COLLECTIVE PRODUCTION

- Processing facility for seaweed in the archipelago of Fitjar

Mina-Matilde Håøya and Maria Højgaard Molden
Supervisor : Bente Kleven, A2
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Abstract

We live in a world where 98 percent of our food comes from agriculture. At the same time more than 70 percent of the earths surface is covered by water, but only 2 percent of our food consumption comes from the ocean (Sæther 2014). New ways to produce food resources is therefore crucial. Seaweed is one of the most unexploited resources. Its a sustainable and renewable source for biomass. With the worlds 2nd longest coastline and good growth conditions, Norway has a great potential within this industry.

Seaweed can be farmed naturally along the Norwegian coastline, therefor we should build a network along the coast with small and large seaweed production facilities. In Norway we have the possibility for both (Funderud, 2018). Large production facilities can distribute to the global market, while for the smaller facilities its important to emphasise the history of the product and the connection to the local communities. The seaweed industry has therefor the possibility to maintain and revitalise the coastal communities in Norway.

bilde av Alex Asensi *Fitjar Gardsmat*

Potentials in seaweed

Today the Norwegian seaweed industry is mainly based on harvesting wild seaweed. Approximately 200.000 tons is trawled from the ocean floor each year. Its important to separate between trawling/harvesting wild seaweed and farming seaweed. In relation to the quantity, its hard to harvest sustainably compared to farming, which can be done in a very large scale. Its therefor better to farm seaweed than to harvest from a wild ecosystem. Locally farmed seaweed creates new habitat for fry and re-establish lost seaweed eco-systems (SINTEF).

Similar to agriculture, is seaweed farming a way to cultivate the ocean with marine organismes for food and other products, and this is called mariculture. Industrial cultivated/farmed seaweed is an opportunity for biomass production that can be used in several products. This can contribute to make Norway more self-sufficient within the food, animal feed and bioenergy industry without occupying large farming areas on land. Seaweed is a primary producer, so no fertilising, fresh water, pesticides or antibiotics are needed (SINTEF 2).

The Norwegian seaweed production`s aim is to be a industry equal to the salmon farming. Growing seaweed will alway be more sustainable then producing salmon because seaweed don't need supplements. Seaweed also contributes by recycling nutritions from fish farming (SINTEF 2).

In Norway, small businesses for growing seaweed are starting to establish. The production quantity is still low. Today there is no permanent facilities. They are either contemporary or existing facilities from the fish industry that aren't built efficient for the seaweed production line. Reduction of production cost through more optimised technology and a general utilisation of the resource is a requirement for a competitive and profitable industry in Norway (Skjermo, 2016). A challenge with the seaweed industry is the short harvesting and processing period from March to June. This is the period when the largest areas (the processing space) will be occupied.

In the Norwegian governments ocean strategy published by Ministry of Trade, Industry and Fisheries in 2017 its written;

"During the past three-four years, there has been great interest in aquaculture of macroalgae (seaweed and kelp), and several research communities consider the Norwegian coast to have a large commercial potential for kelp farming. The potential for growth in cultivation of macroalgae is considered significant, with applications such as food, feed, nutrients, chemicals, and energy… There is a need to increase knowledge of this type of aquaculture with regard to technology development, biology, environmental impact, food safety, and market. The Government will develop regulations and management regime for the cultivation and utilization of macroalgae further."

Seawwed in the sun
Akvarell: Jo Crook

Local anchoring

In our diploma we will design a production and processing facility for seaweed and other resources from Fitjar. We wish to study how the facility, through program and design, can generates awareness around local produced food and contribute to strengthen the local communities identity.

As the world become more globalised, the road from raw material to consumer becomes blurry and complex. Historically the production was located where the raw materials and knowledge was. Today larger parts of the production is moved to low cost countries. This makes a shift of the financial gain and creates both ethical and environmental challenges, and unstable future prospects for countries that are not self-sufficient.

Focus on quality and authenticity gives however nurture to produce locally again. The consumer wish insight in every part of the production process to secure the quality. At the same time, the story of the product gives an added value to the food experience.

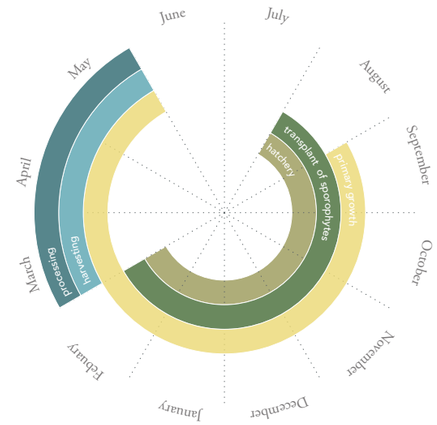
Naturressursene ble godt utnyttet. Alle holmer med dyrkbarmark ble dyrket poteter på i Fitjar.

