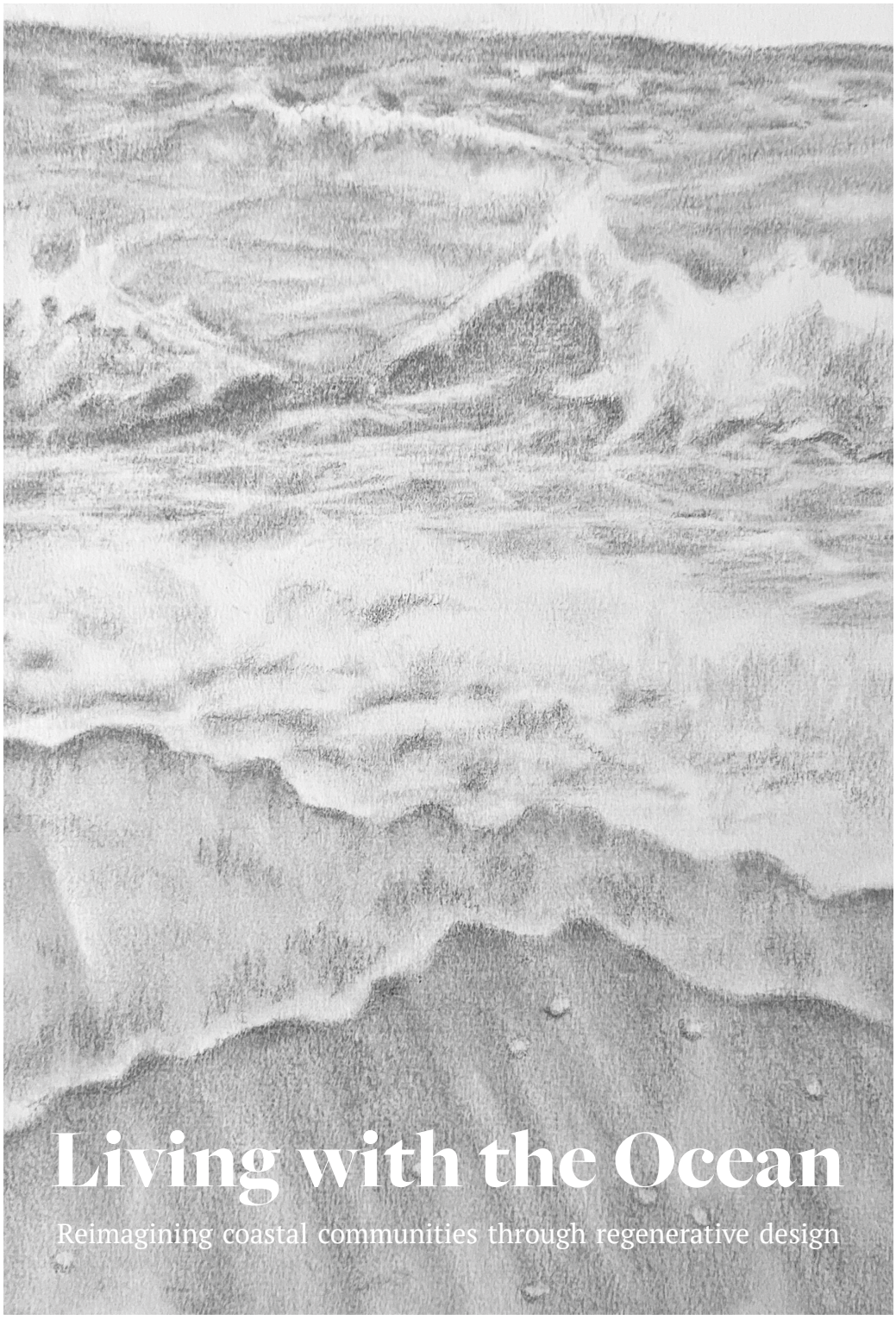

Living with the Ocean

Reimagining coastal communities through regenerative design

Isabelle Olsson & Albina Lampa
Examiner: Nils Björling | Supervisor: John Helmfridsson |
Chalmers School of Architecture | Department of Architecture
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FOREWORD

When first discussing common interests for the thesis, our shared backgrounds and close ties to the West Coast of Sweden became evident. Growing up on the islands outside Gothenburg has shaped our understanding of and interest in the interplay between humans and the ocean. The personal connection we have to islands like Tjörn and Rörö has allowed us to observe first-hand the significant transformations these regions have undergone already within the short span of our lives, such as changes in marine species. When we were kids, you could find blue mussels under every boardwalk, and the bays would flood with moon jellyfish. Today, the cliffs are instead filled with Pacific oysters, and moon jellyfish are a rare sight.

Life on the islands has also changed, and we heard tales from our grandparents time, a time when these islands thrived as local fishing communities, their rhythms deeply intertwined with the ocean's cycles. Over the years, the traditional ways of life centered on sustainable ocean use have vanished, replaced by large-scale fishing and degradation caused by industries and tourism. This densification not only disrupts the natural landscape and ocean health but also erodes the cultural and ecological connection people once had with these environments.

Today, we protect the areas and ecosystems we have not yet disrupted by creating nature reserves, but we ask ourselves if there is another way forward? A way where nature reserves are redundant, where we respect our ocean and understand our deep interdependence.

Our thesis stems from this concern and our desire to challenge and reimagine current development trends. We see an urgent need to reconnect humans with the ocean in a modern, sustainable, and restorative way.

ABSTRACT

The thesis investigates how architecture can reconnect humans and the ocean, and how to align our way of life with the ocean's cycles to propose a regenerative model for sustainable coastal development. Drawing from personal connections to the West Coast of Sweden, the study reflects on how traditional ways of life, once rooted in symbiotic practices and a deep care for the ocean, have been replaced by excessive lifestyles, unhealthy tourism and alienation. The loss of respect and knowledge about our local ecosystems has led to ecological degradation which highlights the need for a societal change. The aim of the thesis is to investigate how architecture can be used as a tool for reimagination and foster a healthier relationship between humans and the ocean.

The theoretical foundation is based on Traditional Ecological Knowledge (TEK), a field of knowledge on Indigenous cultures and practices developed by communities through direct interaction with their environment and a holistic worldview. By identifying key aspects of TEK, a framework of design strategies is formed, providing an ecocentric perspective that emphasize interdependence and symbiotic relationships with nature.

Located on the island of Tjörn on Sweden's west coast, the project works with the region's rich maritime heritage and identity. The design proposal consists of a marine learning and living cluster designed to promote knowledge exchange, restore degraded ecosystems and strengthen community ties. The architecture explores how relationships with the ocean are formed and how multisensory design principles can facilitate interactions with the marine environment. By integrating marine bio-based materials, the sensory experience is enhanced while also offering a path toward a more resilient built environment that utilizes local renewable resources. A system of self-sufficient principles based on the ocean are adopted to operate the building, and transformed into a set of experiential design features to support learning.

The thesis concludes that architecture can play a meaningful role in redefining how coastal areas are inhabited, not only by reducing environmental impact but by reshaping cultural narratives around the ocean. The project does not offer a universal solution, but a context-specific model that encourages further exploration of how the built environment can engage with marine systems in a more informed and responsible way.

Keywords: Coastal Development, Regenerative Architecture, Traditional Ecological Knowledge, Sensory Design, Marine Biomaterials

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Contents

INTRODUCTION

INTENTION

The overall aim of this thesis is to explore how architecture can address the environmental and social challenges faced by our alienation towards nature and our role within the ecosystem, in this case the ocean. The project seeks to reconnect humans with the ocean through utilizing local knowledge and regenerative design principles that foster a deeper understanding of ecological systems and promote ecocentric living practices. The thesis aims to develop a model for coastal architecture and living that regenerates ecosystems, supports local communities, and minimizes the environmental impact of human activities. The building's function will be explored with the context in mind in order to propose an alternative path for the development of coastal communities and our relation to the ocean.

DELIMITATIONS

The thesis is geographically limited to Tjörn, focusing specifically on Västerhavets unique ecological and cultural context. It does not examine the technical aspects of marine biomaterials but rather explores their application in architecture as part of a regenerative and sensory design approach. The study focuses on developing a concept by translating theoretical frameworks into architectural practice and, therefore, does not evaluate economic feasibility or alignment with local building codes and municipal design guidelines.

RESEARCH QUESTIONS

Defining and Fostering Sustainable Coastal Living
How can Traditional Ecological Knowledge (TEK) be used to define a framework for sustainable living in coastal contexts, and how can architecture encourage behaviors and systems aligned with these principles?

Human-Ocean Relationship
How can sensory design be used to create interactive, educational spaces that foster a deeper human connection to the ocean?

TERMINOLOGY

TRADITIONAL ECOLOGICAL KNOWLEDGE	:	*Knowledge developed by Indigenous and local communities through close, long-term interaction with nature.*
SENSORY DESIGN	:	*Design that engages multiple senses to create stronger emotional and spatial experiences.*
”BADORT”	:	*A seaside resort concept in the Swedish westcoast developed in the 1800s. Historically linked to health, recreation, and seasonal tourism.*
CLUSTER	:	*A group of buildings or functions with relationship to one another and arranged after a shared purpose*
EGOCENTRIC	:	*A human-centered view focused on individual and anthropological needs, often at the expense of the environment.*
ECOCENTRIC	:	*A nature-centered perspective that values all ecological systems and all kinds of life as equal.*

BACKGROUND

THE ROLE OF THE OCEAN

The ocean plays a fundamental part of the Earth's environmental systems, contributing significantly to climate regulation, biodiversity sustenance and global bio-chemical cycles. It acts as a heat and carbon sink, absorbing over 90% of excess atmospheric heat and 25-30% of anthropogenic carbon dioxide emissions (Williams, 2011). This makes it a buffer against global warming by reducing the immediate impacts of greenhouse gasses. The process of carbon sequestration happens through oceanic absorption of atmospheric carbon and weathering of rocks and, but is also enhanced by phytoplankton at the surface capturing CO by photosynthesis. Dissolved carbon is then used by shell-building marine animals like corals, mussels and oysters to form calcium carbonate shells. In time, as they die and sink to the ocean floor, carbon is effectively locked away as sediment rocks mitigating the effects of climate change (Williams, 2011). The marine ecosystems also function as biodiversity hotspots hosting a variety of species that perform ecosystem services such as stabilizing shorelines, filtering water, and capturing carbon. Marine life is therefore fundamental for coastal livelihoods and ecological resilience against climate shifts.

The ocean also moderates global weather through thermohaline circulation, a system of deep ocean currents driven by temperature and salinity differences. These currents distribute heat from equatorial regions to the poles, highly impacting the livability in North-European regions like Scandinavia through the Gulf stream. Furthermore, ocean circulation helps in distributing nutrients to marine life and regulates the global weather system through moisture. (Vallis, 2011)

HUMAN IMPACT IN COASTAL AREAS

Coastal areas are zones where human activities directly and intensively interact with ocean mechanisms, often leading to disruptions in ecological and biochemical processes. One of the most pervasive human impacts is eutrophication, driven by the input of excess nutrients such as nitrogen and phosphorus from agricultural runoff and untreated wastewater which increase heavily during the peak tourist season, contributing to nutrient enrichment. This triggers algal blooms, which block sunlight needed for photosynthesis in underwater plants like seagrass. When these algae die, their decomposition also consumes oxygen, leading to hypoxic conditions that can result in "dead zones" where marine life struggles to survive. (Doney, 2020)

Boat traffic in coastal areas is another important factor causing sedimentation where suspended particles block sunlight, hindering the growth of seagrass meadows and kelp forests. Noise pollution is another consequence leading to stress and disruption in navigation and communication amongst underwater-life. Additionally, construction of coastal infrastructure and accommodations often result in shoreline erosion and further sediment inflow to the water. (He, 2019) These sediments settle on habitats disrupting plant growth and animal reproduction. Fossil fuel emissions from motorboats and transport to and from islands also contribute to global warming. Rising ocean temperatures affect cold-water species, such as those reliant on seagrass meadows and coral reefs, forcing shifts in biodiversity. Additionally, increased ocean acidification is linked to reduced CO absorption from the atmosphere since pH and the concentration of hydrogen ions acts in equilibrium reactions together with organic carbon in the oceans.

Coastal tourism is also closely related to waste and pollution with increased plastic waste, litter and untreated sewage entering the water. Microplastics, derived from degraded plastics, are ingested by marine organisms, accumulating in the food web and ultimately impacting larger species including humans. Also frequent trampling by visitors, anchoring of boats in sensitive areas, and the harvesting of marine resources for leisure activities disrupt ecosystems. (He, 2019) For example, the recreational use of beaches and shallow marine habitats damages seagrass meadows, and fishing activities contribute to local population declines of species, disrupting the ecosystem and reducing the availability of food for marine mammals and seabirds. Discarded fishing gear, such as lines and nets, also poses a physical threat to marine life, often entangling seals and seabirds.

ALIENATION

The alienation of our built environment has created a disconnect between people, the materials and systems that sustain our lives. Most modern materials, like concrete, plastic, and steel, are processed to the point where their origins are invisible, weakening our relationship with nature and our understanding of how we are interdependent. In pre-industrial societies, building and living were deeply connected to local ecosystems fostering a sense of responsibility for them. Knowledge of traditional, sustainable techniques, like building with natural materials or producing one's own food and energy has been lost in favor of standardized, industrial methods. (Golden, 2012)

A NEED FOR SOCIETAL CHANGE

Reconnecting with the ecosystems we inhabit requires more than technical solutions. In modern society, the ocean is treated as a distant, limitless resource that we take ownership of. This perception has justified overfishing, pollution, and industrial exploitation, often without understanding the consequences. Reversing this trend requires a cultural shift from seeing the ocean as something to extract from, to something we are part of and accountable to. It demands a shift in values, behaviors, and societal norms. As environmental crises deepen, it becomes clear that sustainable transformation must begin with rethinking how we live, consume, and relate to our surroundings. A medium for achieving this changed mindset can potentially be architecture.

METHODS

LITERATURE STUDIES

A review of existing literature and reference projects provides theoretical grounding and contextual understanding. The research is conducted to identify successful precedents and inform the development of new architectural frameworks.

FIELD TRIPS

To explore different approaches to strengthening the relationship with the ocean, field trips were conducted to various locations: an exhibition about the ocean at the Louisiana Museum of Modern Art; a study trip to Atelier Luma in Arles, France, where we learned about utilizing local resources as biomaterials; and a visit to the eco-village Sieben Linden in Germany to learn about self-sufficiency strategies and approaches to building community and culture.

RESEARCH BY DESIGN

To implement the knowledge gained from literature studies, further investigations, and study trips, an iterative research-by-design process allows for continual testing and refinement of the concept. This method lets us integrate knowledge and strategies into the design proposal, supporting and strengthening our design decisions.

CONTEXT ANALYSIS & MAPPING

Detailed analysis and mapping of the contexts is conducted to understand the environmental, cultural, and spatial dynamics. These findings will inform site-specific and system-integrative architectural interventions.

THEORY

TRADITIONAL ECOLOGICAL KNOWLEDGE

At a global perspective, the areas that consist of the highest level of biodiversity correlate to areas that are home to indigenous people. There is no definite consensus about the mechanisms that form this relationship but for some scholar, the explanation lies in the methods practiced by indigenous people as rotational use, ecosystem management and the intentional shaping of landscapes through fire and other forms of disturbance. The indigenous cultures way of knowing are referred to as Traditional Ecological Knowledge (TEK), but are not limited to ecological strategies but also the process of knowledge transmission and cultural connection to nature. (Berkes, 2012)

Worldview

A fundamental difference between the western-culture and indigenous cultures lies in the worldview and the humans place in it. Indigenous cultures see the human relationship to nature as a symbiotic coexistence with mutual obligations and respect. In contrast, with the rise of industrialization and modern science there was a decline in pantheism, the belief that everything in nature are interconnected, sacred and holds a spiritually significant. Instead we started viewing nature as something humans could control for its own winnings and progress, alienating ourselves from our role in nature, discarding the ethical and belief component of ecological science. (Berkes, 2012)

Another example of the western cultures detachment from nature is the distinction between nature and culture, even present in our terminology, for example the very use of the term wilderness. “Wilderness” is a result of our urbanized and industrialized society, while in indigenous cultures there is no such place as wilderness, only home and Culture-nature or mind-nature are intertwined and can not be seen as separate concepts. (Berkes, 2012)

The modern need for categorization also pose problems in modern preservation methods of “wilderness”, as we connect guarding wilderness with removing human life and activities. Displacing indigenous people resulting in removed stewards, erased knowledge and resilience technologies that has developed for thousands of years. (Watson, 2020)

TEK in practice

When we stand in front of an uncertain future, with extreme climate events, mass extinction and the threat of ecosystem failures, what can we learn from indigenous cultures? In indigenous culture sustainability is directly connected to spirituality in the landscape and belief systems for resource management embedded in the culture of “remember to remember”. (Watson, 2020) There are beliefs that traditional ecological knowledge would be primitive and only relevant in its local context but that’s a very narrow perspective as many of the practices are universal enough to be called principles, like rotation of exploited areas. There are multiple successful examples where the combination of western science and traditional ecological knowledge have been adopted within fields such as climate change adaptation, fisheries management, and forestry. Ranging from community-based forestry preservation in Mexico to wetland rehabilitation in Australia and climate change research in the Arctic. (Berkes, 2012) A first step towards learning from indigenous culture is to shift from “`survival of the fittest´ to `survival of the most symbiotic´”. (Watson, 2020) Done through their practices, social learning, community-enforced rules for resource use, all passed on through stories, rituals and social memory deeply rooting humans as an intertwined part of the eco-system. (Berkes, 2012)

The role of architects

Architecture has the ability to have both immediate and lasting implications. We celebrate it´s beauty and preserve the wonders of dead cultures as the Pyramids of Giza, in awe of the indigenous technologies that formed them. At the same time, we ignore the currently living indigenous cultures, their technologies and worldview. Instead, we have embraced a superficial approach to environmental problems, with green washing and technofixing, telling the story of mother nature turning against us. As designer we have the opportunity to shift the narratives, and re-establish the relationship to nature and encourage positive engagement with nature. We can choose to be inspired by indigenous cultures and their global bank of eco-knowledge and way of connecting people and cultures to eco-systems, in order to inspire a global shift towards a more holistic approach to environmental problems. (Watson, 2020)

THE DOUGHNUT ECONOMY

Kate Raworth's Doughnut Economy (Raworth, 2018) presents an alternative framework for rethinking economic development within planetary and social boundaries. The model envisions a "safe and just space for humanity," which operates within an environmental ceiling defined by nine planetary boundaries while simultaneously respecting a social foundation comprised of essential human needs, aligned with the United Nations Sustainable Development Goals (SDGs). By challenging the traditional growth-centric paradigm, Raworth advocates for an economic model that prioritizes regenerative and distributive strategies, fostering resilience and equity in an era of ecological crisis.

