

Salmon off the grid

Johan Gustavsson

Salmon off the grid - visitors centre

Is it possible to re-assemble the Norwegian salmon farming industry?

2016.01.14

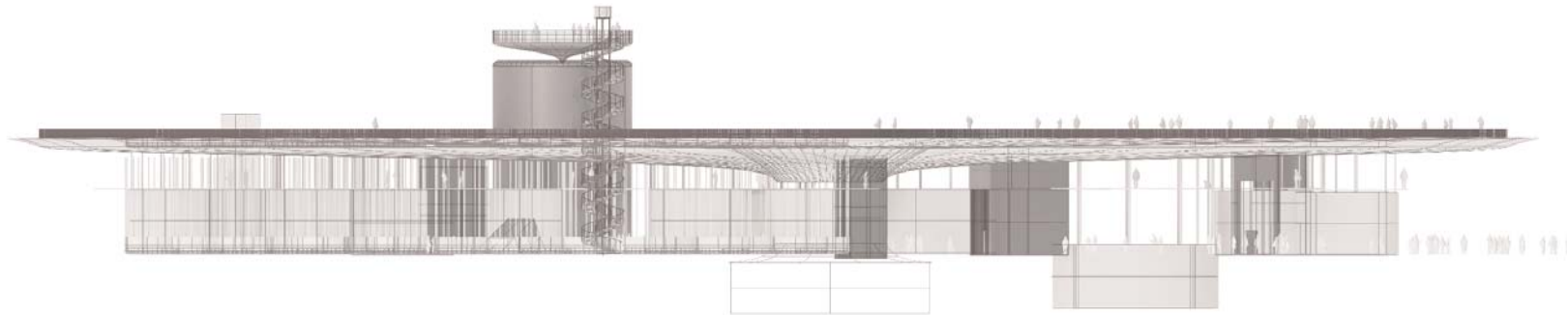
Master thesis at Chalmers Architecture

MPARC Matter Space Studio



CHALMERS

Salmon off the grid



Booklet

Abstract

Johan Gustavsson

Salmon off the grid - visitors centre

Is it possible to re-assemble the Norwegian salmon farming industry?

It has been said that the salmon is to Norway what the panda is to China; An endangered national symbol.

So, what do we do?

Completely removing the farmed salmon from the environment it's about to destroy is one option.

This project is about setting the stage for the public. Creating an easy to-reach setting for visitors that can help raise awareness surrounding the Norwegian salmon industry while introducing some tried and tested features that could help save it.

A land based salmon farm is a massive structure with huge water tanks, pumps and pipes. It's impressive by sheer volume. Is there a different way to utilize these volumes, use them as lighting? Let them shape acoustics? Use them to create rooms?

The building consists of a set of tours from smolt (young salmon) to cooked meal and the processes treating and recycling waste and energy.

The building is also exploring where industry demands and logic meets a design that is usable as a uniting public location and "catch your own salmon" -beach restaurant

Since there is no emissions from this plant it's located in the centre of Slemmestad that is scheduled to host the title of cultural capital 2020, this is answered by a public outdoor stage in the center of the building.

Visitors will be able to educate themselves, enjoy performances and eat actual sushi with salmon that comes fresh out of the farm just minutes ago.

Examiner: Morten Lund

Supervisor: Mikael Frej

Bachelor Degree:

Architecture

Master's Programme:

MPARC, Architecture and urban design

Overview

Salmon consumption worldwide is three times higher than it was in 1980.

What was once a luxury food is among the most popular fish species in the U.S., Europe and Japan.

Salmon aquaculture is the fastest growing food production system in the world—accounting for 70 percent (2.4 million metric tons) of the market.

In Norway only, 1 200 000 tonnes is produced in 2014 in sea-based fish farms.

This can be compared to the global wild salmon population which has been reduced by 80% in the last 30 years.

If the wild salmon is lost, the genetic diversity is lost and therefore also the entire salmon farming industry.

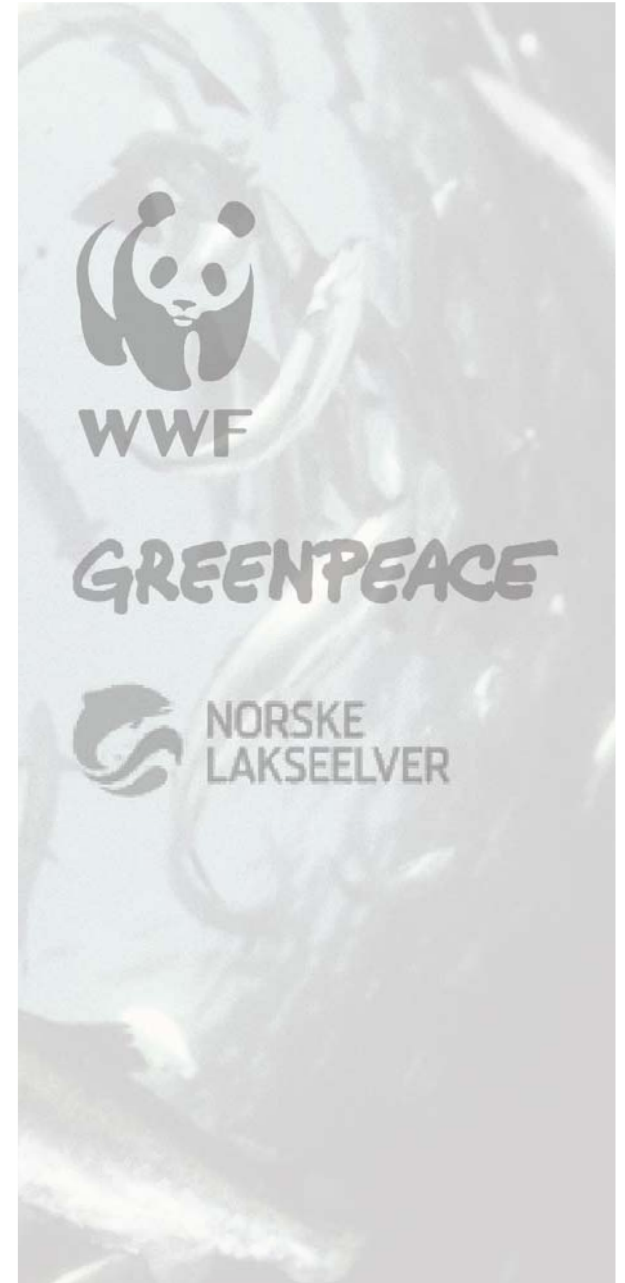
This is also of grave importance for the fishing tourism connected to the wild salmon that is responsible for a total of 3 billion NOK per year in Norway only.

In many other countries land based fish farms serve as sustainable, profitable and more controllable solutions.

In Norway the salmon already is on its way up on land; the debate just needs a final push.

Possibly in the form of a land based salmon farm pilot project, something that can lead the way for others.

The future for Salmon and the tourism of Norway, all in one package.



Why it matters

As the demand for farmed salmon has risen so has the problems and controversy surrounding it.

Everything from parasites, to disease to polluting the ocean with feces from the salmon. Chemicals used threaten biodiversity in the ocean and badly monitored regulations also threatens the labor on the farms in certain countries.

On the positive: Feed More With Less

Salmon aquaculture requires fewer resources than many other protein sources. For example, while approximately 10-12 pounds of feed are needed to produce one pound of beef, only 1.3 to 1.7 pounds of feed are needed to produce one pound of salmon.

Regardless of positive or negative:
Demand is growing

With the rapid growth and increasing demand for farmed salmon, we know that responsible practices must be put in place to protect the places and species we care about.



Project intro

Before we begin

A first set of questions I asked myself in the beginning of this master thesis preparation.

What do I want to achieve with this master thesis?

Enable the salmon farming industry in Norway by taking it out of the highly unsustainable situation in the fjords and up on land. At the same time saving the wild salmon and thereby saving the important tourism industry surrounding it as well as the fish farming industry itself by preserving the genetical diversity of the salmon.



This will be done via a pilot land based salmon farm project in combination with aquaponics, and waste harvesting trying to create a self sustaining biotope plant.

The proposal of such a plant is already being debated in Norwegian media and politics and is just about to become reality.

This plant/center will co-exist with the rest of the city and will also serve a public function as an educational spot for visitors. Much in the same way the whiskey and wine industry have made it attractive to come visit their factories, salmon deserves not only modern and cost efficient production facilities but should also be shown to the world as the exclusive national symbol that it is.

Solve the economical questions. Solve the environmental questions. Expose it to the world and Norway will gain important value as both a tourism- and as an industrial nation

How to do it?

Get going with an overlaying strategy and show how this strategy could be implemented on different situations and locations from cityscape to smaller village.

And finally, become informed on the current situation. **Find out if this is at all possible to make a master thesis out of.**

Find out what the demands are, construction-wise, social-wise and economical?

And, the million dollar question:

What in the world is an architect doing in this situation?

The answer gets simpler and simpler. This is just the place for an architect to be.

Not just as a designer but as a coordinator and conductor of all these different elements that already exist in Norway today but need to be put together in a different way to allow them to support each other.

Momentum, debate and economical interest already exists, it's just a matter of putting the right elements in the right place. And to make the government allow it to happen.

Please read on for further explanation of the autumn fish farming research report.

“The Salmon is Norway’s answer to the panda”

The current situation:

Project intro/background - continued

Who is interested in this?

Salmon consumption worldwide is three times higher than it was in 1980.

What was once a luxury food is among the most popular fish species in the U.S., Europe and Japan.

Salmon aquaculture is the fastest growing food production system in the world—accounting for 70 percent (2.4 million metric tons) of the market.

In Norway only, 1 200 000 tonnes is produced in 2014 in sea-based fish farms.

This can be compared to the global wild salmon population which has been reduced by 80% in the last 30 years.

The salmon is extinct in 11 countries and currently only Norway, Ireland, Iceland and Scotland are hosting salmon population that, so far, are managing to sustain their numbers.

This is of grave importance for fish farmers of Norway since salmon lice, disease and escaping farm salmon threatens the wild salmon population.

Biodiversity Loss

Chemicals and excess nutrients from food and feces associated with salmon farms can disturb the flora and fauna on the ocean bottom.

Excessive use of chemicals, such as antibiotics, anti-foulants and pesticides, or the use of banned chemicals can have unintended consequences for marine organisms and human health

Viruses and parasites transfer between farmed and wild fish as well as among farms, presenting a risk to wild populations or other farms.

Escaped farmed salmon can compete with wild fish and interbreed with local wild stocks of the same population, altering the overall pool of genetic diversity

Nutrient Pollution and Carrying Capacity

Excess food and fish waste increase the levels of nutrients in the water and have the potential to lead to oxygen-deprived waters that stress aquatic life.

Social Issues

Salmon farming often employs a large number of workers on farms and in processing plants, potentially placing labor practices and worker rights under public scrutiny. Additionally, conflicts can arise among users of the shared coastal environment.

If the wild salmon is lost, the genetic diversity is threatened and therefore also the entire salmon farming industry. This is also of grave importance for the fishing tourism connected to the wild salmon that is responsible for a total of 3 billion NOK per year in Norway only.

In many other countries land based fish farms serve as sustainable and more controllable solutions. Why not in Norway?

In Norway the salmon is on its way up on land. The debate just needs a final push in the form of a land based salmon farm pilot project, something that can lead the way for others.

The future for, Norway, Salmon and tourism, all in one package.

Why is this important?



Norway is one of 4

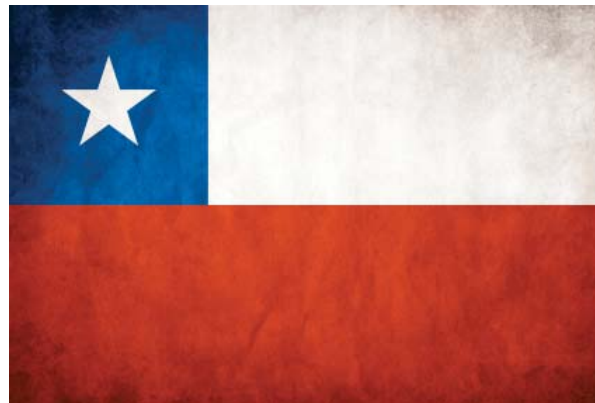
The salmon is extinct in 11 countries. Currently, Norway, Iceland, Ireland and Scotland are the only countries left with self sustaining salmon populations.

Scientists sound the alarm



Alarming reports from scientists tells us that if the situation don't change the salmon is soon to be extinct in Norway as well. Then threatening to take out the 3 billion NOK yearly income from fishing tourism in the Norwegian salmon rivers.

Disaster has already struck



In 2010 a deadly virus crippled the Chilean Salmon industry and it still hasn't recovered. This is mainly explained by the badly monitored sea based fish farms, the same type of farms that is being used in Norway

Land based competition is growing

Land based Salmon farms are already in use in 4 major countries and more are about to join in.



Current debate in Norway

Laks i kjempetanker kan true norsk eksport

I Danmark, Canada, USA og Kina starter selskaper nå å produsere laks i enorme tanker på land. - Norge har låst seg fast i sjøbasert oppdrett, sier professor.

[Øystein Kløvstad Langberg](#)

Oppdatert: 05 okt. 2012 17:16

Fiskerbonden Erik – et utdøende levesett

Posted by Redaksjon on lørdag, september 24, 2011 - 1 Comment

- Oppdrettsnæringa bør fjerne miljøgiftene

- Må redusere der det er mulig, mener forskningsdirektør Janneche Utne Skåre. **Men det akter verken forbransjen eller myndighetene å sørge for.**

Næringsliv Laks

Oppdrettsnæringen må betale for egne miljøsynder

NTB

Publisert: 15.09.2014 – 06:53

Oppdatert: 15.09.2014 – 06:54

Solkrem i fisk

Stoffene som skal beskytte mot solstråler, ender opp i torsk i Oslofjorden.

12.09.2014

Indianerhøvdinger til sultestreik mot norske laksetopper

Protesterer mot norsk oppdrett under OL i Vancouver.

Omega 3-nivået er halvert på ti år

Fordi oppdrettsfisker spiser planteoljer fra raps, mais og soya.

The debate rages on and both sides seems rather set. Two things however are clear. Other countries, such as China and Canada already have begun experimenting with land based salmon farming.

What's also important; Soon the aqua farmers of Norway will be forced to pay for the damages and pollution made to the eco system. It will be most likely be too expensive not to evolve the production methods.

What is being done?

Stakeholders in Norway is working on ways to develop the fish farming technology into something environmentally and economically sustainable.

The economical solution



Aqua farm equipment AS has developed a completely closed floating fish tank in order to control waste, disease, lice and feeding. 22 meters deep, 40 meter diameter.

This is especially important in regard to the sea lice since it lives from the surface and down to 4-5 meters in the ocean. This type of tank takes in water from more than 25 meters depth.

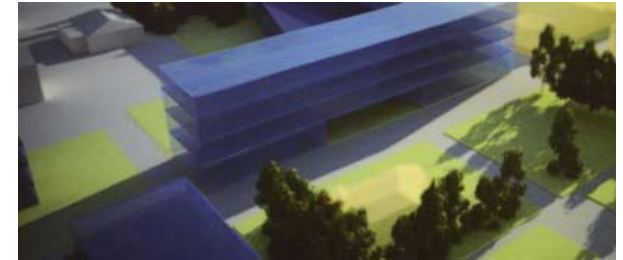
One of these tanks can hold up to 200 000 salmon. The entire wild population of Norway consists of 400 000 salmon.



Land based plant in Fredrikstad



Right now an ongoing debate is taking place between investors and government in the city of Fredrikstad in Norway. The goal: To build Norway's first full size land based salmon farm. Erik Heim and Bård Eker, two of the driving forces behind the project.



Current sketchproject of planned fish farms from Fredrikstad Seafoods conglomerate.

- Vi treng å vise fram kva vi gjer!

Nærmare 500 tok turen yst i havgapet då Namdal Akvasenter opna dørene for sesongen. Visningsanlegget meiner folk flest verkeleg treng å sjå og oppleve norsk havbruk.

- FHL.no

Ingen avklaring om Øra-laks før jul

Fredrikstad Seafood som ønsker å starte landbasert lakseoppdrett på Øra, får ikke svar på konsesjonsøknaden på denne siden av jul. Fiskeridirektoratet har bedt om flere svar i forhold til forsknings – og utviklingskonsesjonen som gjelder 3.600 tonn laks hvert år i 10 år, skriver Fredriksstad Blad. Prosjektleder Erik Heim sier at de var forberedt på at det kunne komme spørsmål, men at de er optimister i forhold til å få godkjent søknaden

- Radio Prime (2014)

The industrial aspect

How is it currently being done? What is the physical requirements for fish farming.

Examples taken from Langsand Laks in Denmark, a relatively small scale (and of realistic size).



Above: Fry delivered in isolated boxes.
Below: Buffer tanks for filtering water from intrates and algae.



A grading machine for sorting fish of different size into different tanks



A pump for transporting fish between the tanks.



Smolt tanks



Above: Building the tanks that will hold adult salmon.

Below: The home made fish transport system.

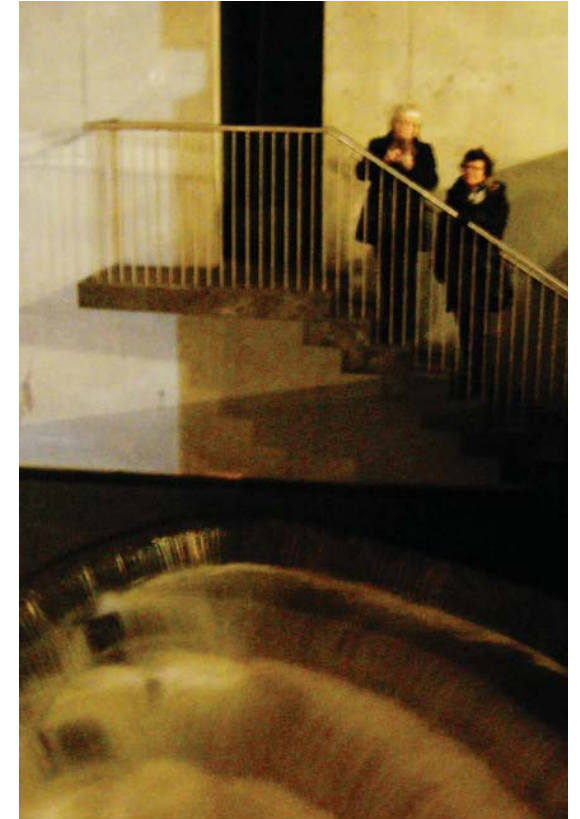




The plant in its entirety with it's tanks ranging from 15 to 25 meters in diameter.



Above: Ryaverken filters.
Below: Inside one of the Langsand tanks; the perfect place for a resturant?



Inspirational image from Ryaverken, what if there were jumping salmon here?



The industrial aspect contnd.

How is it currently being done? What is the physical requirements for fish farming.

Examples taken from Billund aquaculture in Denmark, the company that provided the equipment for Langsand.



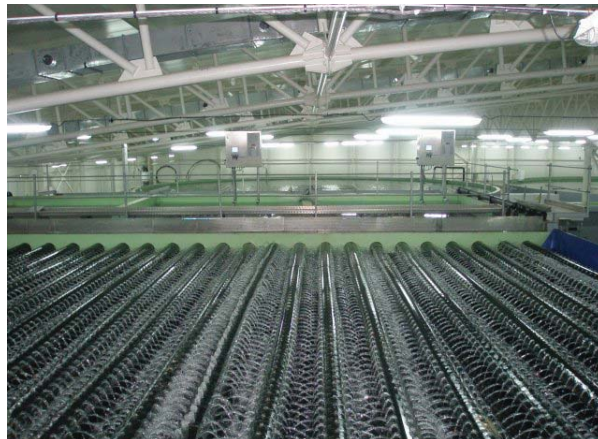
A typical hall with no daylight inlets to prevent algae from developing.