Adaptability in shared use

Adaptability in architecture is vital in a sustainable future. If we say that all new structures will be planed for transformation, change of function or use, will this effect the way we approach architecture? We have studied temporal adaptability through 3 different frequencies; lifecycle, season and day.

Which qualities do we find in projects that are adaptable? The wish is not always the general open space, but it could be a specific architectural expression or spatial composition that can give the structure its potential. Its important to define whats permanent and whats changeable. We think this could be a sustainable tool for adaptable architecture in the future.

You can look at a buildings frequency through the seasons. A structure can have varying intensity and use throughout the year. Some programs has a hight season and a low season. This is a possibility to cover different needs within one building. If the use changes within minutes, hours or different parts of the day, the logistic becomes a vital part of the buildings adaptability.



Seaweed cycle:

Hatchery and processing on land. Transplant, primary growth and harvesting by sea.

"- The West coast has 3 advantages: the people, the nature and the resources. This is a good vantage point for local settlement - and for economic growth over time. Raw material can be farmed, and exists in the forest, in the ocean and on the continental shelf. All this gives a foundation for jobs and settlement also in the future. That the foundation exists, does not mean that it will be automatically realised. This demands initiative from the locals, will to use the opportunity, and it demands that we, the politicians also develops measures that substantiate these opportunities. Excessive belive in the marked, large units and increased centralisation is not the way to go."

Hadia Tajik, interview with Bergens Tidene, 2015

Along the Norwegian coast line there is numerous of towns and villages struggling with depopulation and lack of jobs. When we look at the demands for seaweed production, fresh salt water, even flow, and a safe harbour close to possible growing fields are sentral. Therefor many costal communities are relevant for seaweed production. Our strategy is to locate this new industry out to coastal communities. This will secure a sustainable settlement in the districts where economic growth not only ties to tourism and recreation, but also provide a stable livelihood for the locals.

"Perhaps even in a wider sense. … Architecture can also support cultural identity at a wider level, in my view, architecture creates certain frameworks for understanding things. We understand landscape, for instance, in relation to architecture."

Juhani Pallasmaa (in a conversation with Peter Zumthor 2012)

50 years ago there were residents on many of Fitjar municipality`s islands
Private photo

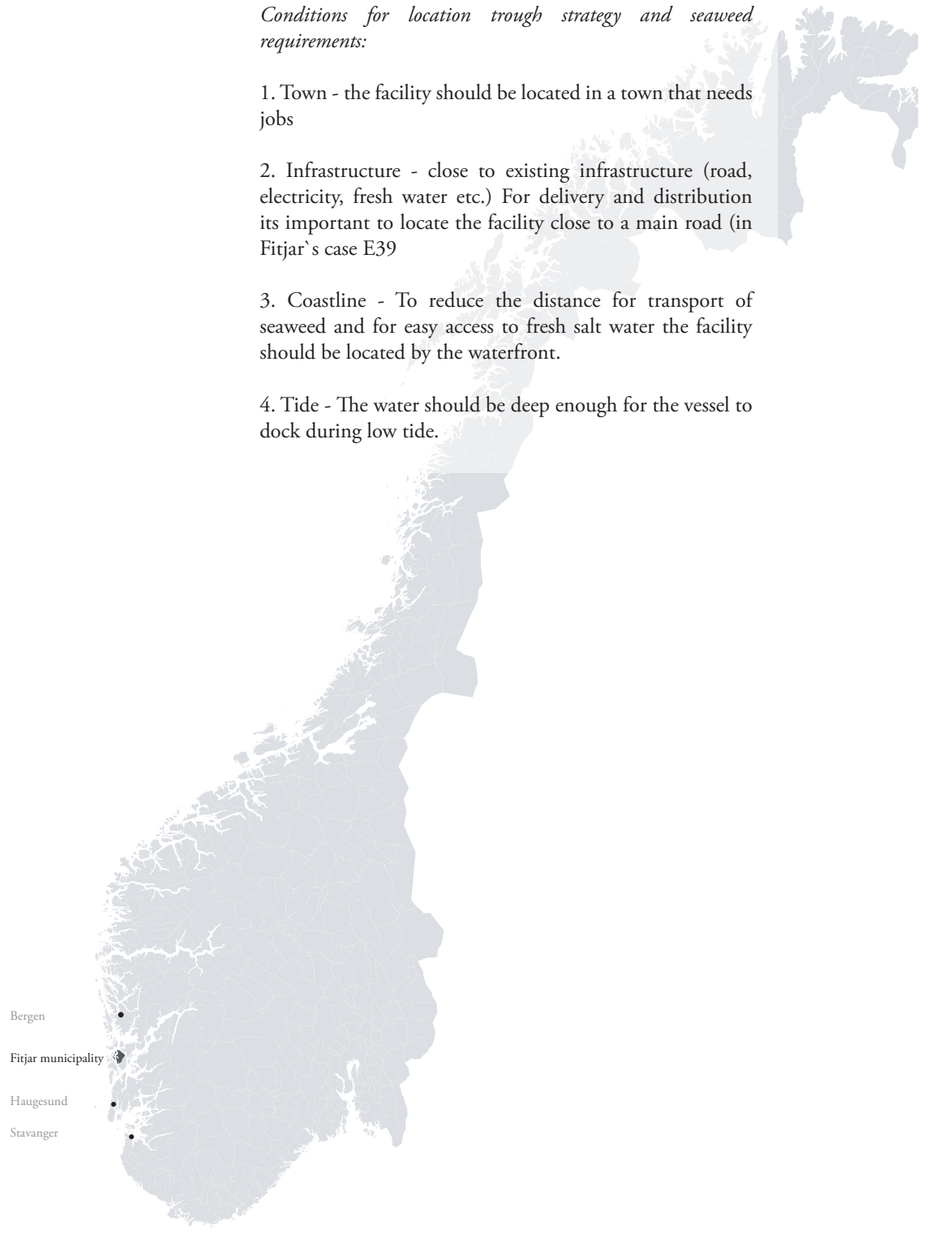
Conditions for location trough strategy and seaweed requirements:

