Maximising the collection of eelgrass leaves and replanting of shoots

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Abstract
“Zostera Marina” numbers have been declining significantly and the topic is important to sustainability because eelgrass is a key asset to absorb CO2 ,create oxygen and offer a sustainable raw material for building.
Currently there are no papers addressing a need for a collaboration between eelgrass collecting and replanting.
The aim is to see how eelgrass collection can be maximised and replanting of the individual shoots can be improved to create larger meadows .
After interviews and research, the conclusion was the need for a tool for stakeholders to increase connections and dialogue while including more key actors.

1 INTRODUCTION.

The Ellen Macarthur foundation (2015) claims that to face resource related challenges and the widespread linear economic model which is based on finite resource consumption with a wasteful economy with high price volatility, there should be an effort towards Systems thinking and a Circular economy that is restorative and regenerative and preserves the value of materials, generating economical and job growth while reducing ghg emissions.

It also states that in this new discourse the focus is on preserving and enhancing instead of degrading natural capital also moving away from a strictly technical and moving toward a biological cycle where circularity encourages biological nutrients to re enter the biosphere at the end of life using regenerative materials.

According to Knight (2023),investing in climate action and environmental sustainability to enhance and protect natural capital can create huge wealth and a great amount of jobs enhancing both climate and the economy; natural capital is a concept that tries to explain nature in monetary terms and highlights the importance it has in sustaining the economy.

He explains further that at the moment when companies exploit and abuse resources from natural capital the price they pay for their activities does not mirror the harm to the environment and thus this phenomena is called unpriced natural capital, in which the actual cost of their impact will be paid for by someone else eventually in the form of sickness, with the cost of sick days and medical aid.

Thus the aim of the report is to address circular economy while enhancing natural capital.

1.1 The solution

The increased concern of climate change with greater importance being given to the circular economy and the sourcing of renewable materials combined with the problem of ever increasing levels of GHGs in the atmosphere with subsequent global warming, has fostered the search for new renewable biomaterials that can be used for construction.
The shedded leaves of a marine plant called “eelgrass”, or scientifically “Zostera Marina” seems to address these concerns.
Currently however, in the Baltic Sea regions of Denmark, stakeholders involved with replanting, collecting ,processing and the end of life of eelgrass are not maximising the potential of material that could be reused.
This report aims to facilitate collaboration between stakeholders so as to achieve maximum amounts of reused material.

1.2 Task of the project and staging

The primary purpose is to see how the eelgrass paradigm can transition so that the maximum amount of discarded eelgrass leaves can be reused following circular economy which also implies improving the replanting of eelgrass thus enhancing natural capital.

1 Research Context: analysis of the plant from a biological standpoint, the strategies for replanting and the sociotechnical significance in history up to now.

2 Synthesis and analysis: finding boundaries and areas for improvement through theory and empirically gathered data.

3 design intervention: co-creating a tool to enhance eelgrass reuse and replanting.

2 AIM & SCOPE

The projects aim is to maximise the reuse of discarded leaves from eelgrass plants by bringing together the actors involved in replanting,manufacturing , collecting and end of life.
The focus is on opportunities for the organisations to increase the amount of eelgrass that ends up as raw material for manufacturing.
This can be achieved by increasing the amount collected by individual companies , increasing the number of collectors and increasing the amount of meadows through replanting,
Replanting in specific areas where it is easy for collectors to access, having manufacturing and selling facilities close to the collecting areas.
Overall the concept is to create dialogue between the different parties and find areas for planetary gain.
Currently, actors involved in the eelgrass paradigm are behaving with insular views and not thinking about the broader lifecycle and benefits of the material in a holistic manner and from other points of view.
Major players involved in replanting in Denmark include Nordea Fonden which is funding Tænketanke Havn ,SDU and the Center for Marin Naturgenopretning for the “Danmark Planter Ålegræs” initiative.
Reefgen is an american company specialised in robots that replants eelgrass in the US ; this is a potential stakeholder . (Reefgen n.d.)
Møn Tang is a powerful actor for collecting, drying ,cleaning, storing the raw materials and upholstering yoga pillows. (Møn Tang n.d.)
Manufacturers like Dormiente, seegrasshandel (Schierup 19/03/2025) and Søuld would gain from cheaper and more available raw material. (Schierup 06/04/2025)
Brainbotics is a danish company involved with collecting eelgrass by using robots (Hansen et Al. 2021), while Odsherred is a commune that has been having different approaches to managing eelgrass in recent years. (Rohden 29/04/2025)

The four groups should be made to create a symbiosis and collaborate.

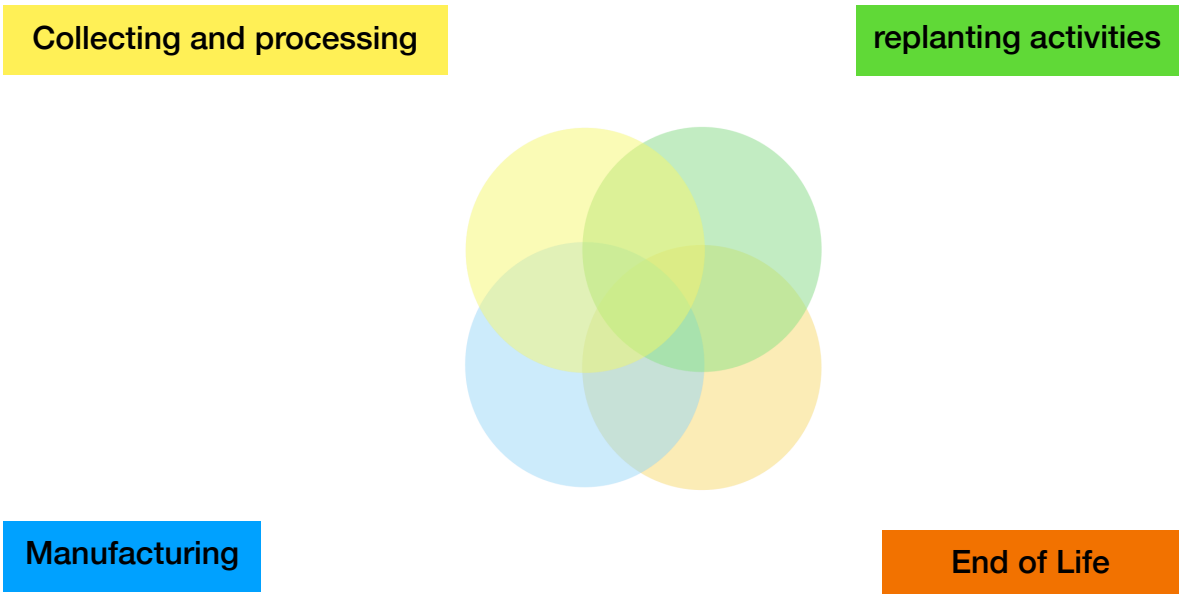

fig. 1. Eelgrass actors scope

EELGRASS ACTORS
Møn Tang
Brainbotics
Tænketankehavn
SDU
Nordea Fonden
Reefgen
Center for Marine Restoration
Dormiente
Seegrashandel
Odsherred commune

fig.2 eelgrass actors

3 RESEARCH CONTEXT

The study starts by looking at the eelgrass plant ,focusing on its biology specifically its influence on its surroundings , how it reproduces and what damages it, then the research goes on to talk about replanting practices and how the plants can be made to increase in number.
This part is then followed by an analysis of how the material has been used in the past and how it is being used today.

3.1 Eelgrass biology

Eelgrass is a marine plant and a specific type of seagrass whose scientific name is “Zostera Marina” and grows in most of the northern hemisphere on muddy or sandy bottoms which are soft and with roots that provide anchorage ;it is a submerged angiosperm meaning it has flowers with pollination and seed dispersal ,growing up to around 9 meters in depth. (Hogarth 2015)

3.1.2 Influence on environment

According to the same source ,eelgrass produces high amounts of oxygen, slows currents, contrasts erosion and helps build up the dunes and coastline by depositing itself on beaches, it also helps create a natural environment for fish, crustaceans and molluscs, with bivalves filtering water turbidity.

3.1.3 Reproduction

For its reproduction, he affirms that 98% of its seeds don’t survive after one year ,so it relies very little on sexual reproduction through impollination ,meaning that the plant grows almost entirely with horizontal rhizomes as a clone ,with many meadows having one species and a single genotype ,with the same DNA and no variation.