Ponds for fry with water pump and feeding mechanism.



Filter and cooling plant for filtering intake water.





An example of a walkthrough for visitors on a farm for flat fish.



Two relatively happy fish farmers.



Beds for flat fish.



Smolt tanks and feeding mechanisms.

Process tree sketch Rev. A

The process between 2014.09.29 up until 2014.10.21

Dokumentation av process

BÖRJAN - RESEARCH
NÄRHAETS ARTIKLAR
SVAR



Skrova and Lysebotn, potential sites that required further research but got left behind when Stavanger came into the picture.

Elin Kjörsvik, welcoming trips to Trondheim for research.



Niklas Wennberg, urban farming



Next step setup business plan



Hunting Bård Eker



Fredrikstad site: Öra industrial area. Area already proposed for development.

KONTAKTER

PROJEKT

INVESTERARE

KONTAKTER

ARTIKLAR

SITE

PROGRAMMERING
 KONTAKTER
 CHALMERS

FREDRIKSTAD KOMMUNE

FUNKTIONER

SVAR

ARTIKLAR

INTERVJUER

ARTIKLAR



KOMPETENS
 ARTIKLAR

Interview with Erik Sterud led to further research of a site in Fredrikstad.



DOKUMENTATION
 SAMMENSTILLING

Feedback. Research. Storytelling. Contacts. Links. Weekly planning.



Hunting Morten Lund
 Get drawings

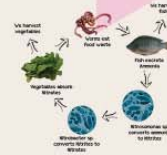
PROJEKT

PROGRAMMERING



STAVANGER KOMMUNE

Stavanger - Tou Scene Revitalization
 Programming of site
 Research of site
 Contact hunting
 Too late, forced to move on



Researching and collecting info about needed/wanted functions on the future plant/site



Hunting Reinhard Kroppf



First sketch diagram

First sketch of many to come about how to tell the story of the project.

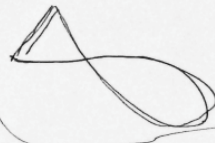
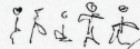
Questions asked:

What do I want to do?

Save the salmon (wild and farmed)
Save the countryside by revitalizing the coastal industrial areas as well as the farmlands supporting them.

A logo for the project! A moebius salmon!

The idea of a city planning project with connections made between outdoor areas, breweries, anaerobic digesters, tourists and farmers.



BIBS VS ROPS



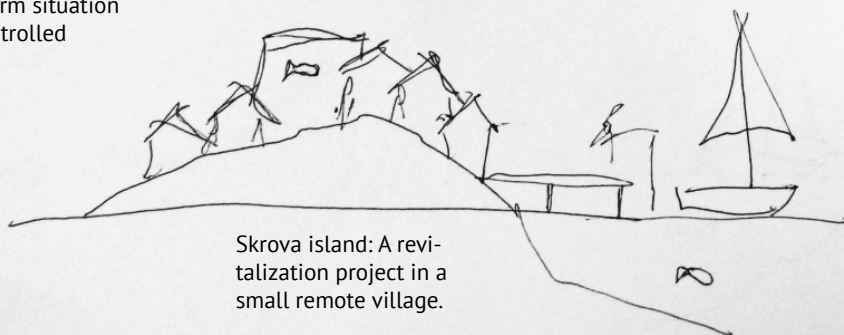
The connection between fish waste and farmers produce

The wild salmon stands for a potential of 3 billion NOK per year.

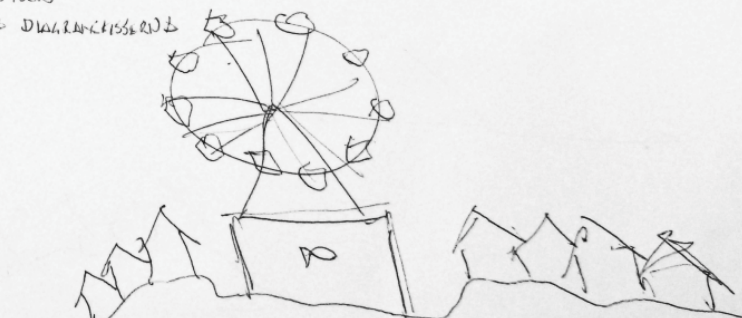
WHAT DO WE WANT TO DO?
SAVE THE SALMON
SAVE THE COUNTRYSIDE
BIBS
SALMON
PIRES
LAKSENER

CONTACTAVENTUREN
FOR EN BUSINESS PLAN
SAMMENSETT DIAKONIKSBERED

The current unsustainable fish farm situation with uncontrolled waste



Skrova island: A revitalization project in a small remote village.



Lysebotn: A revitalization project in the middle of a small village in the bottom of a fiord.

The story

A journey from sea to land in the city of Slemmestad Norway.

The program is a land based fish farm that revitalizes an old industrial area.

A palette of functions and elements that in the right combinations will provide a safe industrial, economical and social climate for future Norway.

A step on the way

Sea farming threatens itself and the environment around it. Closed cages solves some, but not all issues.

Save the genes

Ensuring safety for the wild salmon provides-genetical diversity and therefore the fish farming industry is secured.

Give it back

Use funds from new land-based fish farms to revitalize the shorelines of former industrial sites. Fish power, people power.

Salmon is the new whiskey

Use empty industrial areas for fish farming on land. A new form of tourist attraction is born.

Welcome

The first land based fish farm visitors centre.

Fish is green

Energy from the anaerobic digester is used to power pump systems and greenhouses that provide food for the fish.

Anaerobic digester

Fish waste is transformed into pure energy.

Gold rivers

Salmon tourism stands for over 1 billion NOK per year and a total potential of 3 billion when total tourism income are taken into account.

Fish and Canola

About 3% of the area of Norway can be used for agriculture. Canola can be used to feed the salmon - fieces from the salmon can be used to fertilize the canola.

Site research

Three of the investigated sites where land based fish farming could be suitable.



Tou Scene Stavanger

An old brewery that went out of business in the beginning of the millenium.

A problematic area where investors were hard to find. Since 2013 however the government has decided to create a “cultural factory” in the old brewery.

After further investigation it turned out that the area is already being heavily developed and the decision was made to move on with the site scouting.

Skrova island Lofoten

The island of Skrova housed up to 3500 fishermen all the way into the 60's, then the population quickly diminished and today there are roughly 200 permanent residents left.

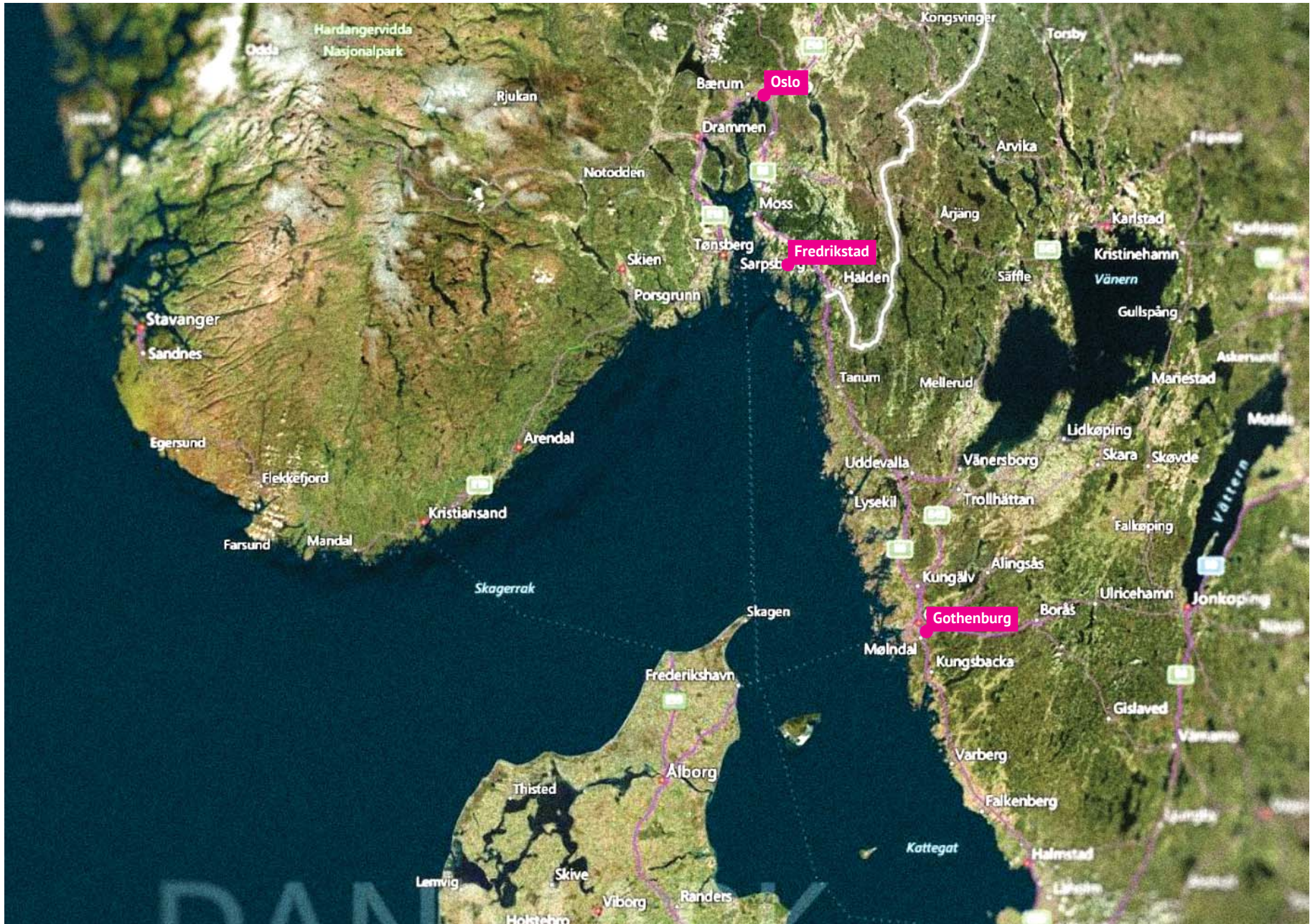
The island struggles to attract tourists and there is a growing interest amongst the locals to attract investors in order to make the once thriving village on the island live again.



Lysebotn Forsand kommune

A small town where most of the residents used to work in the nearby power plant. Once the plant got automatized the town quickly lost it's momentum.

It all changed when it became a hot spot for base jumpers. This is however a heavily seasonal income and there are interests in the town to create a more all-year based type of income.

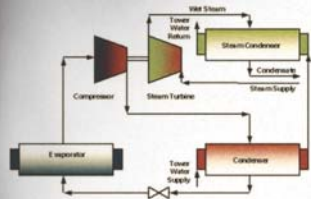






Site programming - Elements

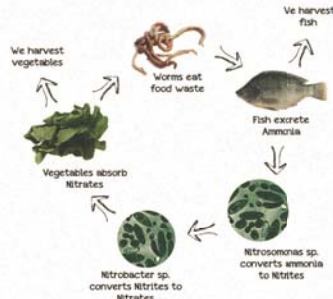
Steam turbine - energy



Hotel for visitors/conference



Aquaponics



Camping



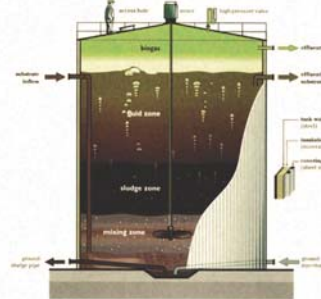
Visitors centre



Fish tanks on land



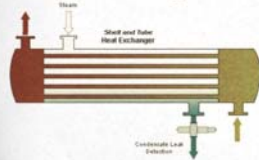
Anaerobic digester



Brewery - waste - fish food



Harvest heat from water cooling



Mix Industry and Housing



Water tower for water pressure



A list of all suggested elements that could or should be represented in the final project.

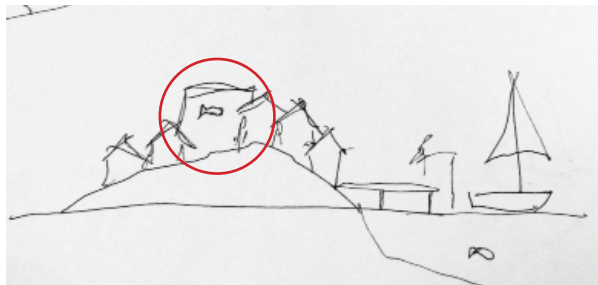
2014.10.21

Reflection

A brief text to describe the decisions that I've made, and have been forced to do, during the preparatory phase of the 2015 master thesis. After the reflection comes the full Resource book with contacts. Ok, here we go, each of the following elements can be found in this resource book for further explanation.

For starters I was very uncertain on what level this project would be aimed.

The entire autumn has been a wide open research process from high to low, at start it looked like the outcome would be a city planning project since the salmon farming is a clean industry.



Picture above: Salmon farming as a rejuvenating strategy for coastal sleeper towns.

As site research continued throughout Norway and interviews with architects, engineers and industry representatives led to news about a planned pilot project in Fredrikstad, Norway.



Contacts, live and phone interviews with representatives from both business and research sides.



So. From the beginning, this project aimed to develop a strategy for rejuvenating the entire coastline of sleeper towns in Norway. After one interview in particular, with Norske Lakseelver (Norwegian Salmon Rivers) a proposed pilot project got my attention.

The rejuvenating strategy for the Norwegian coastline remains but, it became clear that it has to begin at a smaller scale.



Above: Fredrikstad Seafoods is planning a land based Salmon Farm in the industrial area Öra in Fredrikstad, but, it's not in the clear yet, government debate is still ongoing.

This made me scale the project down, after having hunted sites all over Norway it was now a matter of hunting sites in Öra industrial area.

And, since there already are 15 exhibition centres for sea-based fish farms in Norway why not make this the first exhibition centre for land based Salmon farming?



Reflection Continued

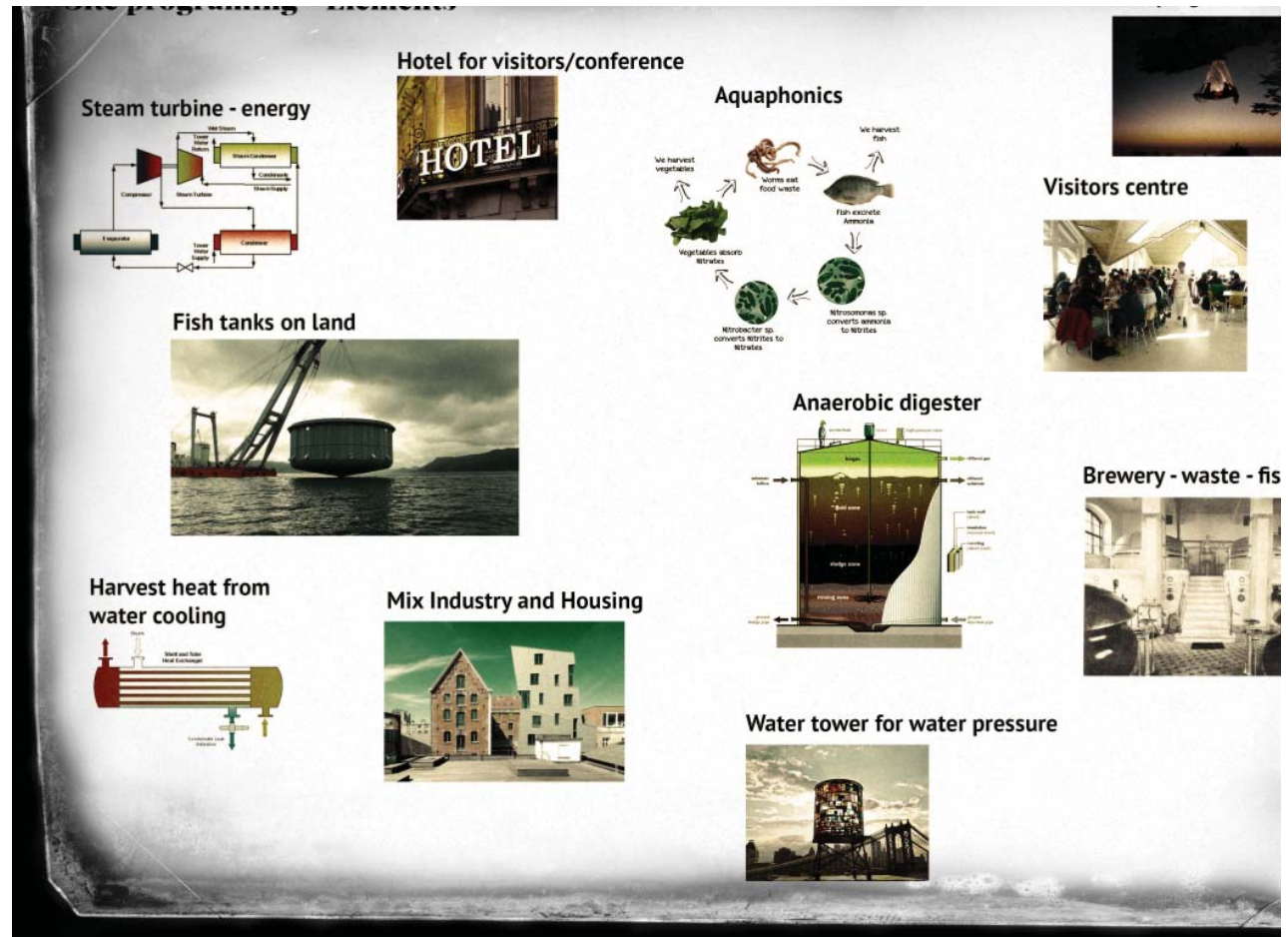
So, what would the plant consist of?

I continued researching the actual components of fish farms such as, tanks, filters, transport systems, buffer tanks, fry beds, smolt tanks, grading machines and so on to try go get a general idea of dimensions and layout of my proposed plant.



Above: The tanks of the Langsand plant in Hvide Sande, Denmark. The biggest are 25m in diameter.

This led me on to asking: If this is a pilot project that aims to be a research facility, what other functions could create a more complete promotional and scientific centre as a whole and not just as a meat production facility.



Above: The complete sheet of ideas for added functions that could add synergy effects and create, not only a food production facility, but also a visitors centre, a biotope strategy, restaurant, hotel and also promote the next steps in sea farming.

And again I found myself researching high and low on a very wide front.

Reflection Continued

I came to ask myself, what if I scaled it down further. This is a clean industry building. That often looks like this:



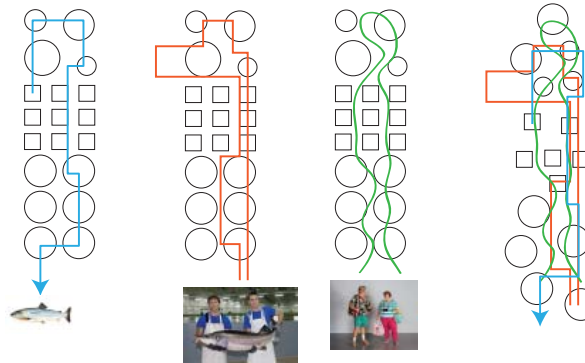
A standard steel hangar. Nothing wrong with that but why should a national symbol be dressed like that when, for example wineries and sanitation plants have gotten their complete makeover:



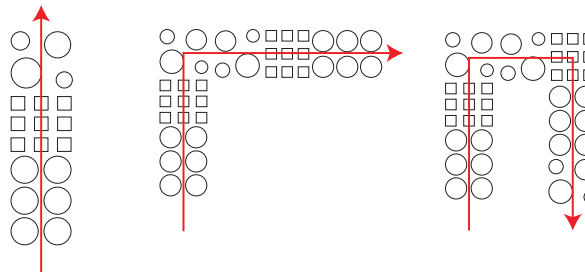
Above: Ryaverken, Gothenburg. And suddenly I found myself researching industrial architecture high and low and, that's when I found out that I have to split the project up into three separate parts.

