ATTACK ARCHITECTURE

DESIGN BEYOND THE BUILT

DAVID HOLST, MATTER SPACE STRUCTURE 3 - ARK258

BACKGROUND

Why is this an architecture project?

Can we decide where architecture starts and stops? For me architecture is design and design is a path making tool into the unexplored.

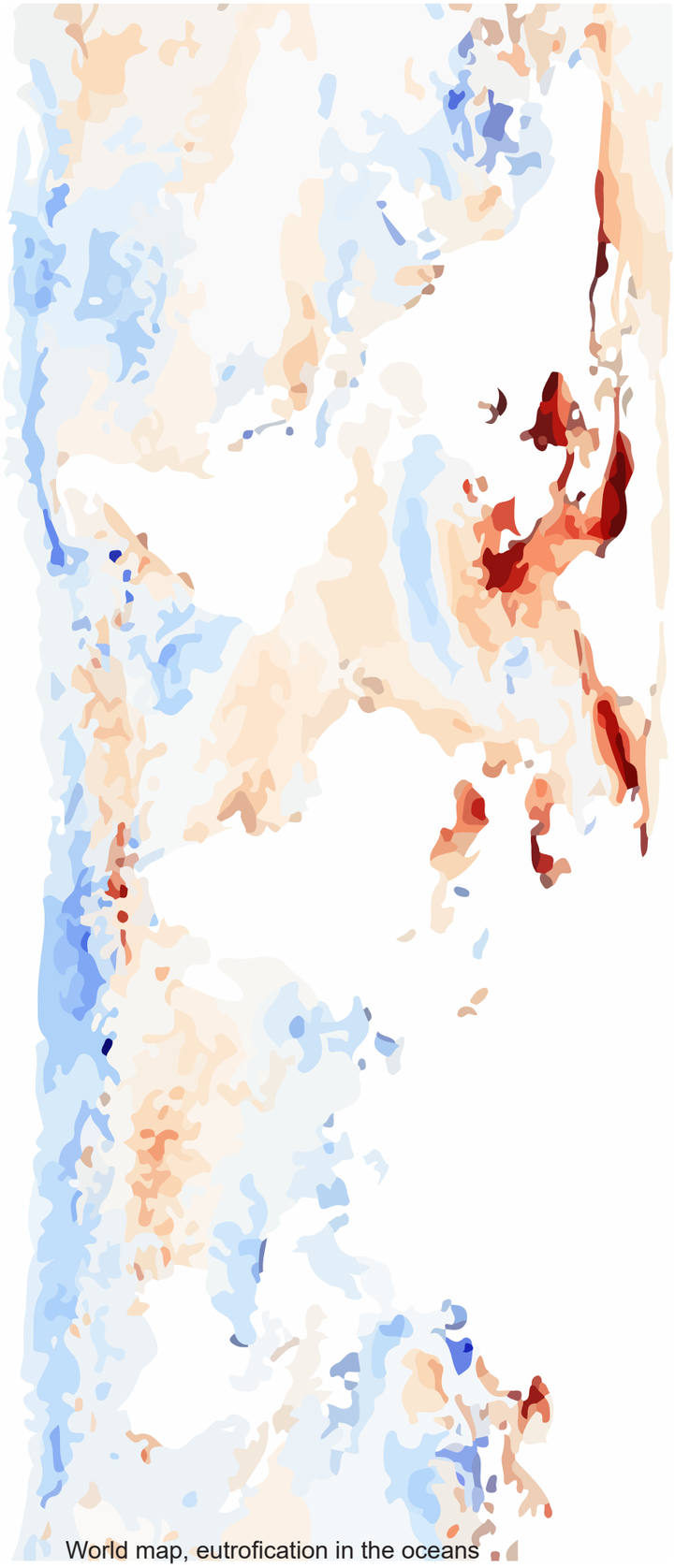
This is a project where I would like to show that design is more than just design, it is a life changing event even if we don't realise it. As designers we have a role to play in the world with creativity to make paths into the future. Creating possibilities we did not have the day before.

We play in the world, the world reacts to what we have made, we then see ourselves in what we have created and then we become.

This is a process of re-reading, understanding and feeling. Leading to a body of a project that has purpose beyond the built and beyond design. But design nonetheless.

I call this project Attack Architecture. I choose to address the issue of the dying seabeds in the baltic Sea for this episode. I choose it because it is close to me, a passion.

The result is so much more than the project itself. The understanding that we design ourselves every day and that we create tomorrow has been an awakening. My view on the creative process has changed.



World map, eutrofication in the oceans

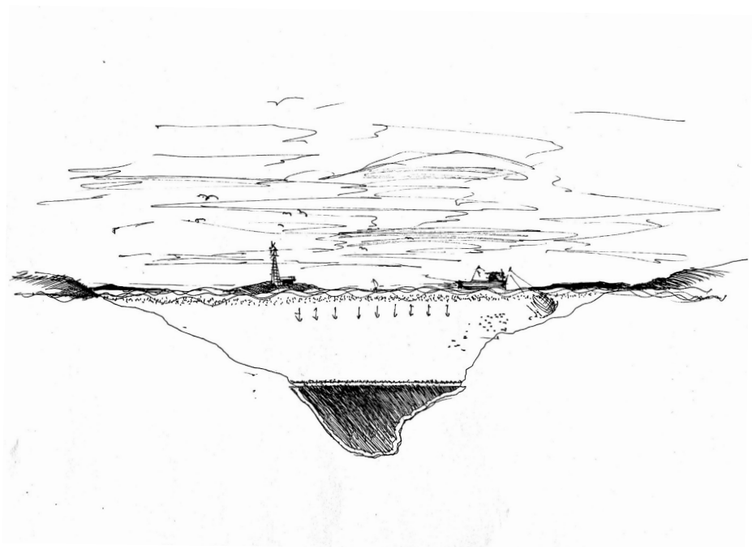
INTRODUCTION

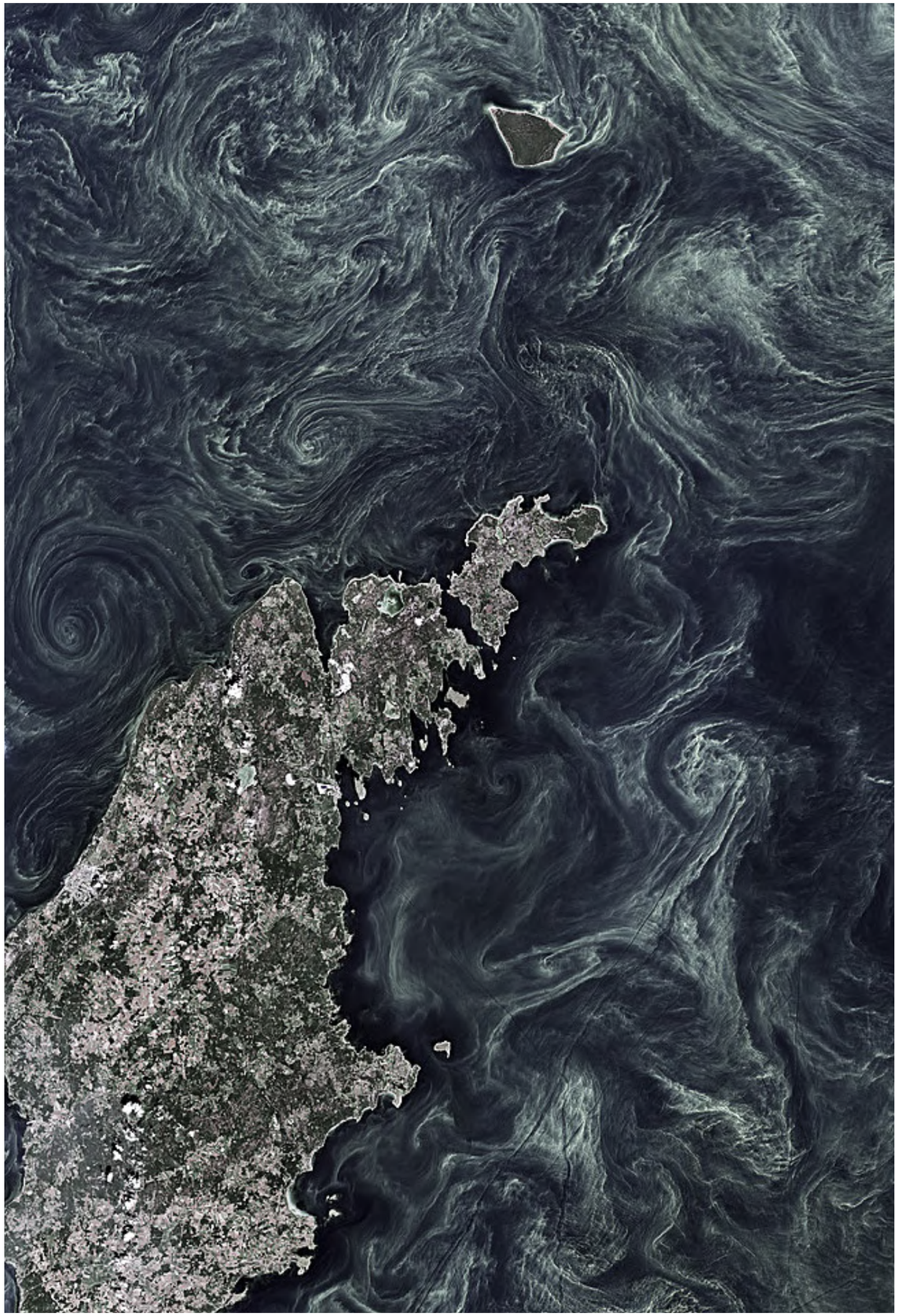
Since the early 1900s the oxygen levels in the baltic sea have been decreasing in the deep-water due to nutrients from infrastructure, housing and farming. The result is a rapid increase of algae blooms in the surface water, leading to the Baltic Sea dying at a pace faster than ever before. The dead zones of the ocean, the ”Hypoxia”, are now reproducing by themselves and our efforts of reducing the pollution is no longer sufficient enough to reverse the trend. We need to work proactively with the issue instead of simply trying to recover our mistakes.

By breaking the layers in the brackish water with pumps, the oxygenated top layer of water can be relocated to the suffocated bottom layer, activating the sediment and giving nature a chance to break down the algae and eventually heal itself.

This project shows an example of how it is possible to revive the anoxic deep water basins, making it possible for sealife to strengthen and enable a cultural coastal life in the future. The design is based on an understanding of the site with the aim of showing how architectural design can be used to push sustainable inventions further.

Research question - How can design drive sustainable inventions further and be the driving force for change?





ABSTRACT

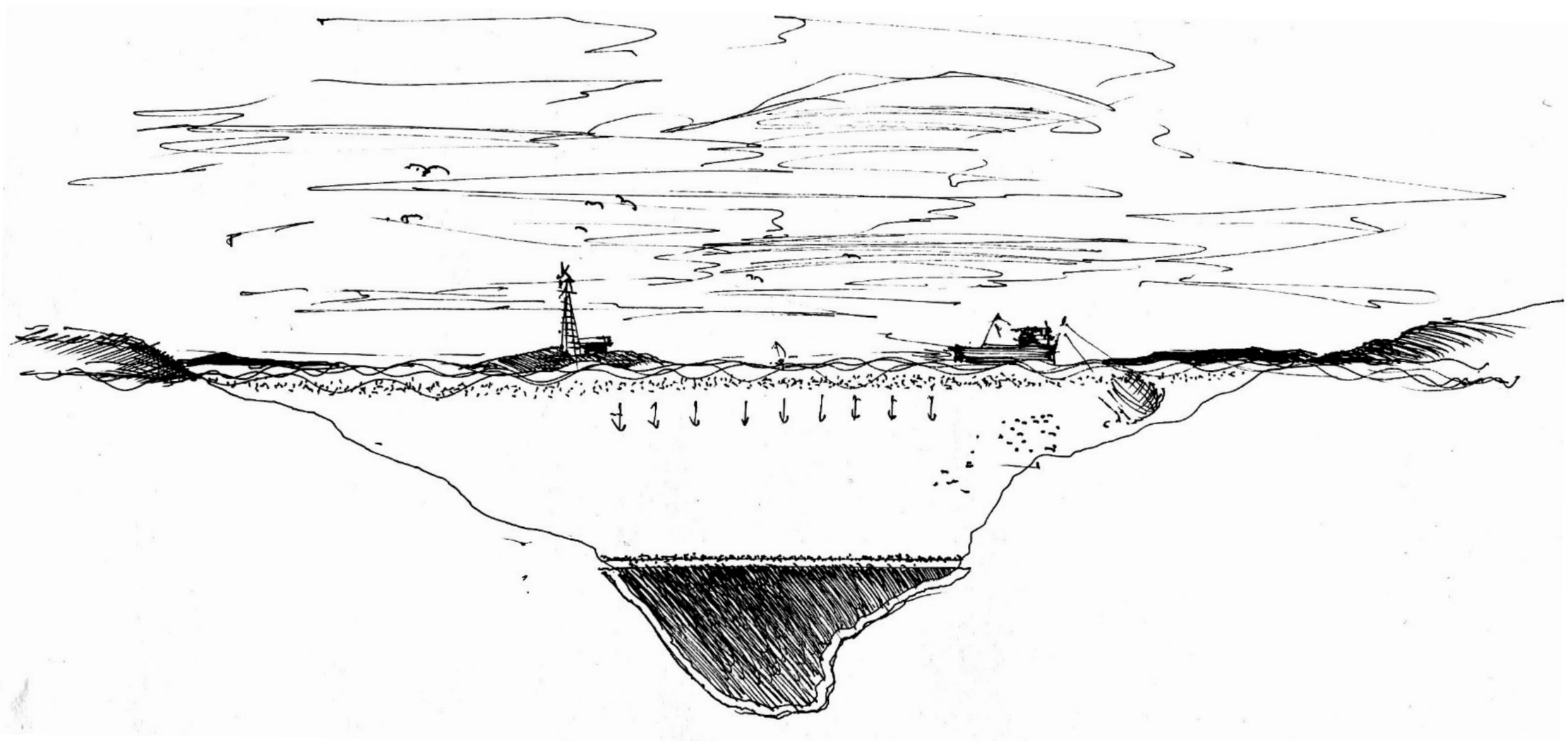
Design and innovation have always been driving forces in human evolution, however, the ripples of new ideas have not always been accounted for. When the purpose of the design is to solve a specific problem, the effects that the design might have on its surrounding environment often ends up in the periphery. Rather than seeing design for the sake of design, it can become a tool for increasing the understanding of complex problems and used to speed up the process of developing sustainable solutions.