3.1.4 What damages eelgrass

The same author continues by saying that ,eelgrass meadows are threatened by biological and mechanical hazards, with the main cause of biological hazard being nutrient overload which causes overgrowth of epiphytes and algae while the latter being caused by trawling,dredging and storms which eradicate plants from the bottom.

He also states that epiphytes are microorganisms and microalgae that build up on eelgrass leaves, blocking the sun from reaching the surface which then reduces growth , oxygen production and accelerates the death of older and weaker ones.

He continues ,saying that nutrient overload also causes macroalgae to proliferate which grow very quickly blocking out the sun from reaching lower depths and which also decompose very quickly creating dead zones where there is no oxygen.

According to Duncombe (2018) , the Baltic Sea is one of the largest dead zones in the world due to low circulation of water and it is getting worse due to rise in temperatures and nutrient increase.

Hogarth (2015) adds to this point by stressing that in these areas fish don't survive therefore decreasing predators that normally eat urchins and molluscs which feed on the eelgrass, also high co2 means acidification which has negative consequences for marine life.

He also states that another type of Biological attack, is posed by a marine slime mould called " Labyrinthula" which reduced the numbers of eelgrass greatly in the beginning of the 1900s; the mould is in actuality often found on these plants but they were rendered more vulnerable because of probably human made environmental stresses.

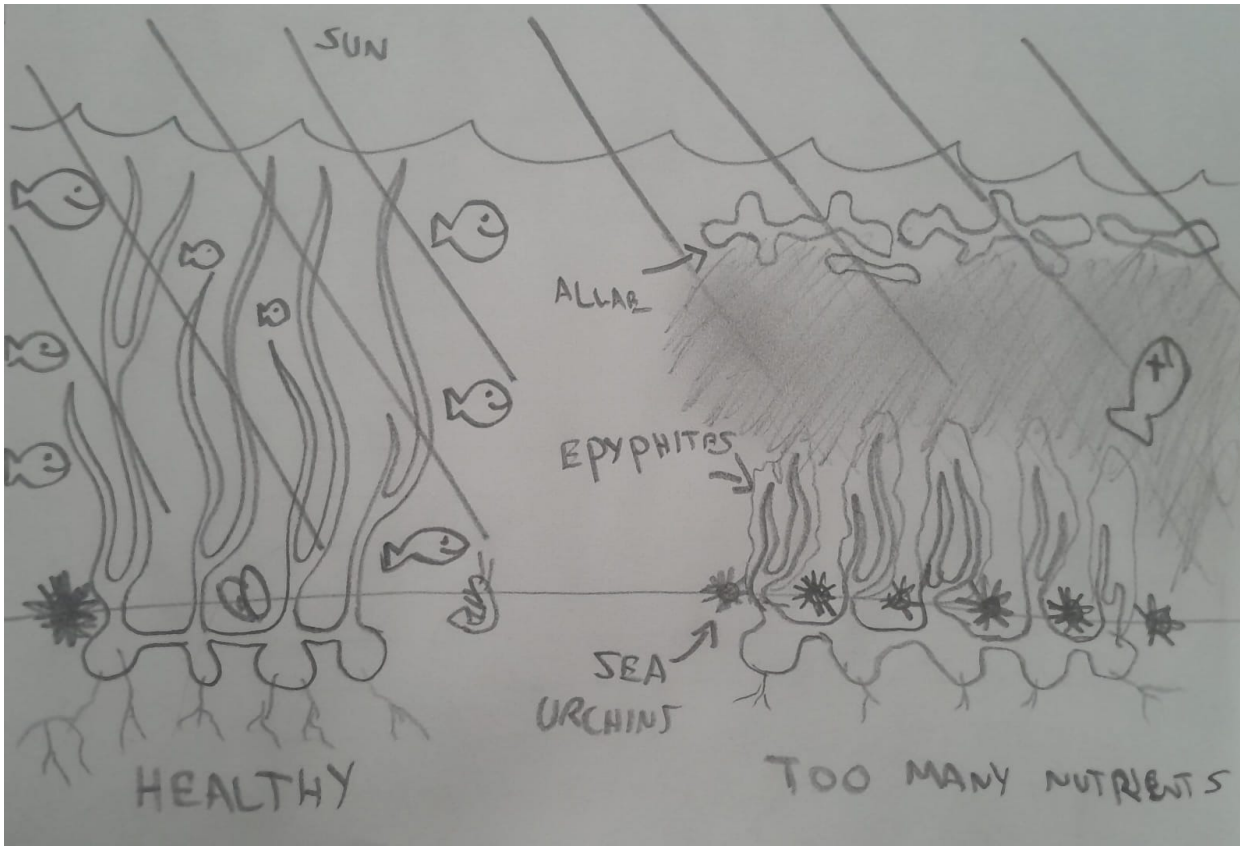

Fig.3 eelgrass biology

3.2.1 Reintroducing eelgrass

Eelgrass meadows are a good option for carbon ,nitrogen and phosphorous sequestration, nutrient immobilization development of higher faunal densities and biodiversity, but these plants have declined by 90% in danish coastal waters. (Lange et Al. 2022)
For this reason, there is an effort from different organisations currently to restore marine habitat, including the EU which wants to restore 20% of land and sea by 2030.(World Economic Forum 2023)
It is no longer enough to only reduce nutrients going into the sea it is instead important that reintroduction be actively supported through replanting. (Orth et al. 2020)

3.2.2 Replanting techniques

Eelgrass can propagate vegetatively by dispersing fragments of rhizome or above ground elements that can make root , which are good for reproducing after storms. (Hogarth 2015) Tests have proven that in Denmark it has been very inefficient to rely on seed broadcasting, instead it is better to do transplanting; seed broadcasting has been successful in the US. (Lange et Al. 2022)

Other sources like Zhou et Al. (2014) affirm that in China the plant has also been disappearing since the 70s and thus even here ,transplanting is taking place; according to him ,seed broadcast techniques can be successful if put in places with low predation or disturbance from currents.

However , according to Duarte (2002),transplanting has had mixed success often damaging existing meadows and it is too costly to be done at a large scale it is hard to manage a meadow and it must be coupled with social awareness and understanding of stresses.

Thus Ward et Al. (2020) propose a more sustainable transplanting method where instead of collecting the plants from an already healthy meadow, the plants are gathered from the shores or surface after they have been washed away by currents.

In the paper they say the shoots must be collected before they dry and present advantages such as easier collection, higher amounts and not creating impact on existing meadows.
According to the research, the shoots were collected only if the leaves had no necrosis and the rhizomes were at least 5cm long; these then were stored in containers filled with seawater that was changed every 1-2 days.
It must be noted that their experiment was performed in the aegean sea and with another species of seagrass called “Poseidon Oceanica”, but this technique was also mentioned by Kurt Schierup from Møn Tang. (Schierup 06/04/2025)