Small, Medium, Large.

Part 1, "Small". A complete research of the industrial building itself, how does a day look for a salmon, a worker and a visitor, how, and where do they move throughout the building?

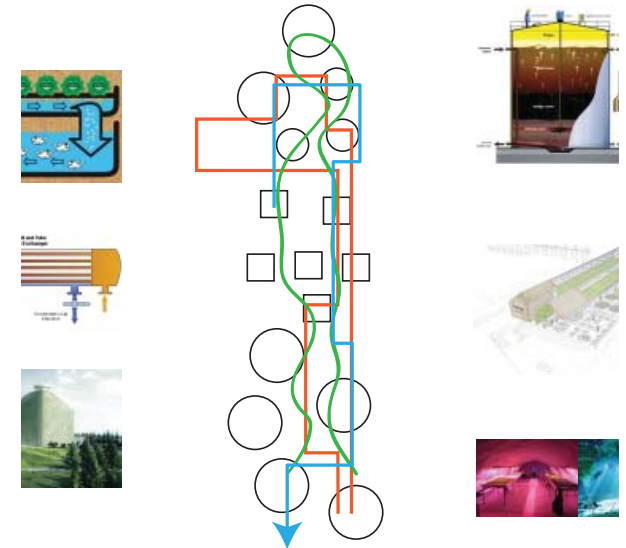


Above: Diagrams describing the different needs and routes for different visitors of the plant. Which led me further on, researching the plant design itself. The standard production line:



Above: The standard layouts, fry goes in, develops through different tanks and comes out on the other side.

Is there any other way? And what possibilities and challenges does added functions give?



Above: The Medium version of the pilot project, besides exploring the ins- and outs of the industrial building itself exploring the effects of added functions such as, aquaponics, heat exchanger, anaerobic digester, algae-farming, greenhouses and underground farming.

Reflection Continued

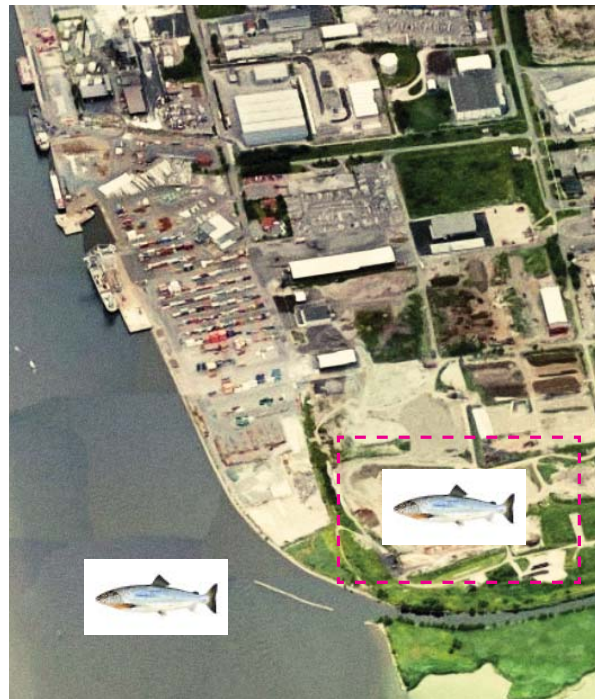


Above: A principle layout of the fish plant section. Bottom: A dark and isolated place that could be used for “underground” farming that works in symbiosis with the fish tanks through aquaponics ”

Middle, tank access, a industrial area available to the workers only.

Top: An added greenhouse that works together with the fish tanks, also through aquaponics.

In the middle of it all, suggesting a suiting site, near the coast line of Öra to really emphasise on the newly created healthy dynamic between the new industry and the wild salmon's newfound freedom.



Above: A suiting placement of the site, to prove the dynamics between the different salmon industries.

This is also a site that could be developed into something more than just an industrial site. This could be a place that people want to come and visit.



Above: The Large version of the pilot project with non-industrial functions added such as, hotel, restaurant and gift shop, even housing. This adds functions that are not directly industrial but works in synergy with the fish farm in terms of heat exchange and power management, and last but not least it creates a place where people wants come visit, a small piece of what a future industrial area should look like.

While the industrial building has so much to offer in itself when it comes to exploration; this will also be a pilot project and a promotional project that needs to be presented and shown to the nation of Norway and the rest of the world as well.

However, I believe it needs to be divided into different steps instead of creating a salmon megacity from the start. Hence: Small, Medium, Large versions.



Suitable sites continued

Fredrikstad 

versus

Slemmestad 

Land based fish farm with educational and commercial addons.

The project is already moving for good and for worse. It's a strictly business sided proposal but that is where an architectural approach would make the project more dynamic.



Investors lined up, increasing chance of realization.



Site closeness to wild salmon population.



Site already in development.



Fredrikstad kan bli en pioner i ny fiskerinæring

Et ekspertvalg anbefaler regjeringen å si ja til lakseoppdrett på land uten antallsbegrensning og vederlag. – Positivt også for oss, sier Erik Heim.

Østend Lågta
Publisert 16.01.2016 kl 22:41 Oppdatert 17.01.2016 kl 07:16

Experts are siding with the project as a research facility.

Same people founded aqualand



Oslo fiord fishing debate sounds the alarm. This is where Slemmestad comes in.



Norges største bilfrie fergesamband

Nesten 3 millioner passasjerer reiser hvert år med Norges mest trafkkerte bilfrie fergesamband mellom Oslo og Nesodden / Slemmestad.

A project in Slemmestad could connect to the already well functioning infrastructure

Aquaculture project with city rejuvenation ambitions.

Making a political statement by placing the project close to the capital and in the middle of a highly debated fiord. This is a location that, better than Fredrikstad, supports the commercialized and educational parts of the project.



Slemmestad ready to push for development of cultural activities in inner city and coast line.

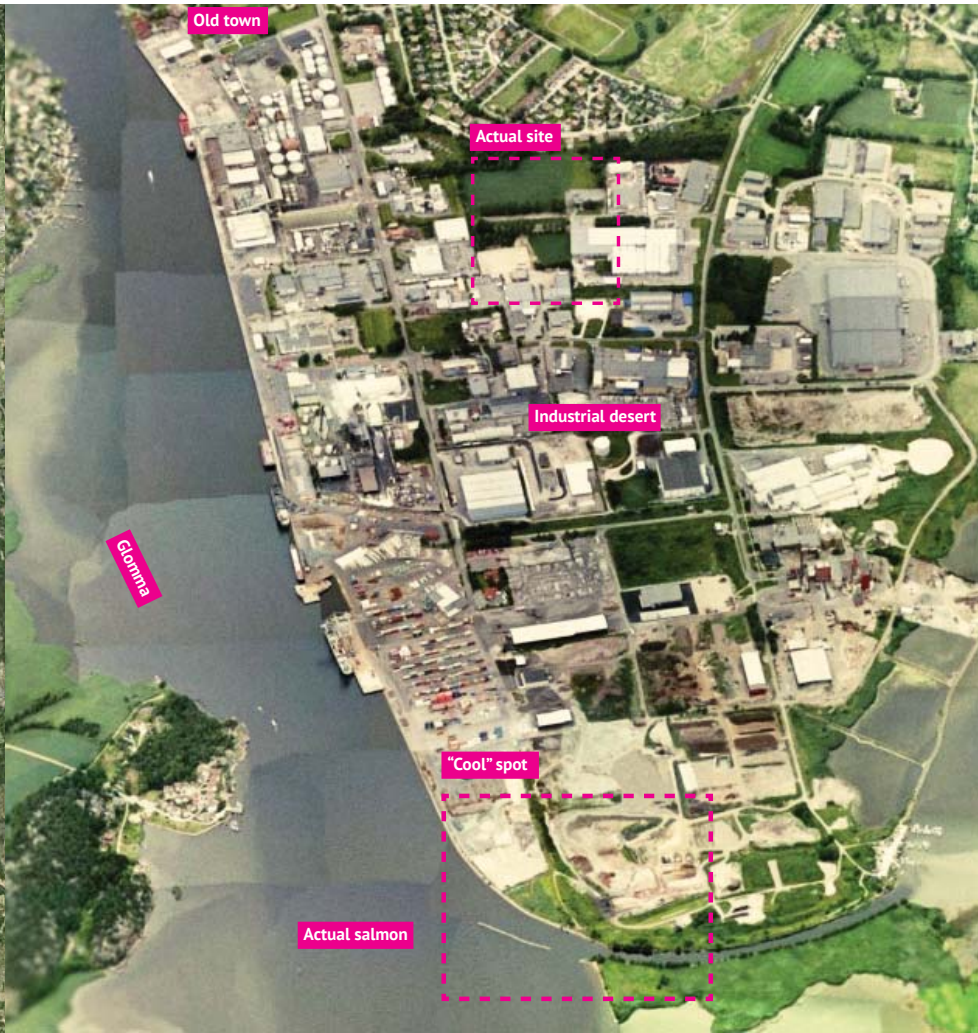
Er norsk lakseoppdrett bærekraftig?

Norsk oppdrettslaks er et økonomisk eventyr som skaper mange arbeidsplasser. Myndighetene forteller oss at dette er en bærekraftig virksomhet. Hellstrøm besøker kokkekolleger i Europa og snikker pent om Salmalaksen. Eksporten av oppdrettslaks øker i volum for hvert år og er blitt en milliardindustri.



Vi kan også lese at hvert 3. anlegg i Norge sliter med lakselus. Hundretusener av laks rammer i året. Fiskeriministeren vil fryse nivået på botene for ramming. Villaksen står i fare for å bli utryddet. WWF truer med å sette norsk oppdrettslaks på sin rødliste. Ordføreren i landets største laksekommune mener: - oppdrett er viktigere enn villaksen.

A fish farm in Slemmestad would mean a direct way to introduce a sustainable alternative in the infected salmon farming debate.

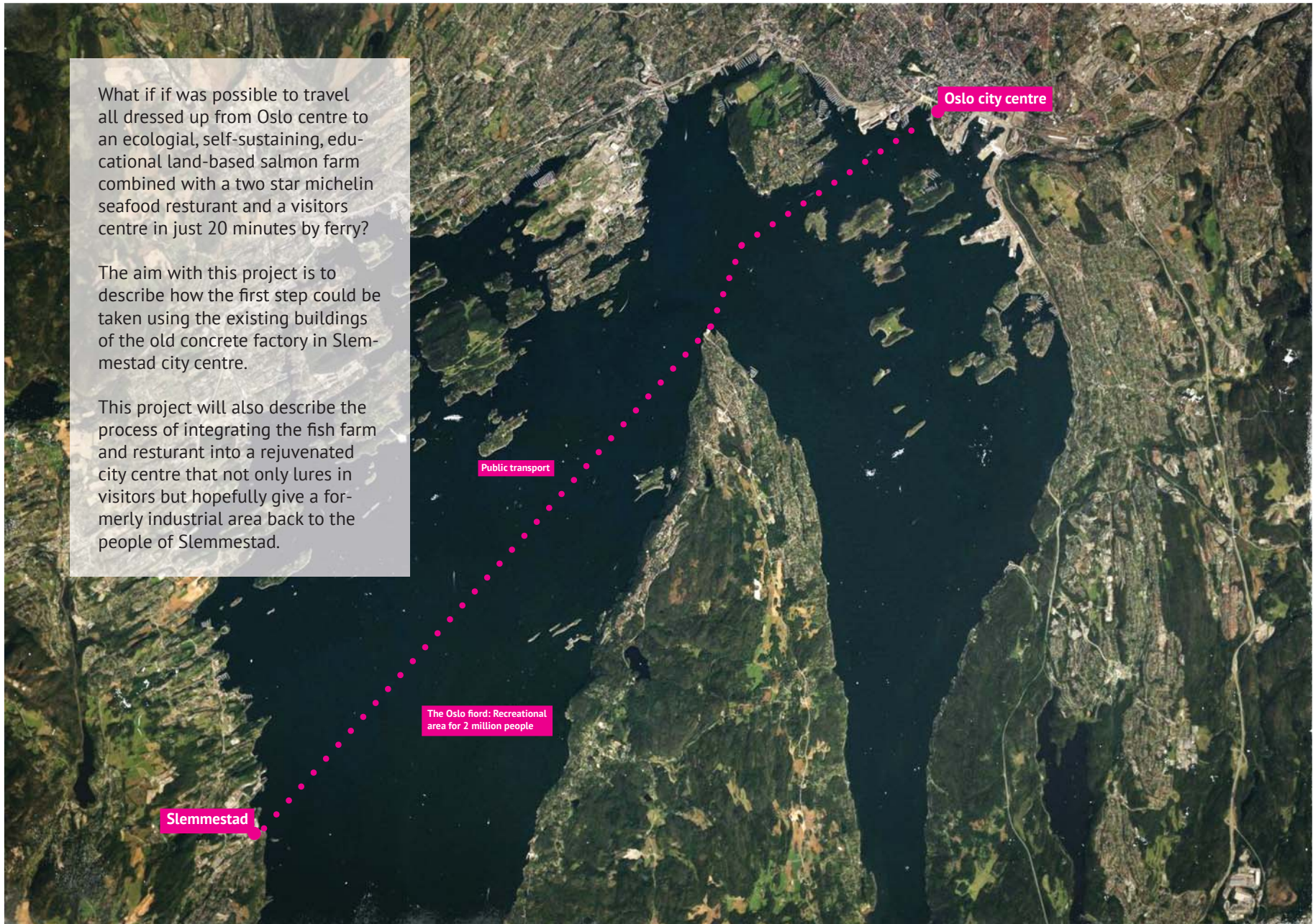


Hvaler area

What if it was possible to travel all dressed up from Oslo centre to an ecological, self-sustaining, educational land-based salmon farm combined with a two star michelin seafood restaurant and a visitors centre in just 20 minutes by ferry?

The aim with this project is to describe how the first step could be taken using the existing buildings of the old concrete factory in Slemmestad city centre.

This project will also describe the process of integrating the fish farm and restaurant into a rejuvenated city centre that not only lures in visitors but hopefully give a formerly industrial area back to the people of Slemmestad.



Slemmestad Concrete plant

Site research.





Old factory towers 16x72 meters.

- Land-based salmon farm
- Experimental sea farm
- Visitors centre
- Public park/entrance area
- Rooftop restaurant
- Helipad connection

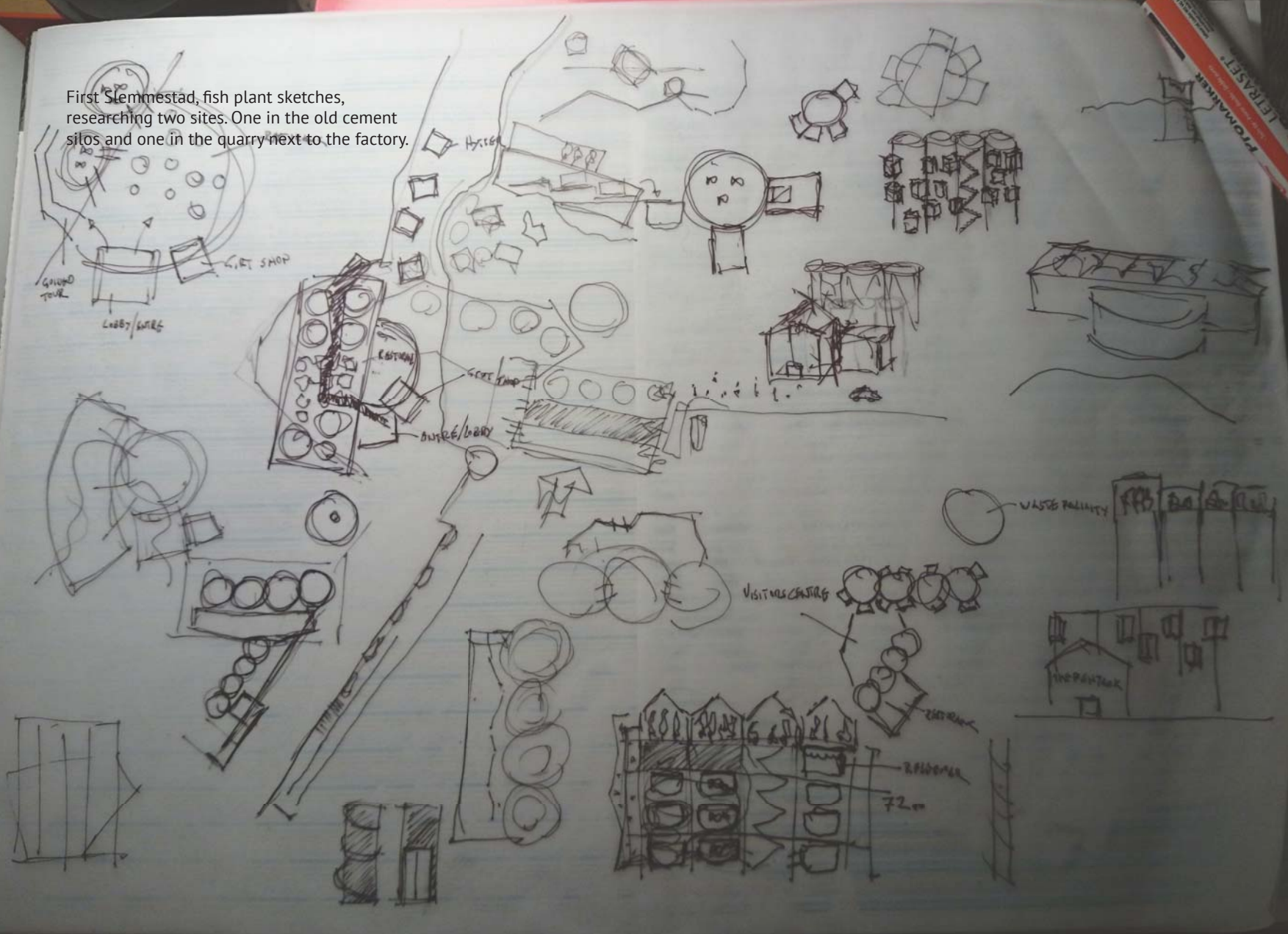




If all production is halted, can the factory be used for different projects?



First Slemmestad, fish plant sketches,
researching two sites. One in the old cement
silos and one in the quarry next to the factory.



The quarry

Moving out of the old factory and into the quarry. Could both productions be combined? Or does Nordcem have to move in order for Slemmestad to be allowed development?



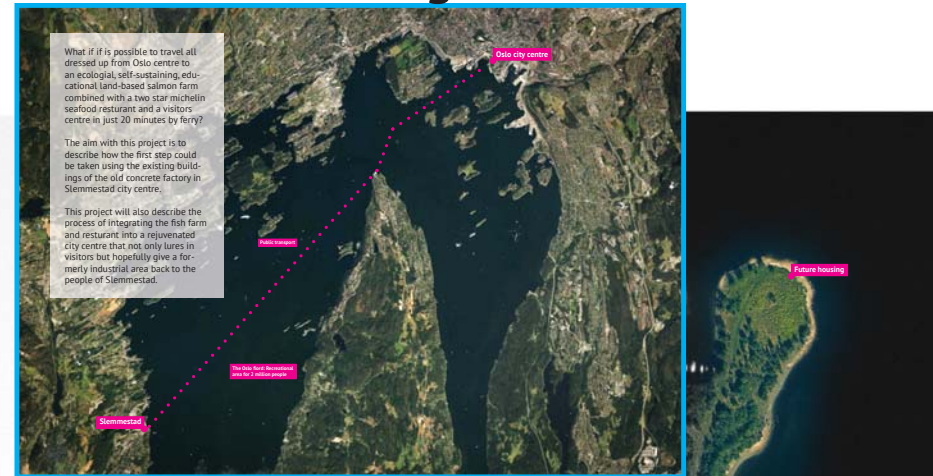
If the factory moves, by CF Möller.