The relevance of Raworth's model is particularly evident in coastal regions, where economic activities are deeply intertwined with environmental sustainability. Historically reliant on marine resources, many coastal communities now face increasing vulnerabilities due to climate change, biodiversity loss, and resource depletion. The Doughnut framework provides inspiration on how sustainable development can be reimagined, emphasizing localized approaches that integrate ecological awareness with socio-economic resilience.

Bioregionalism

The concept of bioregionalism aligns closely with the Doughnut Economy framework, stating that human activities should align with the ecological and cultural context of a given region. This perspective underscores the importance of locally adapted solutions that are developed based on naturally defined regions and not national or political boundaries. This approach encourages decentralized decision-making, where resource management, economic activity, and social structures are designed to function within the carrying capacity of a given environmental region. (Bove, 2021)

"For over 70 years economics has been fixated on GDP, or national output, as its primary measure of progress. That fixation has been used to justify extreme inequalities of income and wealth coupled with unprecedented destruction of the living world. For the twenty-first century a far bigger goal is needed: meeting the human rights of every person within the means of our life-giving planet."
(Raworth, 2018)

REGENERATIVE ARCHITECTURE

Regenerative architecture moves beyond sustainability by treating the natural world as an active participant in design, integrating living systems as the foundation for architecture rather than viewing the built environment as separate from its site. Unlike conventional sustainability, which aims to minimize harm, regenerative practices seek to reverse ecological damage and achieve a net-positive impact, producing resources like clean water, energy, or biodiversity through system integration (Littman, 2009). It employs biomimicry, systems thinking, and designs that align with natural cycles, ensuring mutual support between the built and natural environments, such as in buildings that purify air, capture carbon, or generate energy (Gattupalli, 2023). The design framework of regenerative architecture emphasizes a holistic and integrated approach and pushes the boundaries of traditional sustainability concepts by identifying five major thematic areas that guide the design process; Environmental sustainability, social equity, cultural relevance, economic viability, and participatory learning and community engagement (Charanya, 2023). The aim of the strategies is to bridge the gap between theory on regenerative design and practical applications in architecture, encouraging building design that actively contributes to the health of ecosystems and communities. Regenerative architecture is built around five key principles (Armstrong, 2023):

- **Restoration of the Living Realm:** Emphasizing the need to restore ecosystems, enliven communities, and enrich soils as integral parts of the design process .
- **Bioremediation:** Creating environments that actively restore ecological balance and health, addressing pollution and degradation.
- **Interdisciplinary Approach:** The field encourages collaboration across various disciplines, integrating knowledge from architecture, biology, engineering, and social sciences to develop innovative solutions.
- **Dynamic and Evolving Concept:** Regenerative architecture is viewed as a living concept that adapts and evolves rather than a static practice bound by traditional norms.
- **Community and Inclusivity:** The practices aim to engage communities and consider their needs, fostering a sense of ownership and responsibility towards the environment.

To tackle the current challenges posed by the Anthropocene, an experimental approach to architecture is encouraged to develop new tools and technologies that could offer a radical shift in thinking, advocating for new paradigms that prioritize ecological health and a net positive contribution for human habitats (Armstrong, 2023).

"Regenerative design is an approach in which human systems are designed to co-exist and co-evolve with natural systems, ensuring planetary and social health." (Arup, 2024)

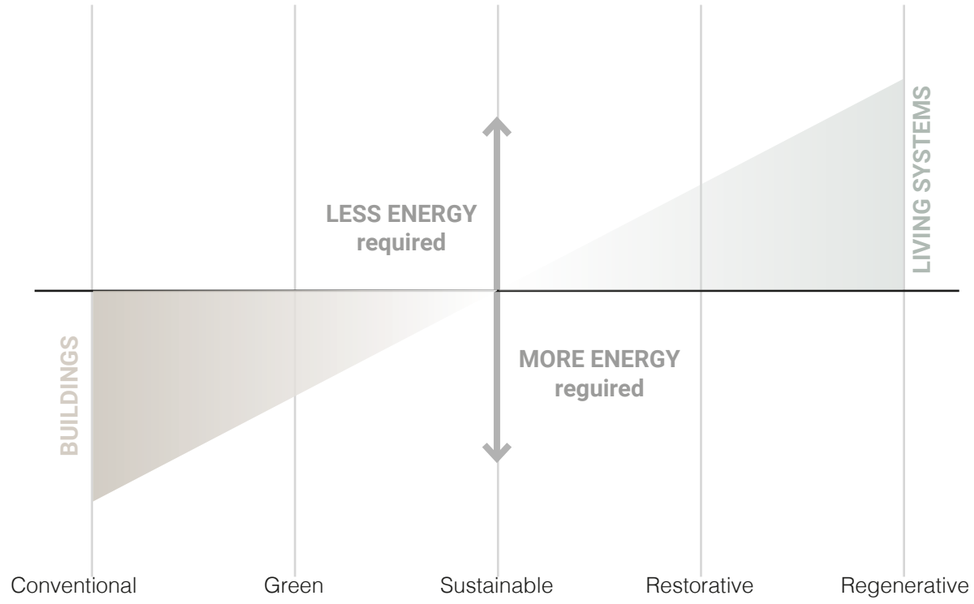


Figure 1. Environmentally Responsible Design (Reed, 2007)

MULTI-SENSORY ASPECTS

A way of creating spatial experiences that promotes wellbeing and foster a learning environment is the activation of different senses, that combined affects the human brain and evoke emotions. The multi-sensory designer, Jinsop Lee, emphasizes in his TED Talk how wellbeing and many of life's greatest pleasures (like eating and intimacy) are enjoyed deeply because of the presence of multiple senses interacting at the same time. Though, all senses are not equally affecting the human perception and understandings about the hierarchy of the human senses suggest that vision is dominant followed by hearing and touching (Pallassma, 2015). Though, for memory creation, which is an important aspect in learning experiences, smelling is of all senses the greatest generator of emotions and therefore memories (Herz & Schooler, 2002). Working with activating different senses in architecture could therefore have a positive impact on the visitors and contribute to the intended function of a building.

Looking at the relationship between humans and nature, it is also clear that the stimulation of multiple senses plays a crucial part. The harmony of watching the movement of the waves and hearing the sound of the ocean. Feeling the water touching the skin. Tasting the salty ocean and smelling the seaweed by the shoreline. All impressions combined creates the indescribable feeling of wellbeing when being around nature. Research on oceanic education also shows that a multisensory approach helps to bridge the gap between public engagement and oceanic science. It states that interactive and experiential education is more effective to form cognitive learning skills. (Panieri, 2024)
One example of a project that works with stimulation of multiple senses in human-ocean habitat is the "Sea Organ" in Croatia. The public staircase by the waterfront in Zadar integrates a tube-network inside the marble staircase that amplifies the sound of the waves and wind that hits the shore (Delaqua, 2023).

Marine Biobased Materials

Biomaterials often engage the senses in ways that conventional materials do not. The scent of seaweed, the ribbed texture of seashells, and the taste of ocean salt can be used to creates a tactile and interactive experience in architecture. Beyond their sensory appeal, these materials offer significant sustainability benefits in the construction as a low-carbon alternative to traditional building materials. Biomaterials both reduce greenhouse gas emissions linked to conventional manufacturing processes, but also possess natural properties such as moisture and fire resistance and air purifying abilities. (Nordic Innovation, 2024).

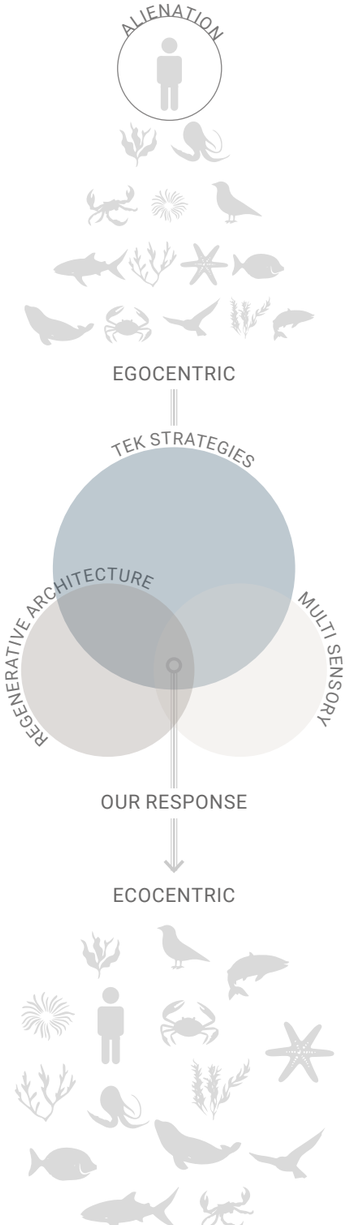
Marine materials have the potential to function regeneratively, sequestering carbon and supporting biodiversity, fostering the development of "living buildings" that grow and adapt over time. Responsible cultivation and harvesting of marine resources can further enhance ecosystems by creating fish habitats, increasing carbon uptake, and improving overall marine health.

Beyond ecological benefits, marine biobased materials contribute to local economies by generating employment and fostering economic resilience in coastal and rural communities (Nordic Innovation, 2024). Ongoing research is expanding their applications, including the use of marine biopolymers as binding agents in concrete and marine fibers for insulation and cladding, demonstrating their versatility in sustainable construction.

// INVESTIGATION

LIVING WITH THE OCEAN

In this chapter, the theories will be translated into a framework for sustainable design practices and adapted to a westcoast context. TEK strategies, regenerative architecture, and multi-sensory design together form our design response to counteract alienation and connect humans to the ocean through architecture.



Framework

TEK AS A FRAMEWORK FOR SUSTAINABLE PRACTICES

A literature study of **Sacred Ecology** and **Lo—TEK: Design by Radical Indigenism** is translated into a framework of traditional ecological knowledge strategies. The framework provides tools for sustainable practices, where humans and nature can benefit from eachother in a just way.

We have selected two goals (marked blue) to work with more actively in the design, through flows, ,atmosphere, spatial features and functions of the building. These we believe are the most forgotten and overlooked strategies of TEK, that are important in order to shift the narratives and putting humans as part of their ecosytem in contrast to putting humans above nature as in the western world view. We also believe they have the greatest potential within the architecture field to, through architecture reconnect humans with their surrounding ecosystems.

The remaining goals (marked brown) will be researched and implemented with the context in mind, to support the projects aim of living in symbiosis with the ocean, but will not be developed to the same extent.

"The Gitga'at people of British Colombia, Canada, collect edible seaweed. Women harvesters watch the growth of stinging nettle plants in the camp to tell when the seaweed is ready, without wasting time to go out to the seaweed grounds."
(Berkes, 2012, p. 32)

FOOD & RESOURCE MANAGEMNET

Ecologically native

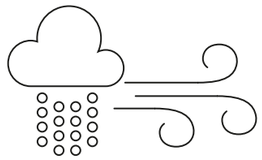
GOAL

Taking part in nature's circular flow by acknowledging the interdependence and supporting its mechanisms.

SUPPORTING STRATEGIES

- **Permaculture**
  Selecting spiecies that support eachother and follows the seasons in order to create no-input systems that mimics natural ecosystems. Gather and harvest in a way that ensurec long-term abundance.
- **Zero-waste philosophy**
  Using every part of a resource ensuring that waste is minimized, repurposed, or returned to nature in a way that regenerate rather than pollutes.

"The Uros constructed reed houseboats, and then later islands and platforms, to seek security from neighboring tribes. Their oursuit of isolation led to the construction of a unique floating world built with totora reeds, a local, organic material."
(Watson, 2020, p. 273)



SHELTER & ENVIRONMENTAL ADAPTATION

Leaving no trace

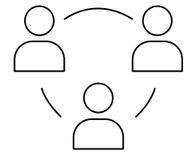
GOAL

Avoid depleting natural resources and leaving irreversible traces. Human habitat should rely on pure, nature-based materials.

SUPPORTING STRATEGIES

- **Bio-materials:**
  Sourcing building materials from land and sea, using what is naturally abundant in the region to ensure long-term ecological balance.
- **Working with the elements**
  Utilizing the elements like sun, wind, water and soil. Identifying local sources to integrate.

"Elders provide corporate memory for the group, the wisdom to interpret uncommon or unusual events, and they help enforce the rules and ethical norms of the community."
(Berkes, 2012, p. 126)



KNOWLEDGE TRANSMISSION & GOVERNANCE

Caretakers of ocean

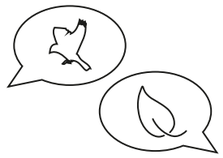
GOAL

Nature belongs to all, including future generations. It´s our shared responsibilty to care for it.

SUPPORTING STRATEGIES

- **Knowledge keepers**
  Utilizing knowledge keepers to pass on their wisdom through intergenerational learning, creating a social memory of past events and natural phenomena to guide future responses.
- **Hands-on training**
  Practicing social learning for building knowledge. The group is collectively responsibility for everyday chores and regenerative duties.

"For the aboriginal people of Australia, ancestors have provided songs, dances, narratives, ceremonies, sacred objects, and paintings in order to maintain the bond between land, people, and totemic beings"
(Berkes, 2012, p. 32)



STORYTELLING & CULTURAL IDENTITY

Tales of sacred ocean

GOAL

Creating a narrative that explain natural cycles, ethics and creates a sense of place and respect for our surroundings.

SUPPORTING STRATEGIES

- **Rituals**
  Using rituals to honor the land, seasons, and animals. Seasonal cermonies align with important shifts like the start of harvest season.
- **Symbolism**
  Natural elements like mountains, rivers, and forests hold deep spiritual meaning and are integreted into crafts, and ornaments to tell the story of our co-existance.

PROJECT IMPACT

- Ocean farm location
- Program related to resource flows

Food & Resource management

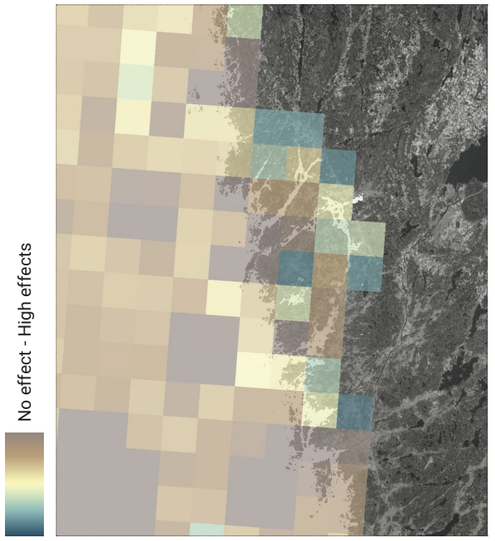
ECOSYSTEM - VÄSTERHAVET

The first step of using the framework is understanding the local eco-system and the role of humans. Mapping processes, resource flows and chain reactions in order to identify unsustainable practices and how they impact the health of the ecosystem.