1. Town - the facility should be located in a town that needs jobs

2. Infrastructure - close to existing infrastructure (road, electricity, fresh water etc.) For delivery and distribution its important to locate the facility close to a main road (in Fitjar`s case E39

3. Coastline - To reduce the distance for transport of seaweed and for easy access to fresh salt water the facility should be located by the waterfront.

4. Tide - The water should be deep enough for the vessel to dock during low tide.



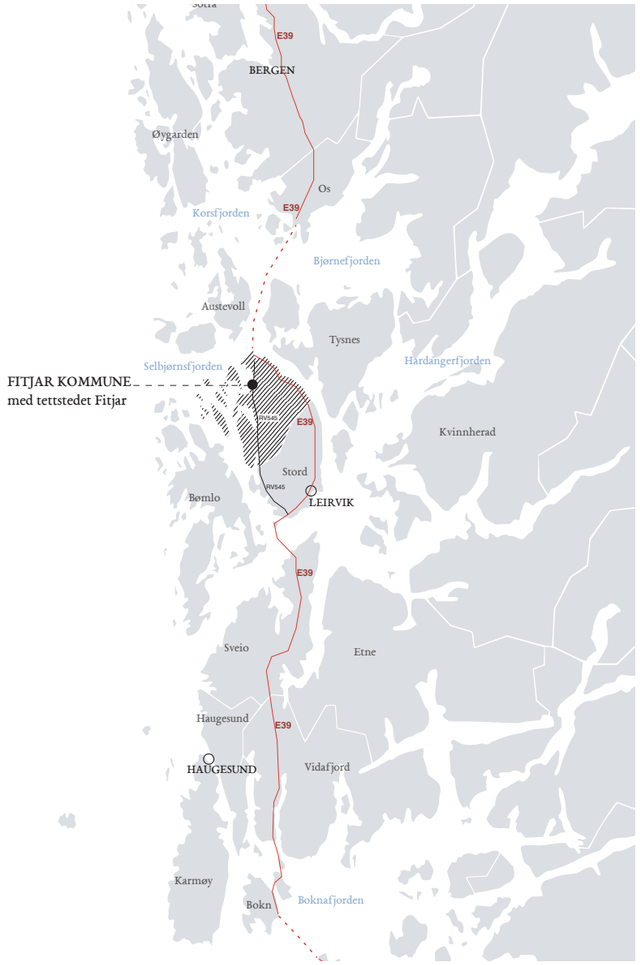
Fitjar

59°55'08.7"N 5°18'19.8"E

Today Fitjar has approximately 3200 inhabitants, where about 1700 of the lives in the centre of Fitjar. Until the 1970´s most of the islands were inhabited, but this is not the case today. In the summer season the islands are used by cabin dwellers, tourist, kayaking enthusiasts and hikers. Fitjar is a municipality with a large archipelago at the north side of the island Stord, in Hordaland county. The archipelago consists of 380 islands, sheers and islets towards Selbjørnsfjorden.

The main road at the west coast of Norway is E39 and it runs on the east side of Stord. On the west side, RV545 goes to Fitjar center. The roads are connected by ferry connection, Halhjem-Sandvikvåg, towards Bergen, and underground tunnel further south on the E39. To get to Fitjar center, you drive 7 km along RV545 from the ferry in Sandvikvåg. This location makes it easy for further transportation.

Fitjar fra Hegreneset, april 2018.
Eget bilde



A few movements in a glacier 15 000 years back laid the foundation for their good cultivation soil i Fitjar even though it's far out to the sea. The name Fitjar is an old farm name from the Norwegian word fit, grønn bakke mot sjøen (green hill towards the sea).
Bare granite rock forms the islands to the west, whereas the flat eastern part is transformed gabbro covered by arable land and fields and the northern part facing Tynes is Tysnes gabbro covered by birch, oak and pine forest. the terrain covering the gabbro rock has ideal conditions for farming. The coastline forms a shifting landscape, changing from rocky beaches, cliffs and cultivated land. All the islands works as a protection against the hard coastal climate.