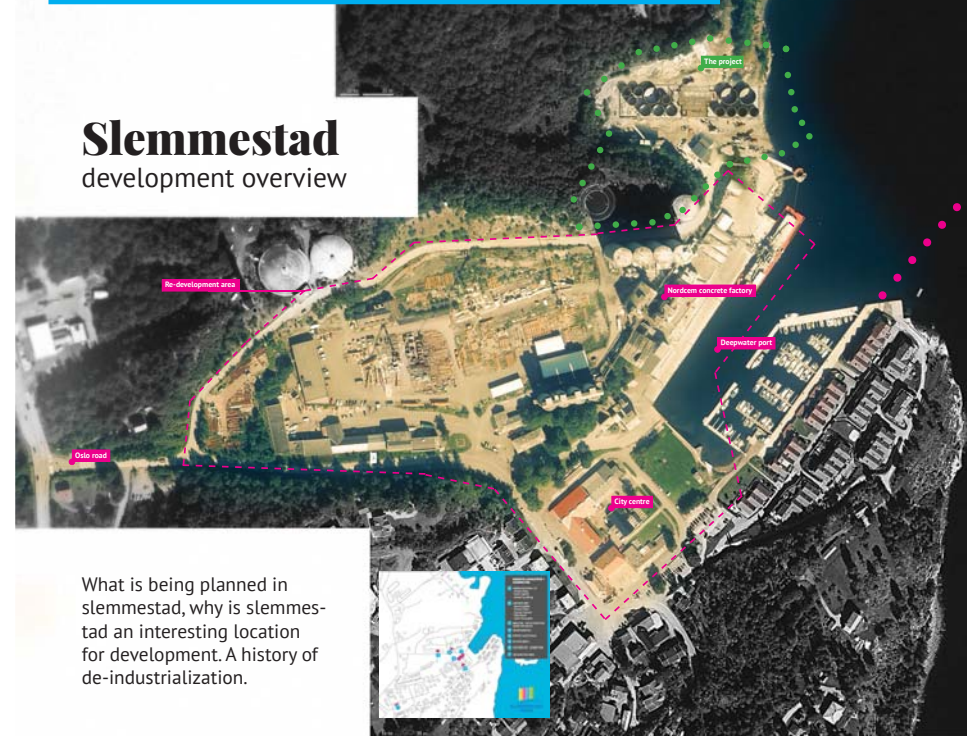
Skyscraper by Snohetta.

Intro poster explaining the new context of the project

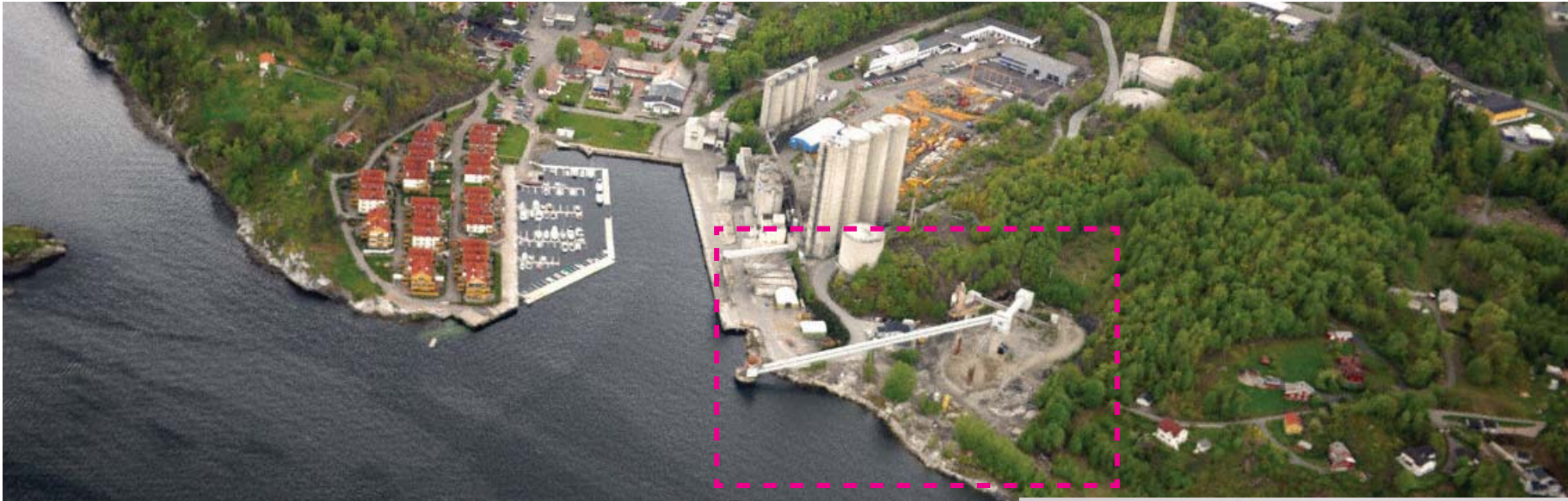
Oslo fiord background



Slemmestad development overview

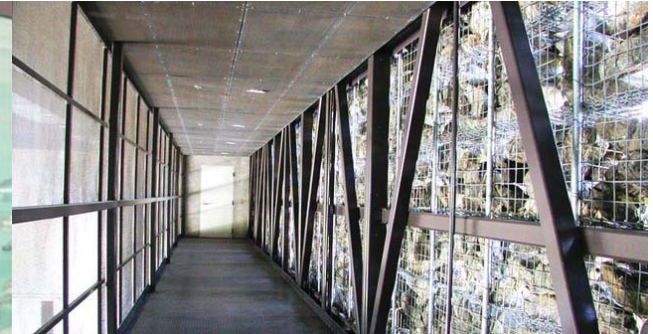


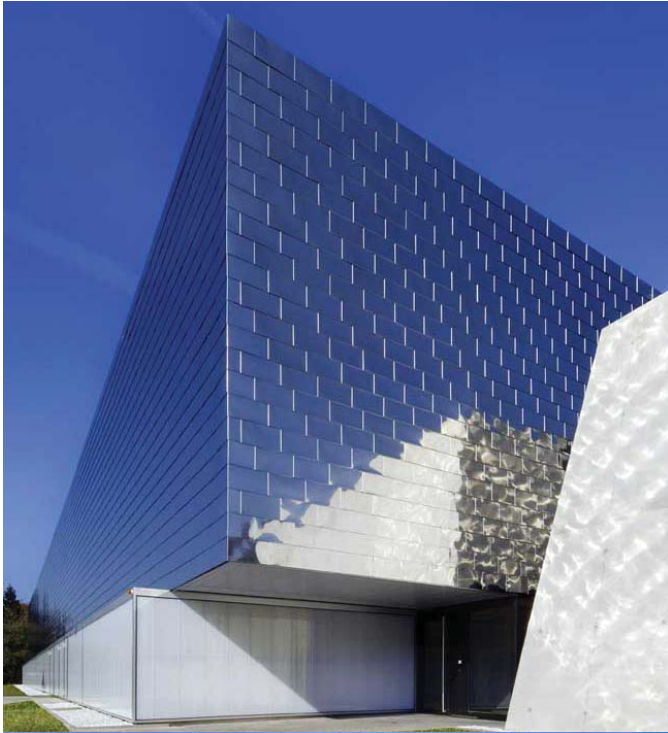
What is being planned in slemmestad, why is slemmestad an interesting location for development. A history of de-industrialization.



Visitors centre

Reference images.





The main site

Explaining the starting point of the project.

The first version of the plant in the old limestone quarry north of the concrete plant.

This image has the site occupied by the langsand



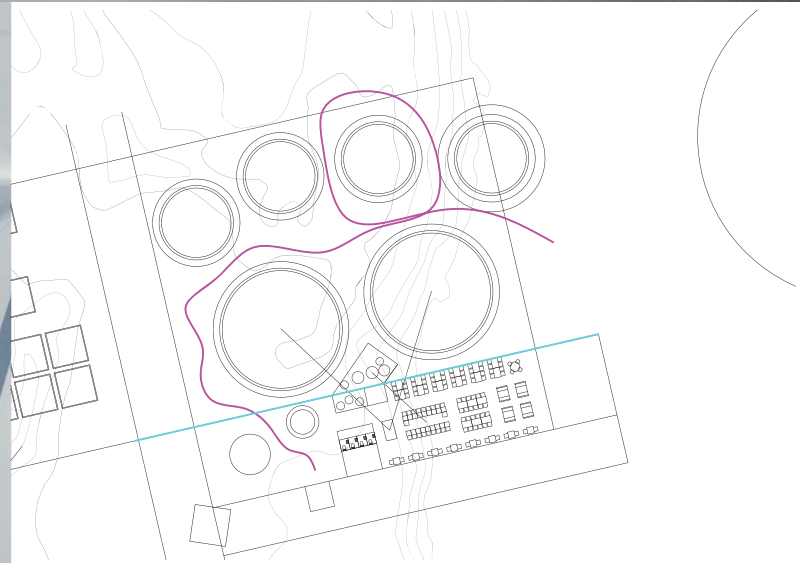
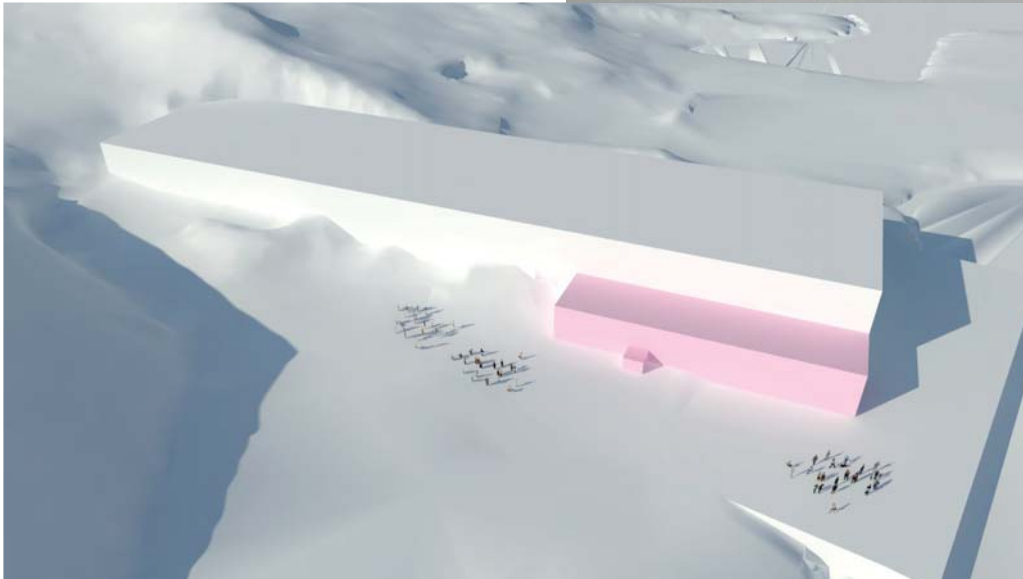
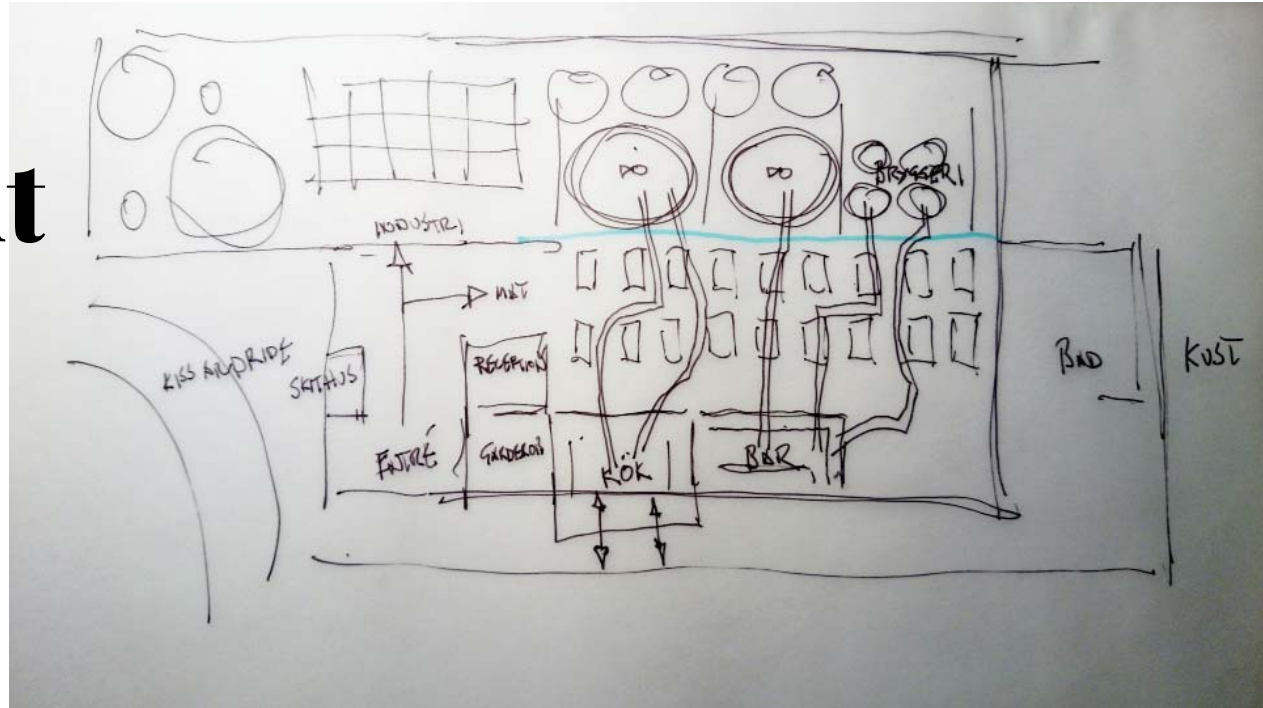
Restaurant

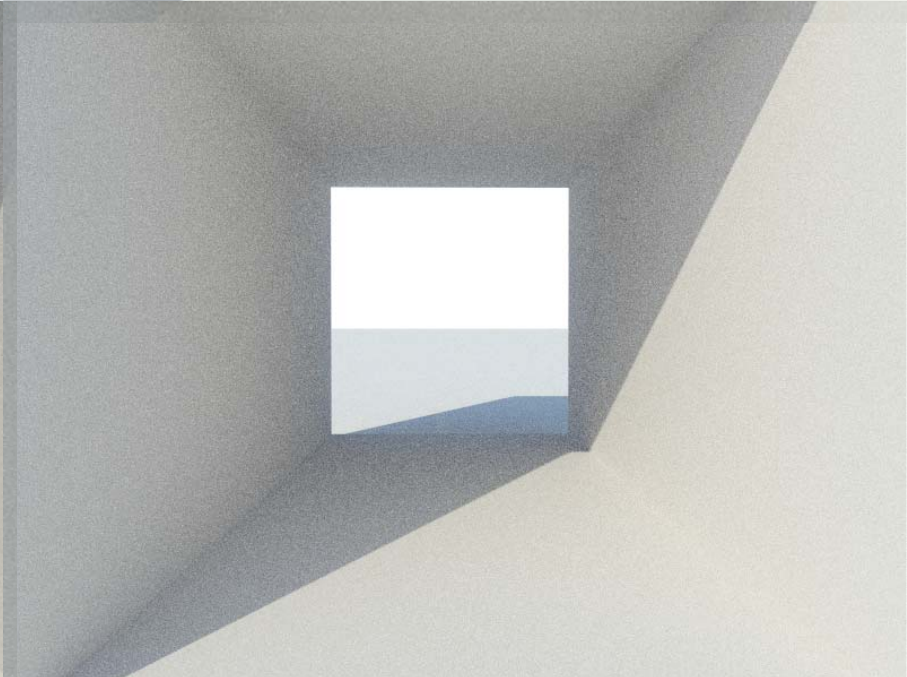
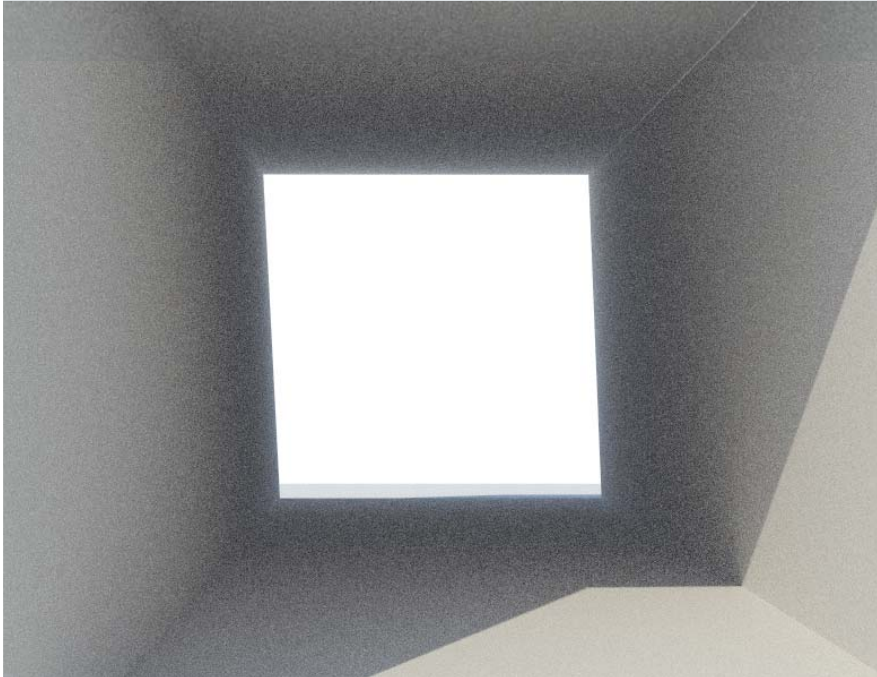
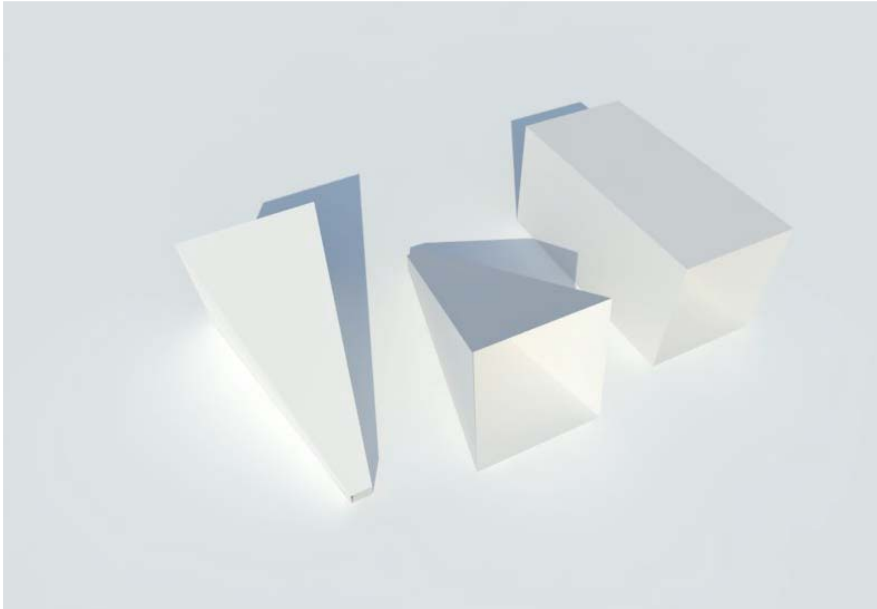
Reference images.