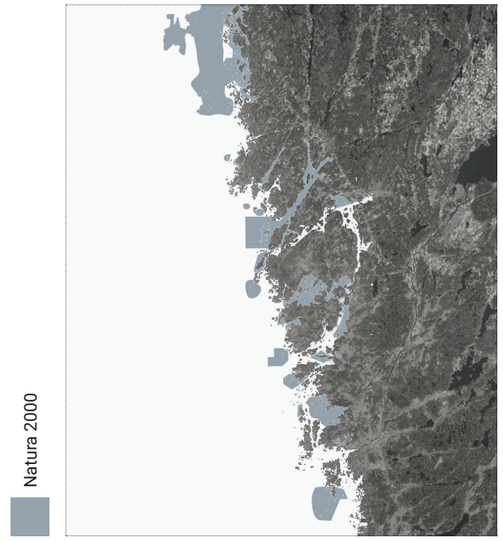
1. Eutrophication
Agricultural runoff, sewage, and industry waste lead to increased nutrient levels in the ocean, which cause algal blooms. When the algae die and decompose, oxygen is consumed, leading to oxygen depletion on the seafloor. This creates dead zones where fish and marine life can no longer exist. (Länsstyrelsen Västra Götaland, 2024)

2. Habitat destruction
Bottom trawling, boat traffic, and dredging destroys the seabed, causing a loss of fish and shellfish habitats like eelgrass and kelp forests that serve as a nursery and shelter for fish and shellfish. Plastic pollution and chemicals harm marine life through ingestion which makes microplastics accumulate up the food chain. Climate change raises sea temperatures, forcing species to migrate while allowing invasive species to spread. (Länsstyrelsen Västra Götaland, 2024)

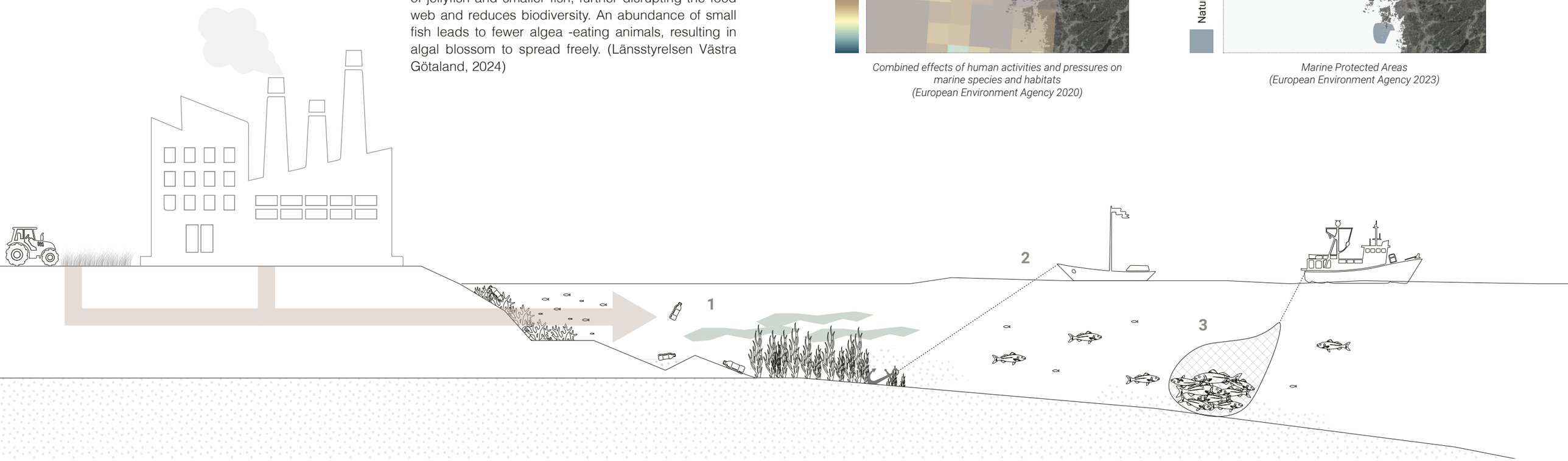
3. Over fishing
Intensive fishing cause a dramatic decline in key species like cod and eel, removing predators from the food chain disturbs the ecosystem. This leads to an overpopulation of jellyfish and smaller fish, further disrupting the food web and reduces biodiversity. An abundance of small fish leads to fewer algea -eating animals, resulting in algal blossom to spread freely. (Länsstyrelsen Västra Götaland, 2024)



Combined effects of human activities and pressures on marine species and habitats (European Environment Agency 2020)



Marine Protected Areas (European Environment Agency 2023)

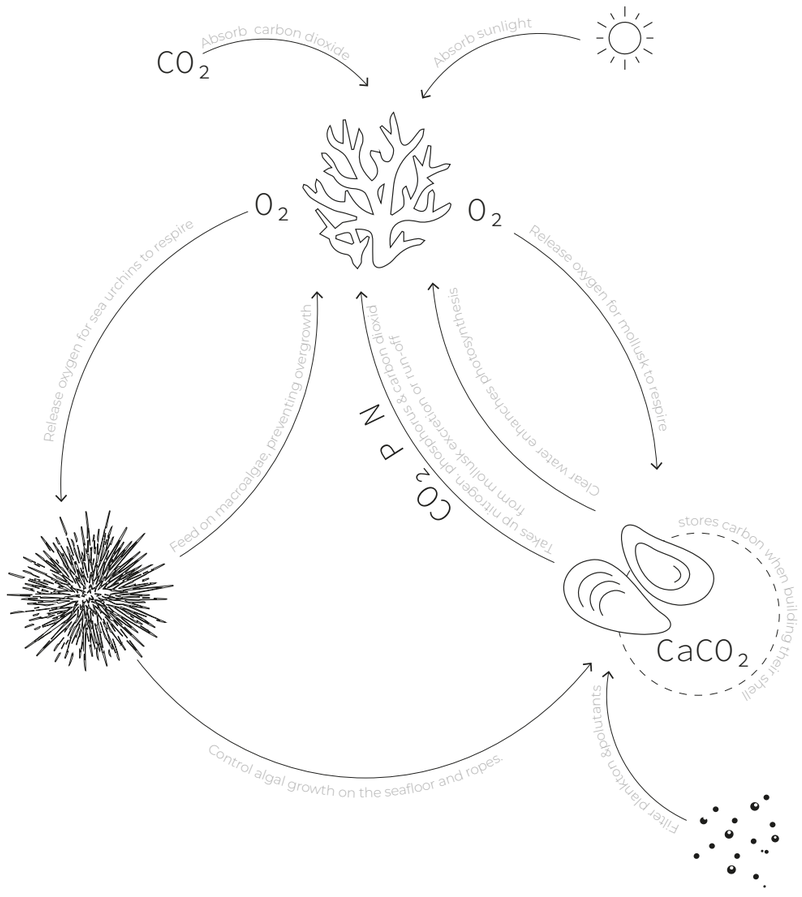


PERMACULTURE - OCEAN FARMING

Humans have cultivated the ocean for millenia in search of food and other resources, but todays methodes with our thrive for profit and efficiency has harmed our oceans. Cool Blue Futures **Manifesto of regenerative ocean farming** emerged as a counter movement to promote and teach a sustainable aquaculture that recover the marine environment.

With the help of the manifesto, the focus is on investigating conscious cultivation, the relationship to humans in regards of effort needed for ethical harvesting, the seasonal pace of multi-species farming, and the taste of blue food.

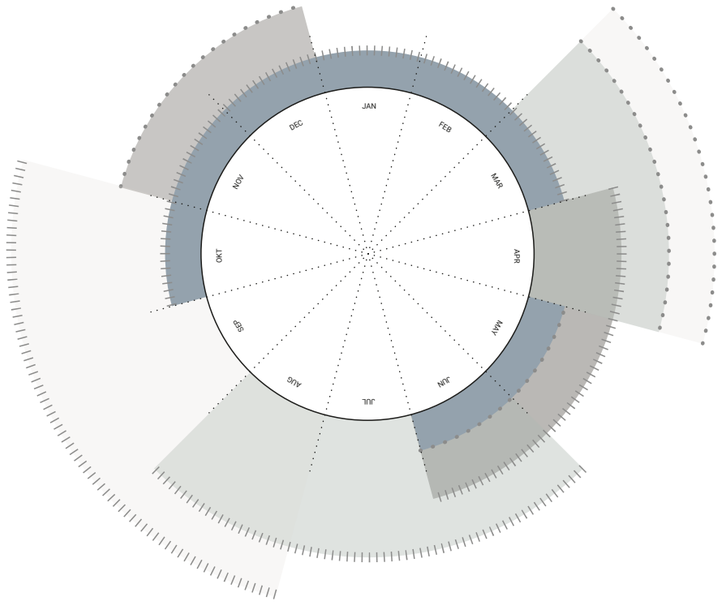
The core of regenerative ocean farming are multitrophic cultivation where multiple spicies are grown togheter to benefit from eachother while offering ecosystem services to the ocean. The farm is floating in the water column which ensures minimal impact on the important habitats on the seabed. This way of cultivating works as a no-input system that does not require any fertilisers, feed or pesticides. (CoolBlue Future)



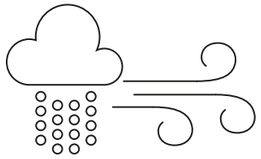
Eco-system services in permaculture ocean farming

		SPECIES SUITABLE FOR FARMING	POST HARVEST	FOOD
ALGAE		• Ulva intestinalis (green • Ulva lactuca (green) • Saccharina latissima (brown) • Laminaria digitata (brown) • Saccharina latissima (brown) • Chondrus crispus (red)	• Fresh • Dryed	Used in salads, soups, stews, fried as chips, seasoning and tea. The red algea can be cooked and used as a binder.
MOLUSCS		• Pecten maximus • Mytilus edulis • Cerastoderma edule	• Fresh • Stored alive in salt water < 1 week • Preserved in brine/oil • Canned	Fresh, steamed, grilled, smoked. Some species are sweet and nut-like in flavor, while others are more salty and rich in minerals.
ECHINODERMS		• Echinus esculentus • Psamechinus miliaris	• Most commonly fresh	Eaten raw directly from its shell or in soups and fish dishes.

Overwiev of blue food suitable for Västerhavet (Appelqvist & Lindegarth, 2019)



Seasonal shifts in ocean farming



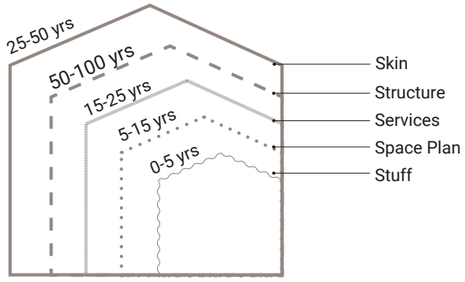
PROJECT IMPACT

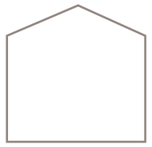
- Material choices
- Placement in landscape

Shelter & enviromental adaptation

BIO-MATERIALS

Exploring contemporary projects and experimentation with ocean resources as bio-based building materials. Focusing on resources that can also be found in Västerhavet. Both inspired by old traditional building techniques and new innovative techniques. Catagorized according to their role in the buidling envelope to give insight in both their lifespan and what layers of the building that might pose biggest challanges for the implementation of ocean sourced bio-based materials.





SKIN

Wadden sea centre

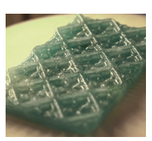
Thatched facade & roof
Reeds can be used both as facade and roof coverage to provide protection and insulation. (Dorte Mandrup, 2017)

Læsø seaweed house

Seaweed facade & roof
Læsø in Denmark has a long tradition of using seaweed as roofing. In the modern seaweed house seaweed has also been used as a facade cladding. (Vandkunsten, 2012)

A Brick for Venice

Sediment bricks
Dredged waste sediment are used to create a low carbon brick. The bricks are not kiln fired but made using a hydralic press. (Fakharany, 2023)



Thames glass

Facade tiles from shells
Bio-glass panels created from mussel shell, local sand and waste wood ash. (Bureau de Change)

STRUCTURE

BIOVALVO

Shells as bindning & aggregate
Shells can be used as aggregate in concrete structures like foundations and walls. It also has the potential to be a natural binder, minimizing the use of cement. (Casadobe Arquitectura)

Kathryn Larsen

Seaweed as insulation
Seaweed is naturally fire resistant, non toxic, rot resistant and has similar insulation properties as mineral wool. (Larsen, 2018)

SPACE PLAN

Søuld

Seaweed as acoustic panels
Eelgrass panels that are sound absorbing while also enhancing air humidity and thermal comfort. (Søuld)

Sea Stone

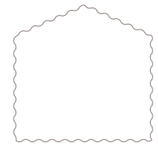
Shells as tiles
Crushed seashells are mixed with sand, minerals and natural binders to be casted into interior products and decorative tiles. (Newtab - 22)

Atelier Luma

Salt as tiles
Salt crystals naturally form on metal mesh submerged in salt marshes, creating glass-like cladding panels. The crystalization process take two weeks and rely only on sun and wind. (Atelier LUMA, 2021)

Ecolurian

Seaweed tiles
A composite tile made of a bamboo base with a layer of kelp algea film. (Ecolurian)



STUFF

Atelier Luma

Algea as bio plastic
Cultivated aquatic algae are dryed and processed into a material that can be used to 3D print objects. (Morris, 2017)

Sea Me

Seaweed as yarn
The yarn i created using cellulose extracted from kelp and the properties are similar to viscose. (Tucker, 2016)

Shellware

Shells as ceramic
Shells are used as a base in both in the clay and glazes that form the ceramic ware. (Hvillum, 2020)

SEAt

Salt as decoration
Salt crystalizes onto cotton wiresframes to provide structure. The form are decided by hanging weights on the cotton wires. (Sibbel, 2016)

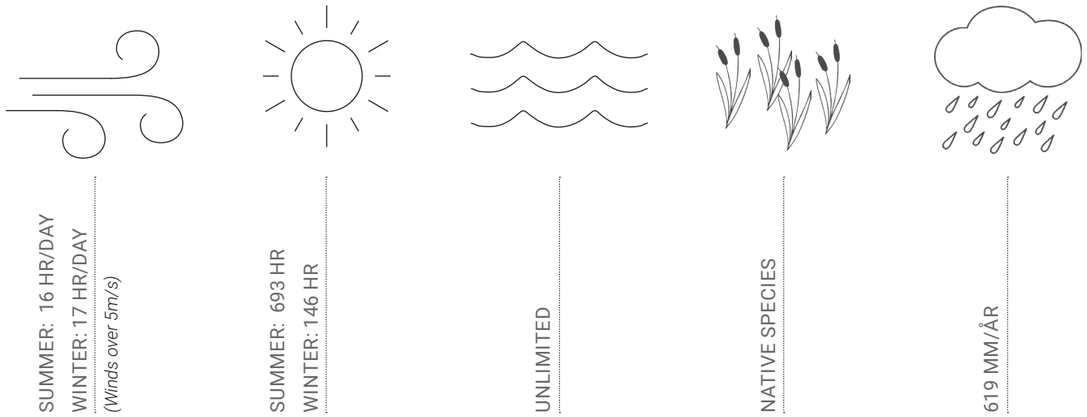
Algarum Natura

Seaweed as fabric
Products extracted from seaweeds, like pigments, binders, and biomass are combined to create a flexible sheet. (Montalti, 2015)

YAMA

Algea as translucent sheet
Reuse of dead algea collected from the beach. (Elkayman, 2022)

WORKING WITH THE ELEMENTS



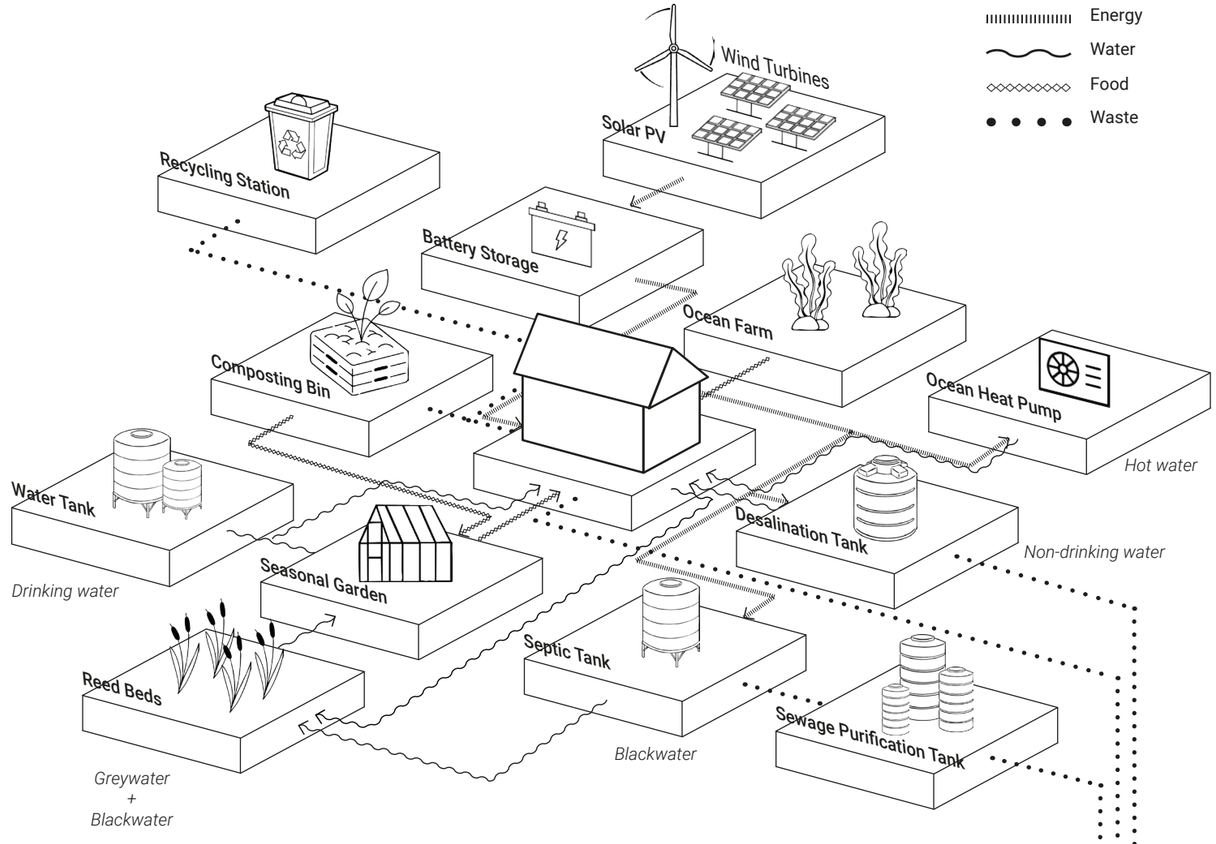
Data from Måseskär weather station (SMHI)

In many traditional cultures, self-sufficiency was not just a practical necessity but a way of life deeply connected to cultural identity and spiritual beliefs. The land, water, and air were viewed as sacred, and knowledge of local plants and animals was passed down through generations, creating systems of food, water and waste that were a part of a larger web (Berks, 2012). The principles outlined here build on that foundation and are rooted in off-grid strategies, suitable for single-unit buildings. The strategies low in complexity and, as much as possible, rooted in natural processes. At the same time, they aim to maintain comfort and uphold the high standards of Scandinavian architecture, demonstrating that a natural building operation is possible without sacrificing quality.

Selecting strategies requires an understanding of contextual factors such as climate, geography, available resources and the technological and economic state of the location. The Swedish west coast is in a temperate region with a mild climate located in a highly developed country. Although heating needs increase significantly during winter, the moderate to strong winds and relatively high sun exposure during the summer, combined with passive design strategies, make it possible to maintain a comfortable indoor climate year-round.

The coastal winds make the area ideal for wind turbines, which can efficiently generate power, potentially supporting the entire winter season. During the spring and summer months, solar PV panels, combined with energy storage, can provide power even during cloudy or darker periods. Together, these renewable sources create a reliable, balanced energy system. For water, the proximity to the sea allows for desalination of ocean water to supplement freshwater needs. This is further supported by rainwater harvesting, ensuring a sustainable supply for drinking. Hot water and general heating of the building are provided through an ocean heat pump, which utilizes the relatively stable temperature of the surrounding sea water.
(Anderson, 2024).

Food security is provided through ocean farming and seasonal gardening, but these methods may not cover all nutritional needs depending on the crops and size of the farms. Waste generated in the building can be managed through composting, efficient reuse and natural water treatment systems with constructed wetlands using reeds for bioremediation.



ENERGY DEMAND

Estimated for a simple off-grid building with 30 staying guests.