Historically the municipality extends back to the Viking Age, and people have lived in Fitjar since the Bronze Age. Håkon den gode (the good one), who was the king of Norway from around 933 fell in the battle of Fitjar in 961, he had his royal farm here. The municipality emphasises the cultural heritage from this time and its a big part of Fitjars history and their identity. All the way back to the Bronze age the inhabitants has been farming and fishing.

The will to create is a tradition and a necessity among the costal life of Norway. From the islands there was a long and often weathered travel to the main land, resulting in self-sufficient and independent societies. This mentality is still a part of Fitjar, even thought the distance now a days seems a bit shorter. In Fitjar municipality they have a positiv attitude to new projects. Here you can find the largest windmill park in Norway with 44 windmills. This has become symbol of Fitjar with the windmill and the mountains silhouette over the town of Fitjar.

Det ble fraktet store mengder poteter inn til Bergen. Her en historisk rekonstruert båt.

Historically Fitjar has been a agricultural municipality, but has always been depending on resources from the sea. In the 1960´s the fishing industry became a significant part of Fitjar´s local production. The potato from Fitjar, Fitjar-poteten, is known for its superb quality. In 17th century Fitjar was the main supplier of potatoes in the near region, also Bergen.

In recent time the industry has taken over. Several large and small businesses have started up the previous years. The municipality also have a growing community with farmers. Today small local farms produce vegetables, berries, angus ox, sheeps, pigs, chickens, eggs and milk. The shipyard Kværner Stord has been a cornerstone business for the whole island of Stord, and many of Fitjar`s inhabitants traveled to work there.

Kråko is a peninsula 5 minutes south of Fitjar centre. Since 2011 there has been built 400-500 cabins at Kråko. This is the largest summer cabin area in the county of Hordaland. It brings a lot of activity and enthusiasm to the municipality of Fitjar.

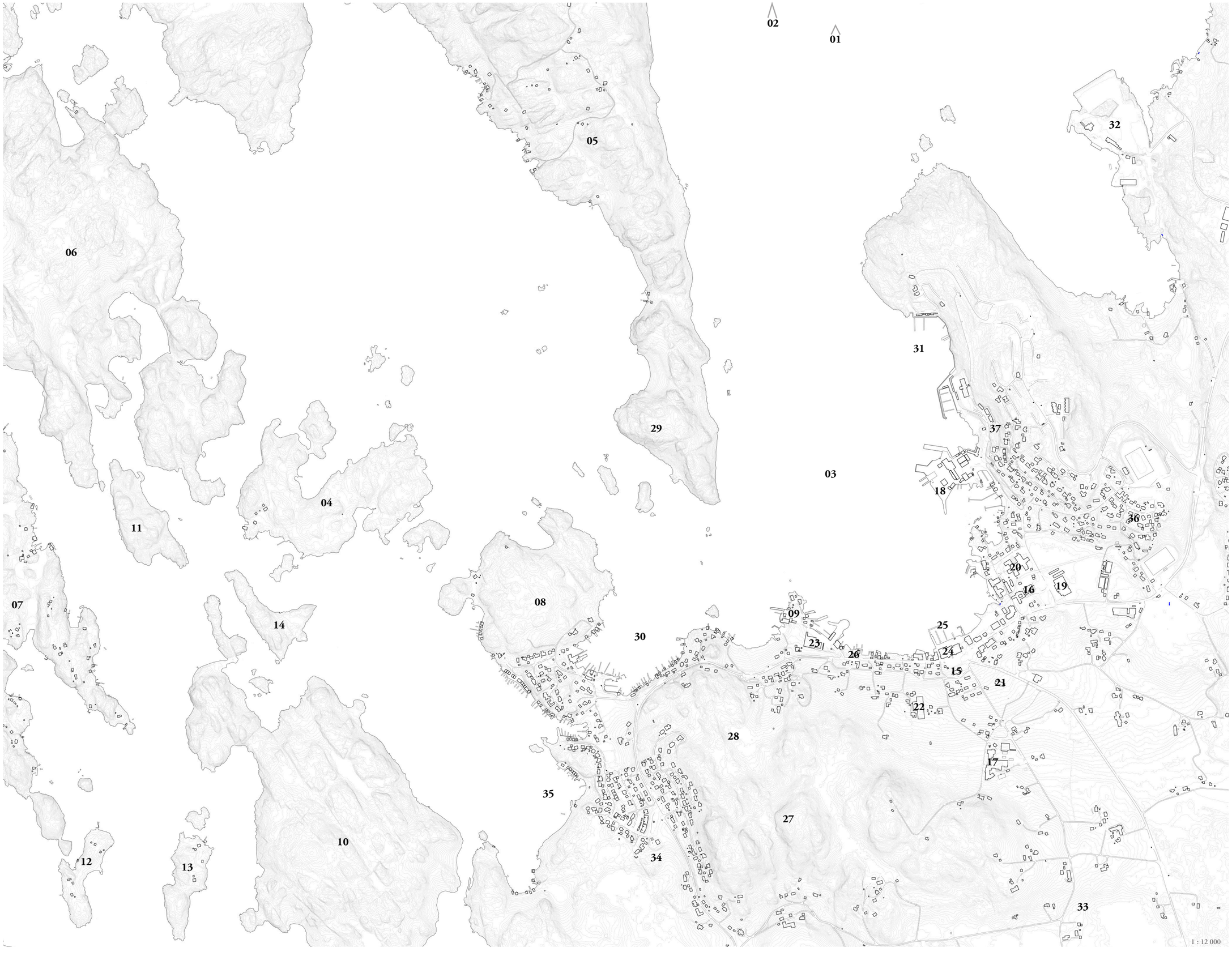
Liabo farm, Fitjar.