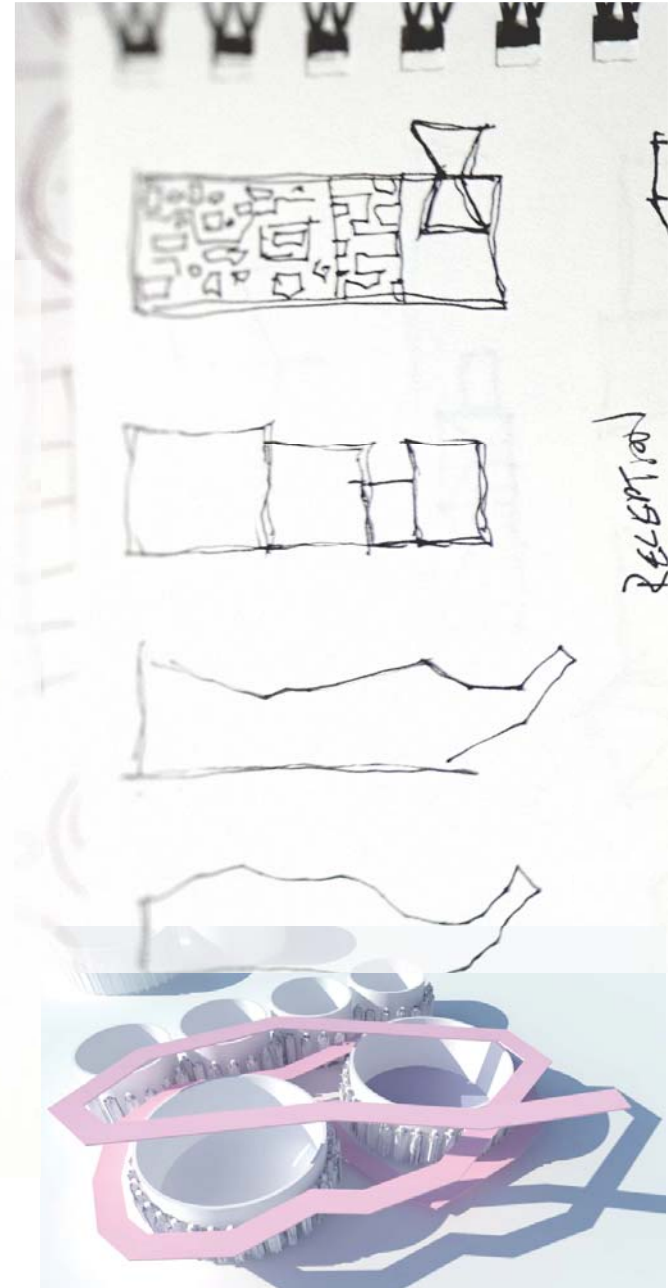
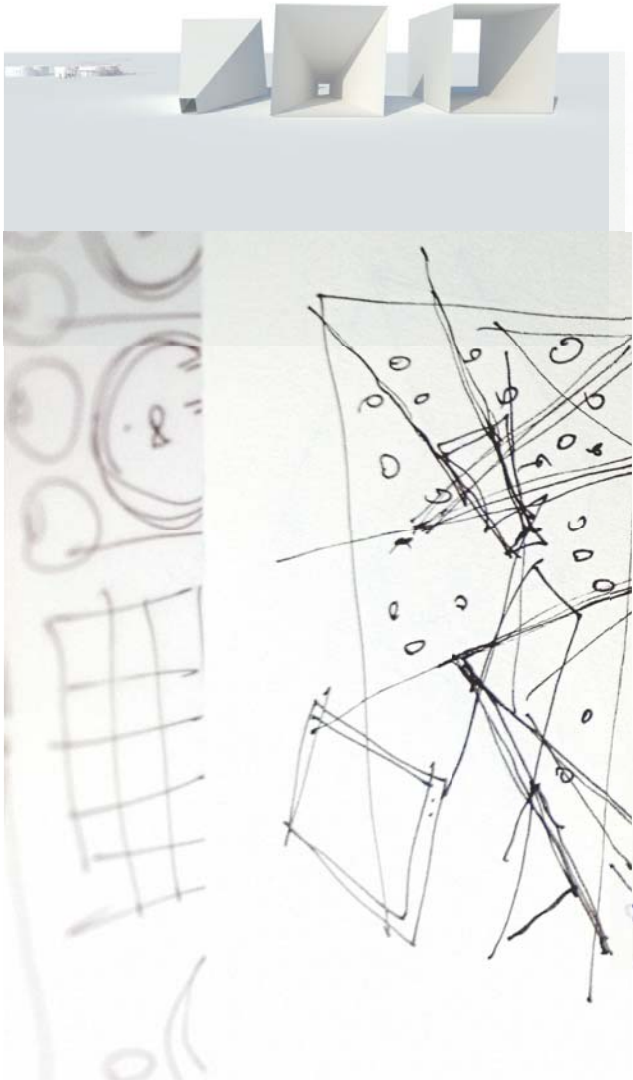
In the cut

Between production and consumption.
Between industry and architecture.





Sketches on quarry site, new visitors centre and restaurant.

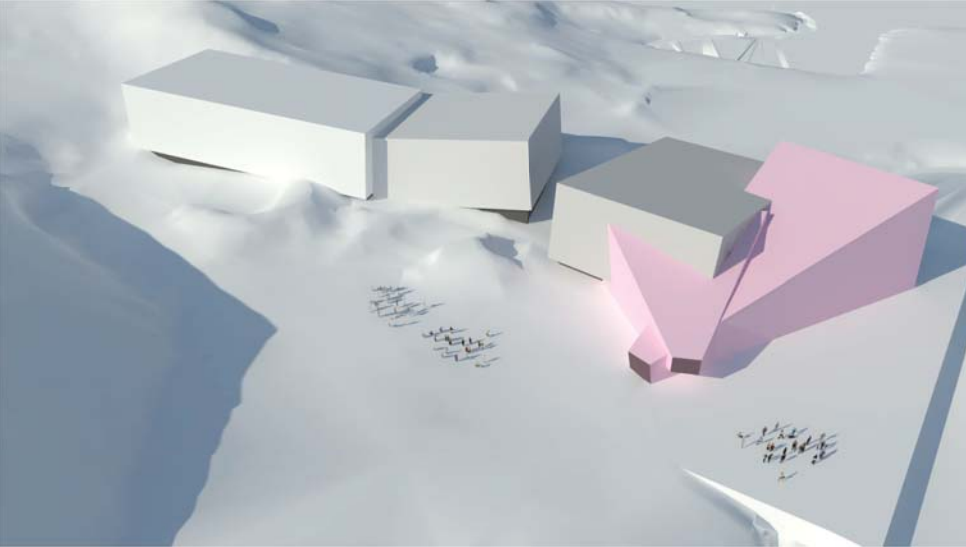


Angles

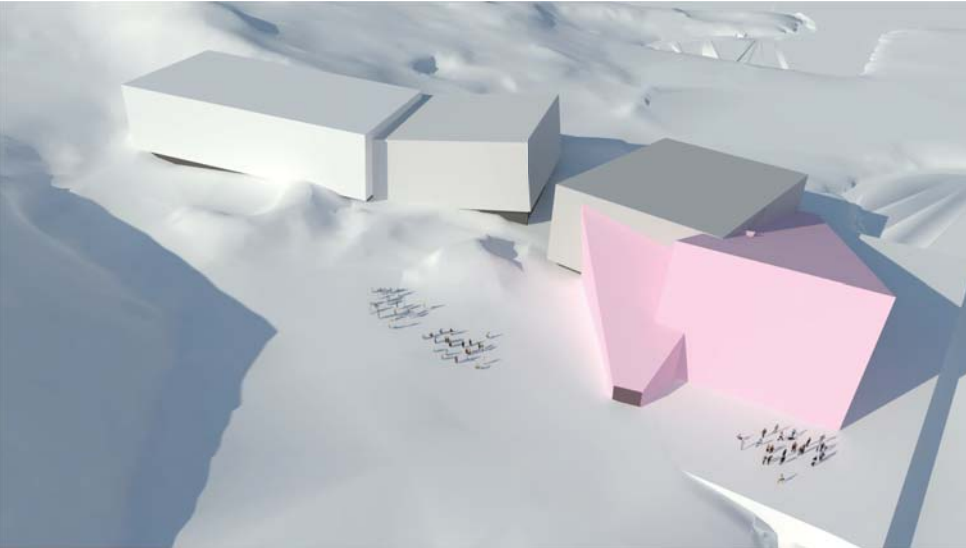


Volumes

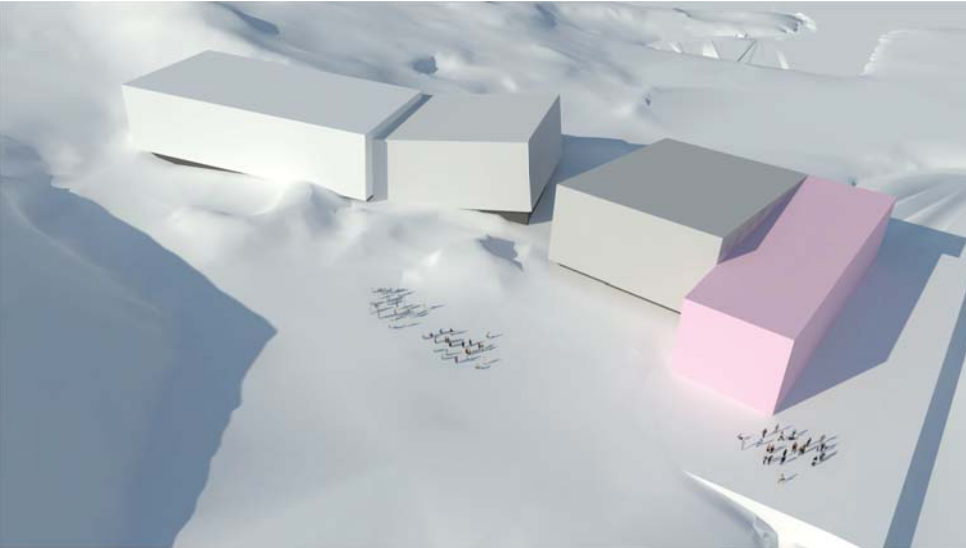
Funnels 1



Funnels 2

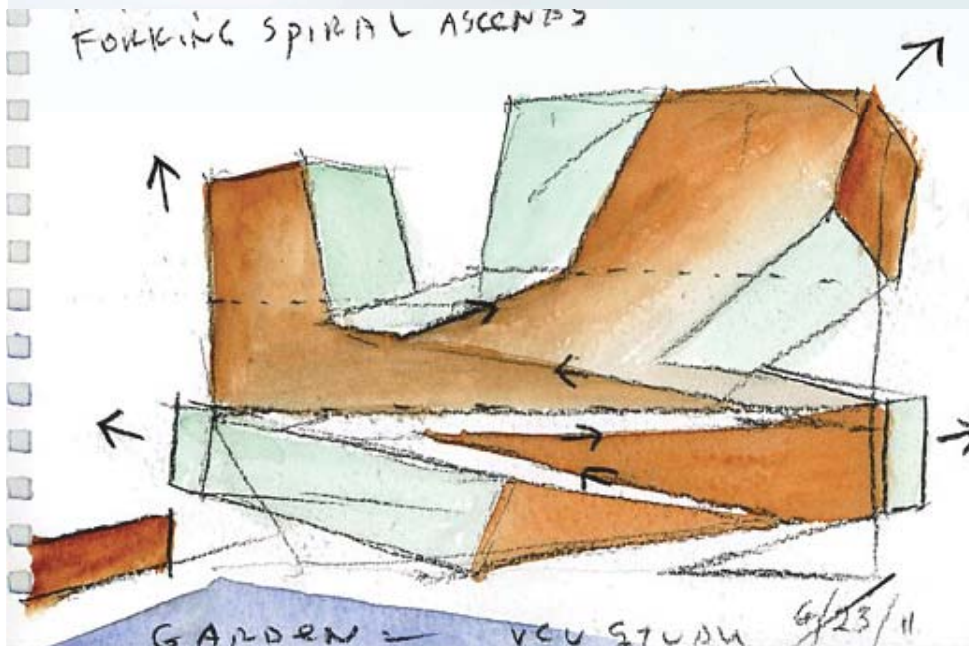
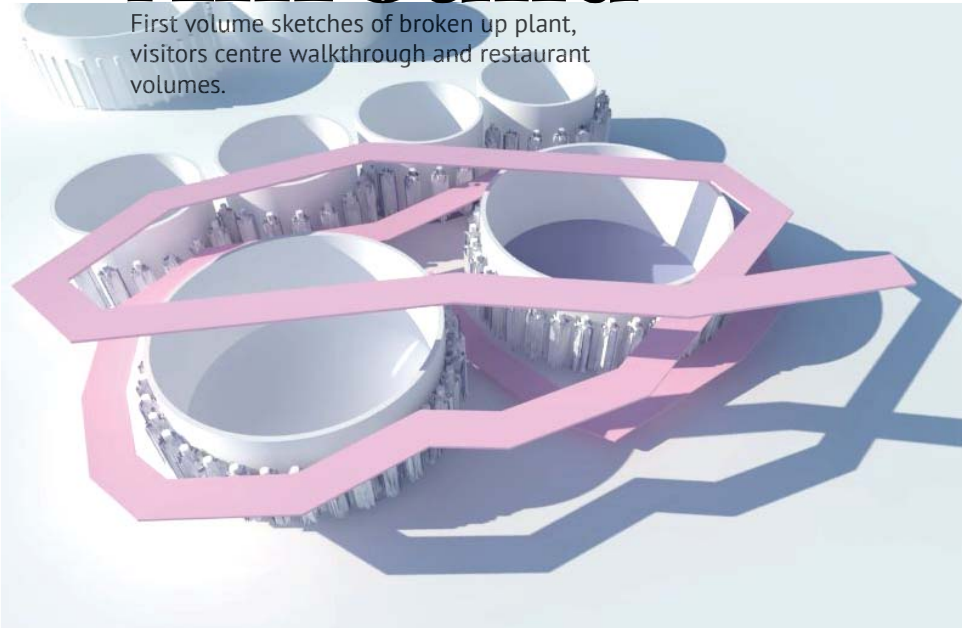


Block



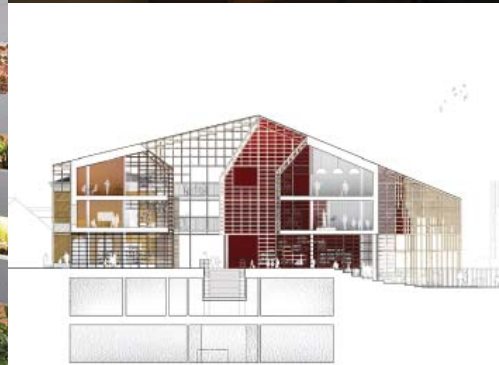
Allround

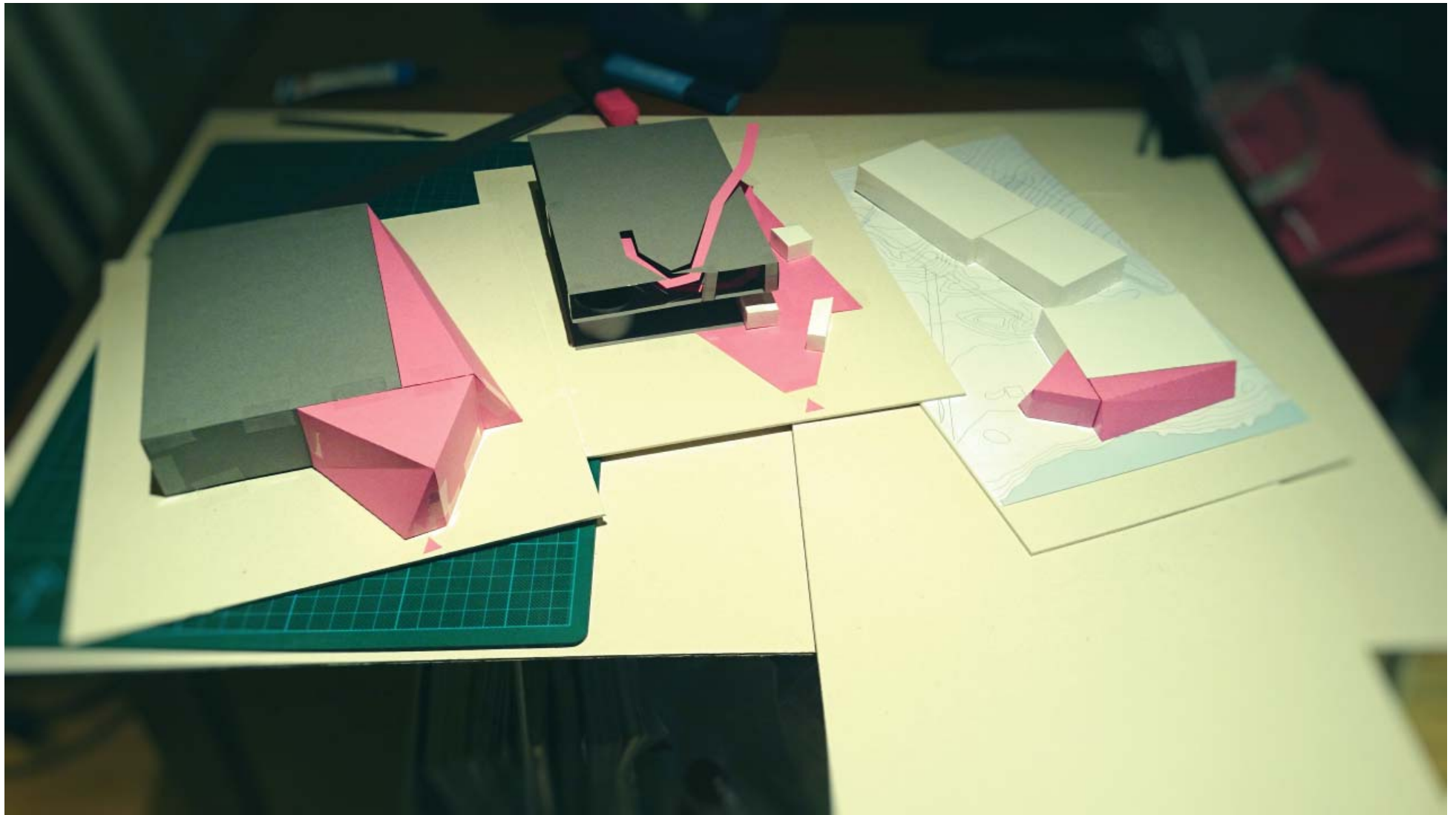
First volume sketches of broken up plant, visitors centre walkthrough and restaurant volumes.