Heating & Cooling (HVAC): 20,000 kWh/yr

Electricity & Lightning: 43,000 kWh/yr

Hot water: 18,000 kWh/yr

Operational system: 10,000 kWh/yr

TOTAL ENERGY DEMAND: 91,000kWh/yr

WASTE PRODUCTS

SLUDGE
NON-RECYCLABLE WASTE
OCEAN SALT
MUSSEL SHELLS

PROJECT IMPACT

- Visitor concept
- Identifying knowledge keepers

Knowledge transmission & Governance

CASE-STUDY: EARTHSHIP BIOTECTURE ACADEMY

The Earthship Biotecture Academy is a learning platform dedicated to teaching sustainable building practices and autonomous living through the construction of Earthships. Earthships are built using recycled materials such as earth-filled tires, cans, and bottles. The movement in Taos, USA, was started by architect Michael Reynolds. Since the academy's founding, 5000 students from around the world have completed the training program.

It offers comprehensive training in Earthship design principles, construction methods, and philosophy. The program includes classroom instruction, hands-on workshops, field studies, and volunteering on building projects.

The academy in Taos also offers self-guided and guided tours of the Earthship community, as well as weekend seminars. (Earthship Biotecture)

This case study will explore the organization and teaching methods of the Earthship Academy, focusing on how they align with the strategies outlined in the framewor, such as social learning, hands-on training, and learning from knowledge keepers. The academy has also succeeded in building a community around the practice and spreading its ideas to other locations.

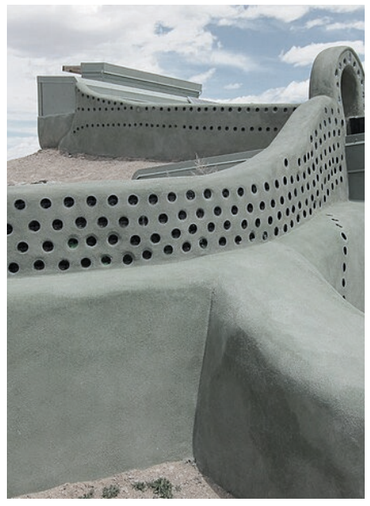
We will do a breakdown of the key characteristics we identified from the training program based on the following three questions:

Who learns from whom?

Where do we learn?

How do we learn?

Workshop earthship academy. Image: Jenny Parkins



Earthship visitor center. Image: Kim Eugene

Earthship construction. Image Jenny Parkins

WHO LEARNS FROM WHOM?

- **Peer-to-Peer Learning**
  Students engage in collaborative learning, working in smaller groups ,sharing diverse backgrounds and experiences.
- **Mentorship from Knowledge keepers**
  Experienced Earthship builders, electricians, plumbers, and plant specialists lead classes, labs, and hands-on construction sessions. This provides students with in-depth knowledge and practical skills.
- **Community Engagement**
  Field Studies and volunteering offer opportunities to work alongside local communities, promoting mutual learning and cultural exchange.

WHERE DO THEY LEARN?

- **Formal spaces**
  Classroom sessions, group projects and hands-on workshops provide a theoretical and practical foundation as well as an overview of aim and methods.
- **Infromal spaces**
  Learning and charing knowledge also takes place during breaks, common dinners and communal living.
- **Online forums & network**
  This platform extends learning opportunities to a global audience, promotes continuous engagement and knowledge sharing along former students and other actors.

HOW DO THEY LEARN?

- **Imitation & observation**
  Learning by watching the different techniques and than recreate and repeat.
- **Co-creating**
  Learning by building something together, designing orproblem solve in real-time as a team.
- **Dialogue and reflection**
  Learning through group discussions and feedback sessions where students can reflect on their experiences, share in and learn from each other's perspectives

PROJECT IMPACT

- Cold bath facilities
- Inspiration for symbolism and storytelling

Storytelling & Cultural Identity

TALES OF THE WESTCOAST

The Birth of the ”Badort”

The great herring periods of the 18th century transformed Bohuslän's coastal villages into thriving fishing communities. Shores once quiet were filled with the sounds of boats unloading barrels of salted herring, workers pressing fish oil, and merchants trading across Europe. The sea was both a source of survival and prosperity, shaping the rhythm of life along the coast (Andersson, 2023).

By the mid 19th century, as the herring shoals waned, seaside tourism began to rise. Steamships brought visitors seeking the therapeutic benefits of the sea, and small fishing villages gradually evolved into popular seaside resorts. Bathhouses, spa hotels, and promenades were constructed, where people swimmed in hot and cold saltwater, enjoyed seaweed treatments, and inhaled the fresh ocean air, all believed to restore health and vitality.

During this period, staying in simpler conditions became an integral part of the ”badort” experience. Guests often rented rooms in houses or small hotels, where they would live modestly and sometimes engage in self-maintening practices like preparing their own food. Over time, some visitors began building their own summerhouses along the coast. These seasonal return created a unique sense of community, with families and individuals coming back each year to reconnect with old friends, establishing lasting bonds and traditions that made these coastal areas so special. The ”badort” became not only a place for recreation, but a place where lasting memories were made and where people shared a life with the timeless rhythms of the ocean (Bohusläns museum).

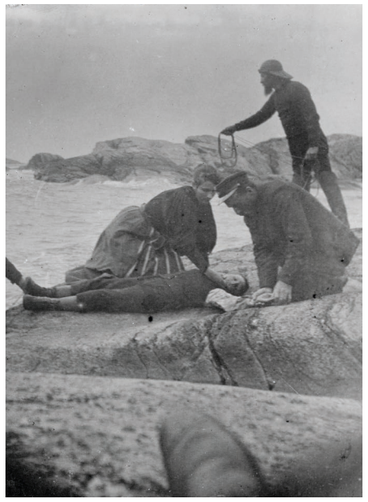
The Archipelago Dialect

The Bohuslän archipelago dialect is characterized by often substituting the swedish ***u-*** and ***o-***sound with ***ö***. The traditional accent also has a different way of expressing the ***a-***sound by having the same pronounciation as the short ***a-***sound in ***'hatt'*** but using the same length as the long ***a-***sound in ***'mat'.*** (Petzell, 2018)

môwe	:	seagull
gàle	:	black-backed gull
tôga	:	fog
makkel	:	makrill
kôrsfesk	:	starfish
betäter	:	potatoes
sinna	:	late
howwart	:	remember
sli	:	seaweed
shotte	:	mainlander
vôrna	:	weather
bôs	:	minor scrap
gààrn	:	crazy, madcap
bônn	:	bottom
hannklä	:	towel
klôvva	:	mountain scree
mögge	:	much, many

Source: Hembygdsprojekt 1983: Öckeröarnas historia, Rörö

Drowned boy, 1890s. Photo: Victorin, Carl

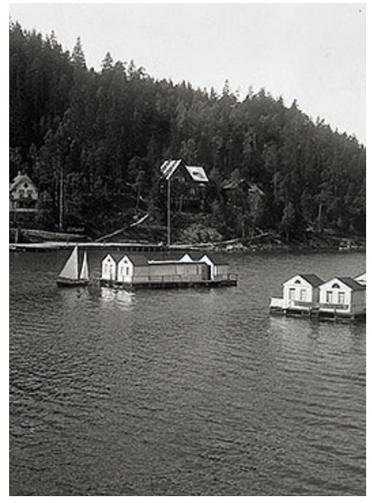


Fishermen in Marstrand, 1920s. Photo: Heurlin, Gustav

Herring on Qvirist's plot in Kvarnholmen, 1920s. Image: Bohusläns museum

Seaweed bath in wooden tub. Gustafsberg's hot bathhouse,1940s. Image: Bohusläns museum

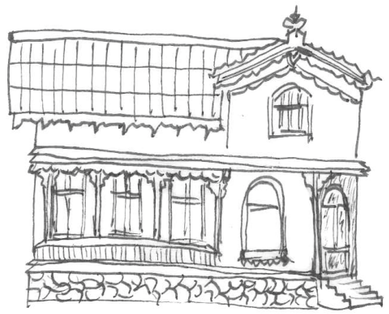
Swimming competition in Lysekil's men's cold bathhouse in 1911. Image: Bohusläns museum



Gustafsberg's floating cold bathhouse, 1900s. Image: Bohusläns museum

Source: https://digitaltmuseum.se

DETAILS OF THE WESTCOAST



SENSING THE OECAN

FISHING FOR CRABS

SCENTS OF THE SEA

The smell didn't bother us in the exciting hunt for crabs and fishes beneath the boardwalk. The mussels used as bait that we had cruched agains the cliff behind us had left a a little puddle of smelling goo. But we had our faces closer to the water where we only felt the smell of salt and seaweed in the shallow parts of the harbour, hoping to see a crab crawl out of its hiding.

DIVING & PLAYING

COLLECTING SEASHELLS

RESPECT

COLOURS OF THE OCEAN

The summer days in the natural harbor of Vasholmarna passed at a leisurely pace, there were no schedules to keep. Well, there was one: sunset. When the sun began to glow golden, it was time to pause the yatzy game and gather the blankets to head up to the cliffs, where the rock was still warm from the sun.

There, from the best seat in the house, you could watch the sun sink into the horizon. Sometimes, the sea lay perfectly still, like a mirror. Other times, the rays scattered in the foaming waves. Always beautiful, perhaps dangerously so. They say that the most stunning, blood-red sunsets, when the sea lies calm, are a sign of the storm to come.

UNDERWATER SWIMMING

SCRATCHING BARNACLES

FALLING OFFBOARD

JELLYFISH STINGS

MOODY

CONTRASTS

VOICES OF THE DEEP

I woke up in the middle of the night by a loud crash, the boat was moving with jerky movements and I could hear the whining sound from the masts in the bay. The wind had changed direction and the anchor must have lost it's grip of the seabed and now the stormy waves were pushing the boat onto the hard cliffs.

NIGHTSWIMMING

SAILING

FISHING

TEXTURES BELOW SURFACE

Me and my best friend Sofie used to bring our snorkels down to the beach to explore life beneath the surface. We would touch the slimy yellyfishes, dive after seaflowers that would crawl in our hands with their little tickeling tentacles. We looked for anything beautiful or rare, the most perfectly smooth stone or shells with unusual colors, patterns or shapes.

SUNBATHING ON THE CLIFFS

SNORKLING

POWERFUL

FRESH SEAFOOD

A TASTE OF THE UNFORGIVING

It looked so effortless when others tamed the wind on their windsurfing boards. But the wind was fickle, a sudden gust could rip the sail from your hands in an instant. Sometimes, you managed to catch it, feeling the board surge forward beneath you, only to suddenly lose control. The sail swung against you, knocking you off balance, and you were forced under the surface. Panic set in as the sail blocked your way up, and a mouthful of seawater became inevitable. The taste of the ocean burned in my throat, and I marveled at how something as simple as salt could make water taste so awful.

WINDSURFING

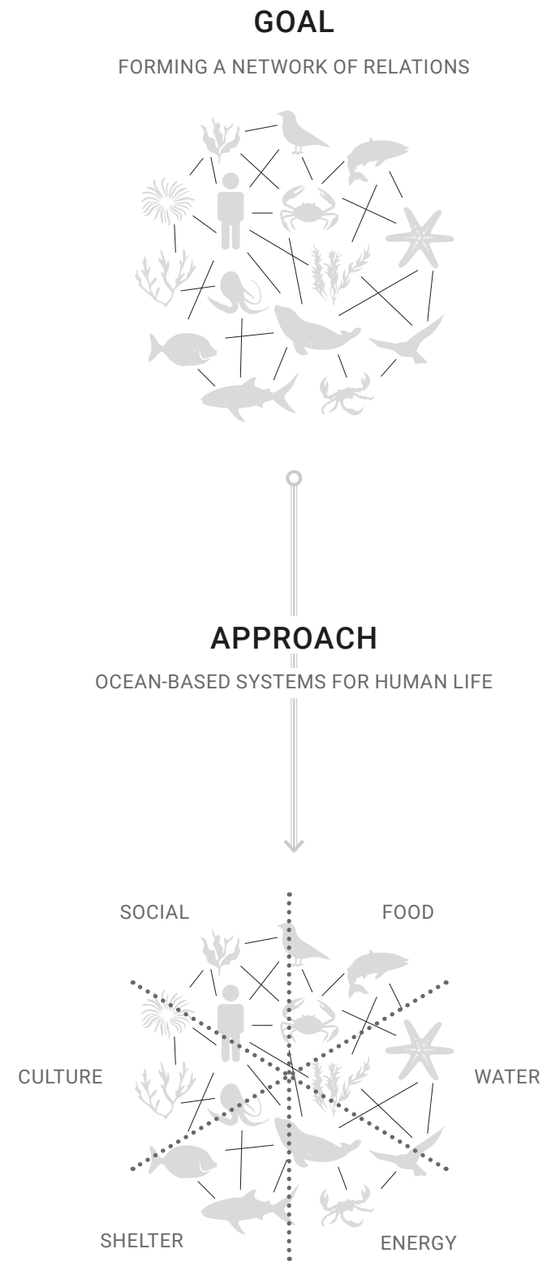
RELIANCE

RUN AGROUND

// IMPLEMENTATION

BLUE HOUSE

In this chapter, the investigated strategies will be implemented and combined through research by design into our project the Blue House, with the aim of achieving the four goals stated in the framework: becoming caretakers of the ocean, being locally native, telling tales of sacred ocean, and leaving no trace.



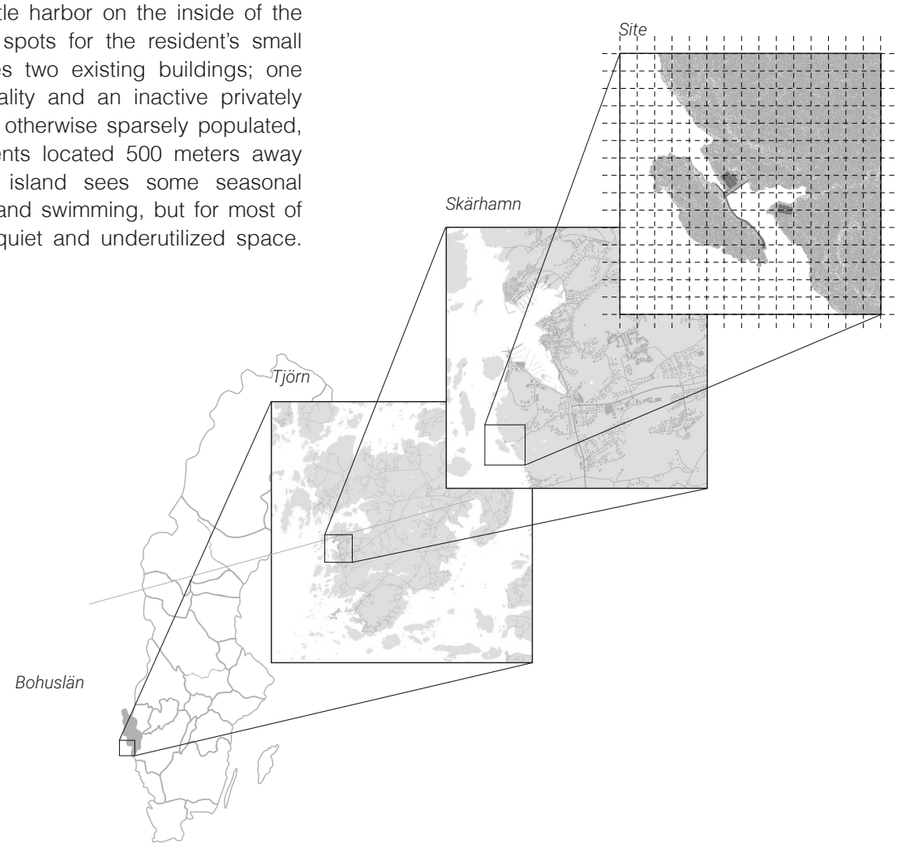
Site & Context

SKÄRHAMN, TJÖRN

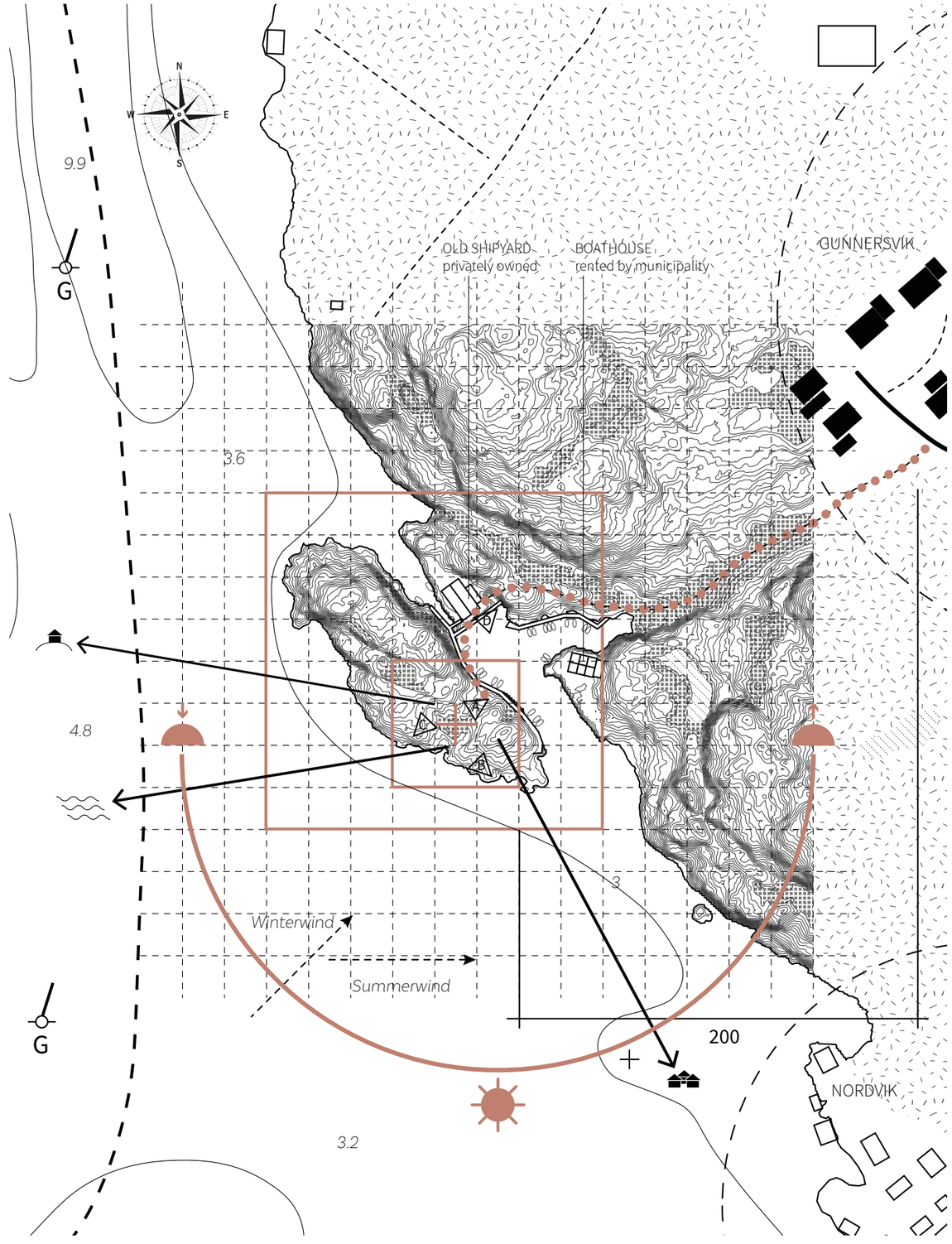
Our chosen site is located on a small island just south of Skärhamn, Tjörn, situated on the rugged cliffs characteristic of the Bohuslän coast. This location presents an opportunity to explore off-grid solutions in a setting that remains easily accessible from the larger community of Skärhamn. The west coast has a long tradition of adapting to challenging rocky terrain, and we embrace this legacy by integrating our project into the landscape.