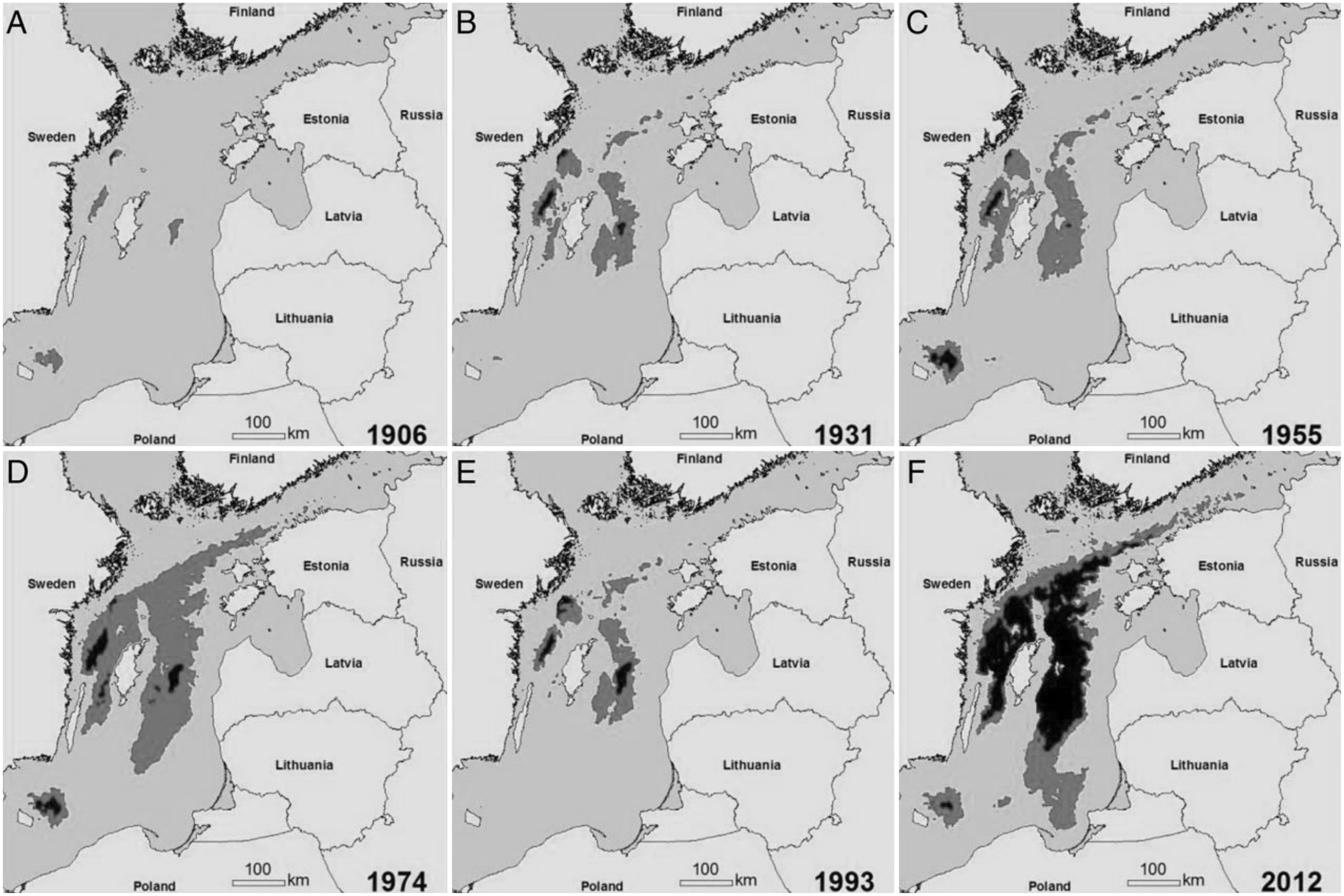
The aim of this thesis is to highlight the role of design going forward, working proactively with design to tackle upcoming environmental changes before they occur. This is done within the project through a research station located at Bornholmsdjupet in the baltic Sea, showcasing an example of how it is possible to live in symbiosis with nature while helping recover the dying oceans.

Through the design of a pump tested in several simulations, the project shows that it is possible to exchange the layers of oxygenated water using only the power of the wind. The design makes up a base for further devlopment using the structure to enable off grid living and working in remote locations.

The technical aspects of the project is based on the works of Anders Stigebrandts pilot project ”BOX” where researchers at the University of Gothenburg and Linköping carried out the first experiment of shifting water layers to get circulation in the anoxic bottom layer.

The design is based on literature studies, Interviews and simulations and show that it is possible to reverse the trend of dying seabeds through engineered solutions and sustainable design. This project goes beyond conventional solutions, showing a self sustaining design where technical solutions are being pushed further through design.





The spread of ”dead zoones” in the Baltic Sea

STORYTELLING

This is a part where I will start to map out why I will address the topic of the baltic Sea and why I feel so passionate about the issue. This will continue to grow throughout the master thesis.

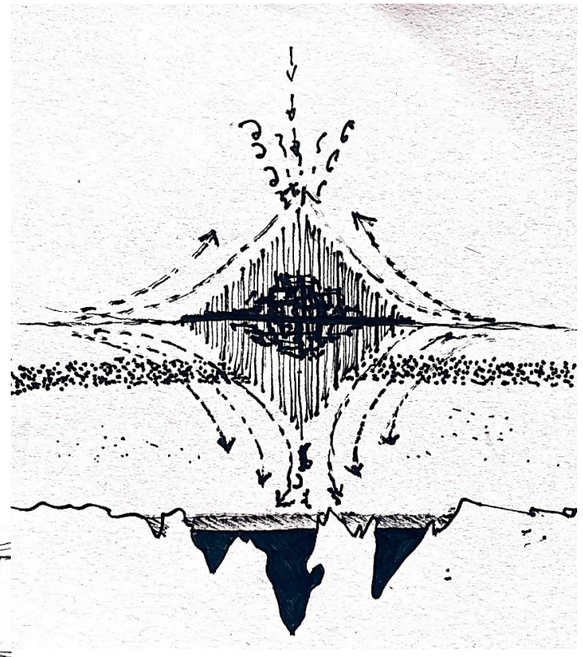
I found an old logbook from a hunting cabin where I spent a lot of time when I grew up. The stories are partly beautiful and painting it its own way but they also describe a painful realoty of how the sea life is being affected by climate change.

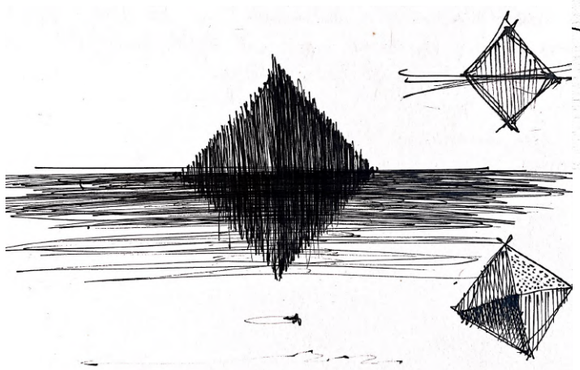
I will illustrate these stories through paintings adding another layer to the project, seeing myself and the site through art and stories.

Upcoming painting

THE SITE

The Baltic Sea is big enough to show the full extent of the issue, but also small enough to be able to document the direct effects of the work that's been done, therefore I believe that the Baltic Sea could be a generator for change, creating hope, knowledge and awareness for the future.





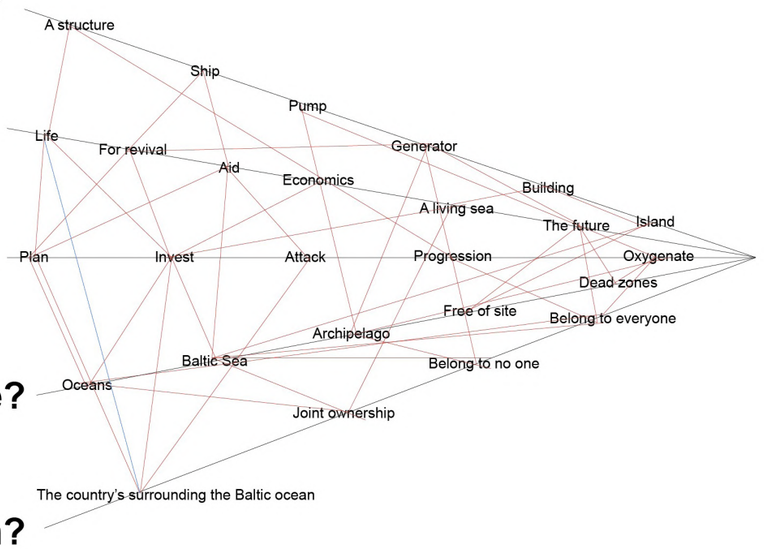
What?

Why?

How?

Where?

Whom?



A project for tomorrow, today.

THE UNDERSTANDING OF PROBLEMS AND DESIGN

How we attack problems is very much an individual process, in this section I try to explain how I face issues and how I tackle them through design.

I believe that we have control over ideas for a long time in the process but that the end result often is steered by uncertainty. However, we can give the uncertainty direction, and shape what the retriever in this scenario will pick up (the ball/idea in this drawing). Later I will draw the retrieval process and re-read objects to fit a new purpose.