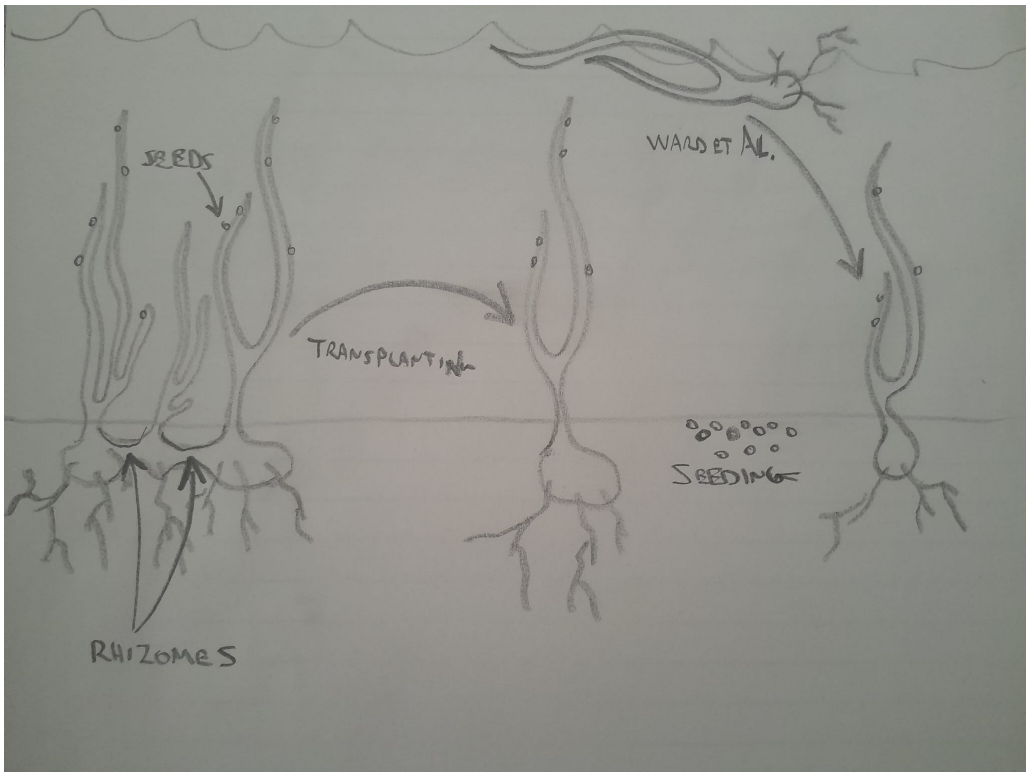

fig.4 replanting techniques

3.2.3 Spot selection

The restoration needs selection of the best spots that limit stress or to add protective elements like nets or cages and also need anchoring support to withstand currents, otherwise another technique is to transplant large amounts specifically above 10.000 this way they protect each other. (Lange et Al. 2022)

The site selection can be done by selecting areas with empty spots and scattered shoots with a play between growth density and area covered.

3.2.4 Nutrients

Flint et Al. (2024) have made a study and have discovered that Eelgrass only thrive where few nutrients are available; instead when there is a lot of nutrient, the epiphytes grow a lot ,covering the plants surface and enabling macro algae like ulva lactuca to dominate.
He continues by affirming that macro algae and epiphytes only take weeks to decompose meaning there is a sharp shift in periods of good oxygenation and anoxic conditions destroying food webs, eelgrass on the other hand takes more than a year to decompose also requiring very low amounts of nutrients.
Epiphytes reduce eelgrass absorption of co2 and light by 38% in the best light conditions , but this increases even more if the light is less intense,nutrients intake like nitrogen and phosphorus is not affected because this is mostly absorbed from the roots.(Sand-jensen1976)

3.2.5 Replanting in Denmark

Det store ålegræs initiativ is a 3 year initiative where volunteers transplant and monitor eelgrass in the sea once a year ; the project is lead by Tænketanken Hav ,SDU department of biology and the center for marine restoration and has received 8.845.000 dkk from Nordea foundation. (Nordea Fonden n.d.)

According to the same author ,the replanting is supposed to occur in 25-30 locations across Denmark and data is collected so that people can follow the progress of the project with the first one on June 8th 2024 on world ocean day and continuing until 2026, Tænketanken Hav is a privately funded thinktank founded in 2021.

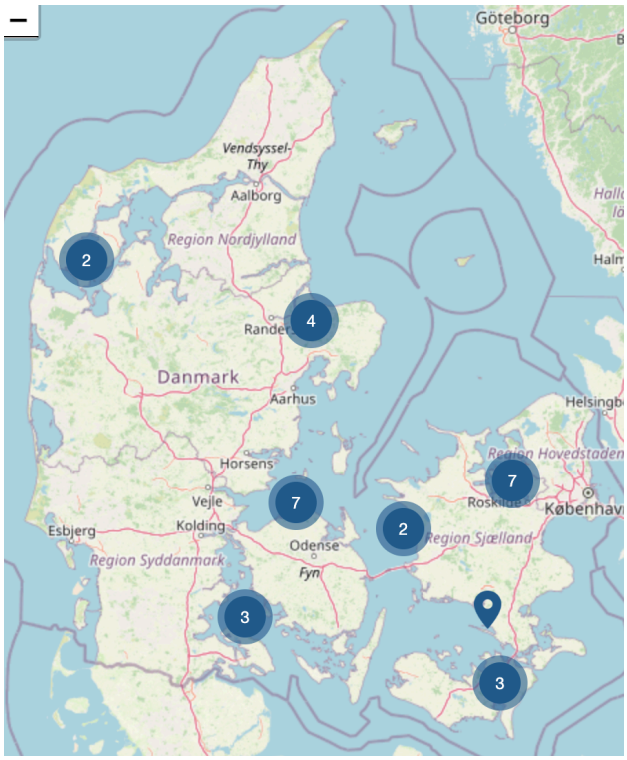

Fig.5

The map shows where the replanting sites are. (Taenketanken Hav n.d.)

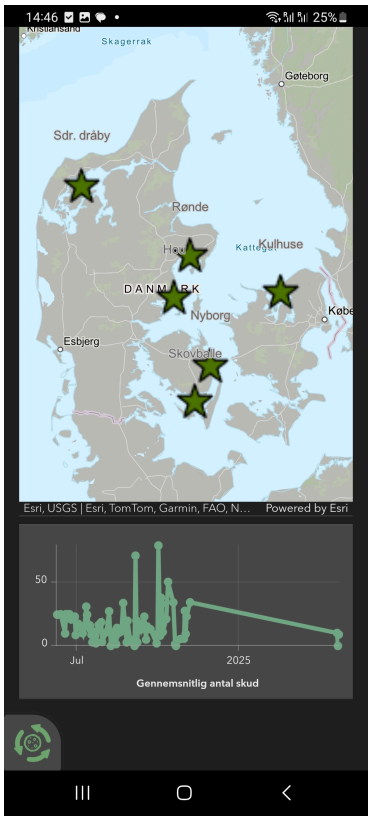

Fig.6
Average number of shoots replanting in a set period (Center for Marin Naturgenopretning 1 n.d.)

Nielsen et Al. (2024)show a guideline to have permission to replant from the danish coastal authority in which one must replant only single plants and not continuous mats of multiple shoots because otherwise it just means moving an existing eelgrass bed without gains of area covered and these almost never succeed ending up with loss in donor patches.

He also affirms that the transplanting is a balance between having low shoot densities to have low construction costs without having too low densities that don't guarantee self protection and full coverage of an area occurring in 7 or ten years.

The guide also affirms that it is best not to get plants from declining eelgrass beds shoots and one should harvest them from the same coastline water areas where they are being grown so as to avoid genetic contamination and the spread of invasive or non native species also ,harvesting must be done from large meadows that can resist harvesting better than small ones and specifically from the center of the beds.

fig.7

fig.8

Photos of epiphytes build up on eelgrass (Nielsen et Al. 2024 p.14)

Each shoot is counted in the warm season with epiphytes and macro algae being monitored because this can have shading effect or mechanically stress eelgrass when moved by current, sandworms must also be monitored because if they are in moderate amount ,they help oxygenate the soil but if too many are present the plants can be unearthed; meadows are also monitored to see if an area is good for future planting and explain why one site fails and another is successful. (Nielsen et Al. 2024)

There is a company from San Francisco that follows a different approach to replanting by adopting robots that plant seeds mixed with mud or replants shoots , this way replanting faster and cheaper than with people, and not needing volunteers.
(Reefgen n.d.)

3.3 History of the material

Wyllie-Echevarria & Cox (1999) state that since colonisation, european settlers in north America collected from beaches, leaves of eelgrass for agriculture and insulation, but at the end of the 1800s the material was sown between two craft paper layers ,industrially producing a quilt for thermal and sound insulation that was widely used in homes , offices and music halls; much of the collecting was done in Nova Scotia in summer when leaves would increase.

They continue by saying that the first quilt was made by the company Cabot from Boston ,then in the 1930s the company Guildfords from nova Scotia produced a similar product called “seafelt”; People from Yarmouth would seasonally collect the leaves and sell them to these companies with the average price being 10$ per ton with some seasons 100.000$ being exported from Nova Scotia.