“Slaget på Fitjar” year 961 A.D.

Fitjar Kongsgård by Johannes Flintoe

350years old “gjestgiveriet”in Engesund

Collective production



01. Selbjørnfjorden
02. Austevoll kommune
03. Fitjarvika
04. Smedholem
05. Fonno
06. Teløyna
07. Engesund
08. Kalvaneset
09. Hegreneset
10. Store Eldøy
11. Piløya
12. Flatholmen
13. Gloppholmen
14. Bondeholmen
15. Rådhuset
16. Videregående skule
17. Rimbareid barne - og ungsomskule
18. Fitjar mekaniske verksted
19. Idrettshall og bibliotek
20. Sykehjem
21. Fitjar kyrke
22. Bringebær produksjon
23. Engevik & Tislevoll
24. Larsen, nærsenter
25. Gjestehavn
26. Engesund fiskeoppdrett Visningslokale
27. Storhaugen
28. Kjeringskaret
29. Sørfonnotangen
30. Skålevik
31. Russevika
32. Leirpollneset
33. Tangen
34. Vestbøstad
35. Nordresjøen
36. Bakken
37. Træ

Every year in August, a festival called “Fitjarfestivalen” finds place in the centre of Fitjar town. They are focusing on local foods produced in Fitjar municipality. Salmon from Engesund, pork and angus meet from Fitjar Gardsmat and jams from Hogste Gardsmat is some of the products. “Fitjar is proud of its local produced food, and we try to strengthen the focus around this” says the mayor Wenche Tislevoll.

Fitjar is located in between two Bocuse d´Or winners. Ørjan Johannessen at Gjestgiveriet in Bekkjarvik and Geir Skeie, from Fitjar, that has a restaurant in Leirvik. Its an increasing interest in business development through local produced food, and seaweed is a new resource with a growing interest in the culinary world.

Fitjar high school started as a husmorskole in the 30`s. Now they have the 2nd largest restaurant and food processing subject in the county. Our project could be integrated as a part of the curriculum. The education can take part of the processing, sales and communicate the story of local resources to the visitors.

Lokale poteter fra Fitjar.

Program

"Nature and architecture are fundamental themes. I like to find something in between. Not only nature and architecture but also inside and outside. Every kind of definition has an in-between space. Especially if the definitions are two opposites, then the in-between space is more rich."

Suo Fujimoto - Structures between nature and architecture. 2013.

The intention with this project is to design a facility that answers to the opportunities and challenges within the new seaweed industry. The project consists of two layers. The main focus is on the production and visitor program. Dwellings, tourism and waterfront preparation is included in a more urban strategy.

The seaweed production and processing take place in the facility, this includes a hatchery and processing halls.

The facility is approximately 1400m², where 700m² is climatized. The facility will have around 15-25 workers. This will vary during the year.

Unclimatized: 700m²

Dock with crane and space for seaweed
Temporary storage for equipment, pallets and packaging
circulation

Climatized: 700m²
Hatchery
Processing hall
Drying room
Room for smoker
Industrial kitchen
Food storage - frozen, cold, dry
Equipment storage
Changing room, office, workshop, education space, cafe

Processing seaweed:
Primary - Dry, frozen, smoked, fermented
Secondary - Further processing to foods

500 tons wet seaweed equals 50 tons dry seaweed this equals a total of 6000m² growing fields
Production capacity pr season is 500 tons seaweed
Approximately 5 tons is harvested every day
Estimated 100 harvesting days pr year