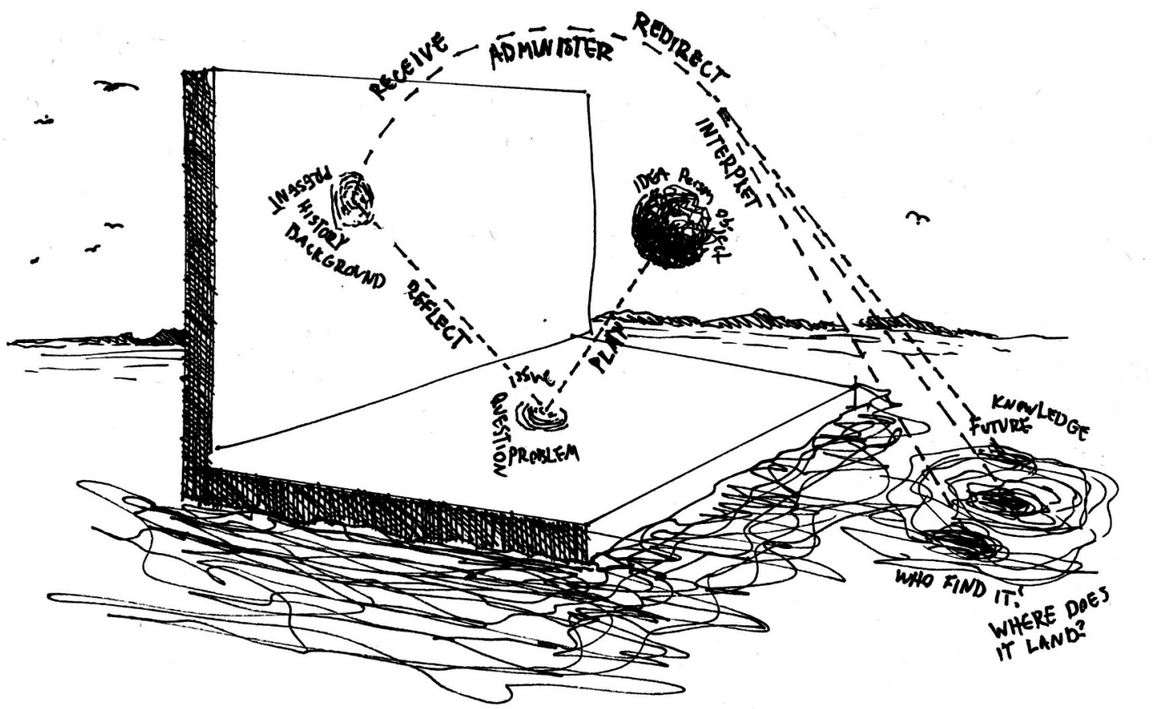
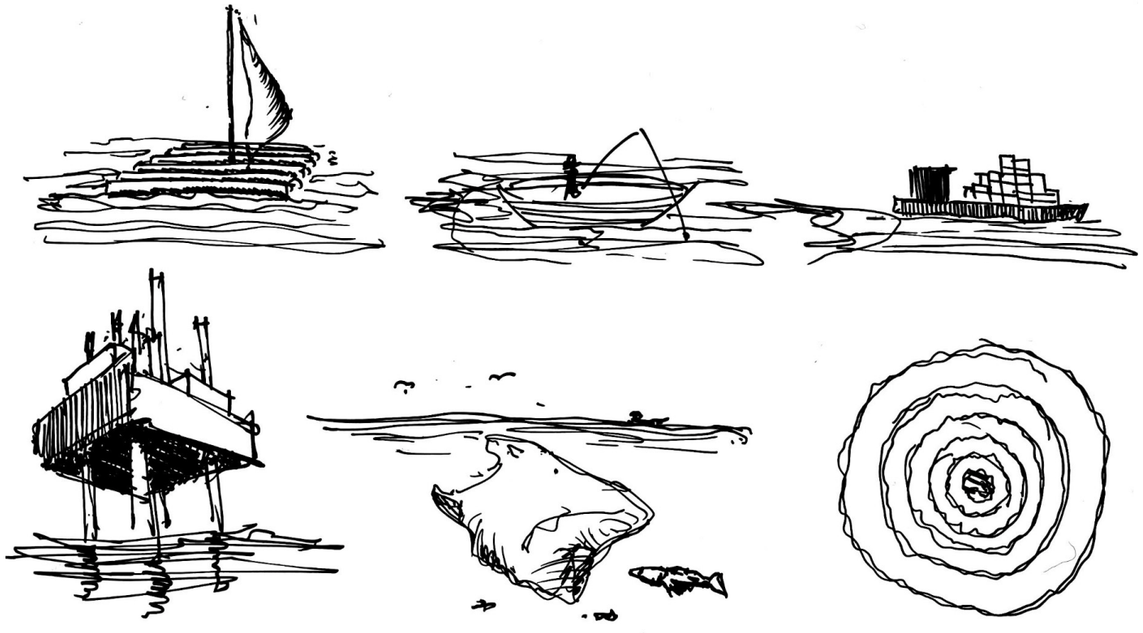
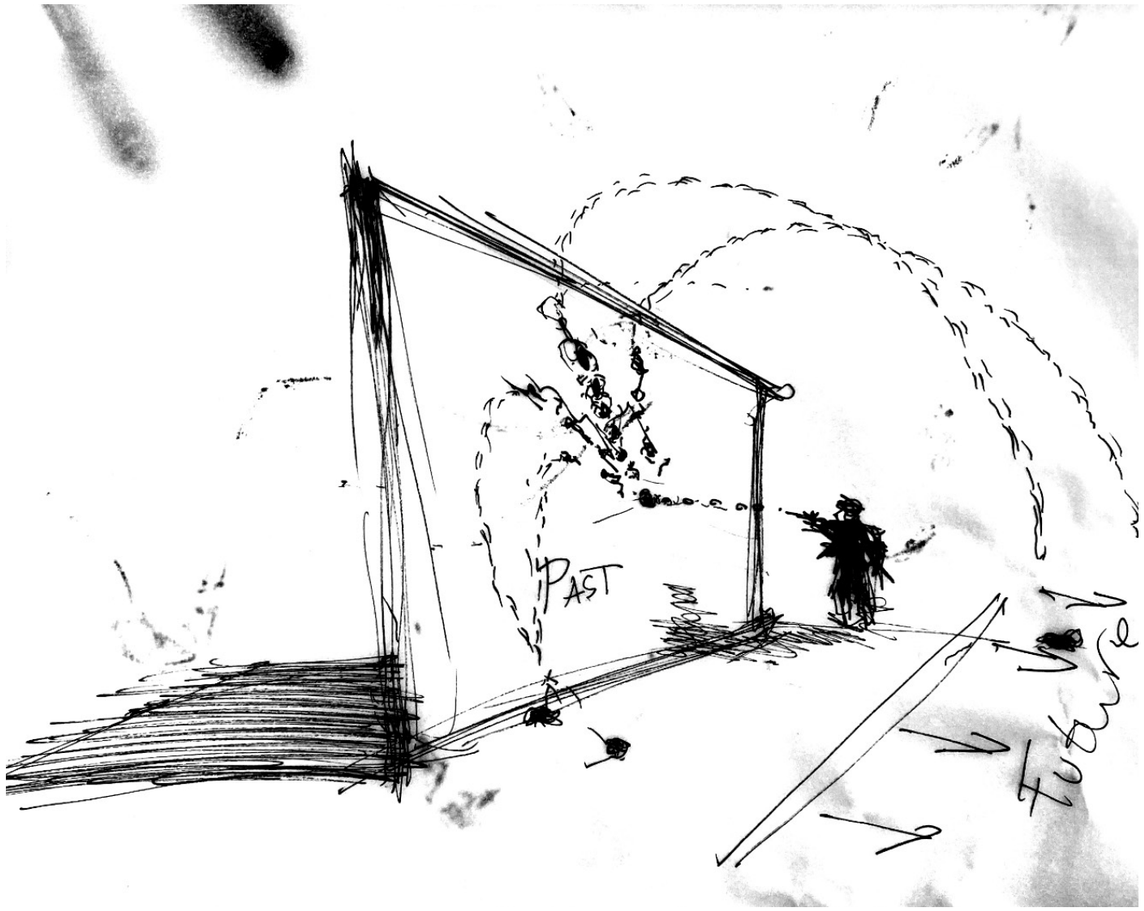
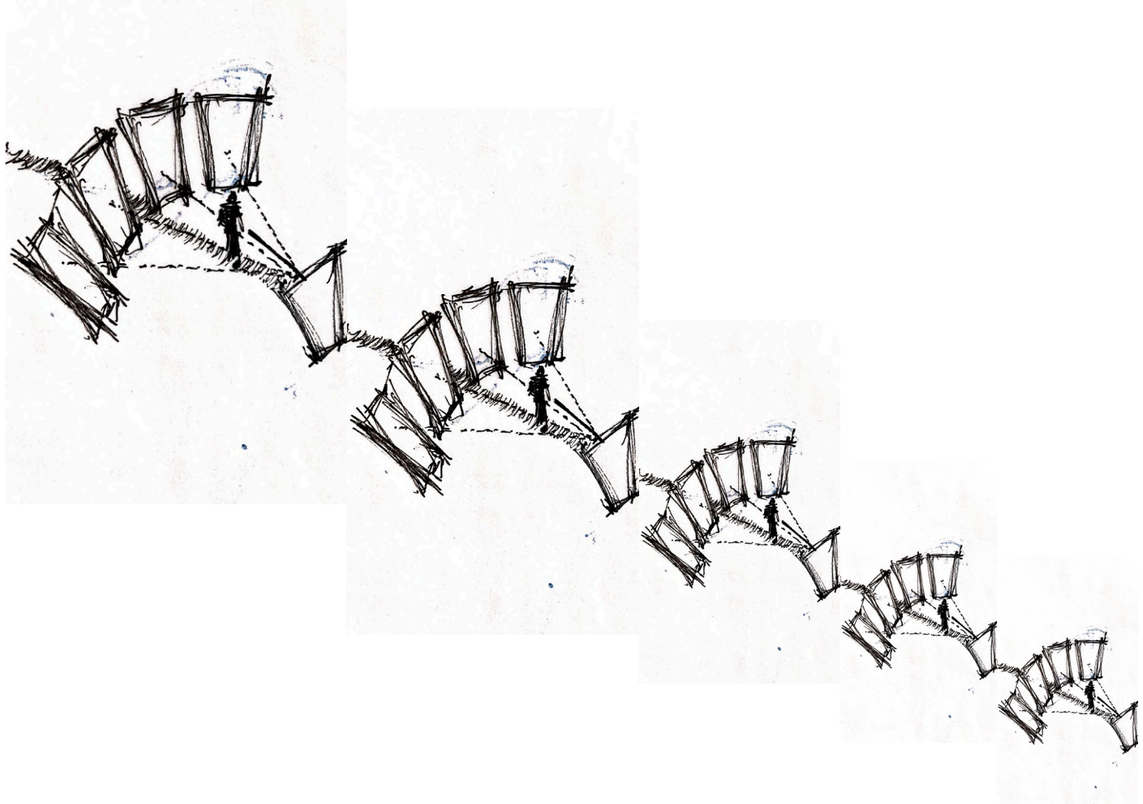


Illustration of how an object/idea grows. The white dot in the middle is the base for the new design. It creates ripples in every direction, but how it gets retrieved is what makes the evolution of the object/idea possible. Some view points will not lead further while others will. This could lead to changes greater than the design itself.







Sketches of thoughts

ONE OBJECT - AN INFINITY OF IDEAS

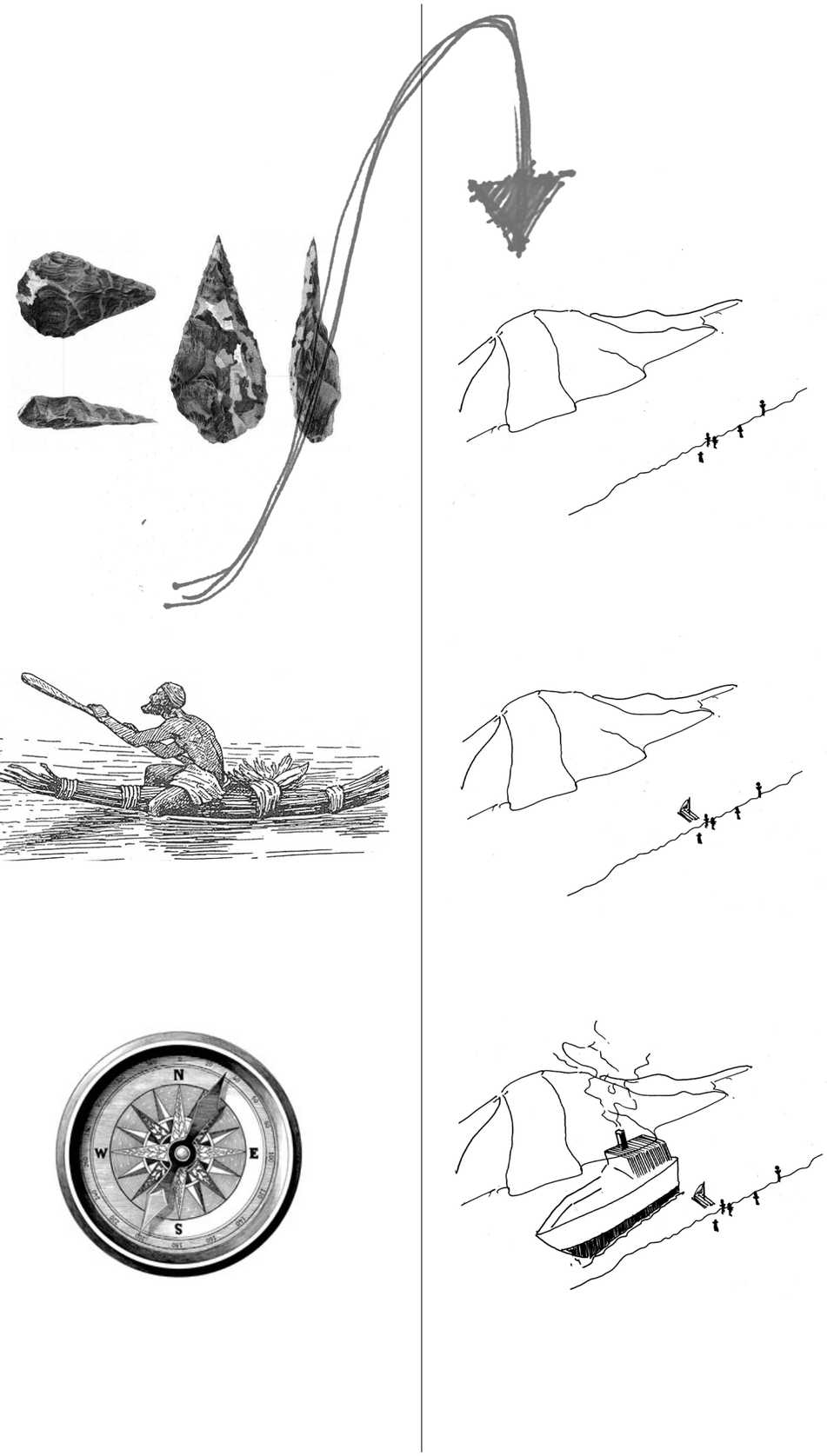
Here are some objects that I looked into which all changed humanity as a whole laying the foundation to the society we all are a part of today.