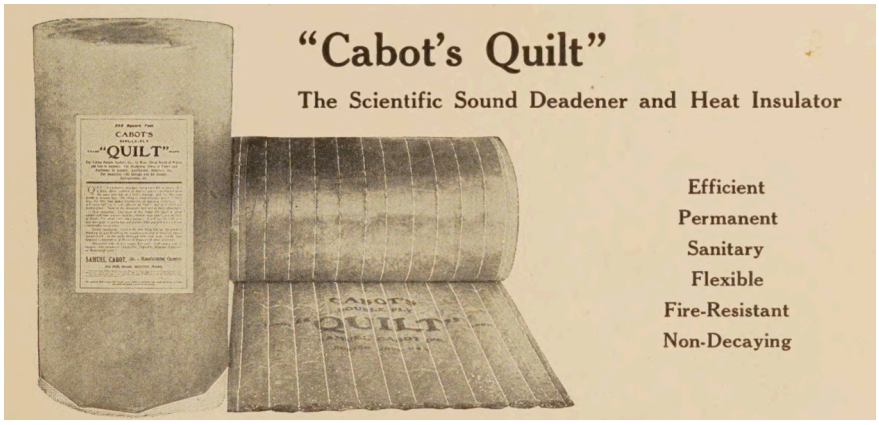

Fig.9. (Samuel Cabot Incorporated 1922 page 2)

TABLE 1. TIMELINE OF *ZOSTERA MARINA* GATHERING IN YARMOUTH COUNTY.

Date	Event
1907	First bales shipped to Boston, USA
1914	Land purchased by Samuel Cabot, Inc. at Morris Island, Argyle Township, Yarmouth County.
1917–1921	Reduction of export associated with WWI
1928–1929	Peak in exports to Boston via Ferry Steamships
1930 or 1931	Gathering for Seafelt begins; transport to Sable River, N.S.
1932–1939	Disease reduces or eliminates resources.
1940	Resource recovery; some gathering resumes
1941–1945	Export and transport within N.S. suspended during World War II
1942	Samuel Cabot, Inc stops production of “Cabot’s Quilt”
early 1960’s	Guildfords Limited stops production of “Seafelt”.

Fig.10 economic botany
(Wyllie-Echevarria & Cox 1999 p.420)

Year	Number of bales
1907	102
1908	592
1909	1744
1910	1175
1911	15
1912	1361
1913	3243
1914	2408
1915	2863
1916	452
1917	n.d.*
1918	n.d.*
1919	n.d.*
1920	n.d.*
1921	n.d.*
1922	842
1923	4810
1924	4593
1925	5758
1926	4183
1927	5244
1928	12 484
1929	12 854
1930	4599
1931	6780

* During this time frame primary shipment occurred on Cabot owned vessels (Cabot 1986; R. Crocker Pers. Comm.).

fig.11. cabot bales
(Wyllie-Echevarria & Cox 1999 p.421)

They add that in the 30s a disease killed many of the seaplants, Cabot stopped production in 1942 because of this, then Seafelt stopped production in the 1960s because of the popularity of synthetic fibres.

They also affirm that the activity was done with widely available farming tools and the same baling machines used for straw with the stuff being dried on the fields and then transported to the manufacturing companies.

This account proves that eelgrass used to be a real industry and that it was a successful material even when its sustainability performance properties were not being taken into account.

3.3.1 What is the material being used for now?

According to Primo (1977), the material resists fire, repels vermin and bugs , it is sound deadening ,does not rot ,it is also useful as a conditioner and fertiliser for soil.

These properties make the leaves optimal for different uses but the problem is that it is widely present on beaches but it is not aesthetically pleasing and thus is often being landfilled. (Kuqo & Mai 2022).

- Used for thatching roofs since at least the 1600s in Læsø (Magazine & Fiorentino, n.d.)

- Used in northern europe for upholstery in mattresses.(Magazine & Fiorentino, n.d.)

- Its fibres can be used to build structural bio composites , since according to Davies et Al. (2014) the leaves have high lignin content providing rigidity.

- As insulation

In northern Germany, the company Seegrashandel which imports the material from Møn Tang(email with Kurt Schierup) is insulating houses with it (Seegrashandel n.d.)
“Zostera Marina” insulation boards resist fire better than those made from wood fibers and are also cheaper to produce. (Kuqo & Mai 2022)

-for composting (Kuqo & Mai 2022), but the material contains heavy metals like cadmium in varying quantities which can be toxic to humans and thus must be first tested (Anon 1984) .

Odsherred kommune has been doing tests on eelgrass from 2018 to 2023 where they show the amount of heavy metals contained inside.
(Odsherred Kommune n.d.)
However they have now stopped (Rohden 2025).

-Pectin can be extracted from seagrass zostera and used to fix mucous in the stomach and absorb heavy metals in the body.
(Anderton 2019)

- for biogas production (Banu 2019)

4. Theoretical framework and methodology

The theories and methodologies used in the report give the underlying structure and are a tool for researching the eelgrass paradigm and showing the main problems with eelgrass to reach environmental goals and an improved management of the material.

4.1 actor network theory

ANT was created in science and technology studies to explain technological developments as a combination of social and technical forces. (Birkbak 2023)
In this project ANT has been a valuable tool to facilitate change and grasp the sociotechnical networks involved.

In this theory, social reality is given by a network of actors that can be human or non human and it focuses mainly on who they are and how they interact, shaping the social phenomena with concepts and realities that exist only because they are being constantly negotiated. (Olesen & Kroustrup, 2007)
When one sees reality with ANT glasses, non human entities are seen as active players in forming a sociotechnical reality shaping and being shaped by human actors. (Latour, 1992)

Translation is the process through which a stable network is achieved and created through the interaction of human and non human entities and this has to be facilitated by the designer to produce change and it is divided in four stages:

-in the problematization there is a definition of the problem at stake and a definition of the most important actors with a subsequent creation of interdependencies among them.

-In interessment the actors are engaged and persuaded to join in the quest to create a stable network.

-In enrolment there is a definition of the specific roles of each actor in the network ,

-and lastly, in mobilisation actors work together to reach their goal.
(Callon, 1984).

Obligatory Passage Point (OPP) is a step in the journey that all actors must go through so that the individuals goals are aligned with the stability of the network. (Callon, 1984)

4.1.2 Boundary Objects (BOs)

Boundary objects are devices that are used in innovation management to create a common understanding and a shared identity so that professionals or individuals with different views, skills or jargon associated to their profession or way of life can communicate and collaborate with each other; this is achieved by equipping the BO with symbolic representations. (Caccamo et Al. 2023)
BOs can be used in ANT in the problematisation phase to overcome boundaries in knowledge. (Iskanderov,Pautov 2020)

4.1.3 circular economy

Some communes are adhering to a linear economy system where eelgrass that has washed up on beaches is considered beachwrack and thus treated as waste and moved to the side.
CE is used as a framework to facilitate change and transform a material that is widely being considered waste into a renewable resource.
The way to go is by following the Ellen MacArthur Foundation (2015) and decoupling the exploitation of finite resources from economic growth.

4.2 METHODOLOGY

4.2.1 design thinking

The report uses design thinking as a research method to design a prototype in the form of a an eelgrass stakeholder mapping co-designed using feedback from interviews with stakeholders. (Brown 2008)

4.2.2 Double diamond framework

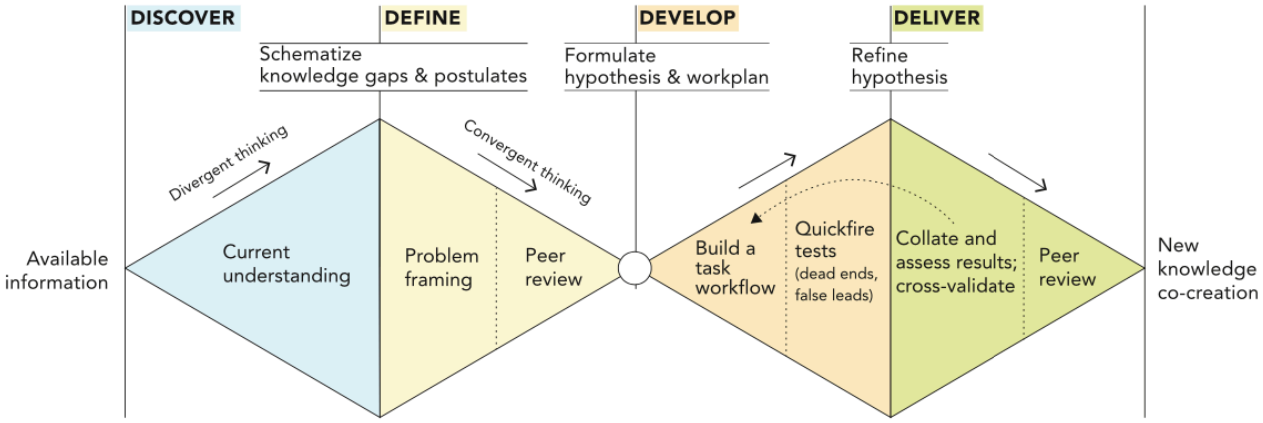

Fig. 12 double diamond (Shen et al. p. 655, 2024)

The study utilises the double diamond creative problem solving approach that encompasses four stages alternating divergent and convergent thinking where the first explores and expands creating multiple actions while the other reduces to find the most effective way.