A small wooden jetty already connects the island to the mainland, and a little harbor on the inside of the island serves rentable spots for the resident's small boats. The site features two existing buildings; one rented by the municipality and an inactive privately owned shipyard, but is otherwise sparsely populated, with the nearest residents located 500 meters away in Gunnersviken. The island sees some seasonal visitors for sunbathing and swimming, but for most of the year, it remains a quiet and underutilized space.

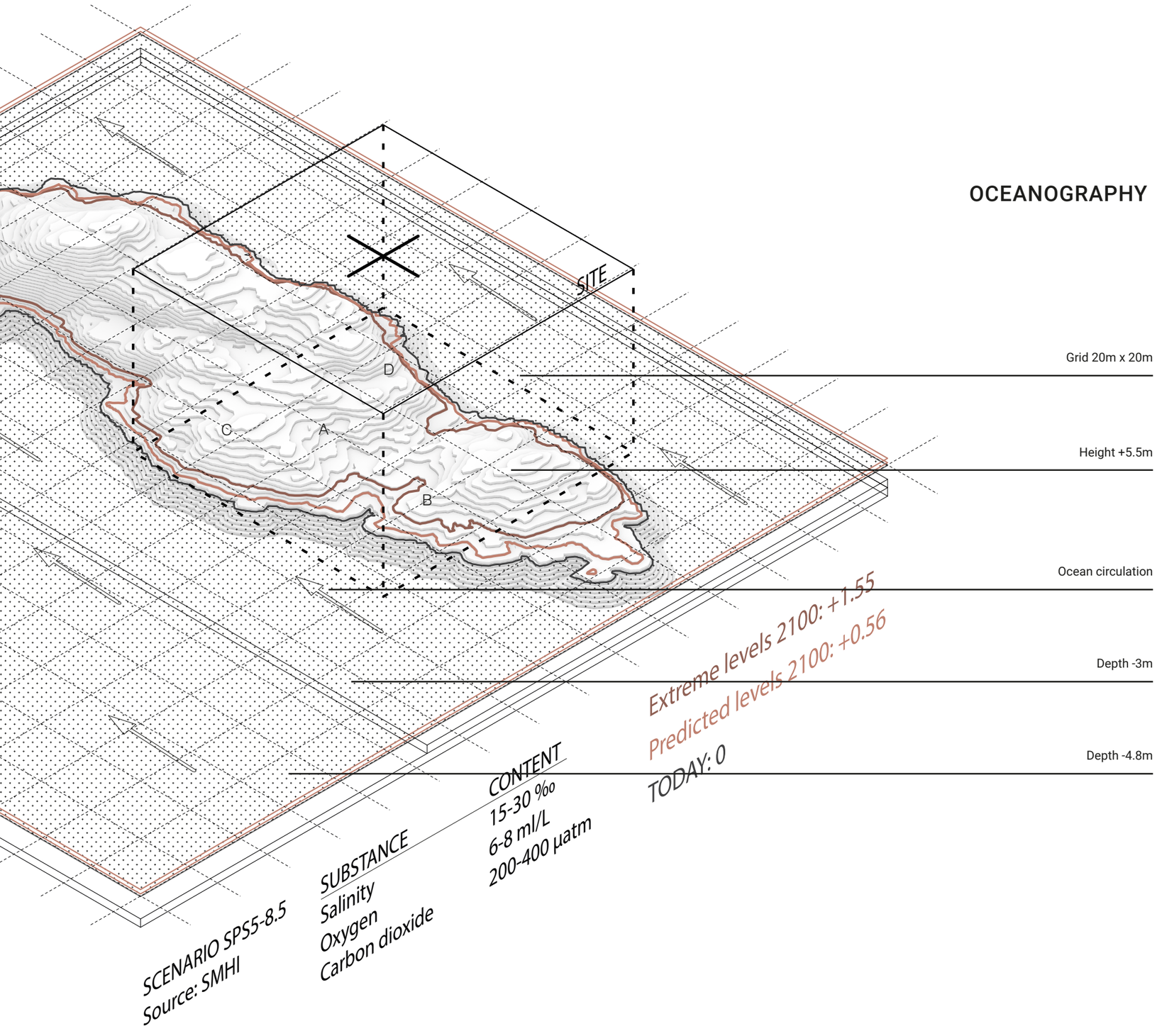
Tjörn's municipality has identified the surrounding area as suitable for pilot projects on marine cultivation, which aligns with our ambition to integrate ocean farming. The proximity of smaller, weather-protected islands offers promising conditions for mussles and seaweed growing, without disturbing the main navigational channel for boat traffic.



SITE ANALYSIS, GUNNERSVIKEN



OCEANOGRAPHY



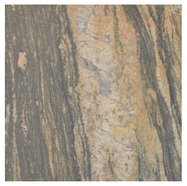
A

B

C

D

SENSORY MAPPING

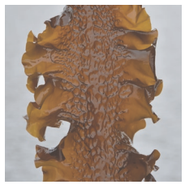


Migmatit

Lichenes

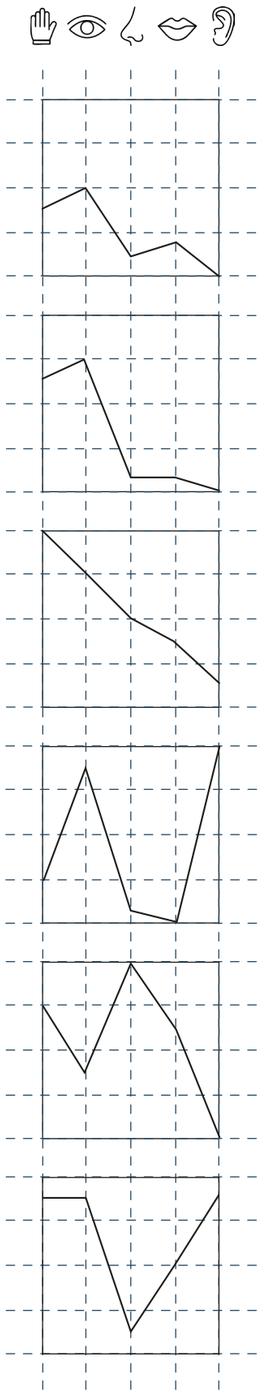
Calluna Vulgaris

Larus Canus



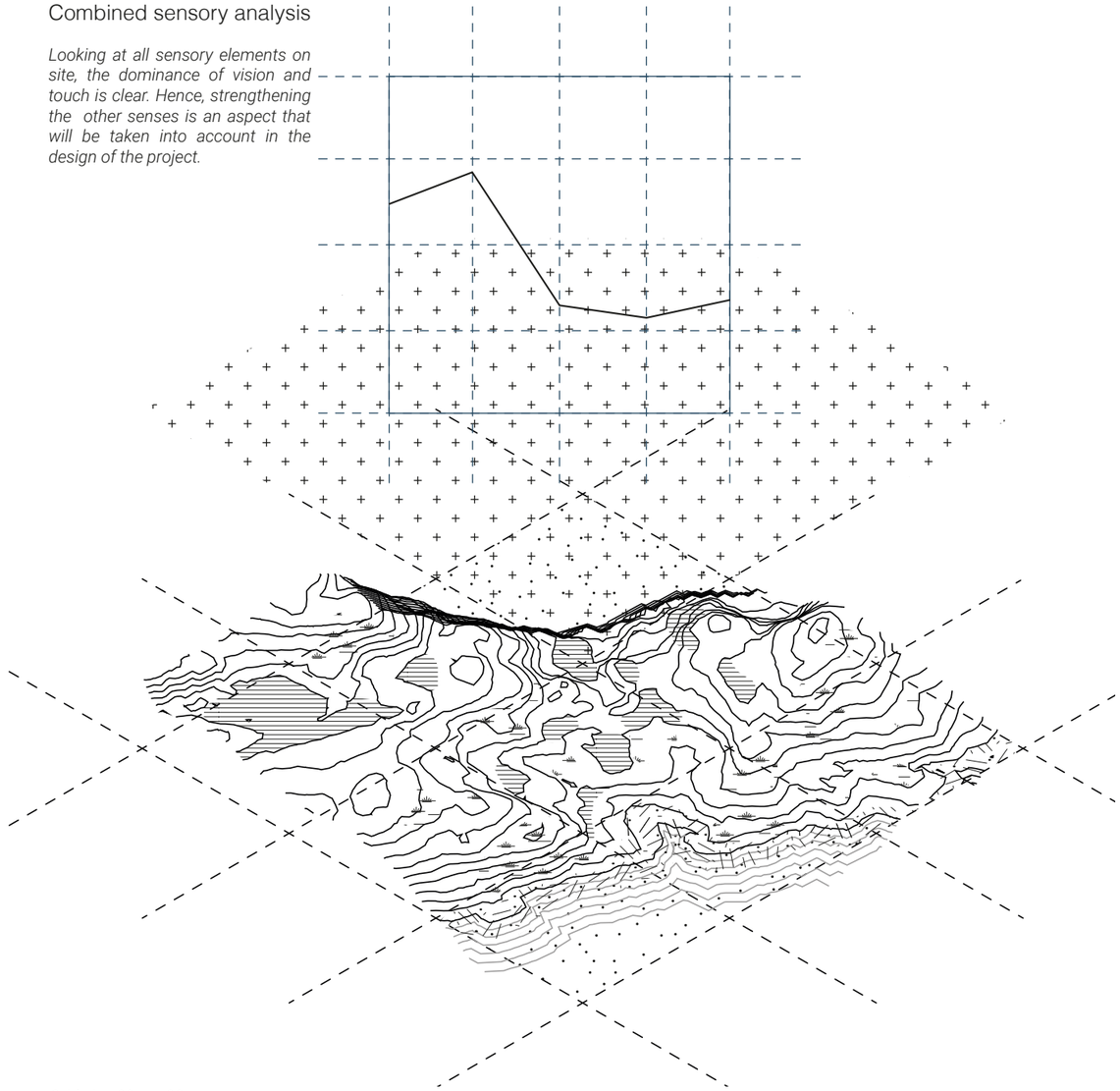
Fucus Vesiculosus

Sal Agua

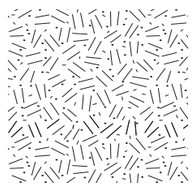


Combined sensory analysis

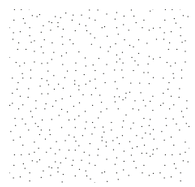
Looking at all sensory elements on site, the dominance of vision and touch is clear. Hence, strengthening the other senses is an aspect that will be taken into account in the design of the project.



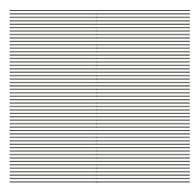
Grid size 20m x 20m



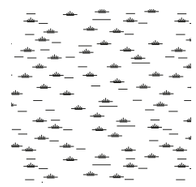
Seaweed



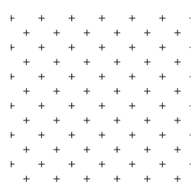
Ocean



Grass & Bushes



Lichen



Birds

SITE PLAN 1:300

Water treatment system

Living units

Reed bed forrest

Old shipyard

Ocean farm 800m

Living cluster &
Energy hub

Main building

Municipal boathouse

Workshop

Greenhouse

Foajé & Exhibition

Kitchen & Dining

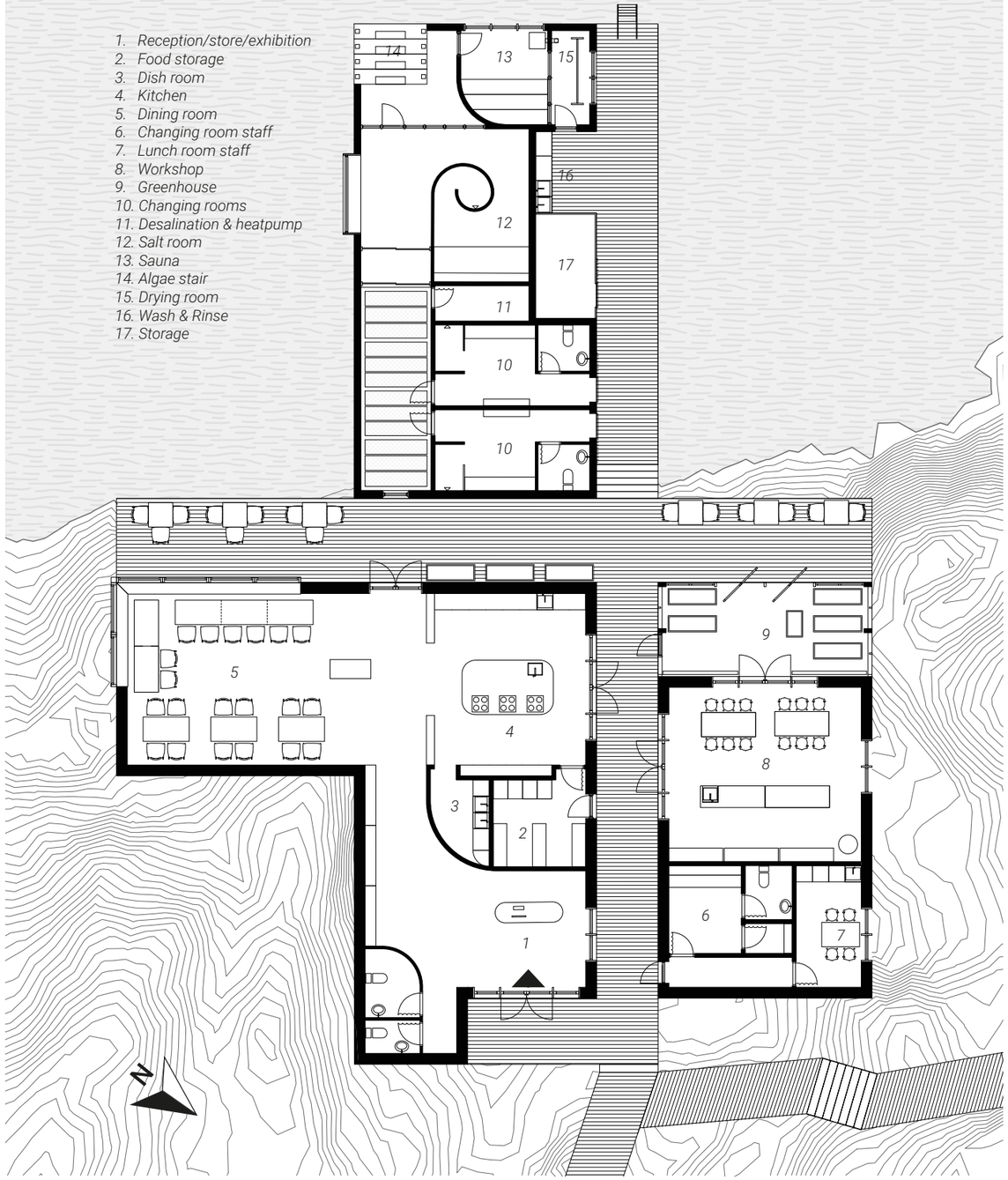
Coldbath

Snorkling route

PROGRAM

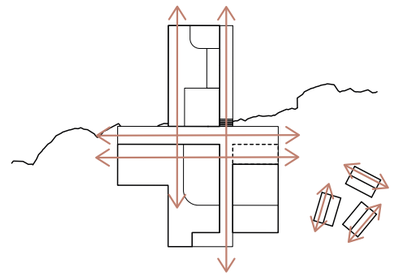
PLAN 1:200

1. Reception/store/exhibition
2. Food storage
3. Dish room
4. Kitchen
5. Dining room
6. Changing room staff
7. Lunch room staff
8. Workshop
9. Greenhouse
10. Changing rooms
11. Desalination & heatpump
12. Salt room
13. Sauna
14. Algae stair
15. Drying room
16. Wash & Rinse
17. Storage