In the first example we see a very early design of a hand-axe. This object can be dated 2 million years back in time, and it is one of the earliest design tools that changed the way humans behaved and the actual physics of the human body.

These artefacts have in fact changed us in every way. You can follow the evolution of humanity alongside the development of tools. This goes both for physical changes in our bodies as well as how our living situations and behavior have changed.

Continuing mapping objects will showcase that design has changed us, not only in architecture but in all aspects and that an idea can lead to something much bigger. If this proves to be right I mean that making an idea-based design for the master thesis will make sense. A project that makes us think has more impact than a single project ever could.

I show this to underline the idea that we design our tomorrow and thereby need to work with design in a way that allows us to grow into the humans that we want to become.



THIS IS THE BOX - PROJECT (BALTIC DEEPWATER OXYGENATION)

This is the first ever attempt to circulate water to recover dead zones in the ocean and has become the scientific foundation of my project. The experiment was carried out by Gothenburg and Linköpings university. It is located on the Swedish west coast in Byfjorden outside of Uddevalla.

The researchers circulated the oxygenated surface water to the bottom layer and activated the bottom sedimentthrough engineered pumps. The problem with the pumps is that they are driven by diesel and it would not be sustainable on a bigger scale which the researchers would like to proceed to.

Through this I located a problem to solve and gained knowledge from the research on the topic. I know that it is possible to make changes and optimize the existing design. Is it possible to develop a project from the understanding that I have collected so far?

References

Author: Colomina Beatriz, Wigley Mark
Year: 2016
Publisher: Lars Muller Publishers

Are we human? is written by Beatriz Colomina and Mark Wigley. The book focuses on design and how we can rethink it.

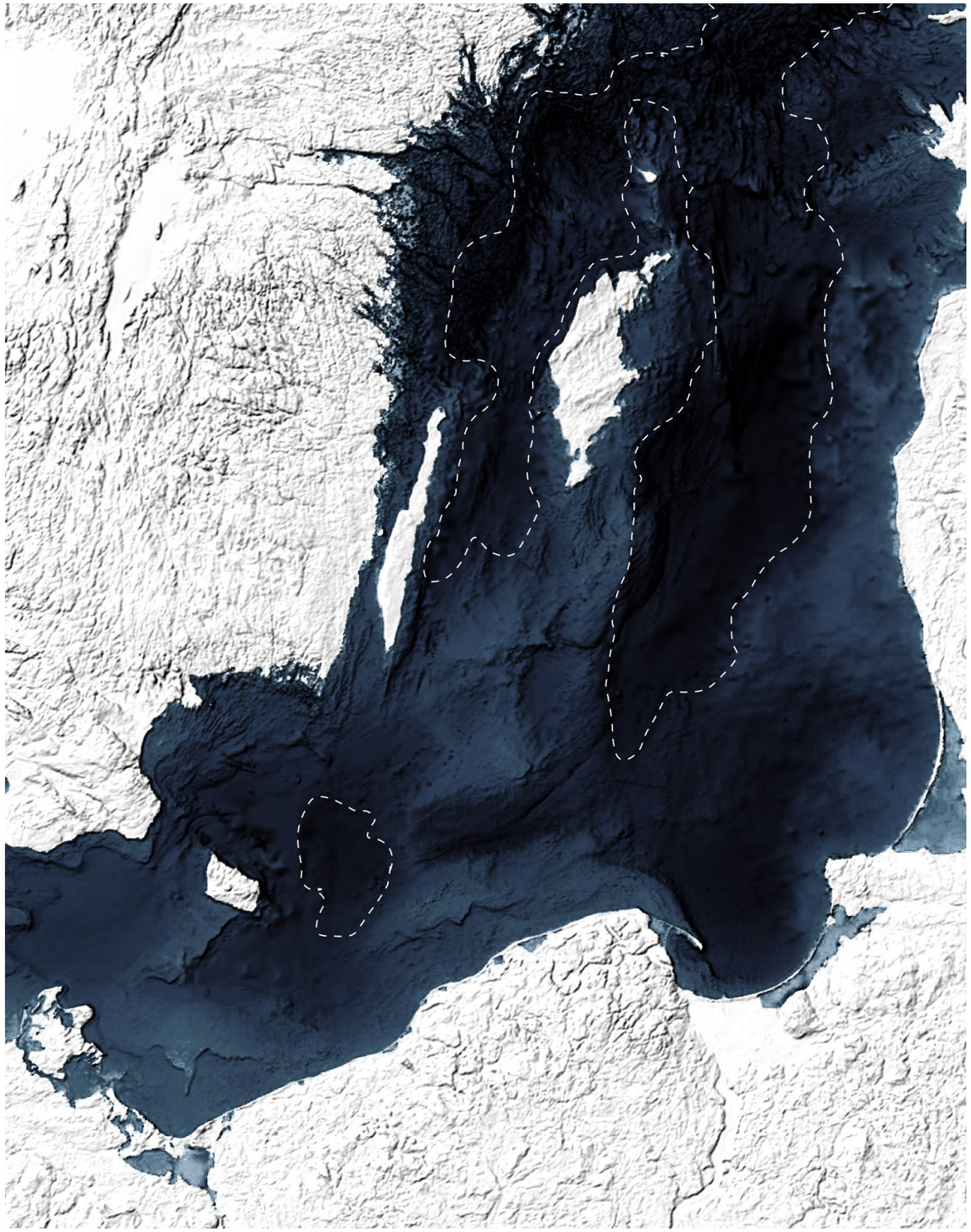
Everything today is design. Design is the world and humanity is because of design. The book starts off with the history of how making tools changed us physically, and ends with how social media and design are shaping us today.

Author: Daniel Conley och Lovisa Zillén
Year: 2008
Publisher: Lunds University

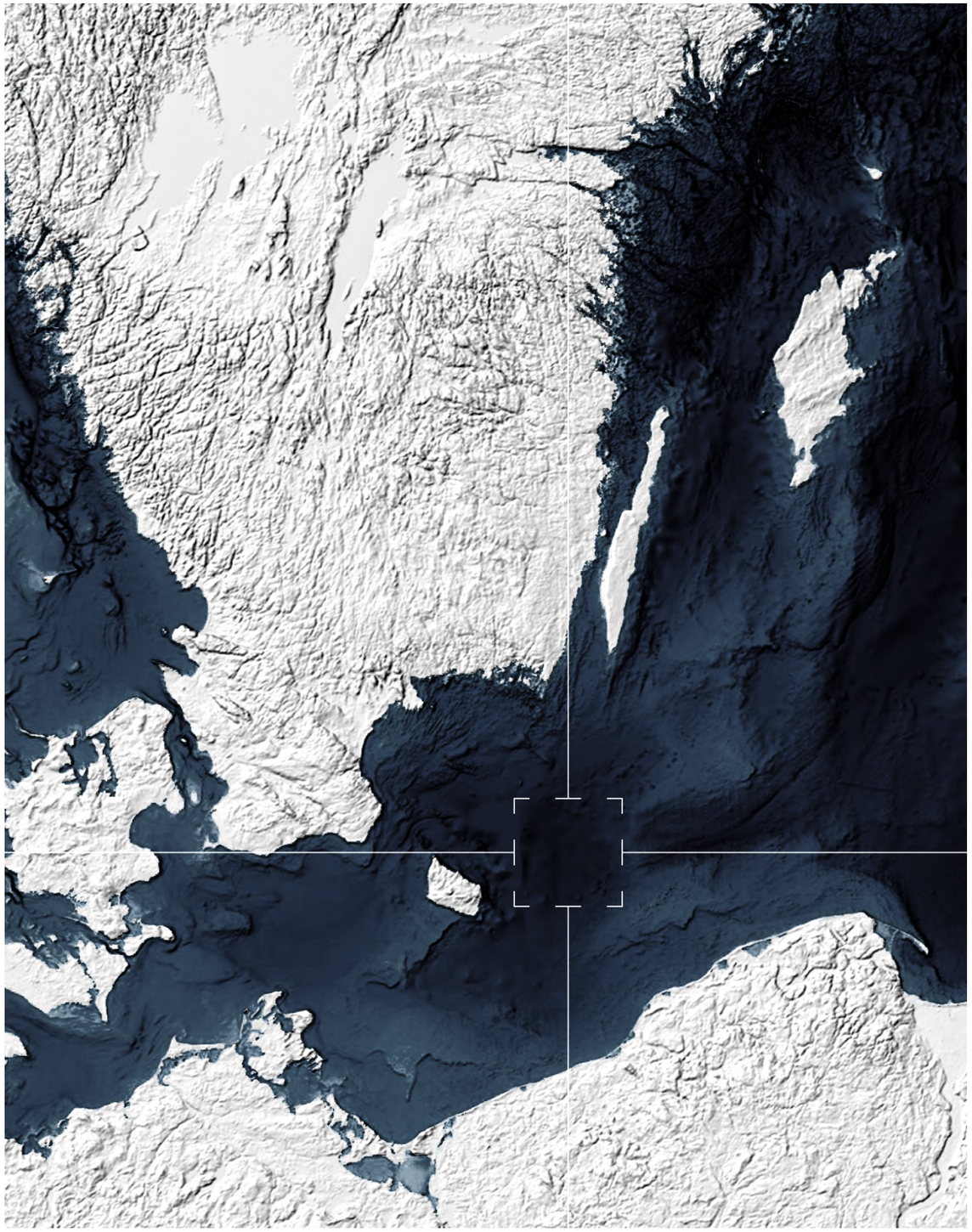
This is a magazine that the marine departments at gothenburg, stockholm and Umeå university released on the situations in our oceans and the marine life. In the magasin they summarize a workshop that over 60 scientists took part in to see what could be done to reverse the dead zones in the baltic sea. Several solutions came up. But economical aspects and the uncertainty of some of the proposals excluded them. The scientists mean that the only engineered solution that they can not preclude is the one where mixing of water from 50 m to 125 is done to oxygenate the sediments of the ocean floor.

Author: Anders Stigebrandt, Ambjörn Andersson
Year: 2020
Publisher: Frontiers in Marine Science

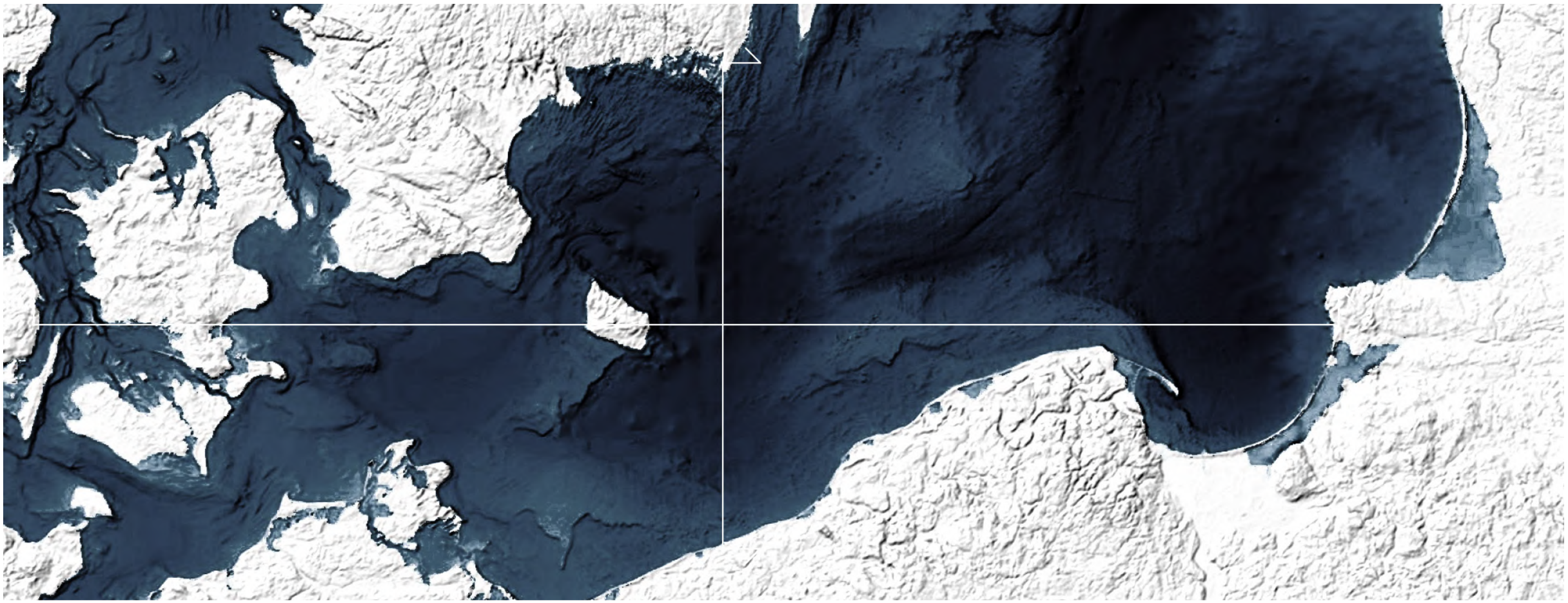
This report is written by Anders Stigebrandt, professor in oceanography at Gothenburg university. In this report you can read how the water has been affected over time and why the changes have occured. He shows in this report an example on how we could stop the changes in the Baltic Sea through artificial oxygenation.