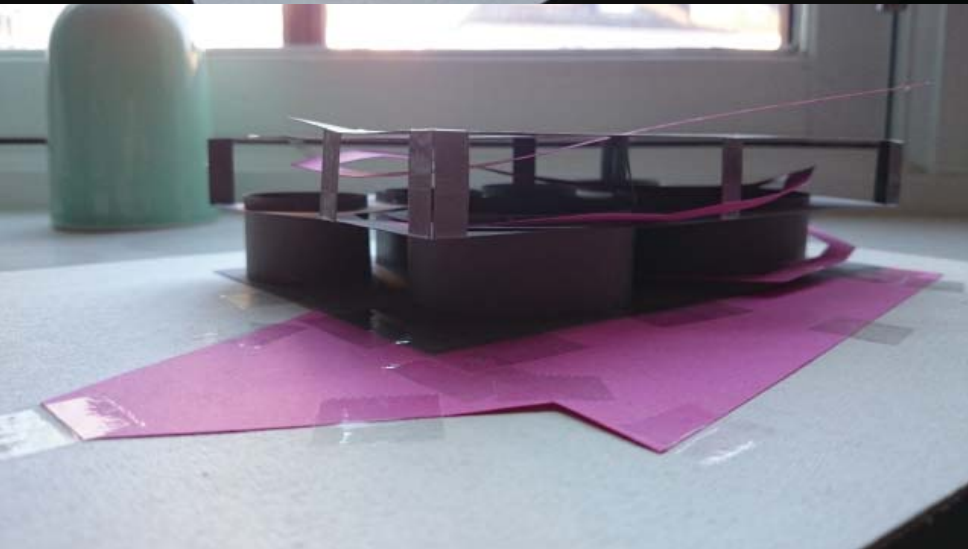
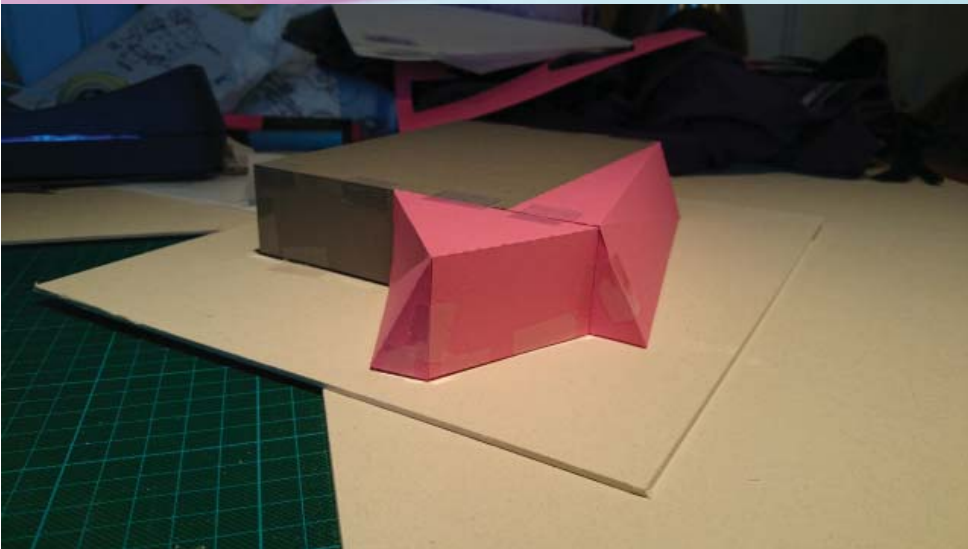
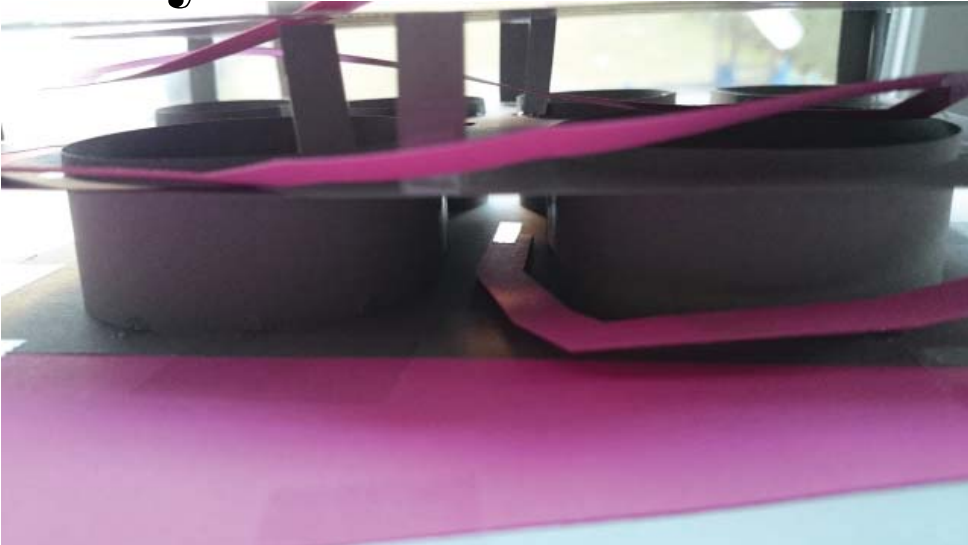
Connections

Adaptions of the surroundings.

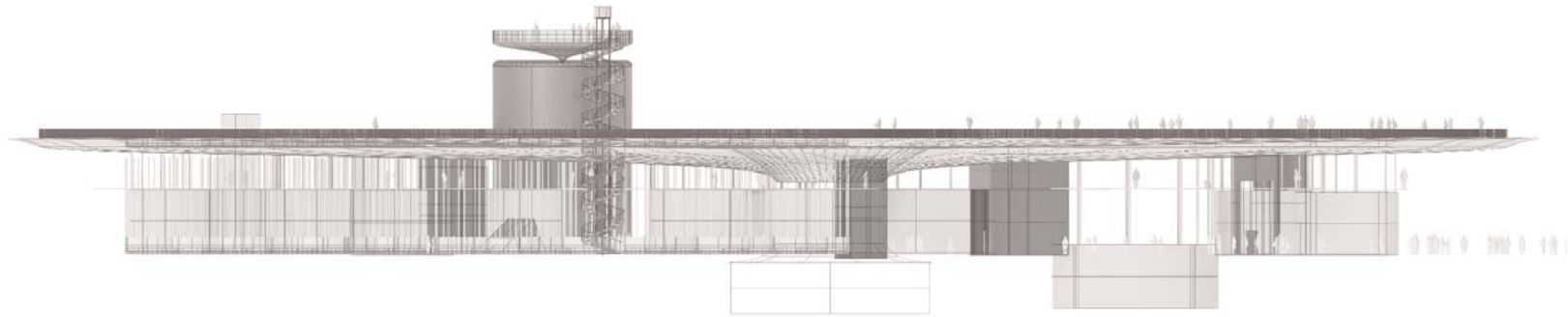




Early models

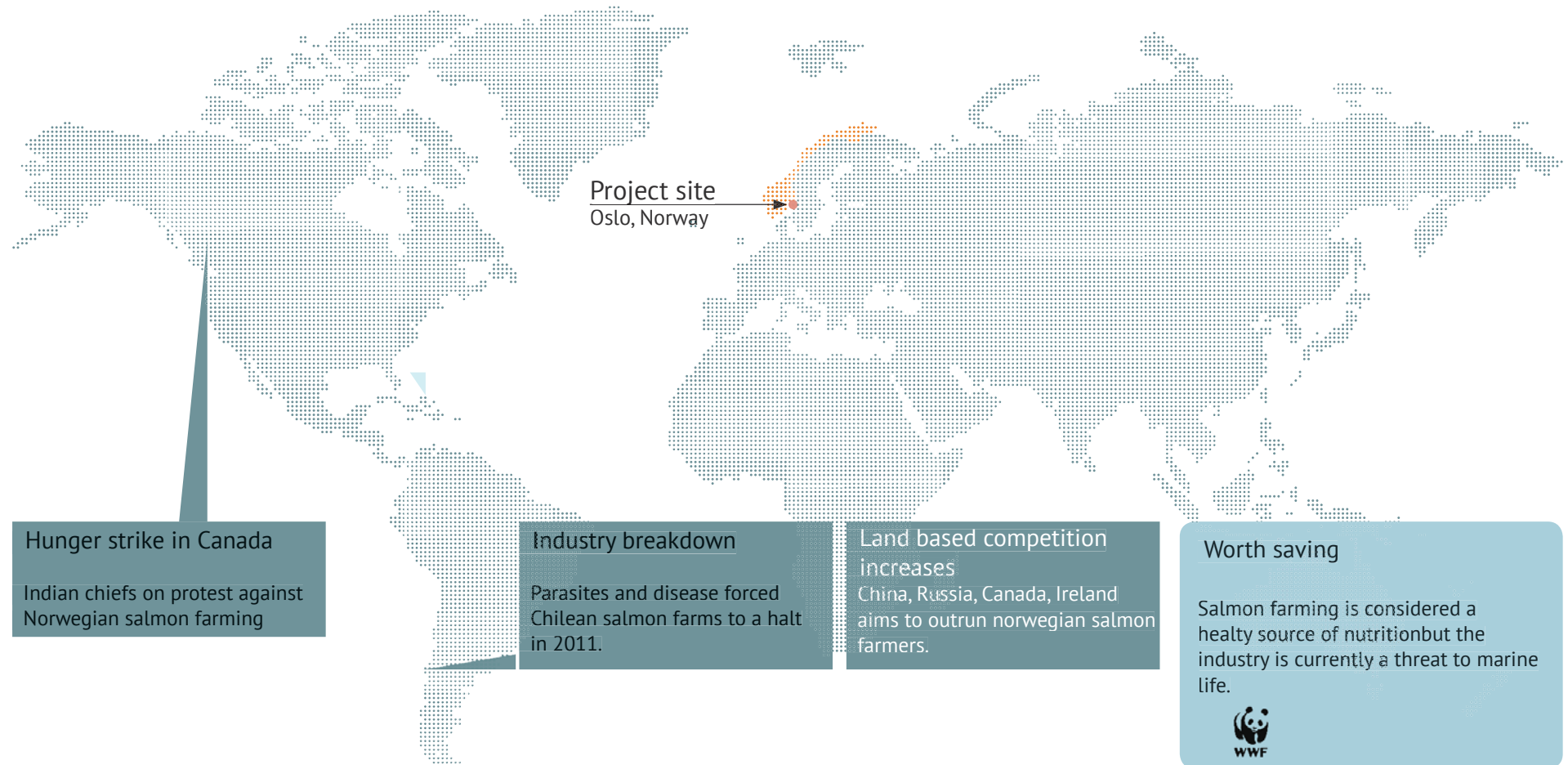


Salmon off the grid

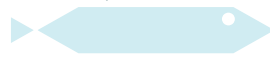


Presentation

Global challenges



The first fish on land



Save the ocean - save the industry

Current method hard to control/contain

Open net cages used for salmon farming. Parasites are free to spread between cages and fish escape.

Industry in rapid growth

Open cage size increase 1970-2010
Diameter/Depth

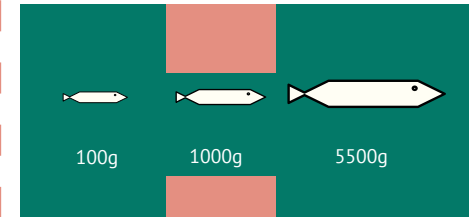
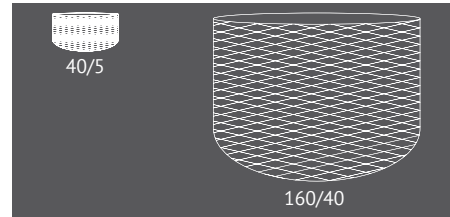
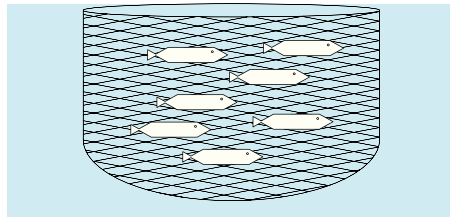
Louse threatens wild and farmed salmon.

Farmed salmon outnumbers wild salmon 1000-1

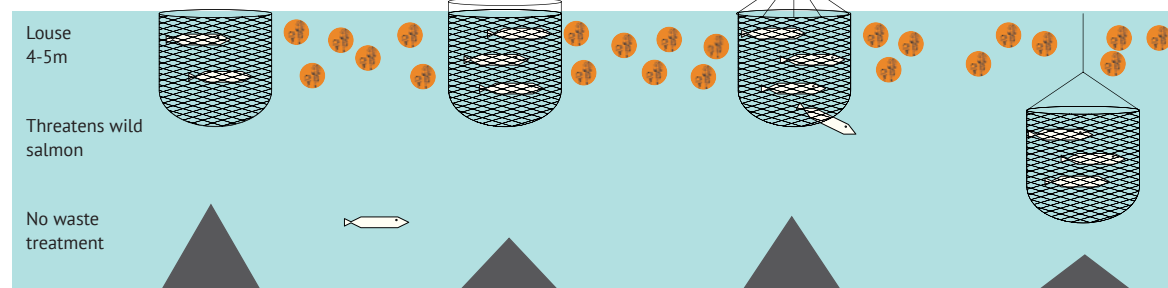
Future methods

From smolt to adult

Adding a step before planting fish in net cages vastly decreases mortality rates.



Current cages



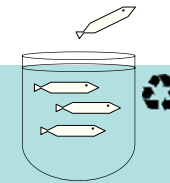
Parasites
Escape
Waste

Fence
Vulnerable to storms
Waste.

Tent still
Vulnerable to storms
Cages breaking
Waste.

Submerged cage.
Avoids parasites.
Waste.

Future methods



Closed cage,
avoids parasites, treats waste.
Vulnerable to storms



Land based farms.
Complete control
Heavy investment
Coming strong
Sustainable

Norway

Current issues

Norway's third biggest export

Oil, tourism, and salmon.
The current salmon farming industry threatens two of them.



The Salmon, Norway's panda.

The salmon truly has become a threatened symbol and said to have the same importance for norwegian food culture as the tuna has in Japan.



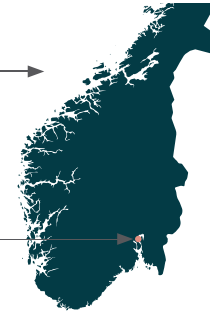
Current pioneers

The Langsand salmon farm

A danish company has pioneered a comparatively small, land based, salmon farm that will produce 3600 tonnes of salmon per year.



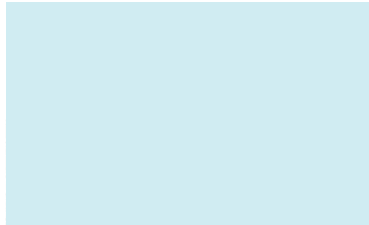
Challenges



Project site
Stemmestad
Oslo region

The ongoing media debate (2015)

The industry is reluctant to change;
The scientists sound the alarm; The industry is threatend to be outrun by competing nations.



Keep it wild

Greenpeace is demonstrating against the poorly regulated salmon farming on the northern coast of USA.



The salmon farm in Fredrikstad

Fredrikstad seafoods are currently pushing construction of a land based salmon farm near Oslo.
- Could the idea be made more flexible?

Fredrikstad kan bli en pioner i ny fiskerinæring

Et ekspertutvalg anbefaler regjeringen å si ja til lakseoppdrett på land uten antallsbegrensning og vedetlag – Positivt også for oss, sier Erik Heim.



The urban food aquarium

A land based salmon farm could very well be placed anywhere in the world. However closeness to water is prefferable, other than that, we have a factory that can live in the middle of any city!



The industry already likes showing off

There already is 15 salmon farm (sea farms) visitors centres in Norway, why not show one that really is the future in a human environment?



The healthy choice?

The ocean side of salmon farming is surrounded by controversy regarding nutritional values of actual produce. Constant poison alarms could easily be controlled before they ever arose in a land based farm.



Tried and tested off the grid techniques

While previously used mostly on more resilient fish like Tilapia, aquaponics works very well in the aid of cleaning the salmon's precious water from nitrates and adds the production of healthy greens on top!



Eat more greens!

For economical reasons, farmed salmon must be fed a strictly vegetarian diet. Current trials with canola is not quite there. Algae on the other hand might prove to be the answer.





Oslo - Slemmestad

4: Bringing it closer to home

All dressed up

The ferry only takes 20 minutes. Capital dwellers can travel all dressed up to a state of the art salmon farm and a high class restaurant.

Oslo

Slemmestad

Why Slemmestad?

Besides favourable location, Slemmestad is the strongest growing city in the Oslo region. Major developments are currently taking place and more is being planned.

Skyscraper

Proposal of a skyscraper to compete with the silos.

The Slemmestad site

5: Orientation - Surroundings - building roof

The Salmon Plant Site

An old quarry currently used as storage and parking lot. An historically important location and the founding reason for Slemmestads location



Redevelopment

Winning proposal to re-develop the city centre from old industry site to modern residential/commercial area.

Concrete silos
70 meters high

Norcem concrete distribution
Only storage and distribution remains of the old concrete plant but it is Norway's biggest plant and an historical landmark.

Ferry landing

Proposal to open the dock

Slemmestad
city centre 5min

Cultural city 2020

Slemmestad will host the title and aims to develop the already rich cultural life in the coming years. That's why the salmon centre needs a cultural scene.

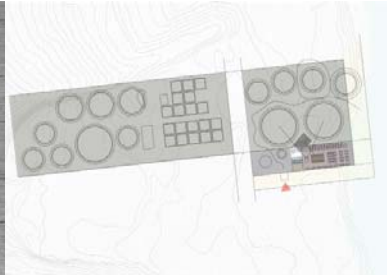


The quarry

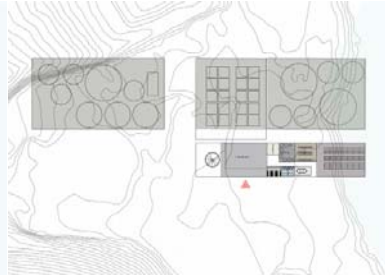
6: Process and siteplan



The old quarry is turned east and proves to hold the perfect conditions for salmon farming and a beach restaurant - cold and dark in the end and a sunny beach in front.



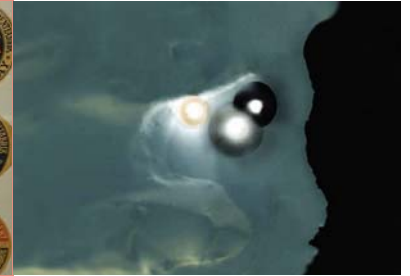
Early studies with the first split in the building to let traffic pass to the proposed skyscraper.



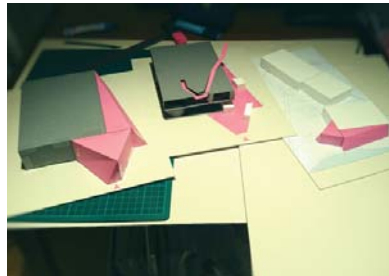
Early sketches with complete outdoor accessibility to the different building functions.



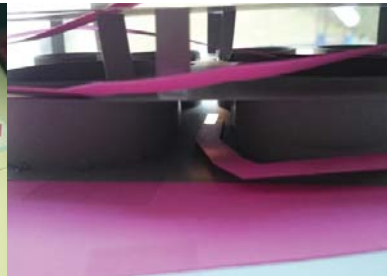
Concrete barrels. Historical images and paraphernalia is currently exhibited at the local library, what would be better than showing it in the actual quarry?



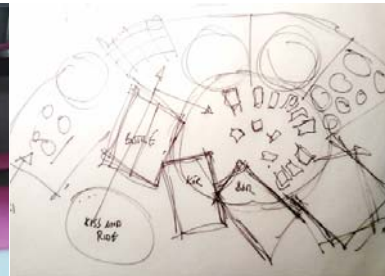
A salmon farm with aquaponics. Let's use it to brighten up the old quarry.



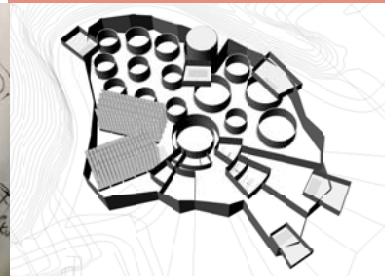
Model sketches where production (rational) and consumption (design) are clearly separated.



A ramp carrying throughout the production facilities from smolt to adult salmon to rooftop view.



Sketches beginning to blur the line and adjusting the building elements to the boundaries of the quarry.



Every element for itself relying on the site and the journey through the building via a set of "lodges" along the sides. Traffic goes behind the building.



The building is stripped of its walls, made available to anybody who passes, the tour remains but in an open version, the tanks create all rooms. The stage is set.



The failed quarry. Originally meant to supply a brick factory but the quality was not satisfactory and the quarry closed down in 1890.



The old quarry, today used as a parking lot. Is there possibly a different use?



When you have an hour to spare in Oslo, why not go to the old dig site in Slemmestad, i hear the food is great!



The legs of the building

Utilizing the outdoor space between the water tanks creates rooms that will house the local historical photo exhibition when the library is relocated.

Artificial lighting

The greens in the aquaponics system demands light. Could it be used to set the mood in the quarry during the darker hours of the year?

In the quarry

This historical place is also cold and dark, the perfect spot for Salmon farming.

Downtown

An old transport road currently is the only way to get to the site by car. This project suggests making the dock a shared space. (this is done in the CF Möller proposal as well)

Up close

On a clear day, it's possible to see Oslo, not to mention the priceless Oslo fiord itself.