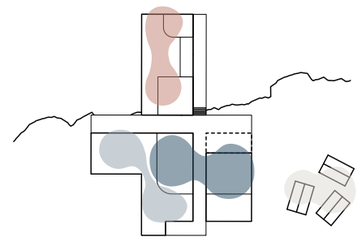


DESIGN STRATEGIES

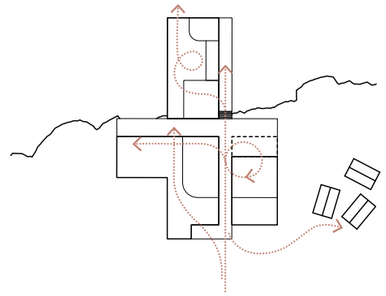
sightlines



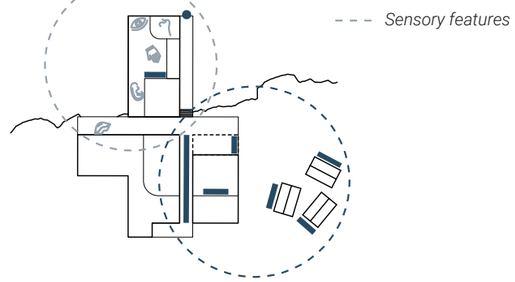
spatial division



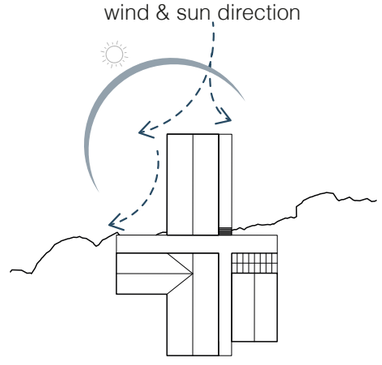
movement



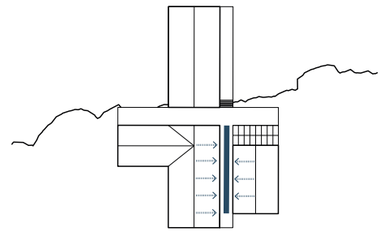
design experiences



wind & sun direction



rainwater collection



SUPPORTING STRATEGIES

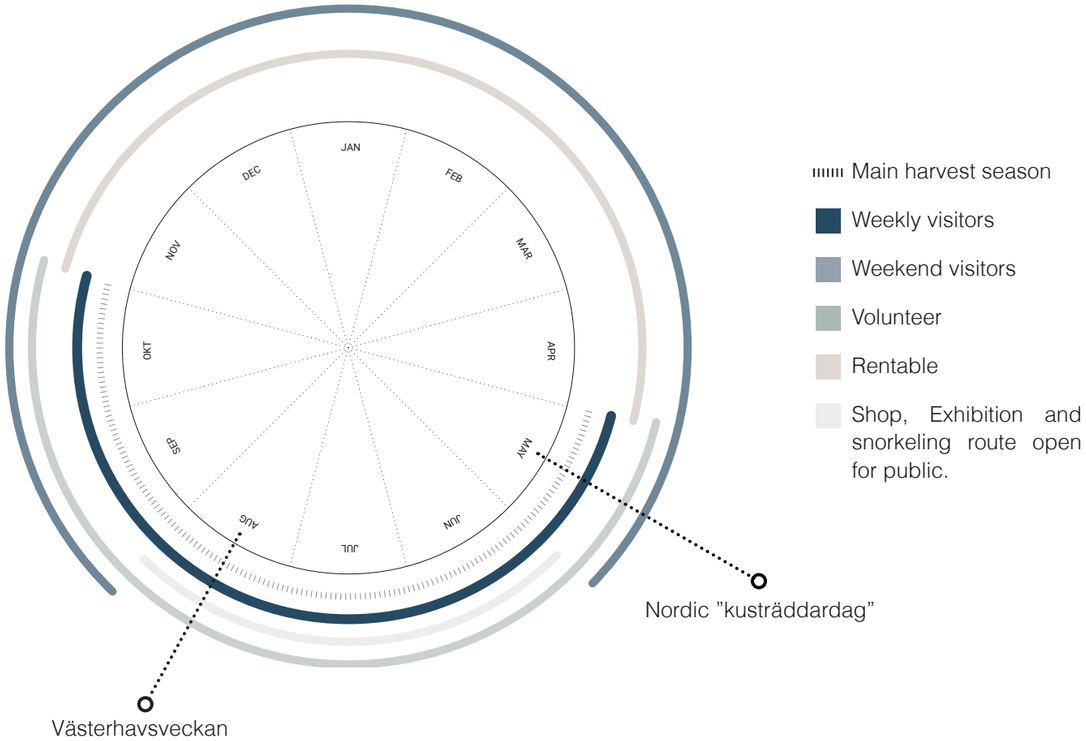
- Hands-on training
- Knowledge keepers

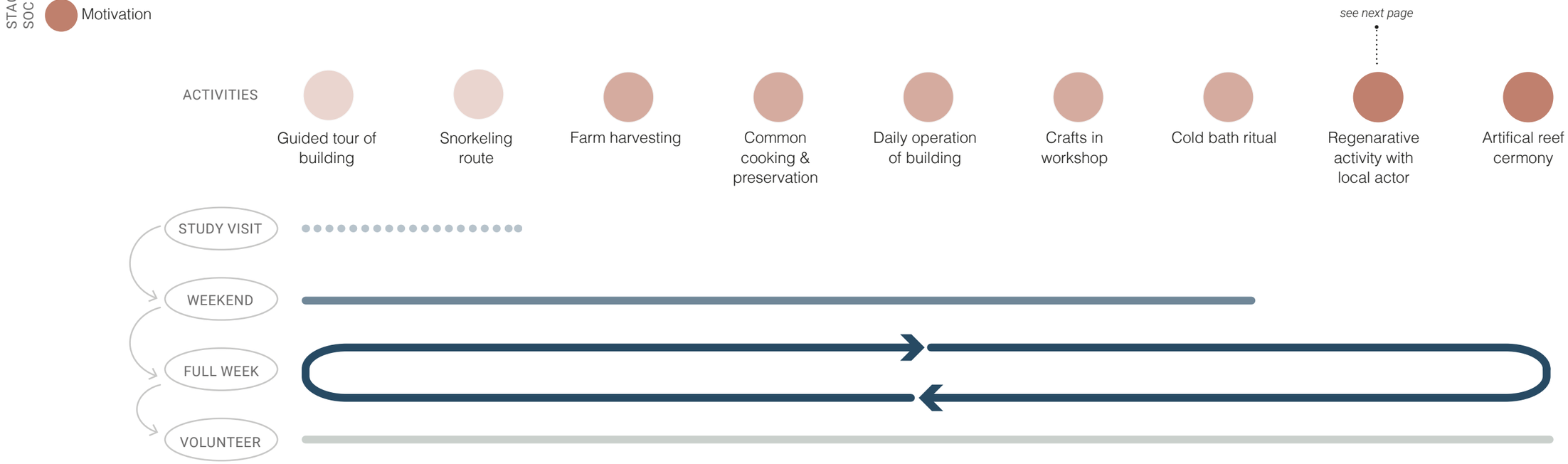
Caretakers of Ocean

VISITOR CONCEPT

The Blue House offers a range of visitor experiences, from study visits to weekly stays and opportunities to work as a summer volunteer. All with the goal of gaining a deeper understanding of the ocean, inspiring a more sustainable lifestyle, and becoming a caretaker of the marine environment. The hope is that the first visit will motivate guests to return, explore the knowledge further, get in contact with our collaborators and feel inspired to share the ideas after their stay. The activities follow social learning theory and are all done in groups, creating bonds and helping to solidify the knowledge gained.

The visitor cycle follows the seasonal changes, with most activity during the summer months, but the season also extends into spring and autumn as harvest time takes place then as well. Weekend visits will be possible year-round, and during quieter periods in winter, the building or parts of it can be rented out to local actors or initiatives. Maybe there will be a community winter bathing initiative, or 8+ Fjorder might host their breakfast seminars in the building.

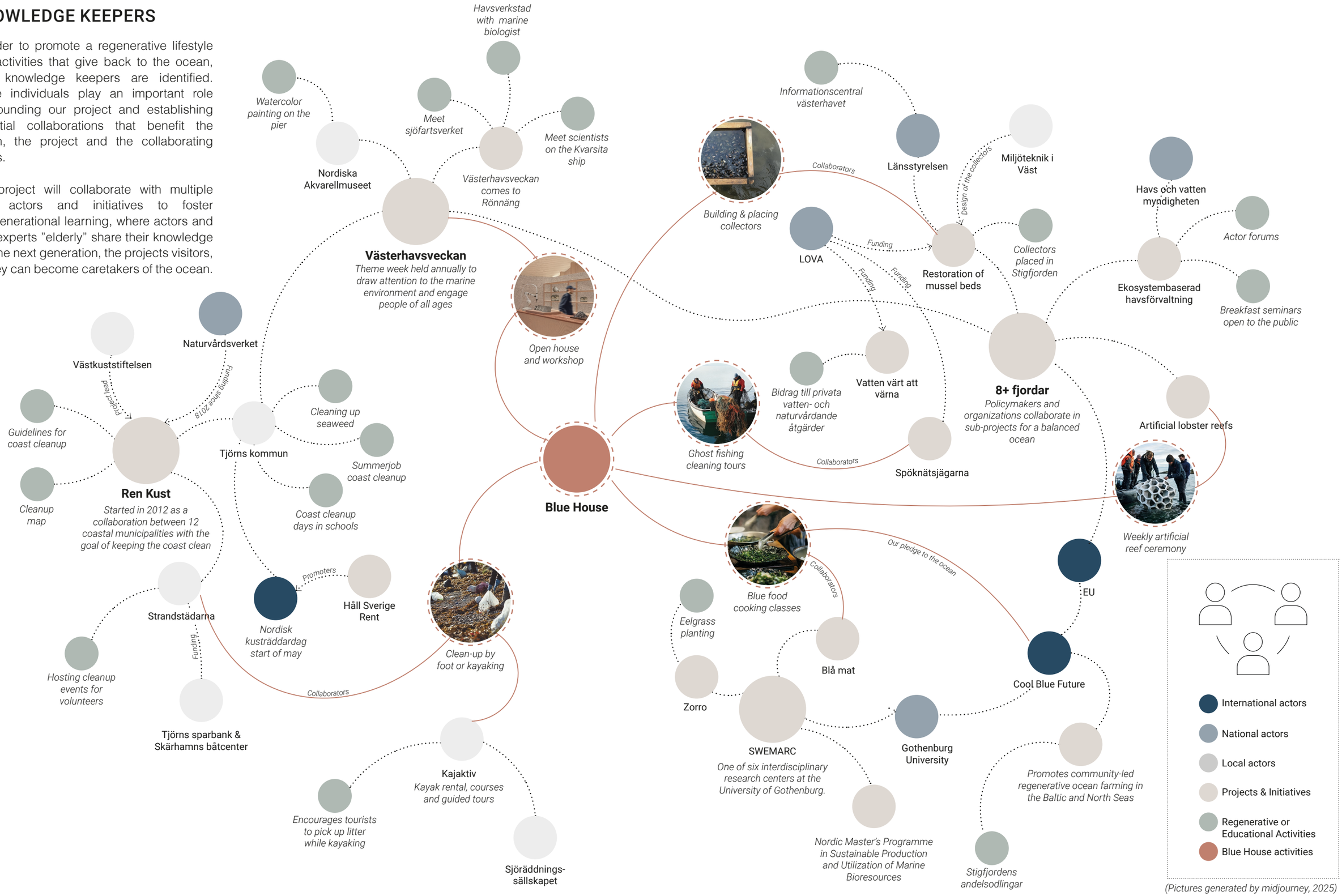




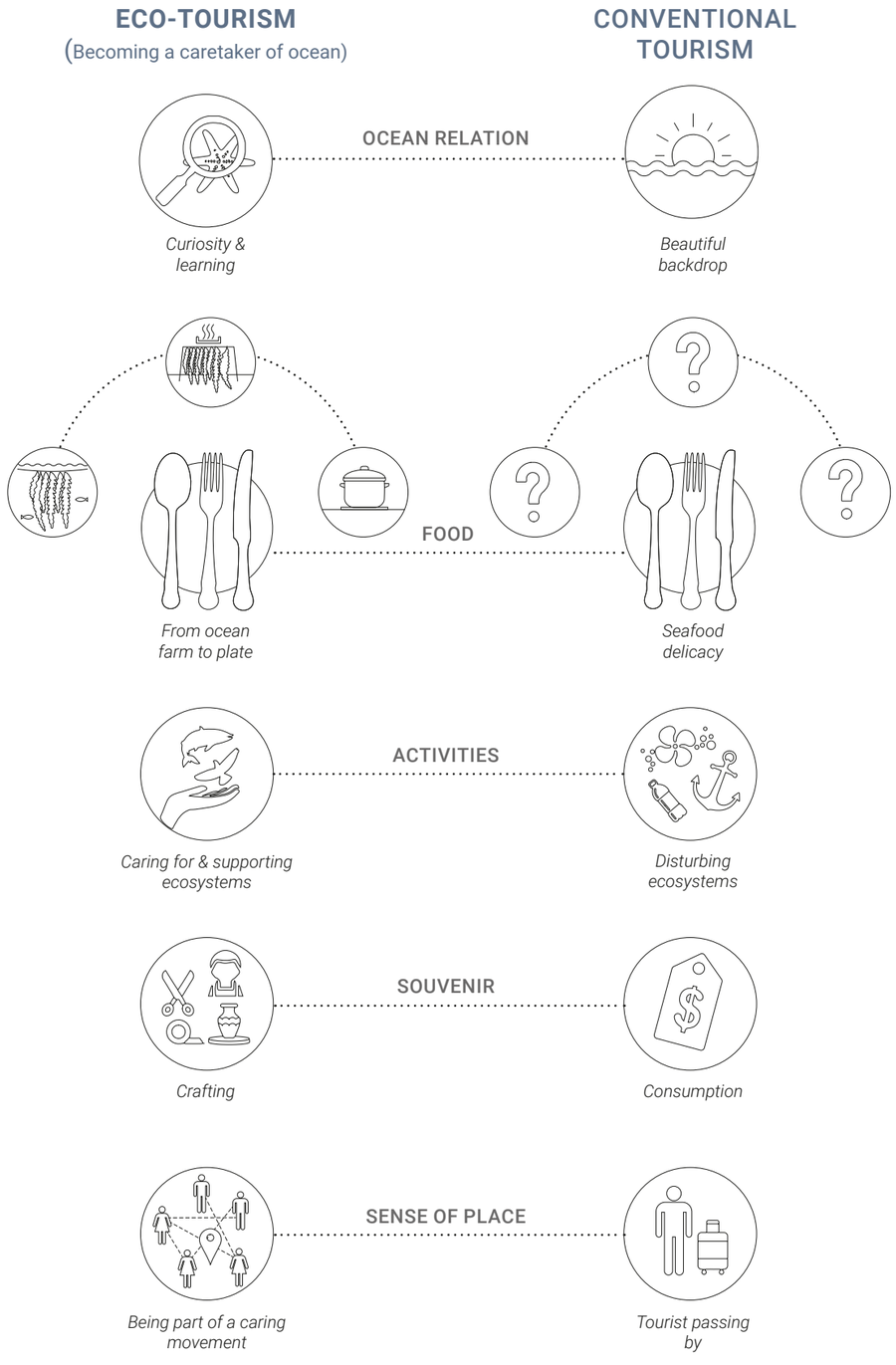
KNOWLEDGE KEEPERS

In order to promote a regenerative lifestyle and activities that give back to the ocean, local knowledge keepers are identified. These individuals play an important role in grounding our project and establishing potential collaborations that benefit the ocean, the project and the collaborating actors.

Our project will collaborate with multiple local actors and initiatives to foster intergenerational learning, where actors and their experts ”elderly” share their knowledge with the next generation, the projects visitors, so they can become caretakers of the ocean.



(Pictures generated by midjourney, 2025)



OCEAN FARM HARVEST

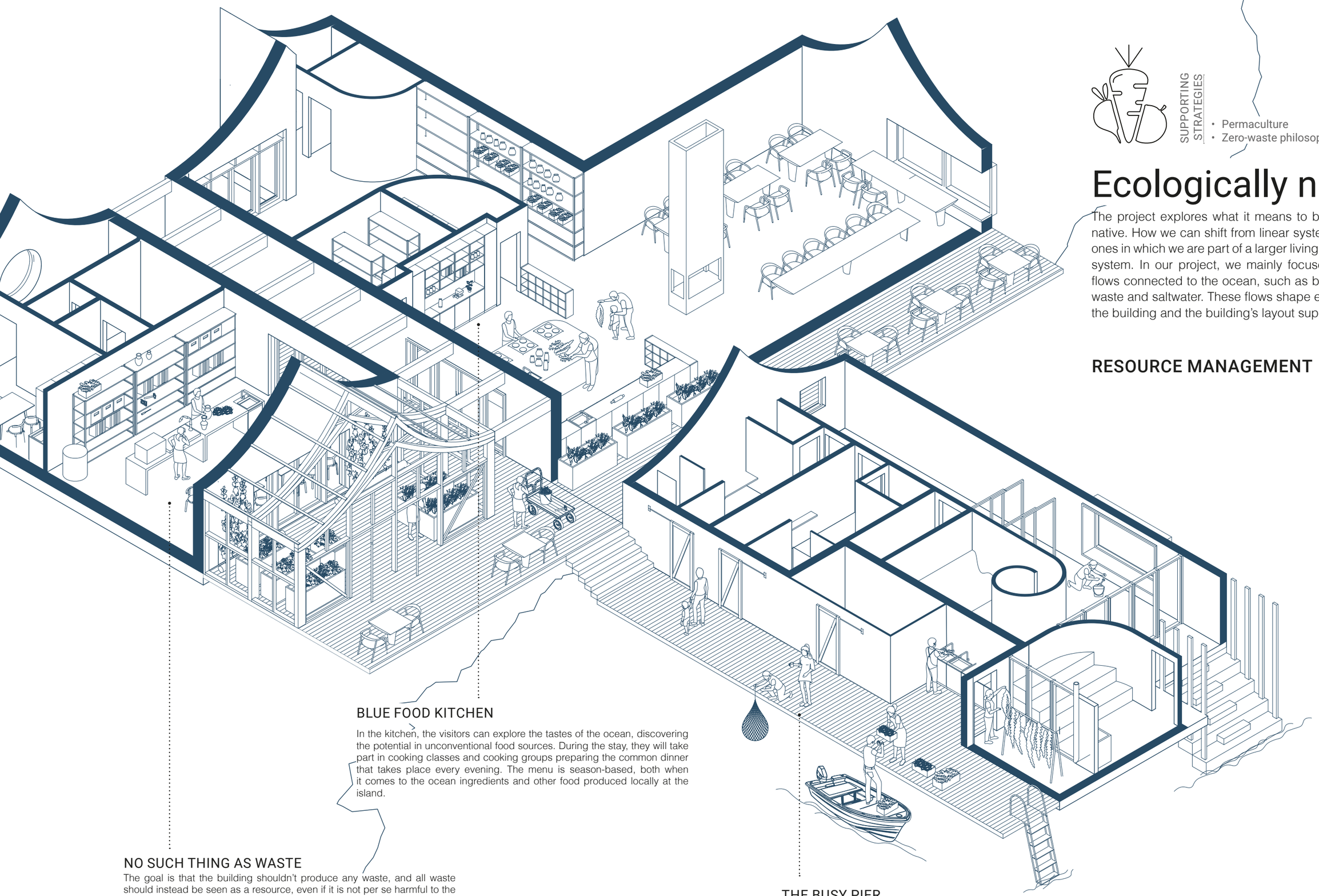
SUPPORTING STRATEGIES

- Permaculture
- Zero-waste philosophy

Ecologically native

The project explores what it means to be ecologically native. How we can shift from linear systems to circular ones in which we are part of a larger living and changing system. In our project, we mainly focuse on resource flows connected to the ocean, such as blue food, shell waste and saltwater. These flows shape everyday life in the building and the building's layout support the flows.