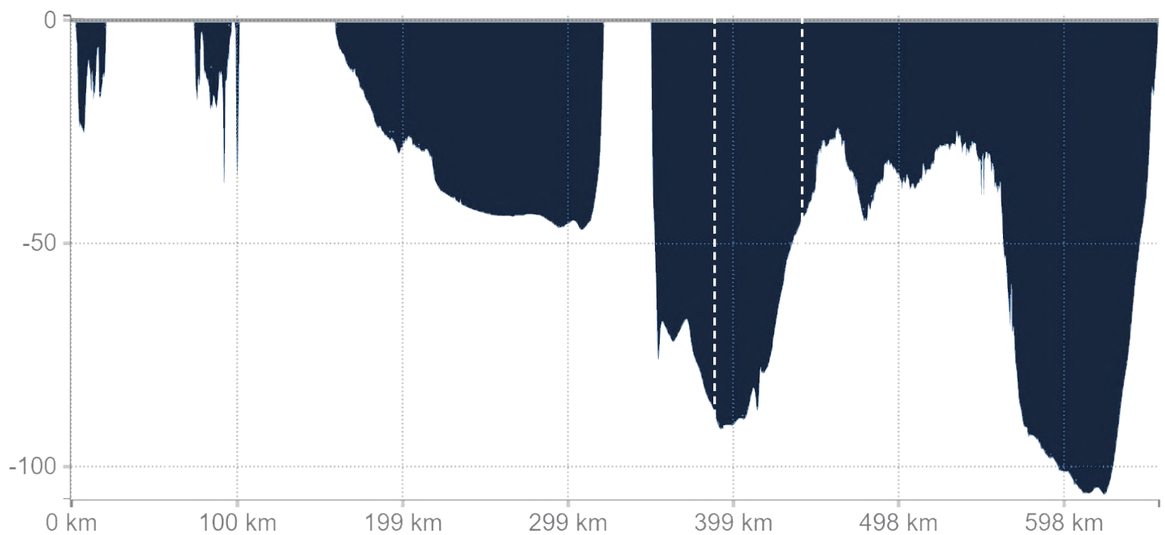
Potential sites ”Dead zones”



Chosen site (Bornholmsdjupet)



Section West - East



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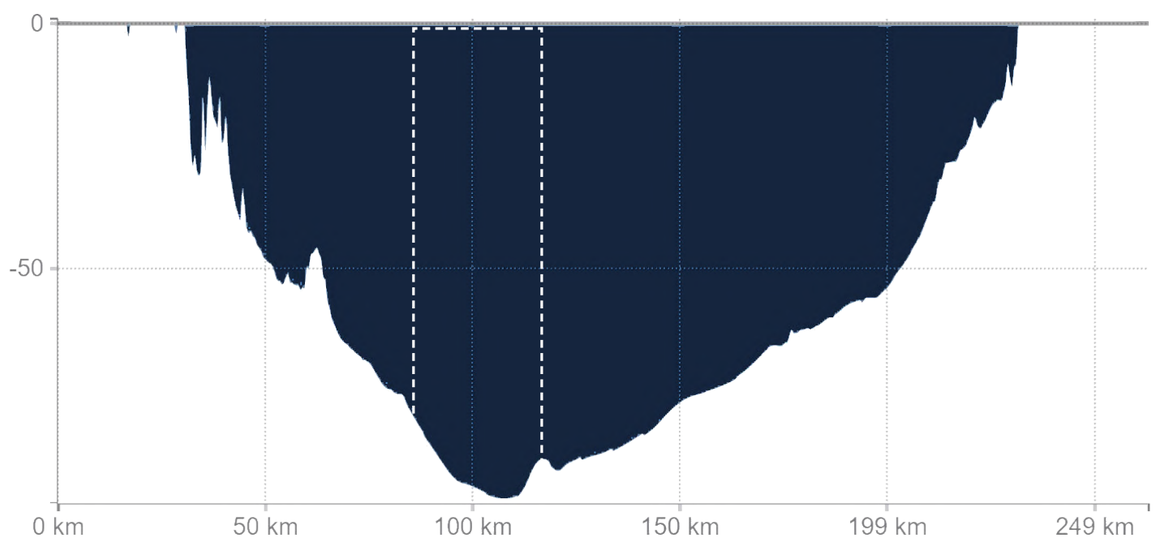
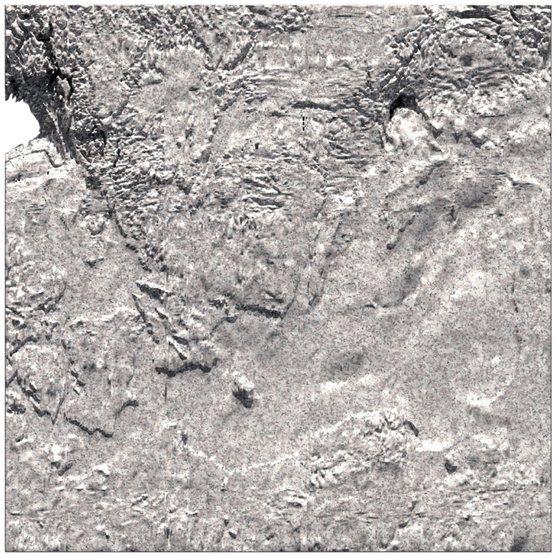
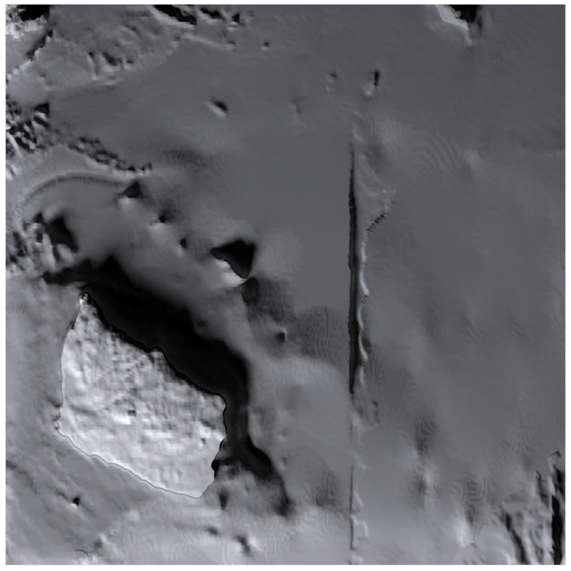
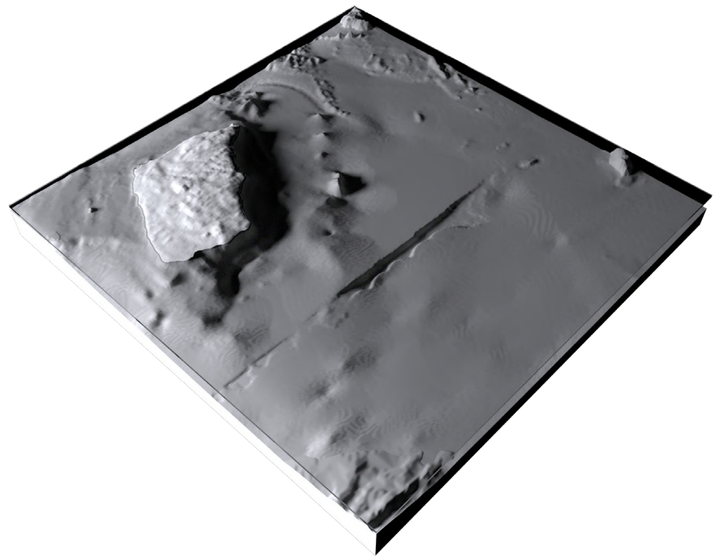


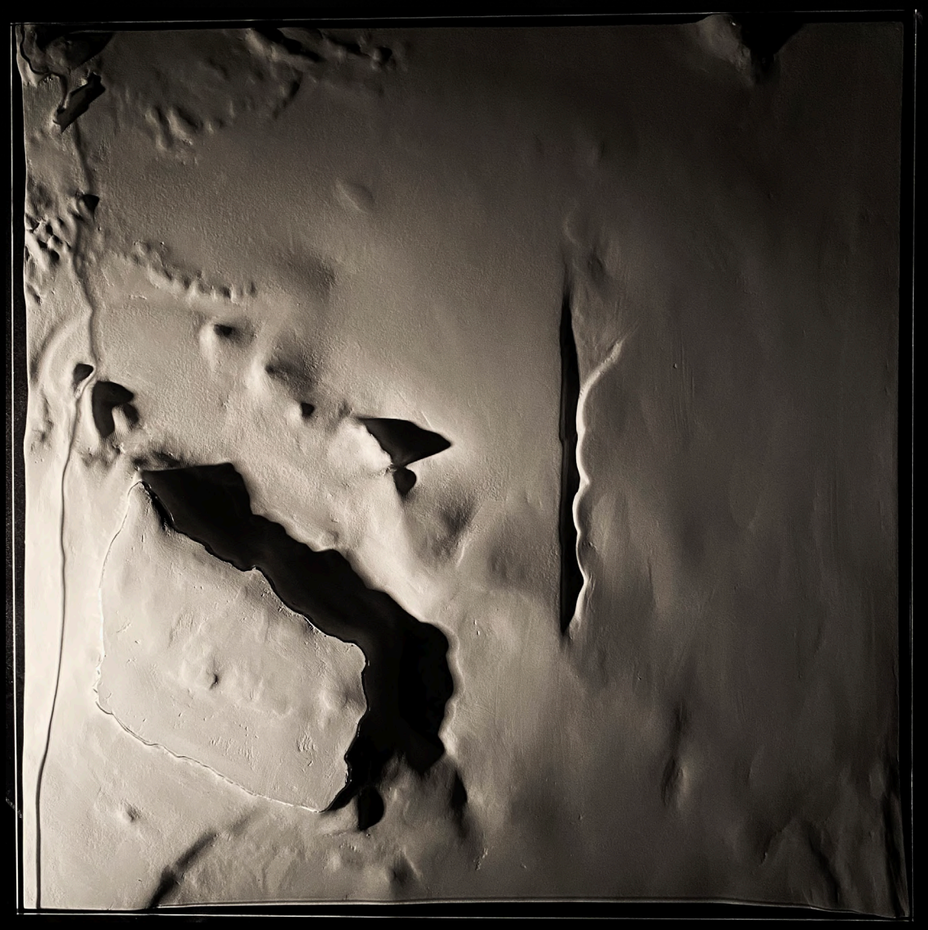


Landscape model southern Sweden, Denmark and southern part of the Baltic Sea



Landscape model (site) Born holm and Born-holmsdjupet





SITE MODEL PHOTOS

In the process of making these models and bringing all the needed data, I realized how little knowledge I have about the landscape under the surface. The photos underline the theory that the ocean is like space on earth. Wast, distant and yet present.