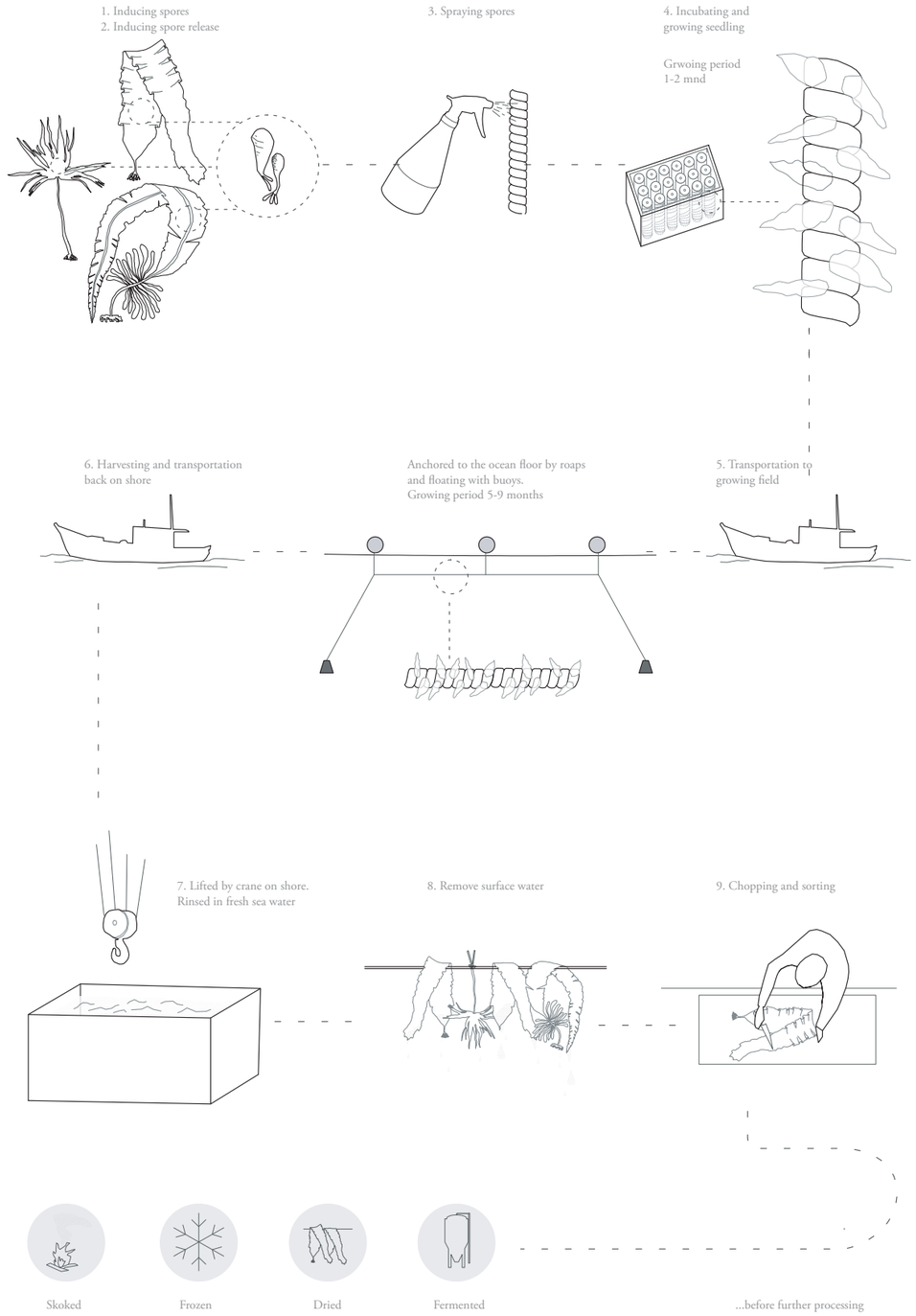
THE PRODUCTION - The rational (preparation)
The production is stationary and you can say that it does not make any demands on it`s environments aesthetics and uniqueness as a workplace, but has a pragmatic and technical logic.
The production line, size of the machines and equipment has the rational as its starting point and gives a frame for the buildings volum. The production line also gives a direction for organisation of the factories floor plan. In the shaping of the project the production part of the program should reflect this rational logic.

THE HUMAN - The irrational (presentation)
The irrational part contains the sensual and the influential - the atmosphere, and deals with humans experience of it`s surroundings. Scala, spatial sequences, daylight, sounds, materiality of the surface, smell and colour is all the factors that can affect one's sense of well-being in everyday life - and at the workplace.

In the shaping of the project should the workers - and the educating part reflect on this. To follow the different light of the seasons and to experience daylight variations. Rooms and the surroundings adapts to human scale and shall provide good and safe conditions for activity and wellbeing. This detailing could be integrated in the rational universe of the production.

Drying sugar kelp . The latine name is laminaria saccharina and it´s a brown alga.