RESOURCE MANAGEMENT



BLUE FOOD KITCHEN

In the kitchen, the visitors can explore the tastes of the ocean, discovering the potential in unconventional food sources. During the stay, they will take part in cooking classes and cooking groups preparing the common dinner that takes place every evening. The menu is season-based, both when it comes to the ocean ingredients and other food produced locally at the island.

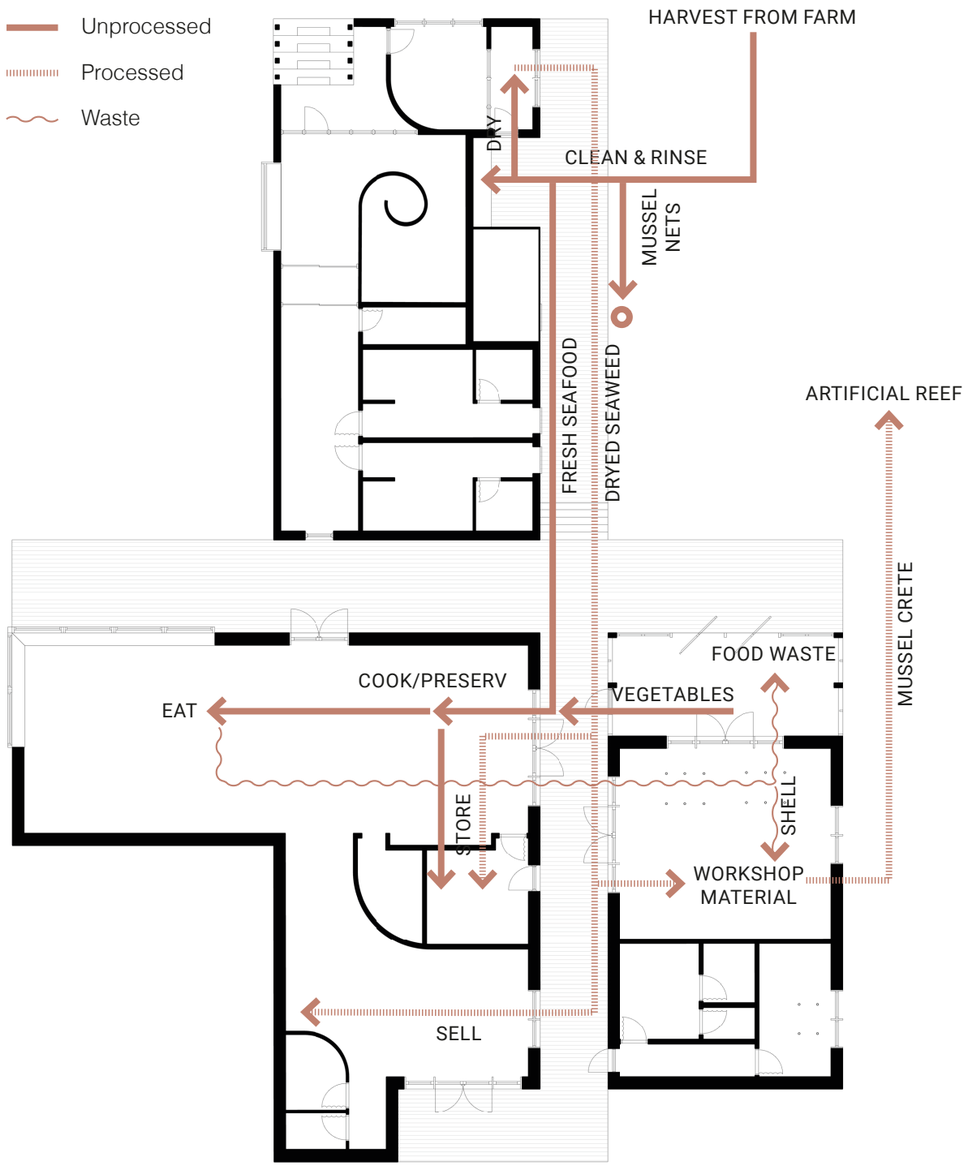
NO SUCH THING AS WASTE

The goal is that the building shouldn't produce any waste, and all waste should instead be seen as a resource, even if it is not per se harmful to the environment. Food waste becomes compost for the greenhouse, and the shells become the main material for experimenting with in the workshop.

THE BUSY PIER

Like in the old days, when Skärhamn's harbours were filled with small fishing boats, the pier is the most bustling place. Harvested mussels and seaweed arrive from the ocean farm by boat or paddleboard. They are cleaned, rinsed, and sorted at various stations, with everyone helping to prevent waste and keep everything fresh. From there, the food is distributed along the main boardwalk, most of the seaweed goes to the drying room, some mussels are stored in nets under the boardwalk and the rest goes to the kitchen for shared meals or preservation.

FOOD CYCLE



VIEW OF WORKSHOP

THE WORKSHOP

In the workshop, visitors can be creative by utilizing kitchen waste and harvest residues to make ceramics, tiles, and various filaments for 3D printing. Craftsmanship plays an important role in interacting, with materials through texture, with each other through co-creation, and with cultural identity, as crafts reflect the place where they are made.

There is also a collective project spanning the entire week: preparing and 3D printing an artificial reef made of musselcrete, which will be placed along the coast during a closing ceremony. This final cermony allows the group to give something back to the ocean and to share their insights and experiences at the Blue House.

Sea Stone

Atelier Luma

Shellware

Algarum Natura

YAMA

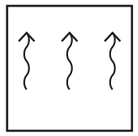
Inspiration of possible workshop experimentation based on the ocean resources from the farm and waste from the kitchen.

Cleaning

Crushing

Mixing

Crafting



Drying

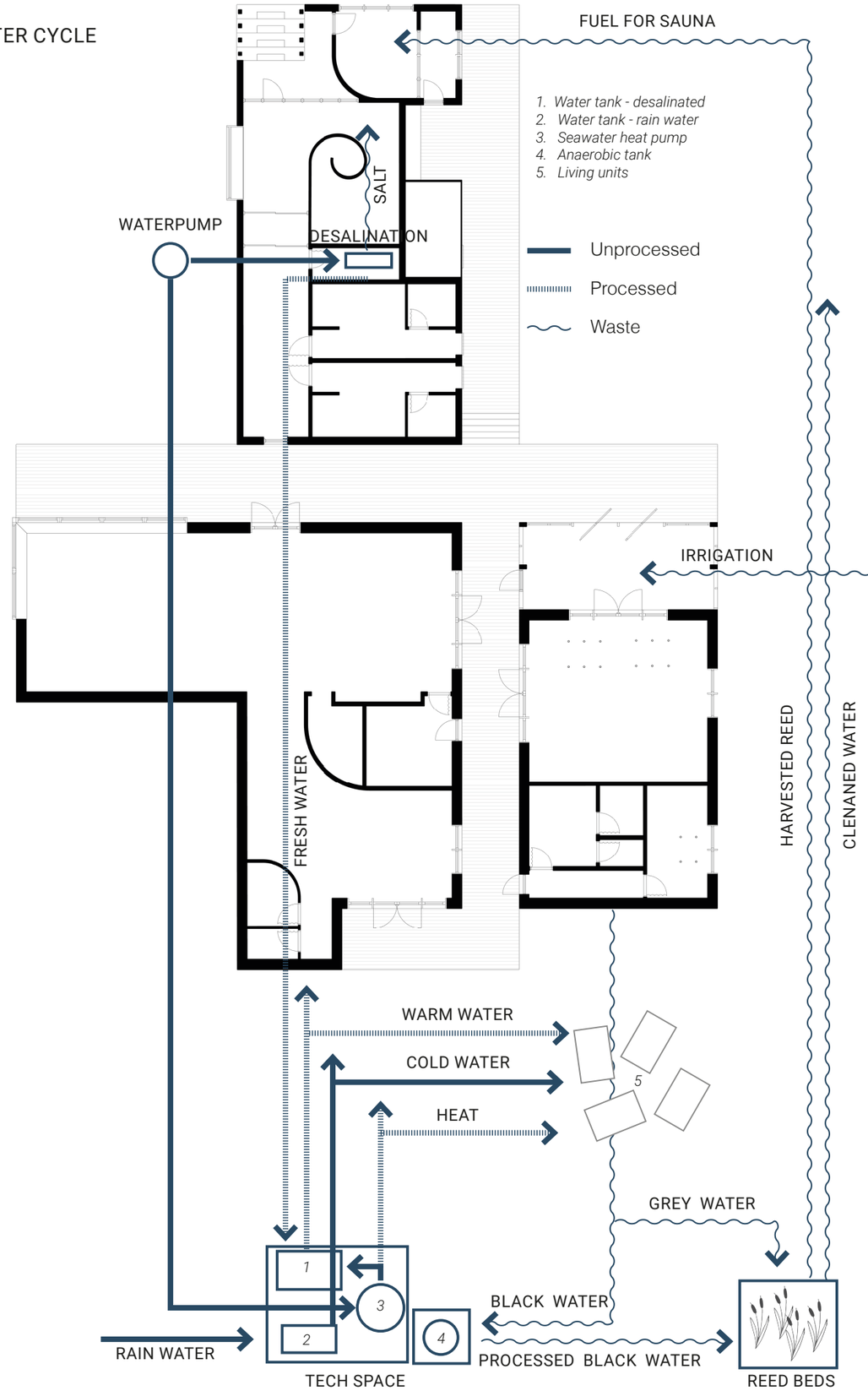
Binders
alginate (brown algae)
agar agar (red algae)
dissolved kelp
cornstarch

Fibers
musselshell
dried seaweed
sand
reed straw

Colouring
spirulina (green algae)
chive blossom
blueberry
turmeric

BIOMATERIAL EXPERIMENTATION

WATER CYCLE



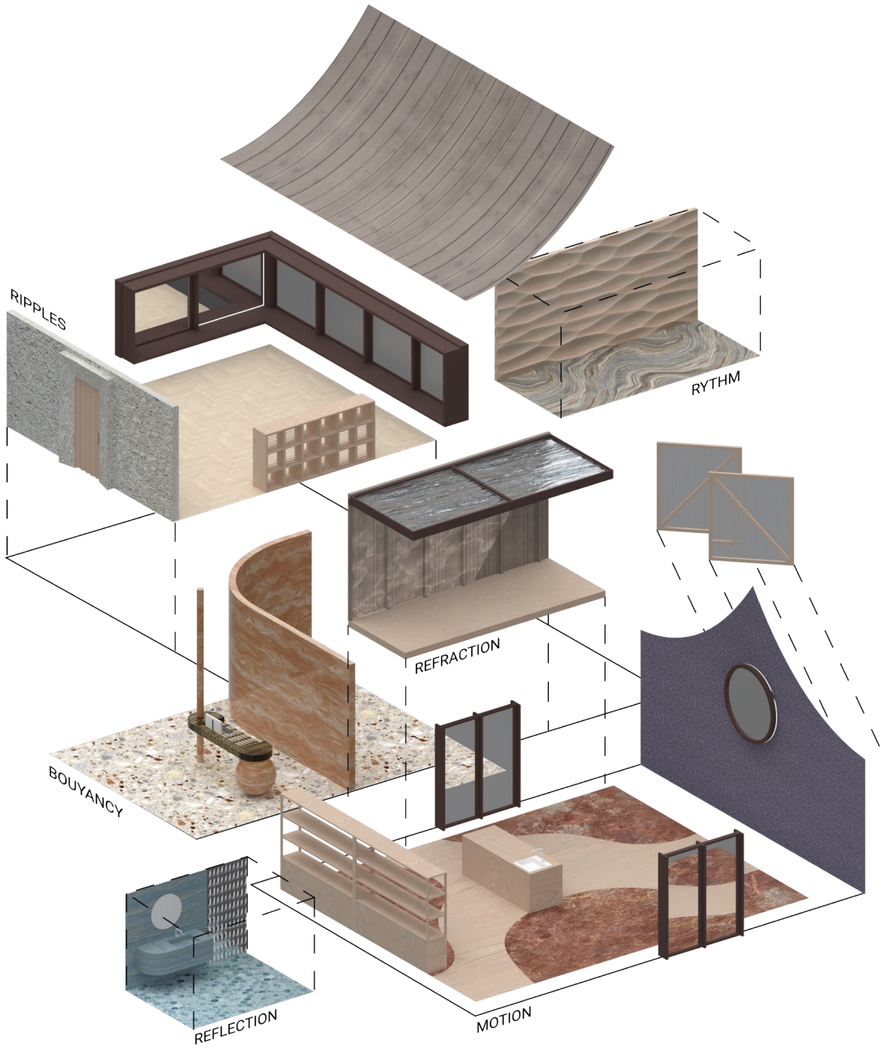
VIEW OF GREENHOUSE

SUPPORTING STRATEGIES

- Symbolism
- Rituals

Tales of Sacred Ocean

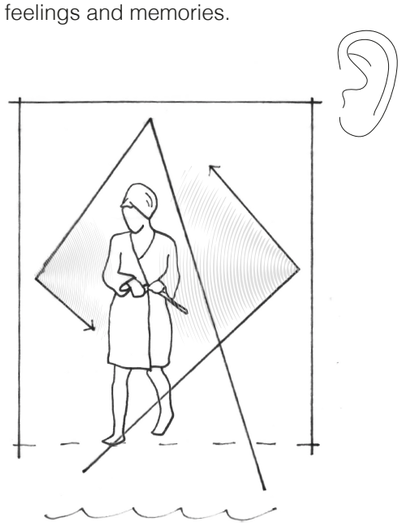
OCEAN SYMBOLISM



VIEW OF KITCHEN

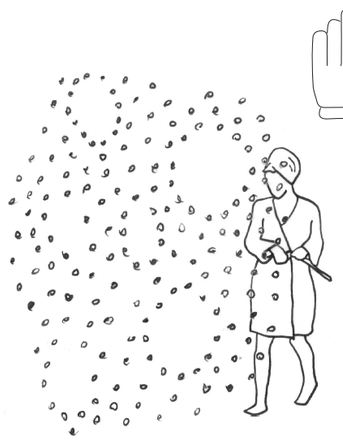
THE RITUAL

By playing with material, light, sound, water, symbolism and texture, the cold bath explores the sensory connection to ocean and how it can evoke feelings and memories.



Roar of the ocean multiplying

A vague smell of the forest beneth the surface



The salty splashes scrubbing and cleansing

Emerging the body into the ocean's embrace

FINDING OUR WAY BACK....

....TO THE OCEAN

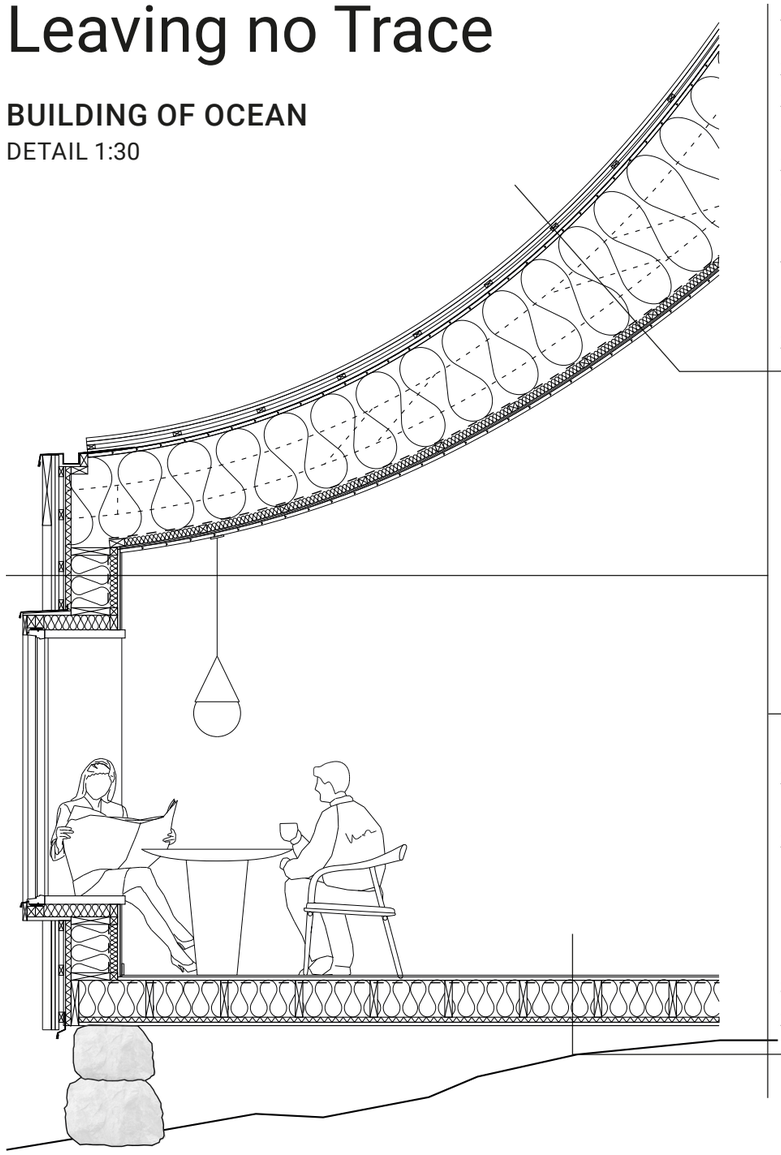
SUPPORTING STRATEGIES

- Bio-materials
- Working with the elements

Leaving no Trace

BUILDING OF OCEAN

DETAIL 1:30



44	22x145 Z-profile timber cladding, pine-tar treated
25	25x75 Counter batten
25	25x48 Support batten
1	Diffusion-open alginate film
21	21x120 Roof decking
500	Seaweed insulation
1	Biobased vapour break
45	45x45 Horizontal battens / seaweed insulation
14	7x60 double-layered plywood
22	22x45 Wood panel
60	60x45 Decorative timber battens (c/c 950)
44	22x145 Z-profile timber cladding, pine-tar treated
28	28x70 Support batten
12	12x60 Plywood strips (air gap)
30	Diffusion-open reed-based board
220	Seaweed insulation
1	Biobased vapour break
45	45x45 Horizontal battens / seaweed insulation
10	Wooden herringbone finish
20	Seawood board
1	Biobased vapour break
220	Seaweed insulation / Primary wood framing 66x270 (c/c 4000) / Secondary wood framing 45x220 (c/c 400)
30	Diffusion-open reed-based board
20	Musselcrete board