Model photos under the surface

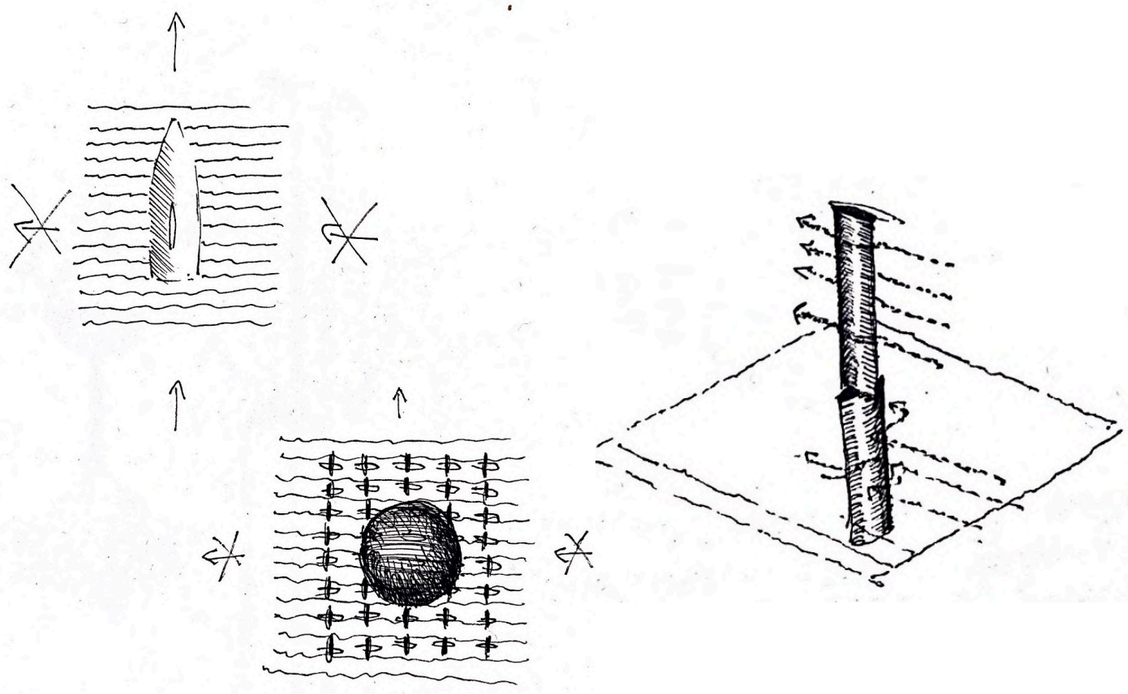
RE-READ

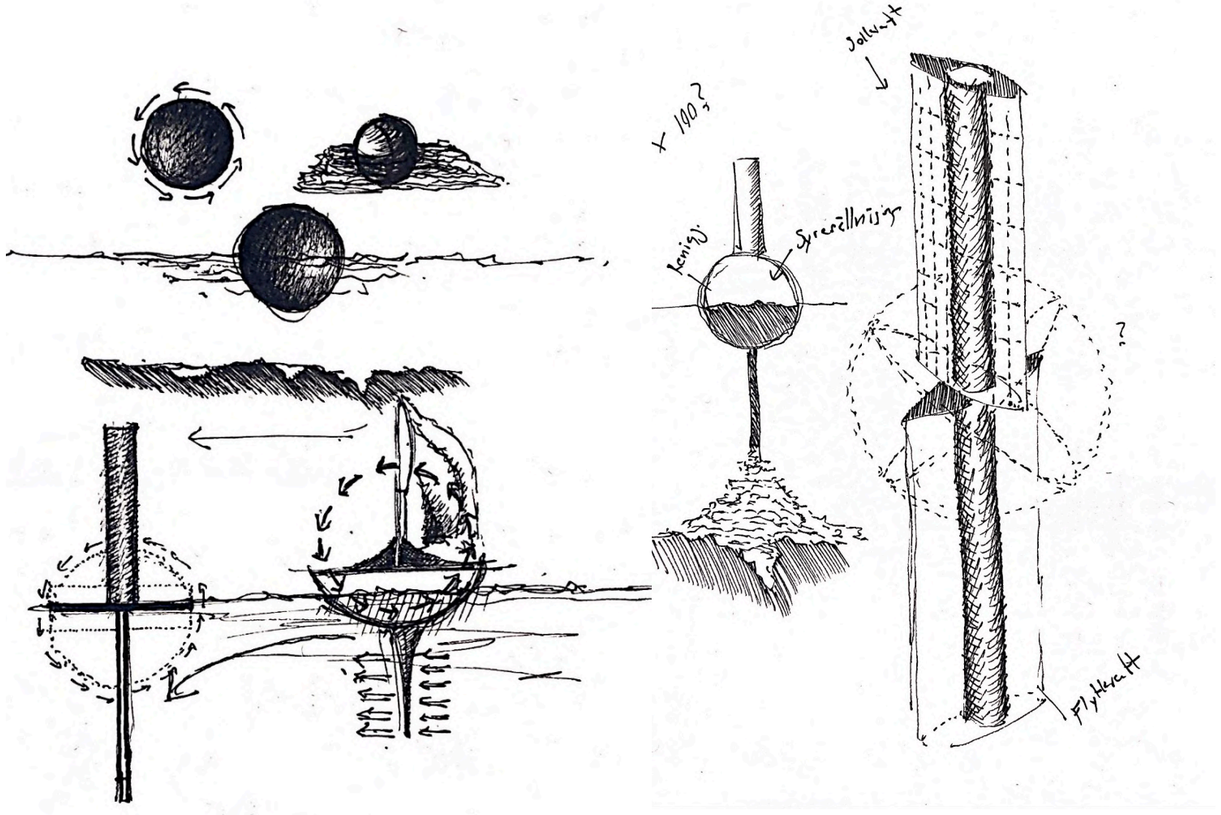
This is the section where I start to use my methods and ideas to transform them into design. I start by studying the object and make an abstraction. What parts do I have use for in the early stages of my design? How can I apply new thoughts for optimizing?

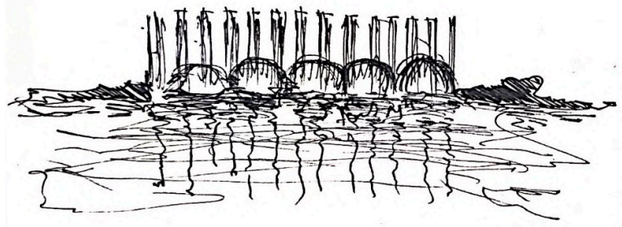
In this example I studied the sailboat. It's now up to me to be the retriever and administer previous thoughts of the object.

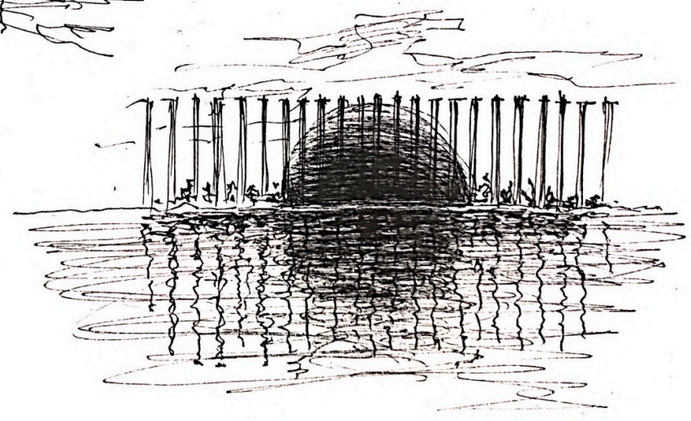
It resulted in that I kept 3 pieces, the keel, hull and the sail, but a boat is designed to have an direction, it's not made to linger over the same area. To solve this i turned the sail and the keel against each other to make breaking effects as seen in the sketches.

Later I added a vessel for the technical parts to circulate the water (Hull) . I multiplied the abstraction to better suit the scale and the program of the project.









The feeling of the design was more important than the design itself in this result. The pictures created a feeling of being monitored, a propaganda picture of what’s to come. Attack Architecture.

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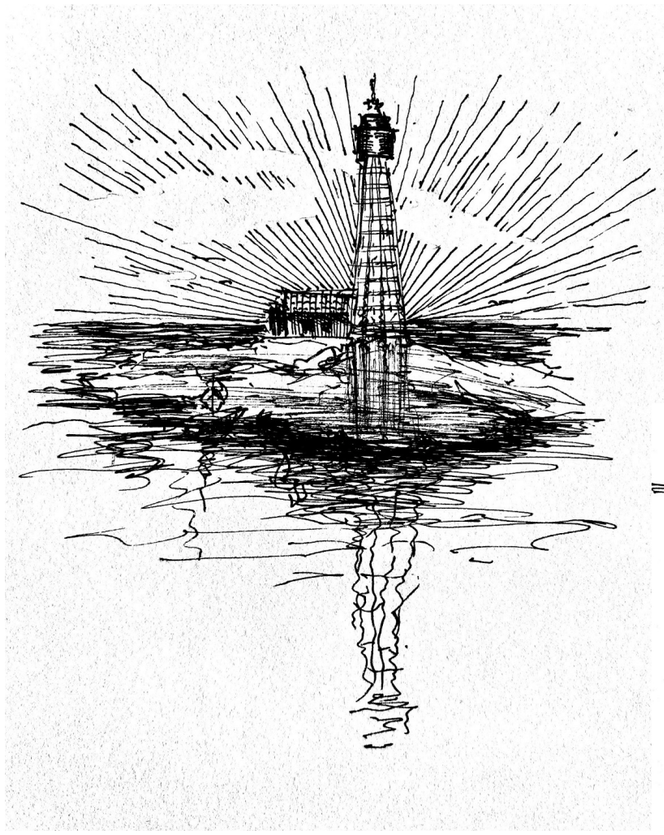
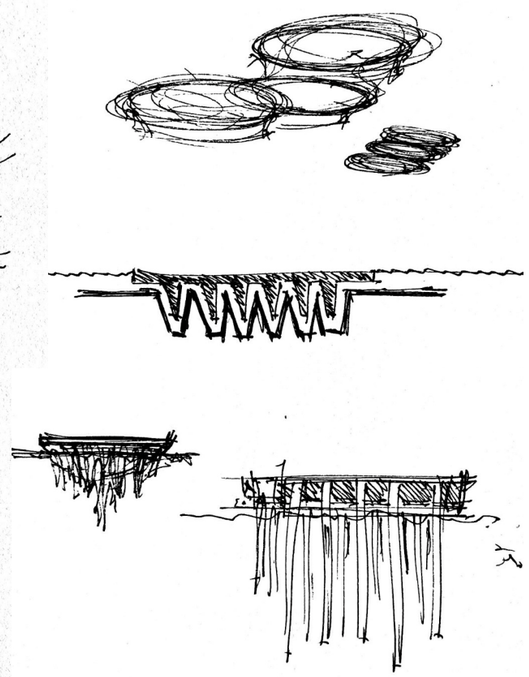
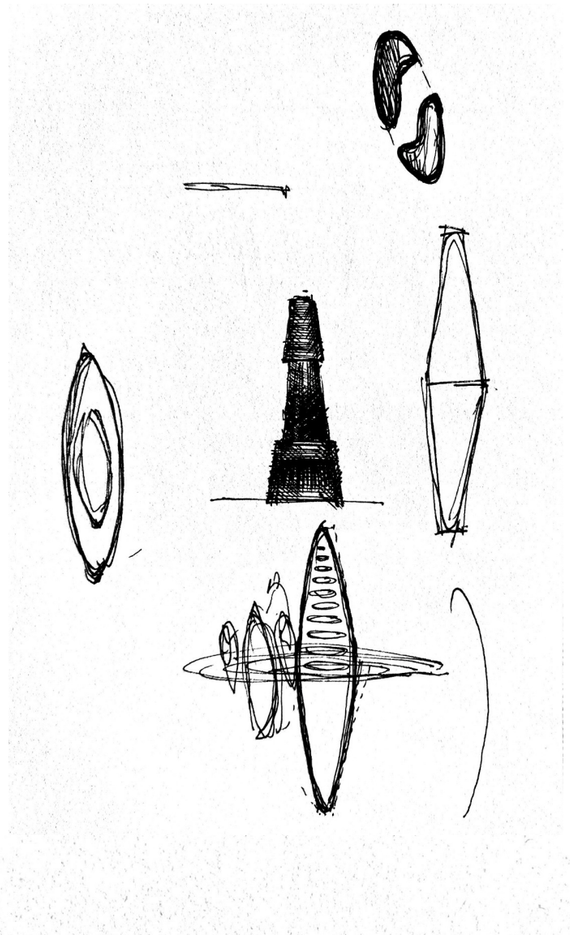
RE-READ

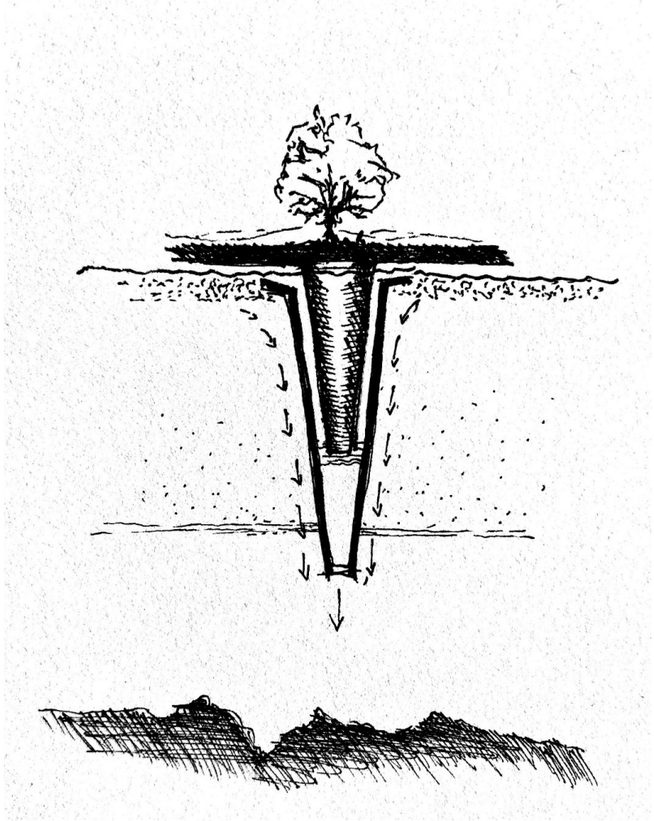
In this example I look into the light house. This is a good example that not everything can be used to your advantage. I tried to take the cone shape of the structure to refit into a new design and I also designed a solution on how to build up water pressure into the shape. The intention was to apply Archimedes' principle to break the water layers.