Access road (downtown)



Ferry

Footpath. Currently industrial

The grand tour 7: From a visitor's perspective



The roof

Hops for the in-house brewery, fertilized by the fish and algae ponds to feed the fish (the next step from canola). The ponds are also being used as skate rinks during winter since the fiords seldom freeze. And you're standing on top of the anaerobic digester supplying the plant with energy.

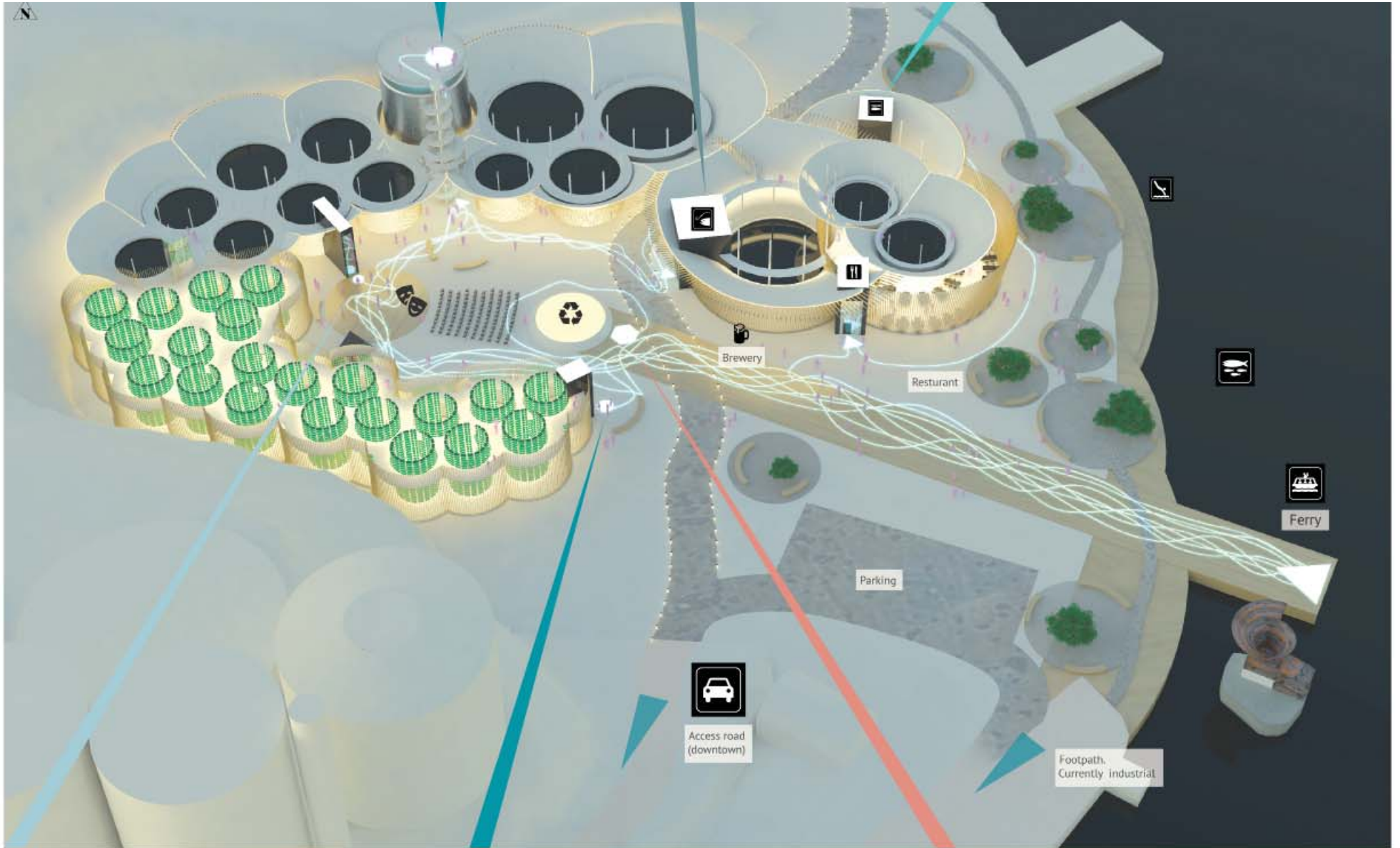
Catch your own salmon (5500g)

After having educated yourself, you might be hungry, go straight to the restaurant or try catching a Salmon yourself hand it over to the chef and get ready for a feast. And, if you're vegetarian, try some of the in-house greens.

Visit the slaughter house

Learn the full process from taking the fish out of the water yourself to slaughter, to quartering and finally ending up on your dinner plate.







Developing Salmon (1000g)

Have a sneak peek into the real life of developing farmed salmon while walking past the photo exhibition and the open stage.

Smolt/Aquaponics (100g)

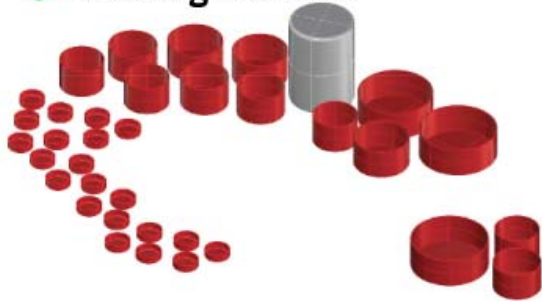
The birth of the Salmon and aquaponics, see the system do its thing live.

The heart

The basement level where pumps, filters and gas turbine is housed. Peek over the edge or take a walk on the glass surface while looking at the sky.

Setting the stage

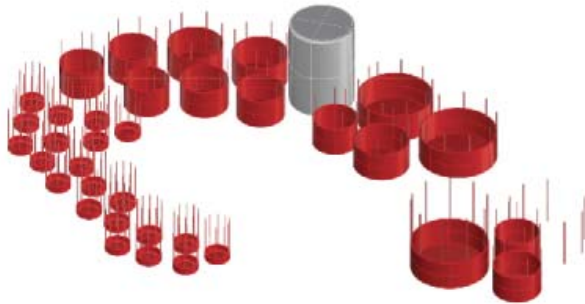
8: Building elements



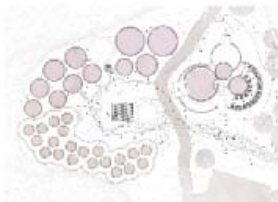
The minimum required industrial volume.
From smolt to adult salmon. Prefabricated tanks/elements 9-16m in diameter for increased stability and insulation.
The water needs to be kept cold and dark to avoid algae



The Langsand farm
The originating dimensions of the Stemmestad farm. Located in Hvide Sande in Denmark, currently up and running.



The main load bearing construction
The latest salmon farm building technique includes using the tanks as load bearing elements, could this be further explored?



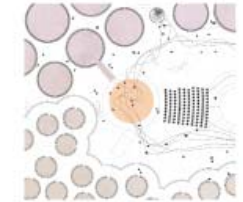
Embrace the site
The construction of the tanks allows for complete freedom when it comes to plan layout.



Outer walls brings lights and sneak peeks
This whole project is about crossing the border between factory/production and cultural entertainment/consumption, tightly packed oak bars lets looks in and light out.



What meets the visitor
No matter where you are moving in the building there is more than one alternate route to explore, while still being easy to comprehend.

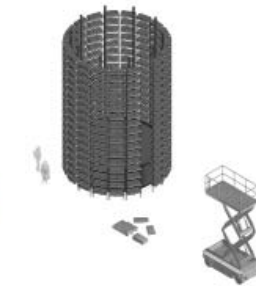


Acoustics
The shape of the walls creates a favourable acoustic space in the center of the building, ready for outdoor concert!



Setting the stage

While the curved outer walls of the bigger "funnels" is used purely as a lighting source the greenhouse provides all year round light from its aquaponics growbeds.



Aquaponics

Provides the farm's restaurant with healthy greens. And the boxes fit on a standard EU pallet.

Design philosophy

The basic salmon tank. Add access bridge. Add fold out screen wall - The plant is building itself!



Off the grid Systems

A set of filter, energy and pump systems known as the heart, the very thing the industry needs to save itself.



Water pumps

Filters

Power units

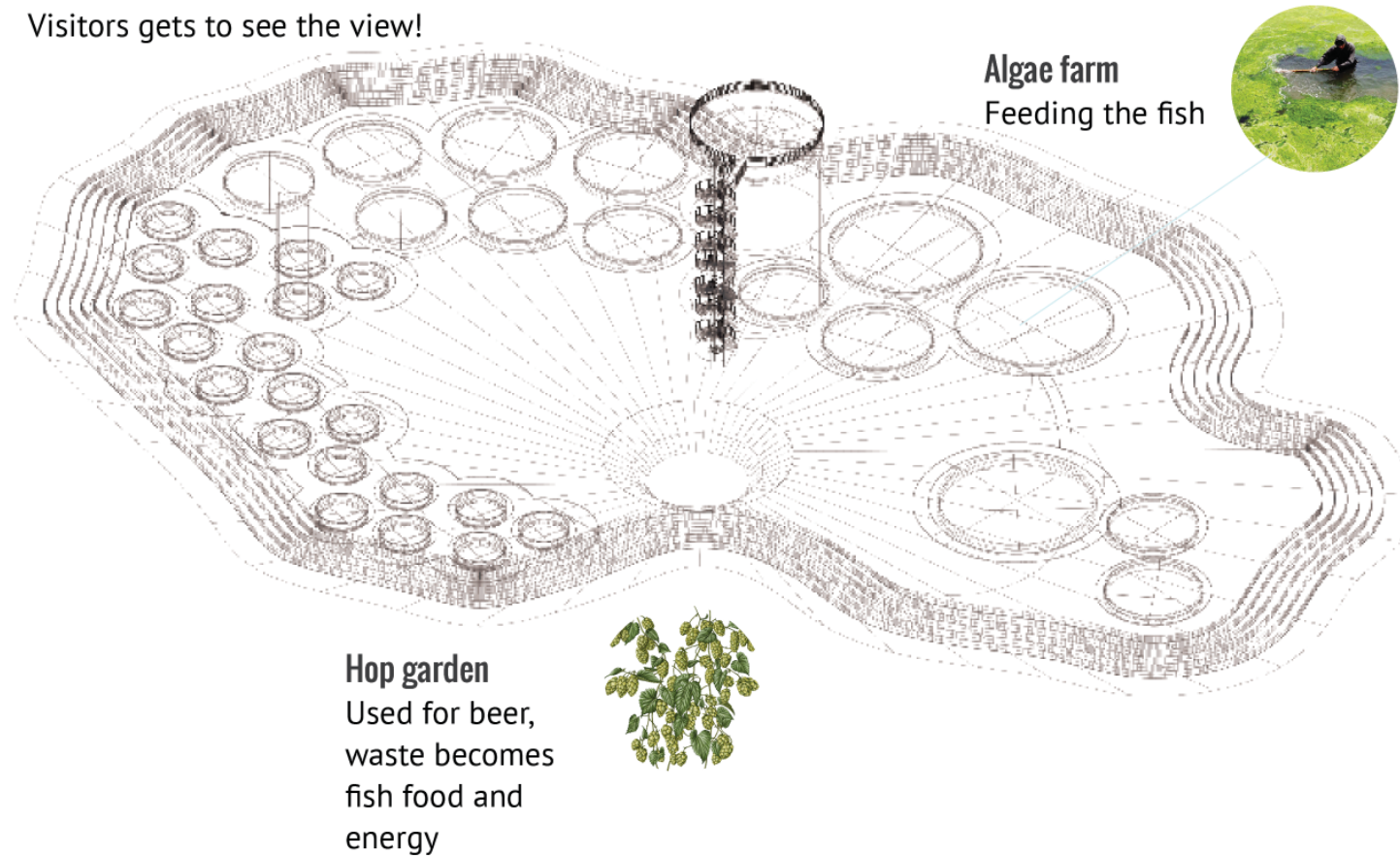
Gas turbine

The building floors

From the bottom up!

The roof

Visitors gets to see the view!

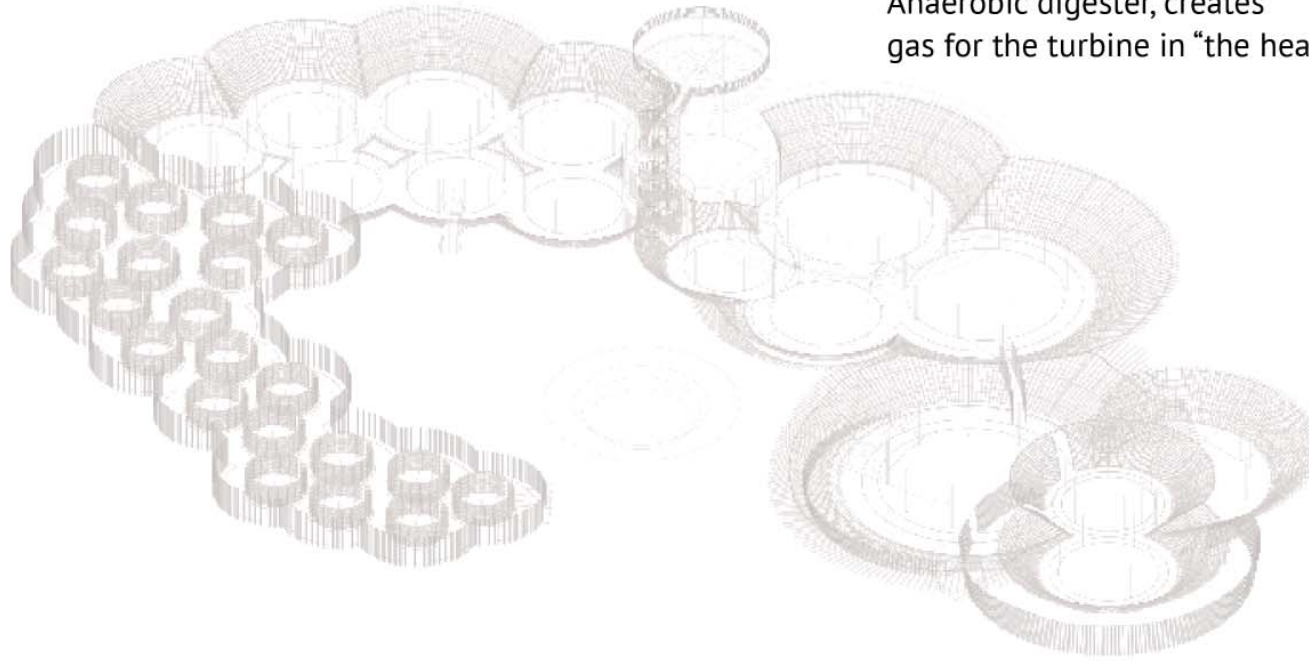


Second floor

Industrial level only, kept in the dark

Waste tower

Anaerobic digester, creates gas for the turbine in “the heart”



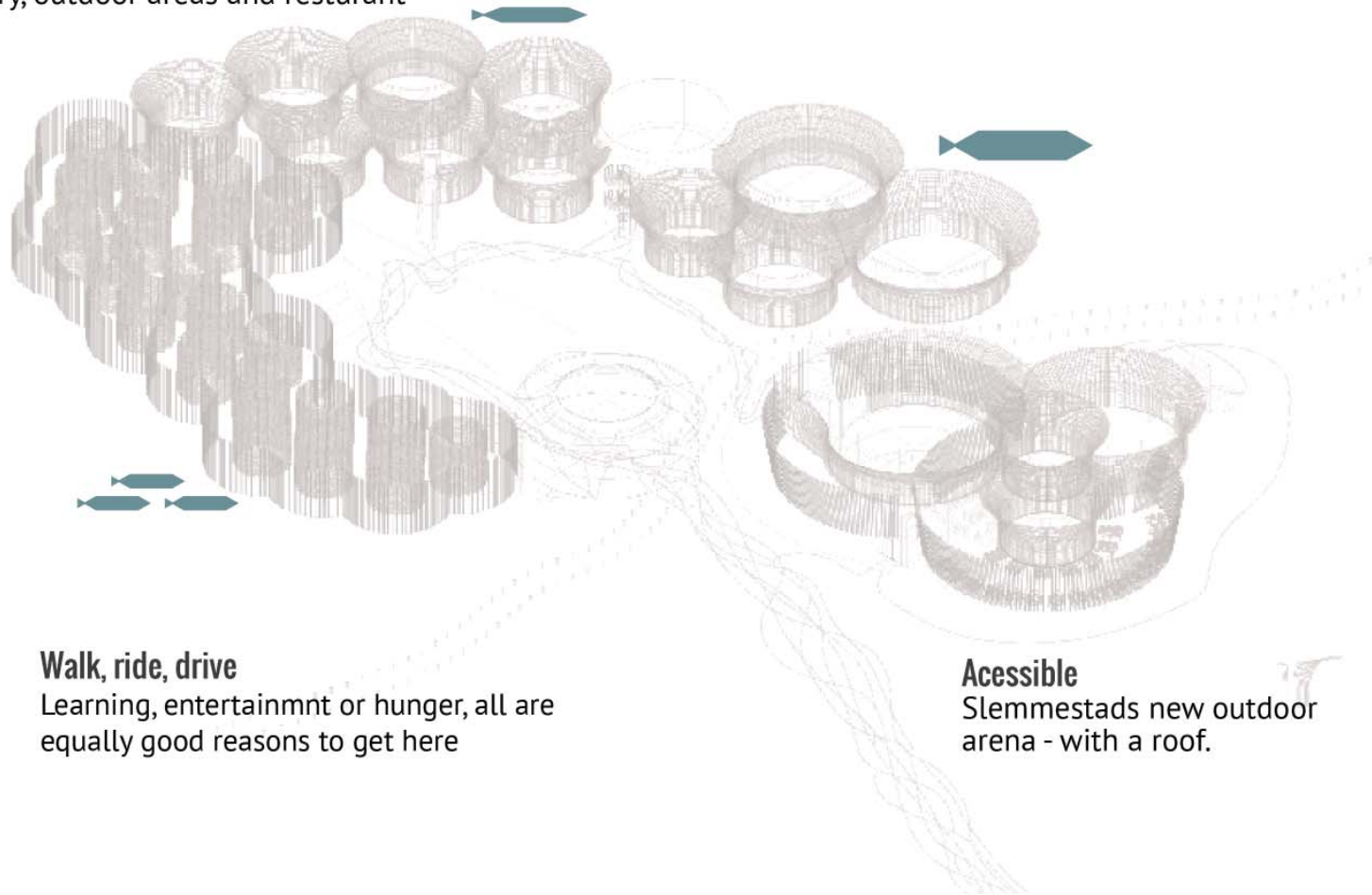
Expensive start - extremely sustainable in the long run.

Creating an off the grid salmon farm is expensive.

What if that was the very reason to do it? Expensive at the start but soon making profit from treating surplus waste, turning it to energy and selling it. All while having the most stable production environment in the world.