It all starts with an abstraction and brainstorming of what the problem can be, then narrowing down and framing the boundaries of the concept; in the second phase then the solution is tested through an iterative process similar to prototyping and in the last phase the solution is defined and needs to be skilfully communicated by transforming science into common knowledge.
(Shen et al., 2024)

4.2.3 Semistructured interviews

The report uses semistructured interviews which are a qualitative research method and allows the interviewer to create more open ended questions facilitating a potentially deeper understanding of the problem at hand and also widens the scope of interest. (Creswell, 2014)
The exchanges were all different since each player had a different role and thus had different goals; from these interactions the research was able to grasp the lock-ins and opportunities to reach maximum sustainability performance.
The aim is to sketch out circular economy and replanting landscapes enabling a more effective collecting and replanting system for eelgrass collectors and manufacturers.

The first interview was done with Kurt schierup , the owner of Møn Tang eelgrass collecting company at his farm in Møn.
The second interview was done with Louise ,a student worker from Tængetankehavn, the think tank involved in replanting the eelgrass. With the "store ålegraes initiativ"; the interview was done through Zoom.
The third one was with Lise, the project coordinator from Odsherred commune.

5 DATA COLLECTION

5.1.1 MØN TANG INTERVIEW. (Schierup K. 06/04/2025)

Kurt Schierup is an eelgrass collector from Møn who has been collecting since childhood; he also runs a farm and is able to use many of the same tools to manage the seaweed.

Møn Tang is his company and it collects ,dries and cleans the eelgrass so it can be used as a raw material.

He gave an ethnographical account about the materials sociotechnical history and
Talked about how the practice of collecting and building with the material used to be popular all around Denmark and even in his own family.
There used to be factories in Kallehave and Aalborg with exports to the US;
in 1988 his father collected 81 tons.

He sells pillows filled with the seaweed and also exports the raw material to northern Germany where it is used as upholstery for mattresses and as insulation material ,he also exports to Læsø where the material is used to thatch roofs.

He talked about replanting from a collectors perspective with its problems and possible improvements.
The amount of eelgrass that ends up on the targeted beaches can vary widely and is not predictable but he said the price he charges remains the same , also because there is not much competition.
He talked about trying to get more people to collect ,infact he contacted 36 people but only 6 were interested.
Logistics for him involve collecting on Farø or Næstved and bringing the material with a truck to the farm in Hårbølle, in the southern coast of Møn. where the material is laid to dry on the fields; the material is then passed through a machine that takes out the debris from it.
Eelgrass that is of lower quality and thus contains more dirt is often used for gardening or thatching because it needs to be fairly clean for it to be used for insulation or upholstery.
This means that to perform the activity farmers don't need to necessarily be close to the collecting spot but closer collecting spots would limit CO2 from logistics and lower cost.
He said replanting could be done in a more sustainable way by replanting shoots from the beach after storms.
Lastly he said the communes don't financially support his practice and
he criticised the current replanting practices of transplanting from healthy meadows saying that shoots that had been eradicated by storms could be used instead.

Fig. 13 Eelgrass for heat/sound insulation.

Fig. 14 Machine for cleaning eelgrass.

fig.15 Visited the Møn Tang eelgrass museum

5.1.2 TÆNKETANKE HAVN INTERVIEW (Mau ,L. 28/04/2025)

The interview was done with Louise Mau a student worker at Tænketanke Havn
and an ecology student at KU.

According to her replanting is having mixed success with one area being discontinued after the plants were being observed to be dying, while another one in Lolland was discontinued because there were too few volunteers.

They are also replanting in Stege in the fjord on Møn island but collectors have not been taken into account for the action.

Overall one must wait until the transplanting is done on the 15th of June to assess the success of the project.
However the project is not only about the technical and scientific side of improving the marine environment but there is also a social aspect since the projects aim consists of creating awareness among citizens.
When replanting the shoots, the volunteers are made to connect with the ocean, creating a bond and an awareness that is strong.

She mentioned there are two startups working with robots to automate the collection and replanting of shoots.
Reefgen replants shoots through a submarine robot but it has not operated in Denmark yet, while brainbotics uses drones to collect the eelgrass from the water.

5.1.3 ODSHERRED INTERVIEW (Rohden, L. 29/04/2025)

The last interview was done entirely through email.

Lise Rohden is an operations coordinator at Odsherred kommune and the aim of the interview was to show how the commune was managing the eelgrass buildup on their beaches.
The interview showed that eelgrass was being collected by farmers before 2023 to be used as conditioner in their fields but to do this, the eelgrass first had to be tested for heavy metals like cadmium.
Just before the summer of 2023 concerns about PFAS came up which made them limit the amount of eelgrass used for agriculture.
In 2024, because of costs and because they had no complaints from citizens or guests, meant they decided to not remove tons of eelgrass from the beach and instead just push it to the side and let it sit.

5.1.4 CONCLUSION of the interviews

Interviews were done with different actors representing a variety of sectors which expressed boundaries and ways for action in switching to a more sustainable modus operandi.
The dialogues highlighted problems in managing the material, concerns with replanting practices , a lack of collaboration between parties and of support toward eelgrass collectors from institutions.
Finally there was an emergence of the possibility of using machines for collecting, monitoring and replanting eelgrass.

The results of the interviews show different themes whose key concepts are:

1. COLLABORATION AND INTERACTION BETWEEN ACTORS
Currently actors involved in replanting and the companies that collect and process the material have no dialogue between them.
In circular economy it is vital to create dialogue and understanding between the different players.

2. MANAGING THE MATERIAL
The goal is to transform into raw material ,something that is currently by in large being considered waste by some communes. The key would be to set up a collaboration with the collectors to create mutual gain.

3. REPLANTING PRACTICES
The replanting actors could use washed up shoots from storms, thereby relying less on transplanting from already healthy meadows.

4. SUPPORT TOWARDS EELGRASS COLLECTORS
Eelgrass collectors could be funded and encouraged in their activities by communes and organisations to increase the amount of material collected and get more people involved.

5. NEW TECHNOLOGIES
The future could be to mechanise collection, replanting and detecting best spots and not just relying on volunteers; similar practices have been used for some time for cutting grass.

To sum it up the results, show a need for collaboration, redesigning waste managenment practices, replanting ,supporting collectors from a more institutional level and using new technologies.

6 ANALYSIS

6.1 potential stakeholder mapping as a boundary object and decision making tool

To aid the eelgrass paradigm in executing an improved management of eelgrass through its whole life cycle, a decision making tool has been created in the form of a stakeholder map.
The map shows potential strategies that could be adopted and presents a holistic view to stakeholders.
This tool has been the result of codesign through an iterative process with feedback from users and is thus the result of the interviews done.

6.1.2 Tool objective

The map is made to guide stakeholders in their decision making for managing detached eelgrass leaves and replanting.
At the moment many leaves are being treated as waste and left to rot and replanting initiatives are not operating to their full potential.
With this tool, the goal is to give a more holistic view to stakeholders ,facilitating collaboration and use of different techniques in replanting and collecting.
The efforts comply with the search for new ways in enacting carbon storage, improving marine wildlife and circular economy with the transforming of waste into resource.
The BO raises awareness and encourages dialogue.

6.1.3 Structure of the tool

The map is structured in a way that shows the journey of eelgrass from replanting to shedding leaves ,collecting and processing, manufacturing and end of life.
Each bubble contains the stakeholders involved and the actions associated.
The first map shows the current state of affairs while the second one shows how things could be.

6.1.4 Map#1 current state of affairs

-EELGRASS: In this bubble the replanting is being done through transplanting with the University of Southern Denmark, the Center for marine Restoration and TænketankenHavn; in it is also the growing of eelgrass meadows.