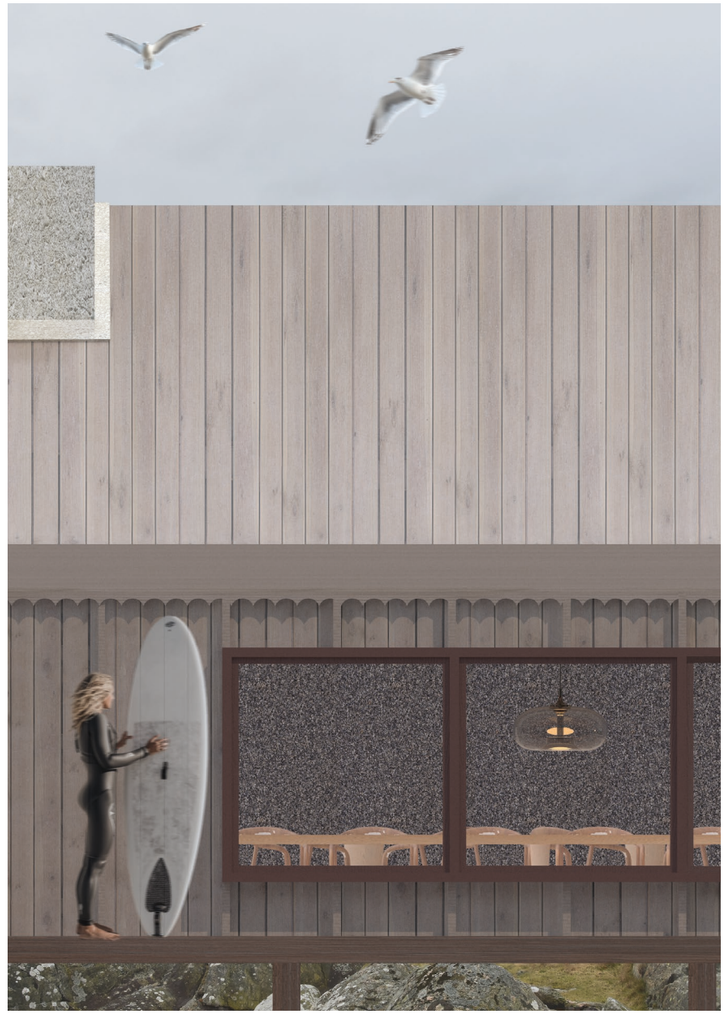
Seawood board

Reed-based board

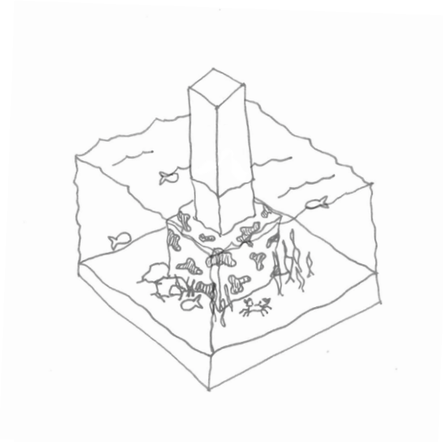
Acoustical shell panel

Alginate film

Musselcrete

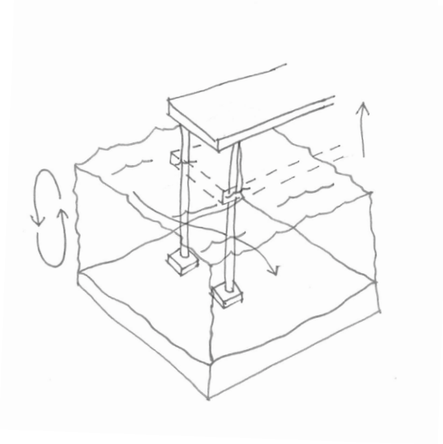


BUILDING IN OCEAN



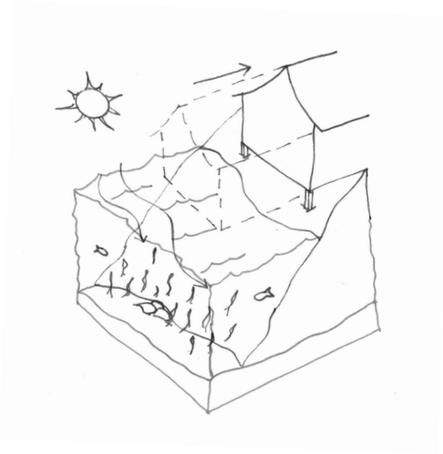
FOUNDATIONS AS HABITATS

Porous foundations made of musselcrete are used in the project for their ability to function as artificial reefs. They provide habitat for marine life, allowing human-made structures to positively contribute to the ocean ecosystem.



POLED STRUCTURES

Buildings and boardwalks that float on the ocean surface disrupt the natural circulation patterns beneath, particularly the vertical movement between the ocean layers. In terms of impact, a floating structure can be considered as a volume extending all the way to the seabed, since it interrupts water flow throughout the entire depth. Poled structures has therefore been chosen in the project to enable better circulation.



ENABLE SUNLIGHT

Structures that do not need to extend over the water are instead integrated into the landscape to allow more sunlight to reach the ocean. Large volumes built above the surface can cast extensive shade, threatening marine life by limiting sunlight, which may lead to dead zones and the decline of underwater vegetation near the shore.

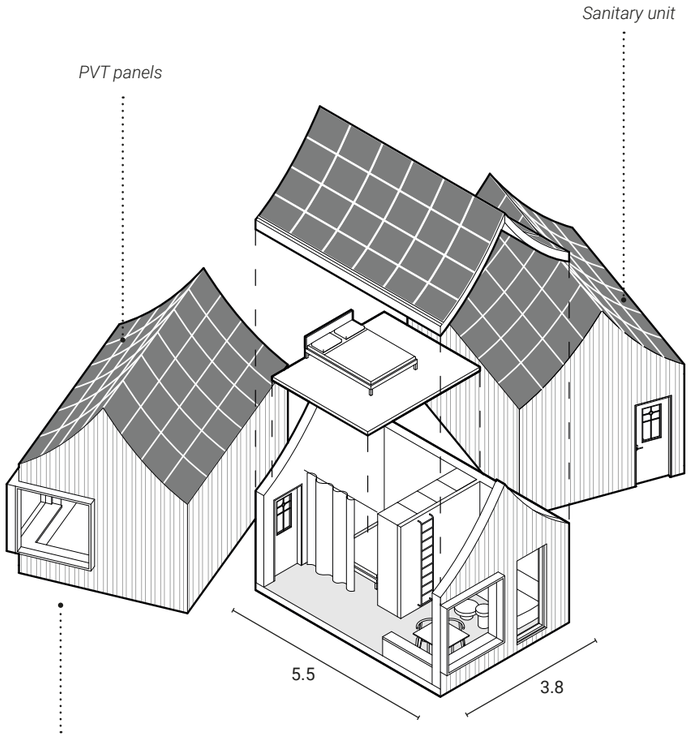
GENERATIVE LIVING CLUSTER

The Living Cluster is designed as a transparent and educational micro-community where traditional boathouses meet regenerative technologies. It exposes the hidden systems of everyday life where cycles of energy, water, and waste are made visible, with a central water cabin displaying real-time data and a surrounding reed forest that filter greywater.

EXPLODED LIVING UNIT

Footprint 20m^2

The small-scale dwellings accommodates four people and are carefully rotated to provide each unit with an undisturbed, framed view of the sea. The cluster offers a low-impact lifestyle that values that togetherness and spatial intimacy over modern maximalism.

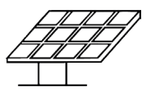


VIEW OF LIVING CLUSTER

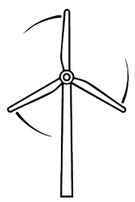
SURROUNDINGS

Water storage & Blackwater treatment

Greywater treatment



Solar PVs



Wind turbine

// CONCLUSION

WHAT IS OUR RESPONSE TO THE RESEARCH QUESTIONS?

1. Defining and fostering sustainable coastal living
The project is grounded in Traditional Ecological Knowledge (TEK), where key principles were translated into a set of architectural strategies and goals that define both concept and program. These were drawn from indigenous relationships to land and sea and adapted to a contemporary coastal context. There is a common prejudice against traditional ecological knowledge, the idea that it is about going back in time or living more primitively. But it is not about returning to the past, it is about being humble towards the accumulated wisdom of Indigenous practices. It is about recognizing that the way we currently build and live is not sustainable.

By integrating Western science, such as innovative biomaterials and efficient systems, with the holistic worldview embedded in Indigenous knowledge, we can create more effective responses to the climate crisis. Instead of breaking everything down into isolated systems, we must remember that everything is interconnected and part of a bigger whole.

In this project, we have worked to maintain that complexity, aiming to incorporate the four goals of the framework to strengthen our relationship with the ocean. For example, serving blue food may be considered sustainable on its own. But the deeper value lies in the entire process of harvesting the food, noticing the improved water clarity around the mussel farm, learning together how to harvest responsibly, and taking care of both the harvest and the waste. These practices help deepen our understanding of our role in and interdependence with the ocean. The result is a systematic design approach aligning human systems with ocean cycles, aiming to encourage regenerative behaviors by creating ecological symbiosis and making the processes visible and understandable.

2. Human-ocean relationship
Architecture is used as a tool to reconnect people with the ocean through sensory design and symbolism. Materiality, spatial experiences, and exposure to natural elements is a red thread through the project. It´s part of the story the building want to tell, strenghtening the goal of creating a sense of place. When smell, touch, sight and hearing is part of the experience when we move through the building and the landscape it will create stronger emotional and cognitive engagent. While the precise effects of this design strategy is difficult to assess, the project seeks to foster awareness and reduce the feeling of alienation.

WHAT IS NEEDED FOR THE PROJECT TO BE REALIZED?

Imagining that this project were to be realized, it would rely on engagement and interest in order to fulfill the full scope of the concept and avoid becoming more of a retreat. We can through the design of the building ,provide tools and spaces for social learning, harvesting, and experimentation, but there must be interest not only from visitors, but also from local actors, to fill the spaces with engagement, relevant knowledge, and skills. This interest can be hard to anticipate but we can look at indications from our investigation.

Looking for inpiration for our concept, we saw that there is a large number of initiatives focusing on eco-tourism as a countermovemnet to conventional toursim. This indicates that there is a growing interest in combining the vacation with also doing something meaningful. We have therefor , in the project also put focus on how to create athmospheres and spaces that support relaxation and contemplation, benefitting from the broad sensory experience of the ocean. Working with materials, symbolism and the buildings relation to the shore, the waves and more.

When reading about local projects in the mapping and speaking with a few of them, there seems to be a growing public interest in helping and getting involved. However, people need to know that the initiative exists, as these projects are not commercial and do not promote themselves to the public. Here, our building could serve as a valuable platform, making these actors more visible and the information more accessible, because it's hard to care about something you don´t know about.

With this collaboration as a foundation, the knowledge would become more rooted over time, as people go through the visitor cycles and we develop our own ocean caretakers. Then, hopefully, the network can grow and spread its ideas and knowledge beyond our building and surrounding ecosystem.

WHAT INSIGHTS HAVE THE THESIS PROVIDED AND WHAT CAN BE DEVELOPED IN THE FUTURE?

The process have offered insights into how architecture can act as a medium for redefining human-ocean relationships and contributing to more sustainable futures by proposing an alternative model of coastal living and tourism. The concept is grounded in interdependence, education, and ecological care, where the project positions itself as a step towards achieving our long-term sustainability goals. Hence, this project seeks to bridge the gap between present conditions and future visions, suggesting that architecture can play a catalytic role in this transition by generating curiosity, encouraging new behaviors, and reimagining established systems.

However, conversations with marine biologists and other collaborators have made us highly aware of the immense complexity of the ocean, much of which lies beyond the scope of our investigation. The limits of our current knowledge though underscores the importance of fostering curiosity and promote deeper, more direct relationships with the marine environment. Concluding from this, our project should not be taken as an end point but a proposition for continued exploration and learning, with architecture as a tool to connect human society and the more-than-human world.

WHAT CHALLENGES HAVE WE FACED DURING THE PROCESS?

One of the main challenges throughout the process has been to navigate the balance between ambition and feasibility. Working with biobased materials, regenerative systems and a low-impact lifestyles often clashed with the expectations and comforts of a Western lifestyle. It's difficult to propose alternatives that feel both realistic and radical, especially when the systems we're designing are so deeply interwoven and complex. Drawing boundaries was necessary to make progress, but those simplifications inevitably come with trade-offs.

Avoiding greenwashing was another concern. It demanded that we remain grounded, transparent, and in dialogue with experts, particularly marine biologists, who could challenge or confirm our assumptions. Finally, finding the right target group for the project proved more difficult than expected. Should we focus on one clearly defined user to be able to push the concept even further, or aim for a wider range of target groups to focus on spreading knowledge and encouraging interactions. The discussion went back and forth between a scheme for more committed participant or opening up more for shorter visitors and the public. Throughout, one of the hardest tasks was simply holding all the parts together and clearly connected, making the systems, the architecture, and the narrative align.

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Diagrams, visualisations, and images have been taken or produced by the authors unless otherwise stated.

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Drowned boy, 1890s. Photo: Victorin, Carl

Fishermen in Marstrand, 1920s. Photo: Heurlin, Gustav

Herring on Qvirist's plot in Kvarnholmen, 1920s. Image: Bohusläns museum

Seaweed bath in wooden tub. Gustafsberg's hot bathhouse,1940s. Image: Bohusläns museum

Swimming competition in Lysekil's men's cold bathhouse in 1911. Image: Bohusläns museum

Gustafsberg's floating cold bathhouse, 1900s. Image: Bohusläns museum

// APPENDIX

I. ARTIFICIAL INTELLIGENCE

ChatGPT have been used as a text correction tool for grammar and spelling mistakes in already written text. Midjourney have been used to generate images of objects and details to be used in visualizations such as collages to avoid copywrite issues.

II. BIOMATERIAL EXPERIMENTATION

BASE RECIPE 1

15g Agar agar
250ml water
15ml cornstarch
50g selected fibre

Conclusion
Worked well with shell and reed as fibre to create a strong and concrete-like material

BASE RECIPE 2

2g Agar agar
3ml honey
40ml water
10g selected fibre

Conclusion
Formed a more jelly and transparent bioplastic.
Worked well with colouring but sensitive to mold, especially when containing seaweed.

III. STUDY TRIP

ATELIER LUMA, FRANCE

- Bio-regional focus, experimenting with local materials and knowledge from the region to explore bio-materials from resources like, rice straw, algae, salt and much more.
- Working a lot with interdiciplinary collaborations, offering residency for artists and researchers.
- The atelier offers a range of different workshops like textile, ceramics, wood and metal.
- Many of the developed materials were integrated when transforming the building into atelier luma. This was especially interesting to see bio-materials in a scale 1:1, actually implemented, as bio-materials usually are seen at a prototype phase.
- We gained a lot of valuable insight talking to the people working there about their approach to mapping local resources, actors and knowledge, which inspired our knowledge keepers mapping.

III. STUDY TRIP

SIEBEN LINDEN, GERMANY

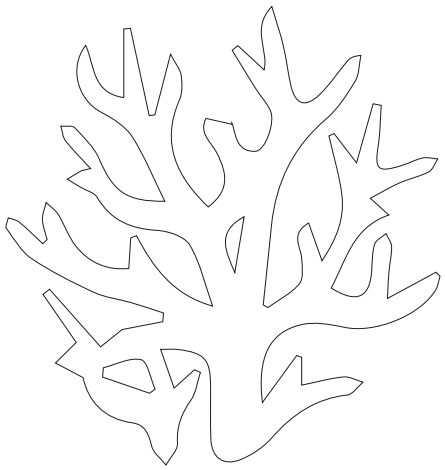
- The Eco-village of Sieben Linden host 150 residents who operates on self-sustaining principles, using wood and solar power for energy, compost toilet, permaculture and grey water treatment in reed beds. This study visit was a great way to see some of the principles we were thinking about using in or project, implemented in a whole village.
- The community has managed to be 75% self-sufficient on vegetables and fruit, their carbon footprint is less than one-third of the German avarge.
- The also challange living norms, and social norms, operating on cooperative principles like shared ownership of land and infrastructure. Even though our project is not about doing an eco-village with permanent residents, we are trying to achive a feeling of living in an eco-village for the visitors during that week. So this study visit gave us a lot of ideas, some that we did not have time to explore further but take with us for other projects.

IIII. REFERENCE PROJECTS

CATXALOT SEAWEED EXPERIENCES

- Social Learning: Interactive experiences combining learning and relaxing.
- EcoTourism: Retreat with the theme of ocean harvest and blue food cooking.
- Strenghtening the ocean-human relationship.
- Most of seaweed collection are done along shore or with kayak/ paddleboard, which is not disruption ocean creatures.
- Prolonging the season for coastal tourism.

V. PHYSICAL MODEL 1:75



Living with the Ocean