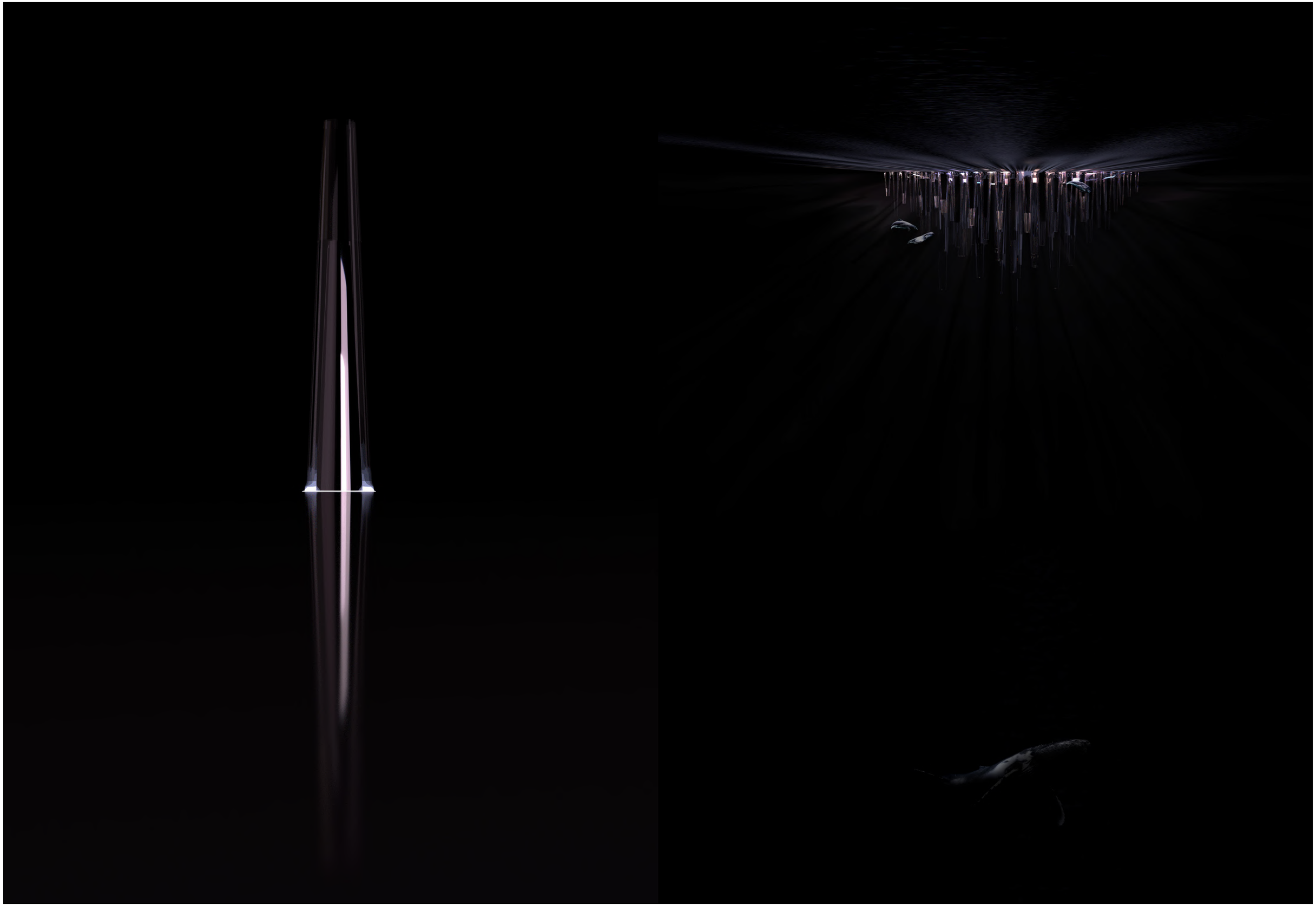
The idea did not go all the way and I felt that the design was not true to its nature. I instead ended up using the design in an abstract way and let the light house put light to the issue, giving an indication of why I try to solve the problem.











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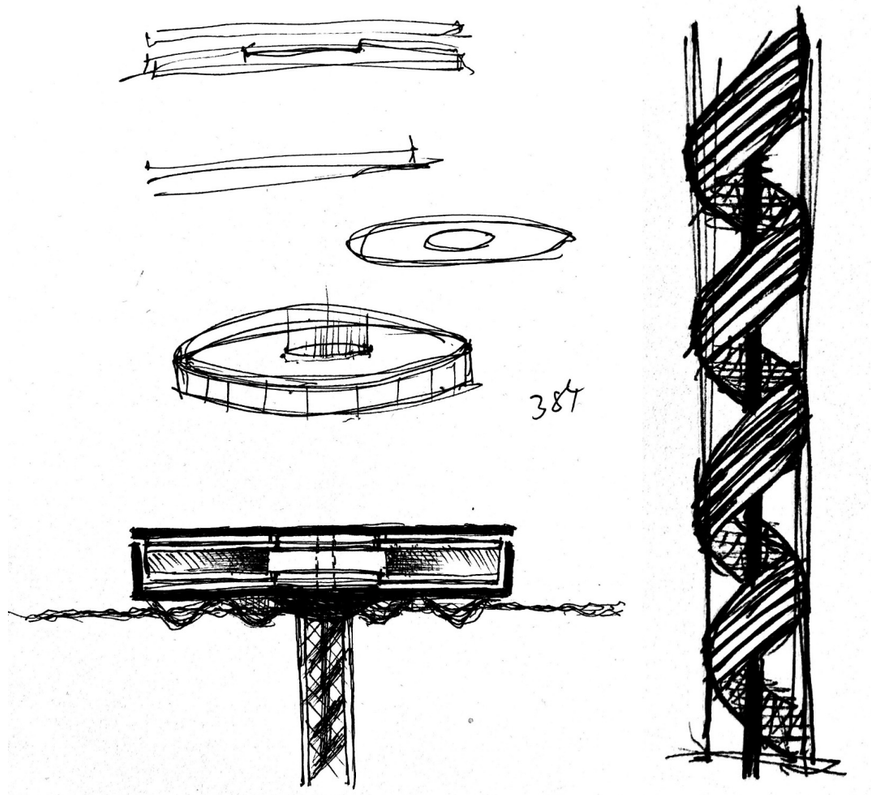
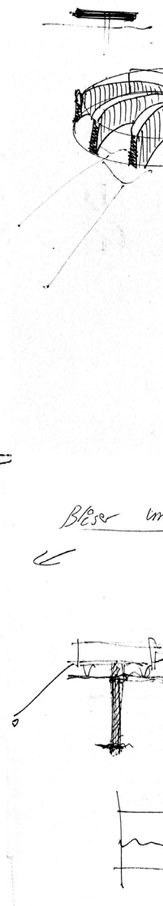
RE-READ

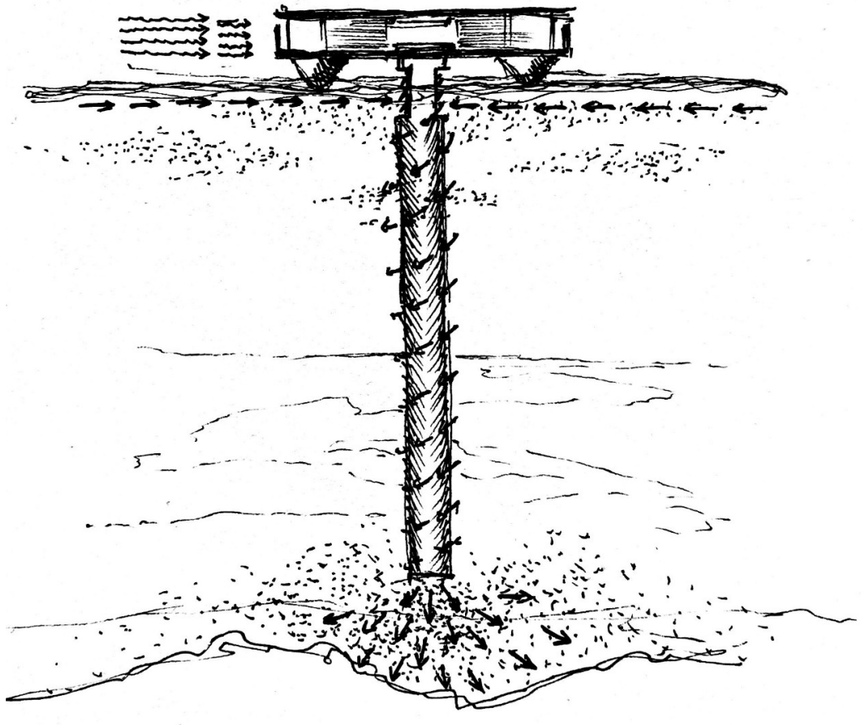
In this last re-reading I studied wind power in the ocean. This object itself could work as a design without any bigger interference but i wanted to see if i could turn it into an analog design where I could use the direct power of the wind instead of using technical aspects to transform the wind into electricity to circulate the water.

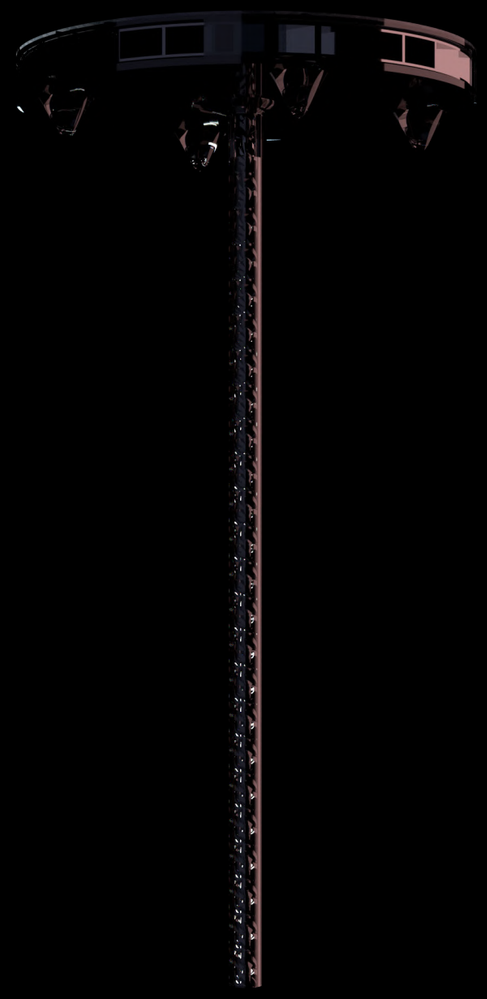
The result was in my opinion something that was worth continuing to develop and test. The idea is that you could just place these structures in the water and leave them there and they will work day and night without need of human assistance.

A series of simulations has been carried out with the design giving varying results leading up to an optimized design that could work in full scale. In the end of the booklet you can find a QR-code that will direct you to the simulation video.