-COLLECTING AND PROCESSING: farmers like Møn Tang collect the material from beaches or shallow waters and then dry it on their fields.

-MANUFACTURING: companies like Søuld, Seegrashandel (Schierup 19/03/2025) , Læsø(https://www.sould.dk) and Dormiente buy the material and make upholstery, thermal and sound insulation or roofing.

-END OF LIFE: communes like Odsherred push the material to the side of the beach and leave it to rot. (Rohden, L. 29/04/2025)

The arrows show that the eelgrass leaves start the journey from their meadows and many reach their end of life on beaches where the material is left to rot.
Some leaves are collected by farmers and end up becoming sustainable products and then reach their end of life.

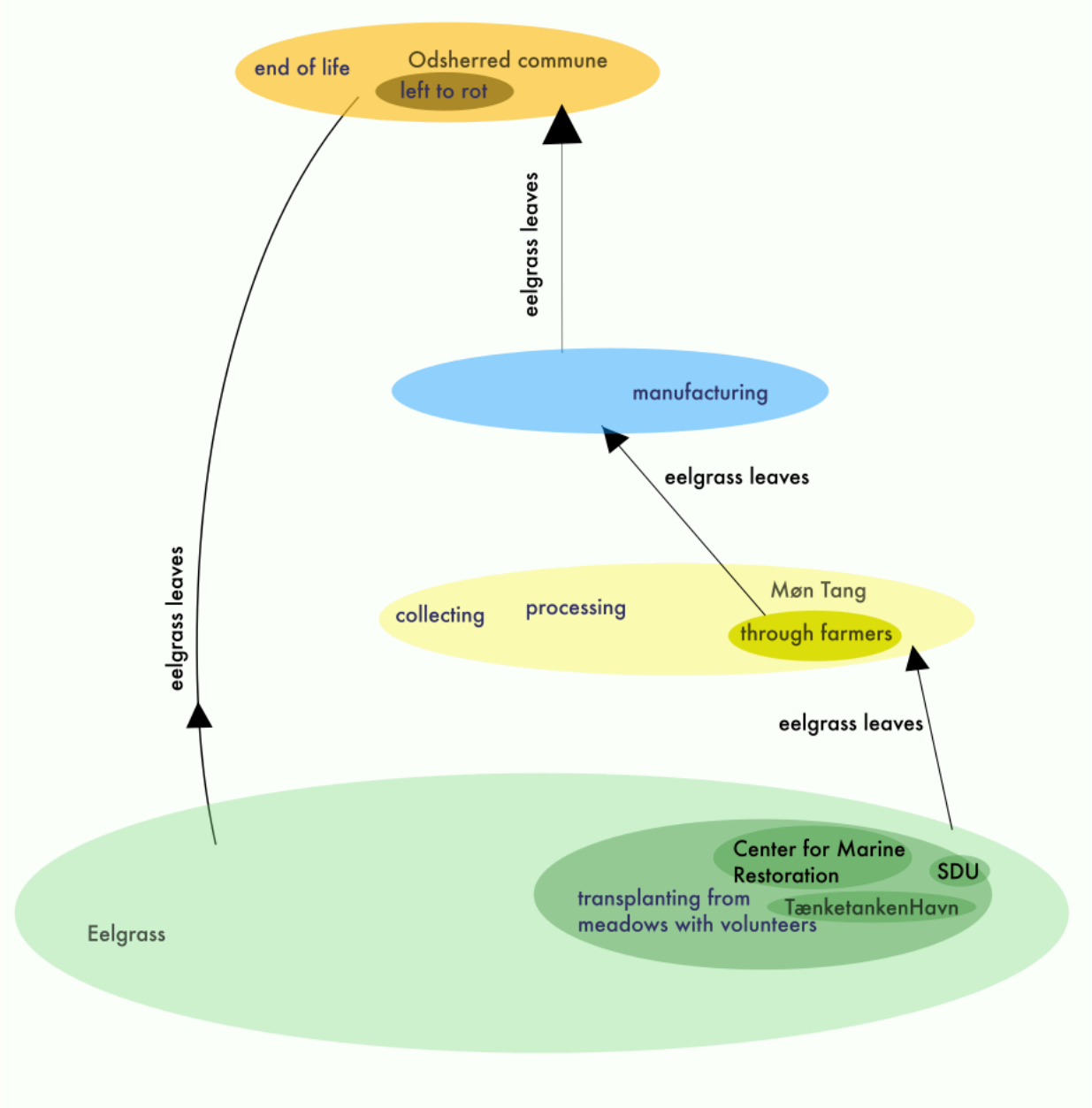

Fig.16. current stakeholder map

6.1.5 Map#2 potential state of affairs

-EELGRASS: In this bubble the replanting is being done by volunteers and robots from Reefgen who use different methods like transplanting with the University of Southern Denmark, the Center for marine Restoration and TænketankenHavn, transplanting naturally eradicated shoots(Ward 2020) and seeding (Granger 2002), all preferably being done close to where the collectors are.

-COLLECTING AND PROCESSING: farmers like Møn Tang collect the material from beaches or shallow waters and then dry it on their fields using a tractor and a truck.
The startup Brainbotics is testing the use of drones for locating and collecting eelgrass.

-MANUFACTURING: companies like Søuld, Seegrashandel (Schierup 19/03/2025) , Læsø(https://www.sould.dk) and Dormiente buy the material and make upholstery, thermal and sound insulation or roofing.

-END OF LIFE: communes like Odsherred push the material to the side of the beach and leave it to rot. (Rohden, L. 29/04/2025) ,the material can be used get biomass energy (Banu et Al. 2019) or as conditioner for agriculture.(Primo 1977)

The black arrows show that the eelgrass leaves start the journey from their meadows and get collected by farmers and robots and end up becoming sustainable products and then reach their end of life.
The red arrows show the dialogues and interactions that should ideally take place:
Replanting actors need to collaborate with manufacturing companies so that manufacturing can publicise replanting efforts as a quality of their products
and the replanting companies can gain from showing customers and investors that by replanting you will also get a sustainable raw material.
Actors in the end of life like beaches and communes should partner with collectors so that their land can be free of wrack and also with the replanting stakeholders so that replanting efforts are not done close to the tourist beaches were the stuff is not wanted.
Replanting players should consult with collectors where the best places to replant are so as to bring the material closer to the collectors.

Manufacturers should talk with the end of life players so that their product at the end of its lifecycle can be properly managed.