Production line



1 Inducing spores

2 Inducing spore release

3 Sprayin spores

4 Incubating and growing seedling

5 Transporting to growing field (growing period 5-9 months)

6 Harvesting

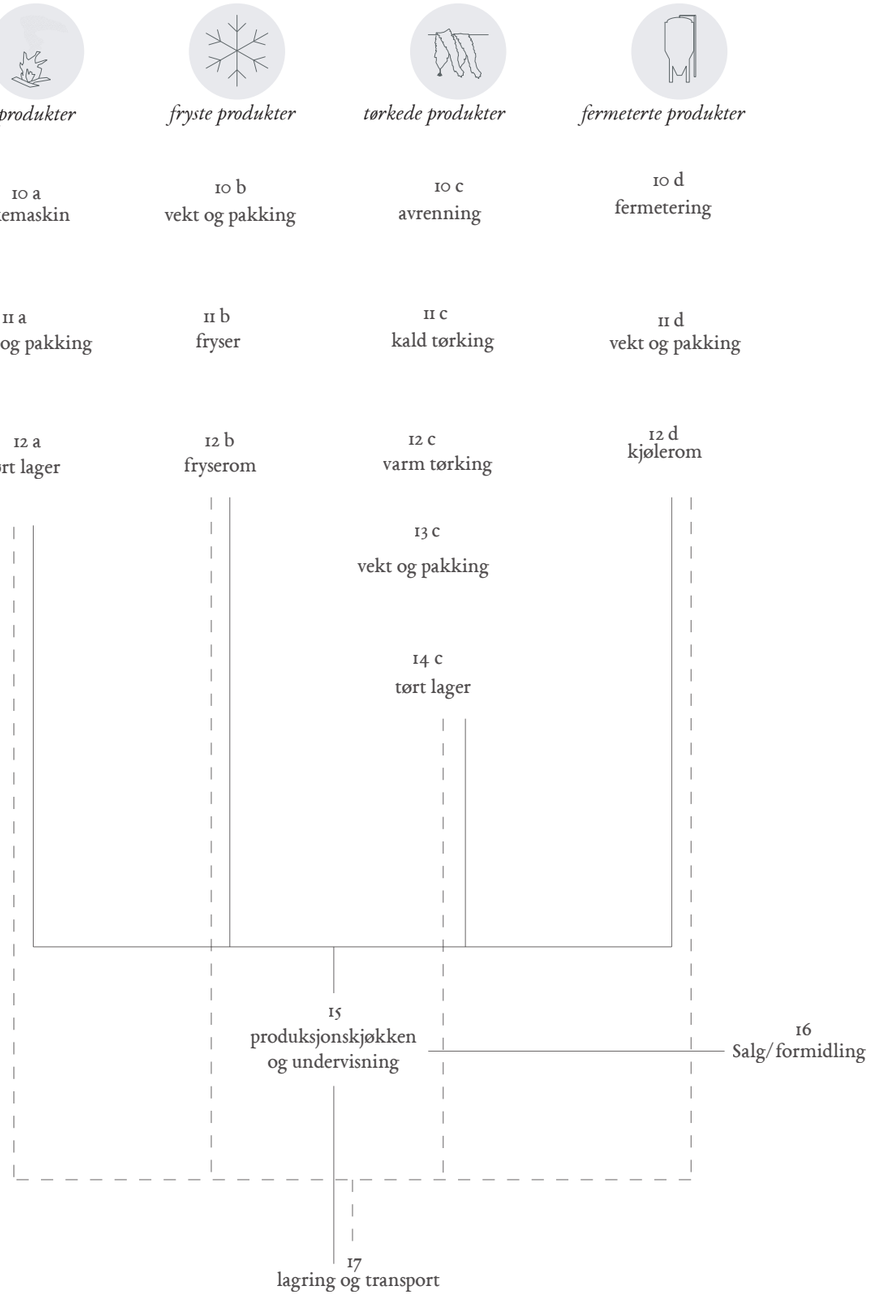
7 Lifting and rinsing
Containers with seaweed is transported into the processing facility

8 Remove surface water

9 Chopping and sorting

Michelin restaurant Noma, in Copenhagen, serving seaweed to food lovers

Processing methods



Smoked products

10a. Smoker - smoked in a smoking room
11a. The smoked seaweed gets weight and packed
12b. Dry storage

Frozen products

10b. Weighing and packing - The seaweed is weight and vacuum packed in portions
11b. Freezing
12b. Frozen storage
17. Transportation - Products are transported by trucks

Dried products

10c. Remove surface water -The seaweed is hanged up to remove surface water
11c. Cold drying - Cold air dries the seaweed
12c. Heat drying - Warm air dries the seaweed
13c. Weighing and packing - The dried seaweed is packed in portions
14c. Dry storage - After packing the products get stored in a temperature and humidity is controlled.
17. Transportation - Products are transported by trucks

Fermented products

10d. Fermentation - Seaweed is stored in fermentation containers for 1-2 weeks.
11d. Seaweed is moved to smaller containers before stored.
12d. Cold storage before further transportation og processing
17. Transportation - Products are transported by trucks

Further processing

15. Production kitchen - In this industrial kitchen the seaweed is furter processed into products.
17. Storage and transportation - depending on the product its stored in dry, cold of frozen storage

Potential sites

Collective production

1. Town - the facility should be located in a town that needs jobs

2. Infrastructure - close to existing infrastructure (road, electricity, fresh water etc.) For delivery and distribution its important to locate the facility close to a main road (in Fitjar`s case E39

3. Coastline - To reduce the distance for transport of seaweed and for easy access to fresh salt water the facility should be located by the waterfront.