Ground floor

factory, outdoor areas and restaurant

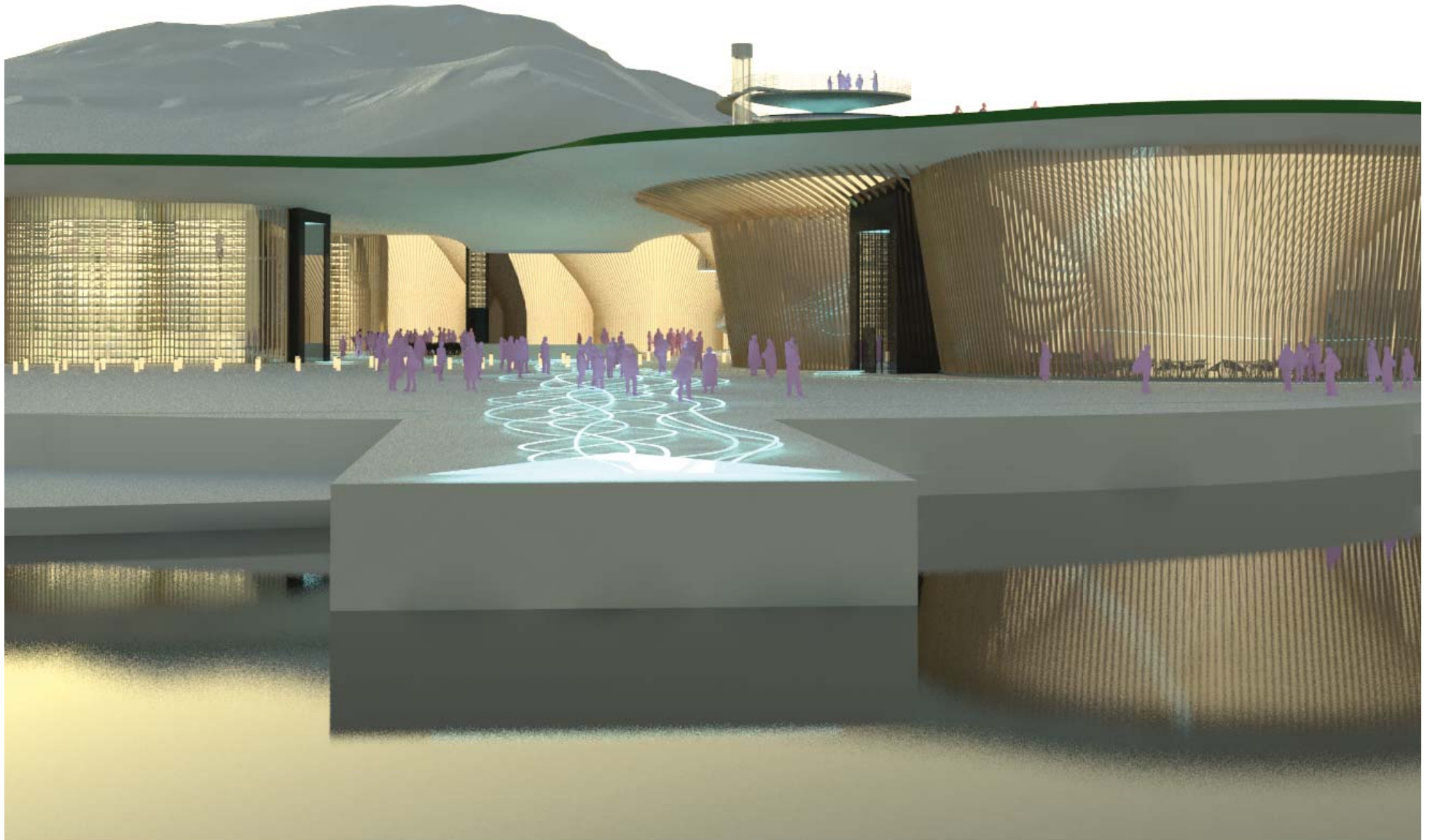


Walk, ride, drive

Learning, entertainment or hunger, all are equally good reasons to get here

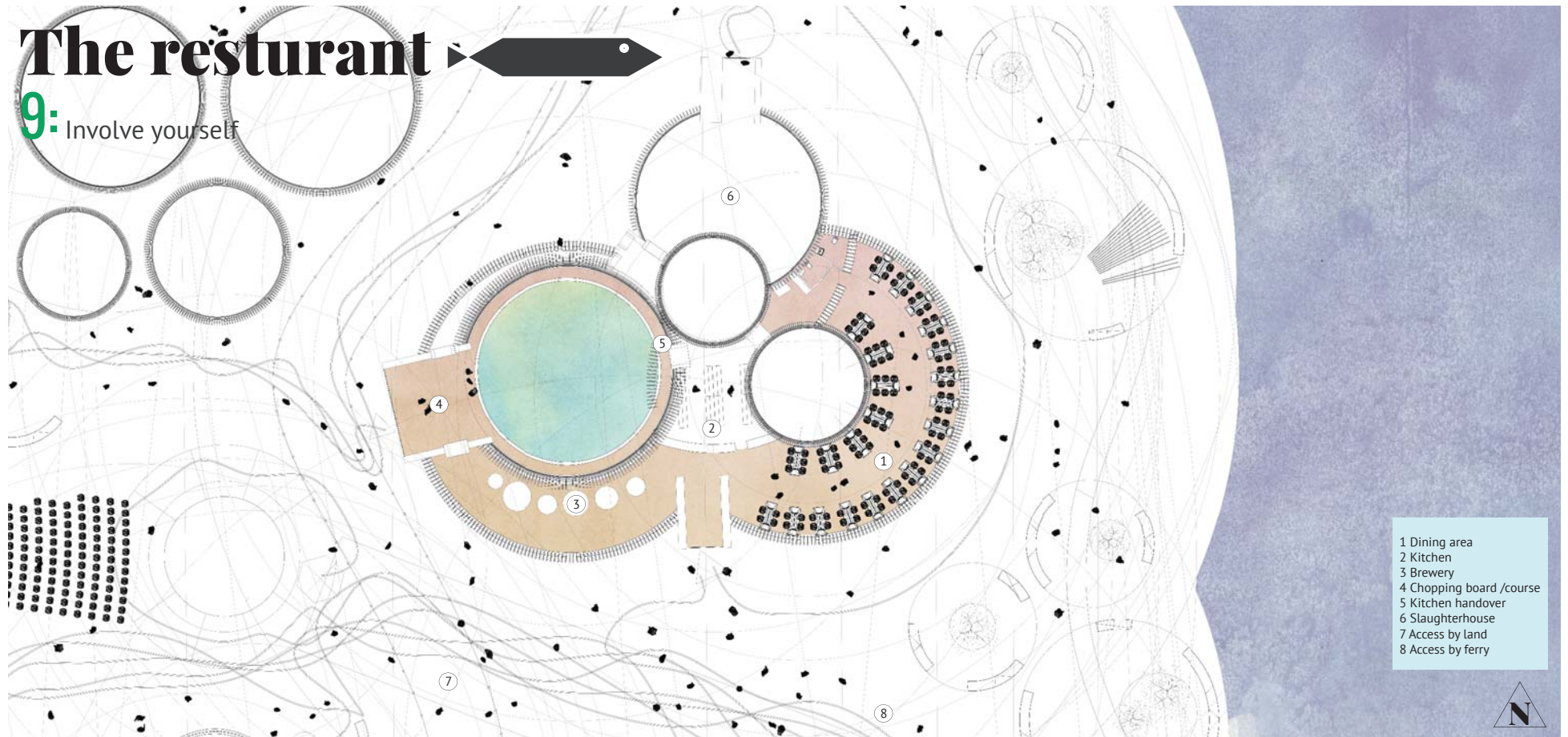
Accessible

Stemmestads new outdoor arena - with a roof.

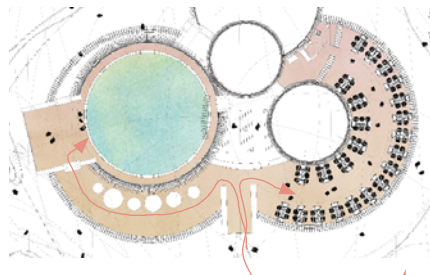


The restaurant

9: Involve yourself

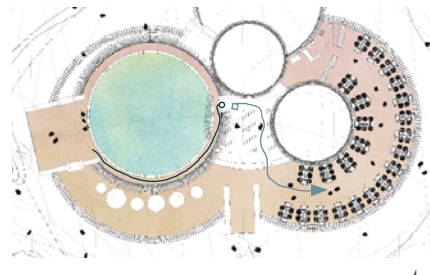


- 1 Dining area
- 2 Kitchen
- 3 Brewery
- 4 Chopping board /course
- 5 Kitchen handover
- 6 Slaughterhouse
- 7 Access by land
- 8 Access by ferry



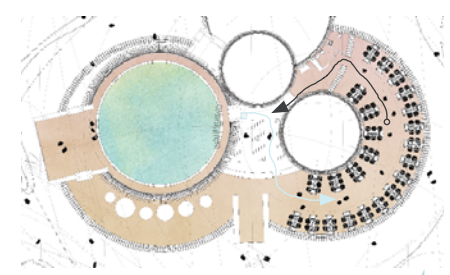
Two choices

Do you want to catch your own salmon, learn how to quarter it or leave it all in the hands of the chefs? Your choice.



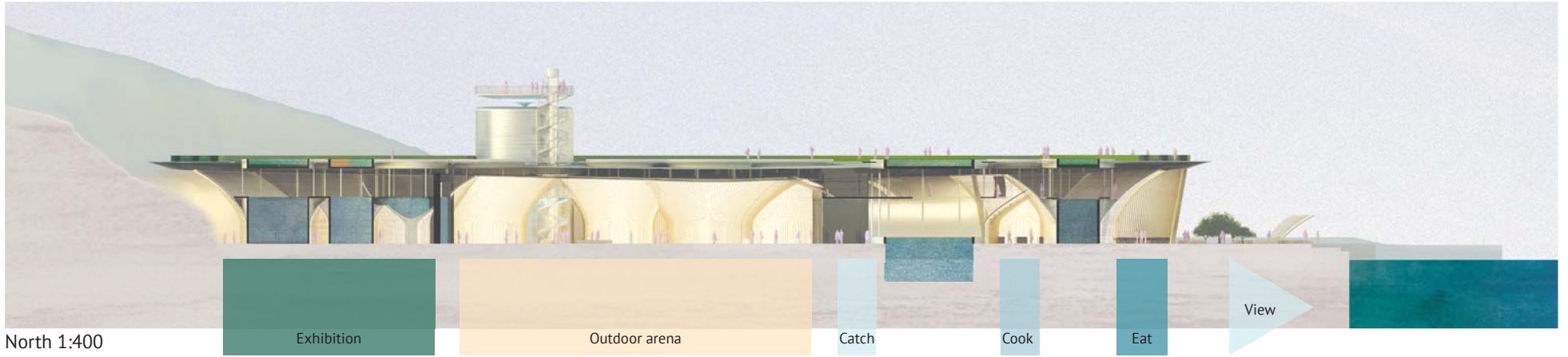
Hand it to the chef

Catch it and hand it over



Clean in, dirty out.

Coming out with clean plates in one place and taking the dirty ones out an other way is just nessecary.



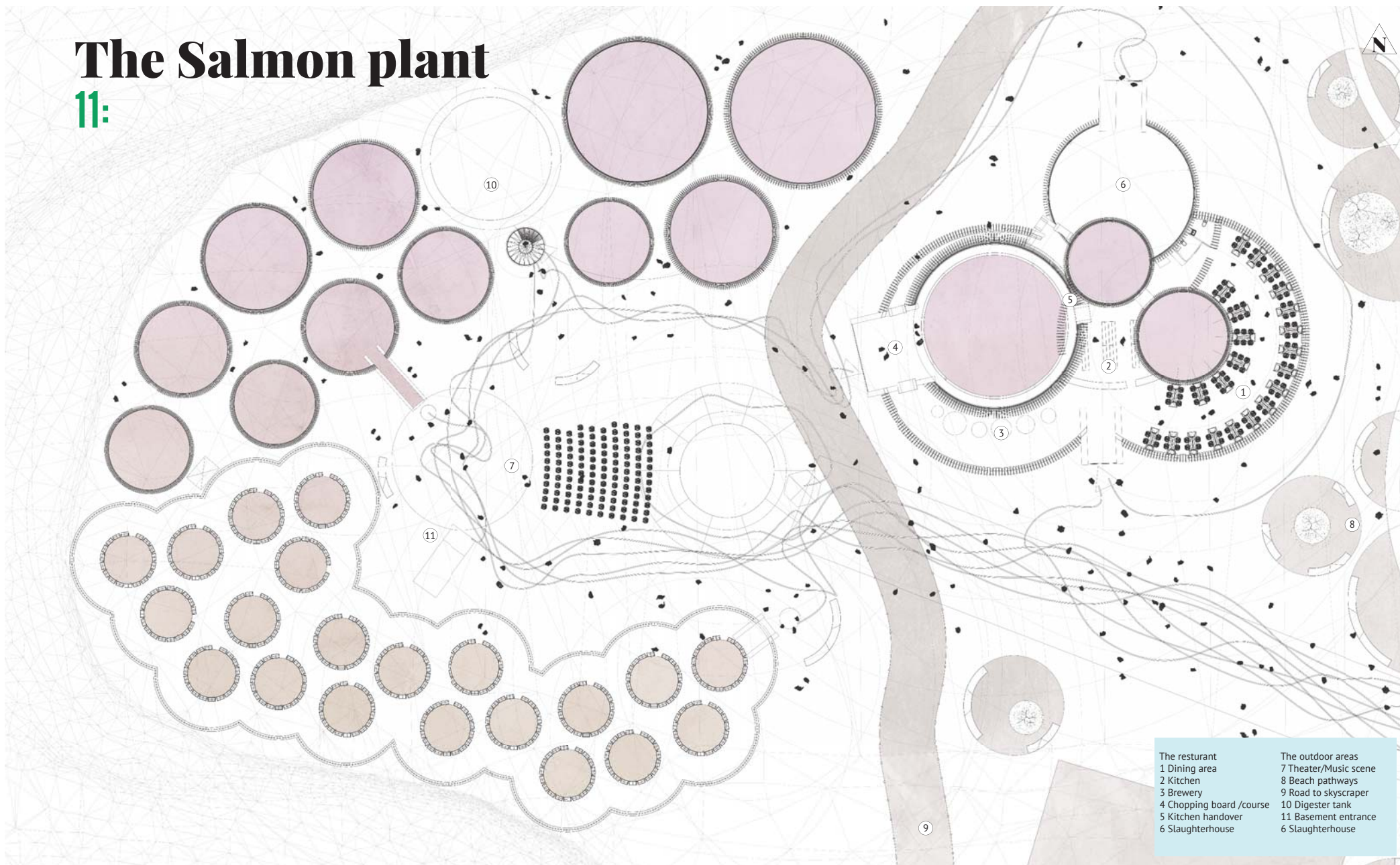
North 1:400



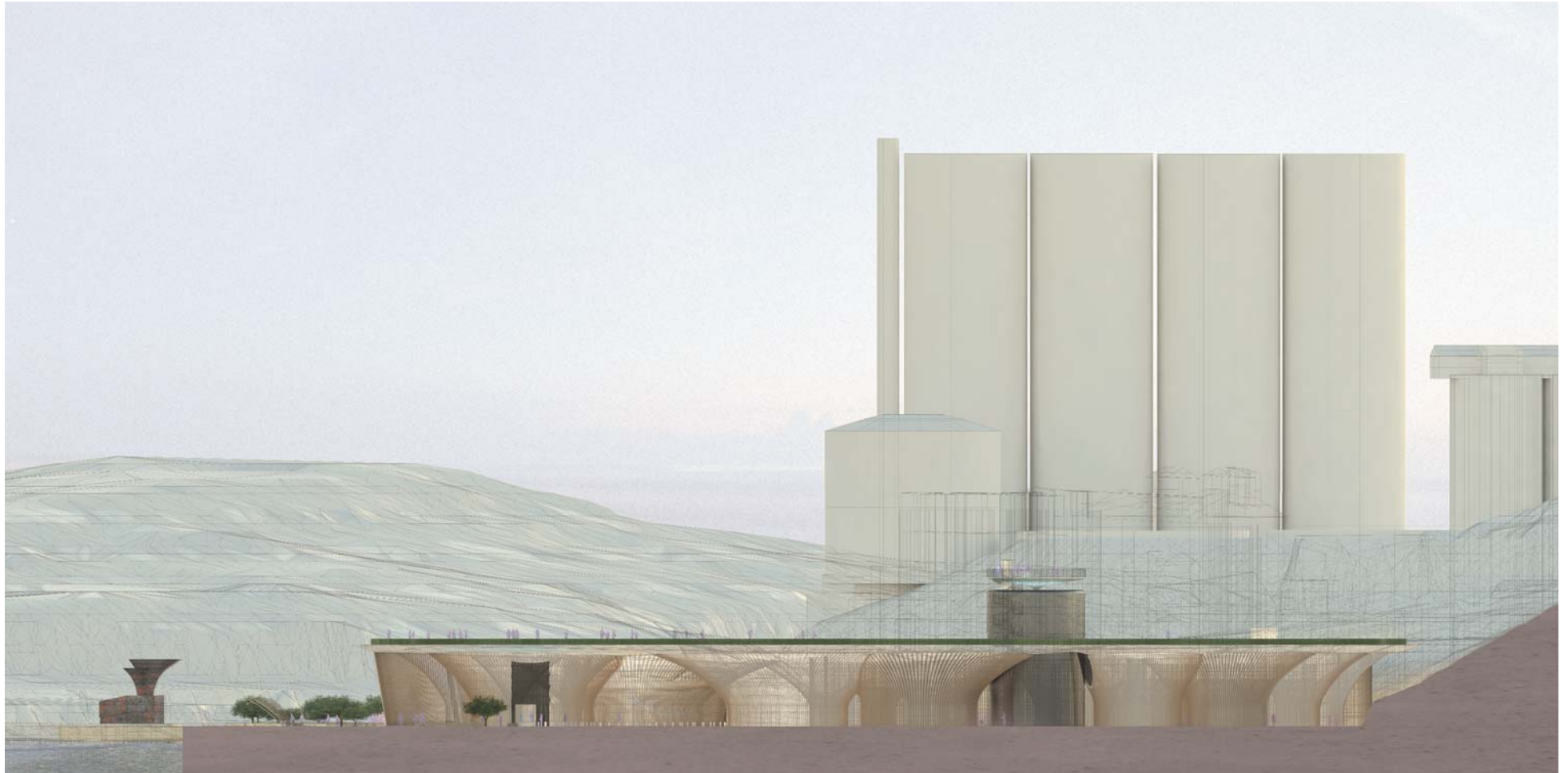
West 1:400

The Salmon plant

11:

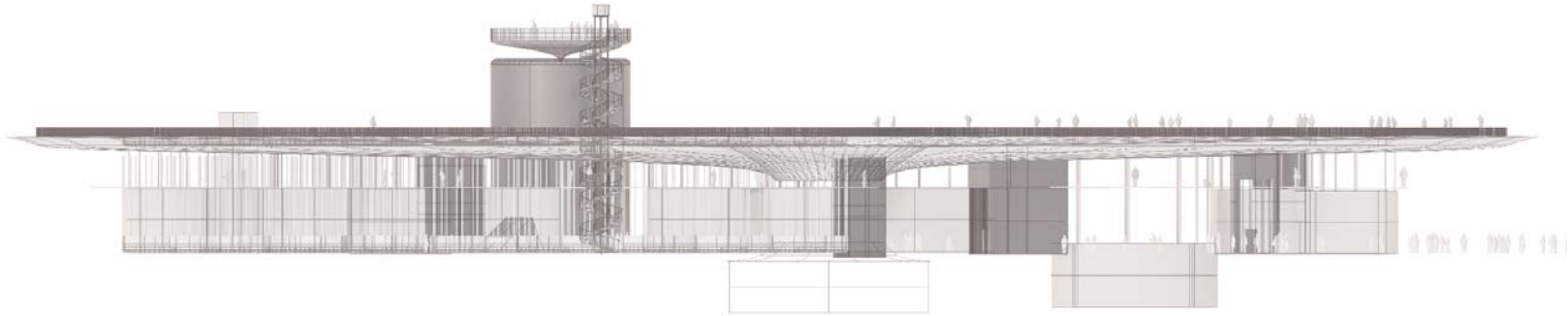


- | | |
|-------------------------|-----------------------|
| The restaurant | The outdoor areas |
| 1 Dining area | 7 Theater/Music scene |
| 2 Kitchen | 8 Beach pathways |
| 3 Brewery | 9 Road to skyscraper |
| 4 Chopping board/course | 10 Digester tank |
| 5 Kitchen handover | 11 Basement entrance |
| 6 Slaughterhouse | 6 Slaughterhouse |



South 1:400

Salmon off the grid



Thank you