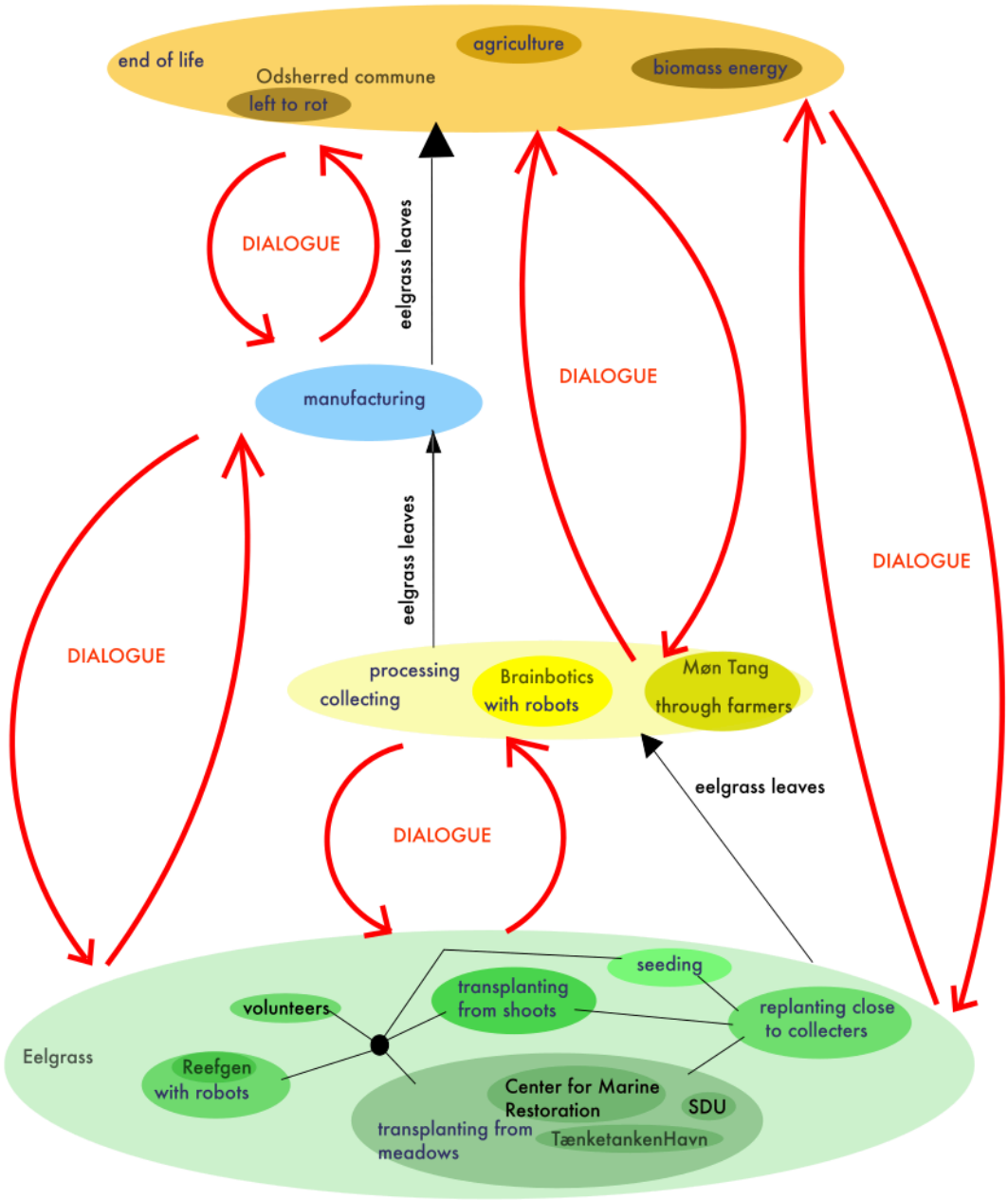

Fig. 17 potential stakeholder map

6.1.6. Expectations for the tool

The tool is expected to generate interest and insights for stakeholders for an improved management of eelgrass leaves and replanting practices.
it is a medium to communicate new ways and promote involvement for organisations to face challenges and possibilities encouraging discussion and teamwork which aligns with ANTs view of innovation on creating a network of players. (Callon, 1984)
The map must inform but also inspire action.

7. Discussion

The improved management of detached eelgrass leaves and replanting practices in Denmark shows difficulties and possibilities.
This section presents the gatherings of the report and gives readers indications for future actions.

During the research process, a number of critical aspects about the eelgrass industry presented themselves.
The largest criticality was the lack of collaboration and dialogue between stakeholders, then there emerged the complexity of replanting eelgrass and the fact that only few techniques were being implemented and lastly the fact that a lot of the material was being treated as waste.

The paper starts by showing the biology and threats to eelgrass which is harmed by excessive nutrients and mechanical tampering.

After this, it shows different techniques to replanting it that are being used around the world and lastly how it is being done in Denmark.

The research continues on the plant and talking about its industrial history mainly in North America and then talks about the different uses for the material.

After three detailed interviews with an eelgrass collector, a Tænketankehavn worker involved with replanting and an Odsherred commune project manager involved with managing beach wrack, different themes emerged.

These included the need for facilitating collaboration and interaction between actors, improving material management and replanting practices, fostering support for eelgrass collectors and using new technologies like robots to collect leaves and replant shoots.

The outcome of these interviews was the need for a tool to aid stakeholders in navigating the actor landscape.
There are two maps presented with the first one showing the current state of affairs and the second one a potential state of affairs.
In the first one a large part of the material is not being collected and is being left to rot , while replanting practices are not collaborating with collectors, manufacturers and actors in the end of life thereby limiting the amount of leaves entering the loop.

In the second one all actors are encouraged to dialogue with an addition of stakeholders involved. In this map, robots are added for replanting and transplanting from shoots, seeding and replanting close to collectors are added techniques.

Robots are also added in the processing and biomass and agriculture are added uses for the end of life.

In the future machine use could increase and replanting could become a more popular endeavour , planting with seeds in greenhouses or labs and subsidies being given to collectors, with thus larger financing.

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Schierup K. (06/04/2025) interview with Møn Tang owner 10:10-10:50 (the interview took place at Brøndegårdsvej 8 4792 Askeby,Denmark) interview done by Denys Fox Hopper

Schierup K. (19/03/2025) interview with Møn Tang owner 12:30 (the questions were answered by email) interview done by Denys Fox Hopper

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APPENDIX.
Interview transcripts

Schierup K. (06/04/2025) interview with Møn Tang owner 10:10-10:50 (the interview took place at Brøndegårdsvej 8 4792 Askeby,Denmark) interview done by Denys Fox Hopper

00:00
Yeah, yeah.
00:05
But, uh, you're the biggest one in Denmark.
00:12
No. No.
00:15
Maybe, maybe not.
00:17
Uh, one year it is next year not.
00:22
Uh, the win and it's not you cannot put it in excel
00:36
collecting. Ah, not. It's a nature. It's a nature. Sometime it's good. Yeah, sometimes.
00:47
That's so good.
00:49
But you're the farmer that collects the most.
00:53
Yes. In all of them.
00:55
Sometime not.
00:57
Also, sometimes other people collect more.
01:01
Yes.
01:02
The wind and how much is growing
01:07
You know, yeah, you can't predict cannot put it in the
01:12
Computer yeah, it's not it's only nature. Yeah
01:19
But you also tried the planting it. No, it's a
01:27
It's a it's not good.
01:32
But I try to make a
01:39
- I tried planting, planting school before
01:51
now they take the plants from plants. There was a lot of sea grass take plants from geese and take it on the other place. Yeah, we think it can maybe grow.
02:05
It's good.
02:06
It's a trans...
02:07
Transplant.
02:08

Transplant.
02:09
You cut it off and not move it.
02:11
It's not good.
02:12
I can use some picture.
02:16
I think under the piece, sometime coming,
02:21
well, you know, plants.
02:24
If you take care of this,
02:27
you can...
02:30
later you can plant this one out.
02:34
Sometimes I come millions of plants to a bit.
02:41
I...
02:43
now I try to make a planning school.
02:50
I could take care of the... when they come in. There's this store, the old glass, initiative, like where they're transplanting your grass,
03:09
like in the audience.
03:11
- Yes, it's not good.
03:13
- Oh, it's not good.
03:15
Oh, I'll say good, but it's not good.
03:19
Take for a good place.
03:21
- Say, I think I can maybe grow it's not good.
03:27
Can take this plant a comer on the beach, you can take care and you can plant it
03:35
a place the zingi. Here can it maybe grow.
03:40
It's so you don't know if you move it is going to continue growing.
03:47
Sometimes sometimes not.
03:49
So you might move it and then it all dies.
03:52
You have...
03:53
Take it from places.
03:58
Good.
03:59
Take it to places.
04:01
Maybe not very well but you take the plant that come in
04:09
if you not take care of it is going dead

04:16
if you take care of it you can make a planning school
04:22
you can plant out on the place you think.
04:27
Yeah, you can maybe grow.
04:31
But planning school means you plan your take care of the plants.
04:39
Oh, and make it clear to plan out on the best time on the year.
04:48
and make it clear to plan out on the best time on the year. But they never tried like the municipality.
04:55
I see they're trying to plant it everywhere but not around here.
05:00
Why in the stay in Noah to summer in this summer they think to plan oh it's
05:11
sinking sinking tank sinky tank sinky tank sinky tank sinky tank sinky tank Yeah, the one of the three.
05:25
Oh, you know him?
05:28
Yeah, I called them.
05:29
I talked and they told me, but they told me they get very, like, not that much.
05:37
Okay.
05:38
And then I tried calling Ib Ungerman, but his number is not the right one.
05:45
Okay.
05:46
Here is the...
05:48
How is the machine?
05:51
You have...
05:52
Mix it?
05:53
We're there.
05:54
Okay.
05:55
Okay.
05:56
Oh, that's...
05:57
Yes.
05:58
And so where did you get...
06:01
Where did you find this one?
06:04
This one? Oh On the farmer.
06:06
- How is the corn?
06:09
- Oh, here we have made a difference.