4. Tide - The water should be deep enough for the vessel to dock during low tide.

A ca 2700m²

Photoes from visit

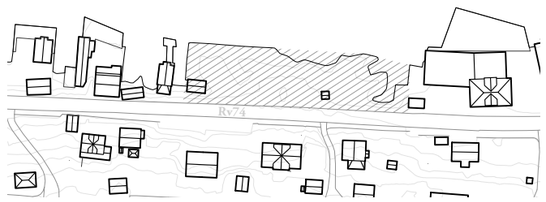
Verksted som har stått ubrukt i 30 år. Kai og slipp på vest-siden av neset

Kårbolig med tilhøreden versted i 1.et. Stått tomt i 30 år

Utsikt ytterst på neset, sett mot vindmølleparken i øst

Tomt sett mot sør fra båt

B ca 1800m²



Photoes from visit

Åpent område med kai og slipp. Smal og avlang tomt

Sjøfront kun mot nord

Slipp

Paralell med rv75 i sør

C ca 5000m²

Tomt sett mot sør-øst. Slak helning mot sjøen med vei

Utsikt mot havn og øyrike i nord-vest. Frisør og Euronics mot gaten

Rv545 sett mot sentrum i Sør-vest. Mange parkeringsplasser ut mot veien

Tomt sett fra havna med gangvei i langs vannlinja og vindmølleparken i horisonten

Submission material for diploma

Tegninger
situasjonsplan 1: 50 000/ 1: 5000
situasjonssnitt 1:500
hovedplan 1:200
snitt 1: 100 / 1: 50
planer 1: 100 / 1:50
detaljer 1:20

Romlige illustasjoner
eksteriør og interiør

Diagrammer
sambruk
produksjonslinjen
prosesseringslinjen til tare og andre produkster
Sesongsyklusen

Modeller
Situasjonsmodell over Fitjar 1:2000
Situasjonsmodell over anlegg 1:100/ 1:200
Snittmodell 1:25
Skissemodeller 1:100 / 1:50

Hefter / Booklets
studier; Fitjar, tare, råvare, produksjonsanlegg
prosess
sensors booklet
pre-diplom

Semester plan

uke 33 Situasjonsanalyser;
- mobilitet
- funkjsonsdiagram bebyggelse
- beskyttet standsone
- dyrket mark, skog, sump og gress
- vind og vær
- andre bedrifter og produksjonsanlegg
- bergart, forhold på land og i vann

Klaregjør et godt dwg underlag og lage en situasjonsmodell

uke 34 Sette seg dypt inn i produksjonslinjene og forelding av de ulike produktene.
Studere velykkede produksjons -og prosesseringsanlegg
Teste ut de ulike orgraniseringsmetodene.

uke 35 Tomte besøk + møter

uke 36 Skisser og romllige studier

uke 37 Skisser og romllige studier

uke 38 Konstruksjonsprinsipper og overordnet konsept

uke 39 Konstruksjonsprinsipper og overordnet konsept

uke 40 Konsept, skissemessike modeller. plan / snitt / sirkulasjon / sambruk

uke 41 Konsept, skissemessike modeller. plan / snitt / sirkulasjon / sambruk

uke 42 Videreutvikling av konsept med fokus på sambruk

uke 43 Videreutvikling av konsept

uke 44 Foredling av prosjekt, se tilbake på strategi, hva gjør det med Fitjar?

uke 45 Presentasjons dummie - layout og endelige avgjørelser

ukr 46 Ferdigstilling av planer og detaljer

ukr 47 Produksjon: Modell, illustrasjoner, tekst, diagrammer

uke 48 Produksjon: Modell, illustrasjoner, tekst, diagrammer

uke 49 Produksjon: Ferdigstilling og test printing

uke 50 Produksjon: Siste justeringer og print

uke 02 Slutt presentasjon

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“Havet som ressurs - fremtidig potensiale i dyrking av tang og tare.”

Intervju:

Jon Funderud
CEO for Seaweed Eneregy Solutions
03. april 2018

Johannes Sandvik
Lokalbeboer og utbygger
21 april 2018

Wenche Tislevoll
Odfører i Fitjar Kommune
21. april 2018

Video:

I en samtale mellom Peter Zumthor og Juhani Pallasmaa
The ‘New Nordic – Architecture & Identity’ exhibition (July–September 2012) at Louisiana Museum of Modern Art in Denmark- https://onlinelibrary.wiley.com/doi/abs/10.1002/ad.1487

Pictures:

Bergen Universitet, Grind kunnskap om landskap

Digitalt Museum

Alex Asensi, fotograf

Egne bilder, 20.-22-april 2018

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