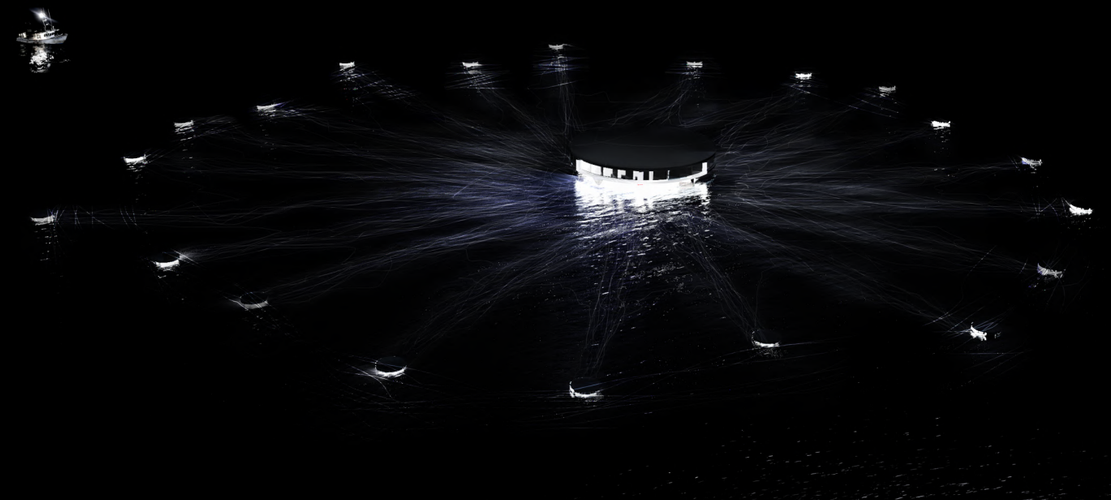


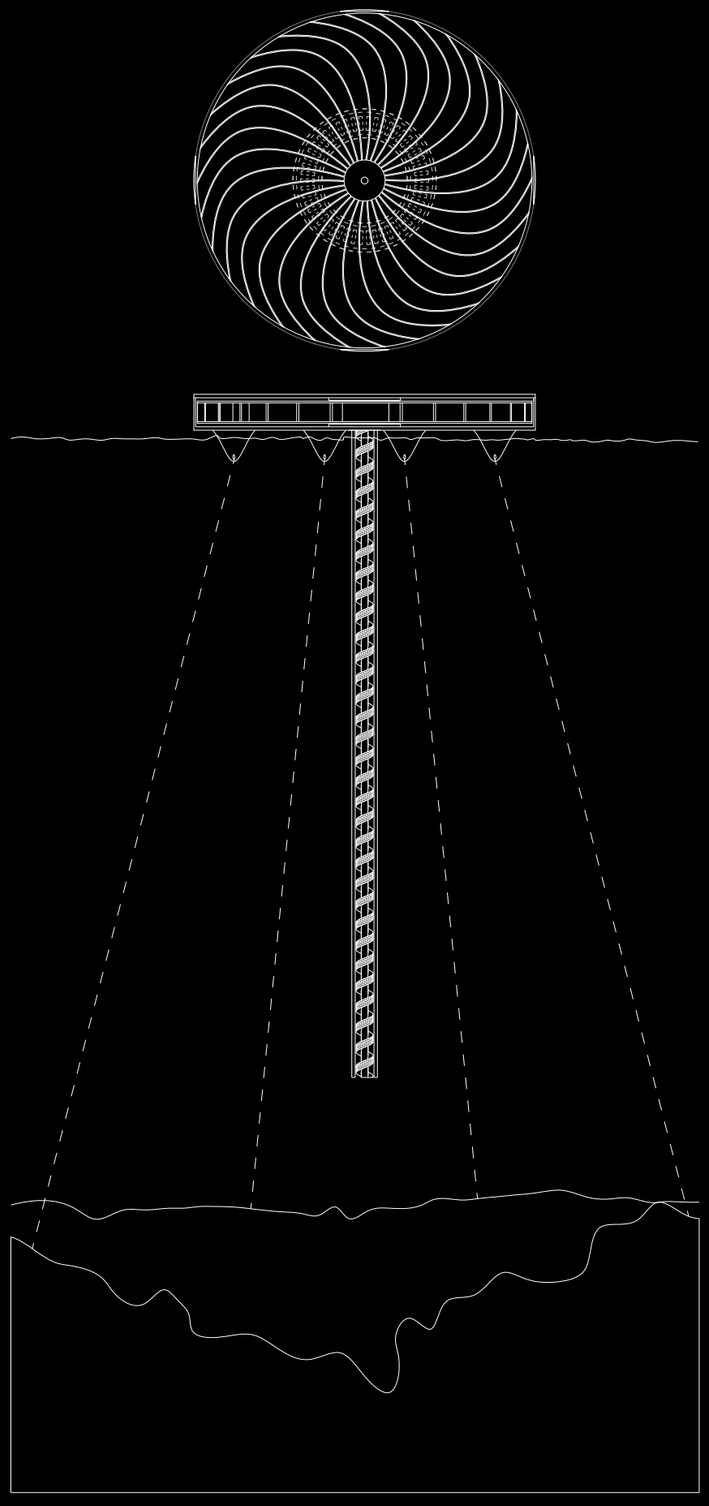




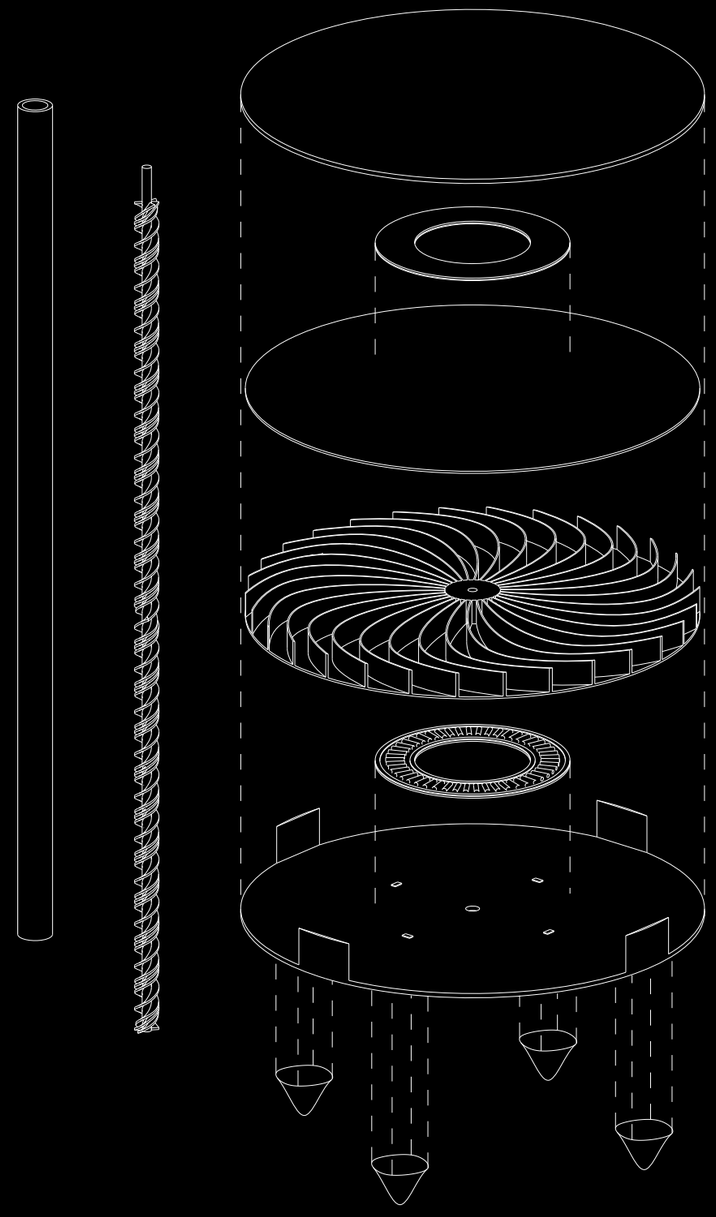
This is the first sketch idea of the master thesis, where I simulate movement to give life to the floating creature that is bringing life back into the Baltic Sea.

The smaller structures are the model to the left. I will develop this chapter even further to make a realistic conceptual project and build up a library with prototypes showing that design IS a driving force for sustainable inventions.





Drawings 1:400



Drawings 1:400

1. Stabilizers
2. Wind turbine case
3. Axial bearing
4. Wind turbine
5. Top wind turbine
6. Top case
7. Propeller axis
8. Direction pipe

Material renders 1:400

Material renders 1:400

Model photos

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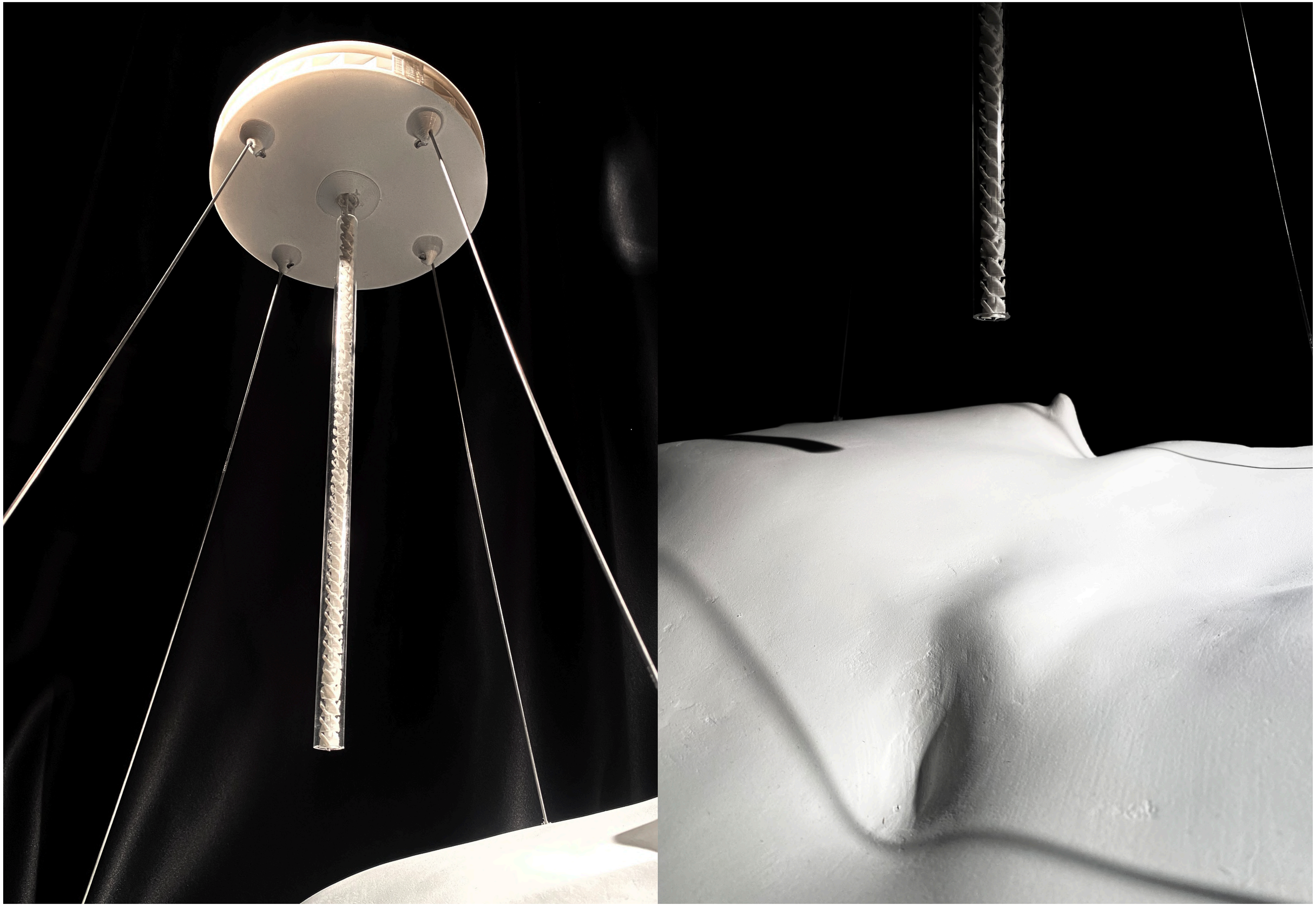

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Testing

To end this part of the project I needed to start doing real testing to be able to fully understand what impact the design could have.

Finding space to execute the experiment was not easy, the container I had access to is 70x70x70 cm which means that it will contain enough water to flood the building. Therefore I needed to refit a bathroom where I could direct the water in case of failure. I built new thresholds and covered all electrics so I could work without any present danger.

I used food coloring to layer the water. By heating the water that had pigments into it could I get an “oxygenated” toplayer symbolizing the brackish layer in the baltic sea.

The first experiment was not as successful as I wished. The food coloring used for layering the water was cooled down too quickly because of the large body of water that was used. This led to an even mix in the water and the result was a whisper of what the result could be. It showed that the principle was working but I needed to confirm with further testing.

Result of the first test, showing small parts of the top layer going through the direction-pipe.

FINAL TEST

You can see the video of the final test if you scan the QR.code on this page.

Here you can see the test more clearly. I downsized the scale of the test, making it possible to layer the water in a more effective manner. This also made it possible to do the test over and over again. I managed to reach the desired result.

WHAT'S NEXT

During this course the outline of the master thesis has gotten stronger. I have found solutions that I can continue to work with and I have also been able to broaden my understanding of the research that has been done on the topic. Most of the investigations are ongoing and I feel that this is a good foundation to start building the master thesis design from.

Will be present for the exhibition