06:12
The same with this we have...

06:15
It's the pick of one, we...
06:17
We come with an hour.
06:20
These here.
06:22
Use it to collect it.
06:25
Yes one.
06:27
So that takes out the sand, or tongue, and stone, and see a sand and... Yeah. But then some you don't clean and use for the garden.
06:50
Yes, yeah.
06:52
But the one outside is from here, actually, from the beach.
06:58
Yes.
06:59
So it's not clean.
07:01
Oh, yeah. clean. The clean and we have a factory in Germany, we need about 50 tonne, - Sea-glass handle. - Yes. Yes.
07:30
They sell it to dominant and spill-take.
07:33
- Yeah, yeah. - All the factory in Germany.
07:38
- We only sell to sea-glass handle. - Yeah, yeah, yeah. - We.
07:39
- Yeah, yeah, you remember. - Yes.
07:42
- We have us.
07:43
We have...
07:45
I remember. Yes. We have us. We have.
07:52
And but Germany used to have it also. They used to collect also. Only collecting for pillars and matters. Not for isolation. It comes on
08:50

installation. It comes on round bars. Yeah, they are actually. And then use the same machines This one we have take some nuts we need to use for collecting and so going inside the machine and come out and we make small round of... [
09:20
When did you start collecting?
09:26
No, ah, you can see here. [BLANK_AUDIO]
09:34
Wow, museum.
09:36
Yes.
09:39
But it's me.
09:40
[BLANK_AUDIO]
09:42
So your whole family is to correct in see class in 50. This picture is from 58.
09:52
Yeah.
10:00
This comes in. Yeah.
10:02
is causing time.
10:11
And where did you get the information from that? It's a V, you're pointable.
10:18
It's a Fok and Floua. folk and flora. The folklore is books in three bins.
10:30
Oh, here.
10:32
Here.
10:37
It's a nice three bin.
10:42
Three bins. Freebing, three bing with NATO flowers and everything.
10:51
It's like a historian history of a floor of books with data. If I can flu one.
11:07
We are pointable.
11:11
This family has gone live here.
11:15
Oh yes. And he wrote so really this is really strong history.
11:25
- Yes.
11:27
- Yeah, I have two.
11:31
- I see the people.
11:34
- Throw?
11:35
- I can see.
11:35
- Yeah, I can see a sheep, I see a sheep.
11:38
- Yeah, yeah, yeah.
11:39
- But no, you cannot go behind the other side.
11:55

can not go behind the other side. You can't see the car. You can't see it's light or dark. Yeah, because I was looking on Google Maps and I could see like around here it was all light. Maybe she could maybe other things.
12:09
You cannot.
12:11
But it was a project we make without this.
12:20
And this is the same.
12:23
Yeah, it's all collecting.
12:27
- What?
12:28
- Like I heard that there was an American company.
12:32
Yes, Cabot is a student.
12:35
It says to a company in America.
12:40
- Oh yeah.
12:43
- My life, yeah. My life made.
12:59
And so how did it work?
13:02
So there was this factory in Callejo but then there were all the farmers that
13:08
said it to him okay in 1988 my father sent 81 ton oh well to him and were there other places you could send it to?
13:27
Yes, of course.
13:29
Yes.
13:30
Is the Tung McAl
13:37
in Yutland and all four
13:38
McAls like.
13:39
Yes, it was McAls for going on.
13:42
On the whole country. Oh, yeah.

00:00
So I'm going to take my jet boat and get a nice
00:04
jet boat and get in the camouflage bar.
00:07
So the little blue, the diamond, the bloke,
00:10

is the middle of the boat.
00:12
For the swimming pool, here we go.
00:15
[INAUDIBLE]
00:17
We are really at the
00:21
new top.
00:22
But what about just like the camping down there?
00:27
Yeah.
00:29
But I called them.
00:30
They said they don't have no--
00:33
Yeah.
00:33
Please.
00:34
You'll dress in there.
00:36
I want to be?
00:37
Yeah.
00:39
He said the current is too strong.
00:41
Yeah, you have to go.
00:42
Inside.
00:43
Yeah. Out to the Baj. This is the second one.
00:46
This is the second one.
00:48
This is the second one.
00:50
This is the second one.
00:52
This is the second one.
00:53
This is the second one.
00:54
This is the second one.
00:55
This is the second one.
00:56
This is the second one.
00:57
This is the second one.
00:58
This is the second one.
00:59
This is the second one.
01:00
This is the second one.
01:01

This is the second one.
01:02
This is the second one.
01:03
This is the second one.
01:04
This is the second one. This is the second one. This is the second one. This is the second one. or the family.
01:07
The view collect only from your beaches or... So different properties all around the moon.
01:28
But there it will have the highway.
01:36
I will come to come this way.
01:39
Yeah, it came to our own power.
01:41
Yeah, it came, yeah. Go out on the balcony.
01:49
And so you have property there or...
01:54
Equalizing.
01:56
Yeah.
01:58
Okay, because you have so much post.
02:00
Yeah, they have a cracker.
02:03
Now, in this place?
02:09
But it's your property or is it someone else?
02:14
It's a kamuna.
02:17
Oh, yeah.
02:18
We're collecting.
02:19
Well, but it means... well by the end
02:25
and so then you just
02:29
dry it here on the fields
02:32
no
02:33
you start
02:36
uh
02:40
uh uh So you dry it here or yes, see after transport it is it is one for the
03:09
transfer so you collect it when it's still wet and then yes okay because I
03:18
thought you could only transport when it was dry. No? It's...
03:25
I don't transport those from firewood too.
03:29
Yeah.

03:30
Oh, yeah.
03:31
Yeah, 'cause from Google Maps I could see that the beat, the water was all clear. There was no green underneath.
03:48
Yeah.
03:49
Yeah.
03:54
And so the, it's the Faro commune or...
03:59
What in the boarding ball?
04:01
Yeah.
04:04
I tried to make
04:10
Secret union ah to take care for the beat in the morning ball. Yeah
04:22
And you you said you contacted like 36 different, you remember you set on the phone that you
04:34
had contacted many people like 36?
04:37
Yes, yes.
04:38
And only six, yes.
04:40
It's not easy to make new farmers.
04:47
It's sometime,
04:49
because very much in,
04:51
sometime, nothing.
04:53
- Yeah, it's different from year to year.
04:59
And it is very difficult to say,
05:03
you must make cigars.
05:05
Yeah, yeah, no.
05:07

How much?
05:09
Yeah, yeah, yeah.
05:13
Yeah, but it's a good.
05:22
Yeah.
05:28
We go out. But do you have to be a farmer to be able to collect it or...
05:33
Yes.
05:34
But it's difficult to...
05:53
But because I guess the farmers don't see it economically so good. Sometimes, very good.
05:55
Sometimes bad.
05:58
Yeah.
05:59
It's this in iron.
06:10
And so you just collect from Fauw and Nistu.
06:15
Oh, nice.
06:16
It's pretty thin for the Nistu also.
06:19
Okay, how big is it?
06:21
So you have to switch a long way.
06:24
You have to cross the bridge and then go all the way.
06:33
But they pay money to take it away.
06:36
Okay, so they pay you to take it away and...
06:59
Because like in Odserid, in northern New Zealand, you learn close to old war. They just sell farmers in limfion. Someone will cure the city cure and someone will see the special
07:32
But instead there's like one commune that just throws the eel grass out. They don't.
07:33
It's not good.
07:35
Hmm.
07:36
Okay, I have done.
07:39
Cool.
07:40
Yeah.
07:41
And they just throw it back to see it's not good.
07:47
But because they can't get farmers to do what you do or...
07:57
Yes.
07:58
...what?

07:59
It's difficult.
08:02
Yeah. It's difficult. Because they don't, they're not paying enough, maybe also the communal is not having
08:09
that money to it. million. Oh yeah but it's not enough. But they don't do anything with the
08:29
real grass to create a shade from it to and use it for nothing.
08:52
And then they have to test it as you must have test.
08:59
If you use it for farming on the wheels, you must have a test.
09:04
Use it for farming also.
09:09
This material we cannot use is raising pillars and all things we get to farming. but we have a test on it
09:26
Can you first one and Chris stuff?
09:32
Oh yeah many and then the test because more or is it very expensive?
09:53
So maybe so you either pay the farmer to get it or
09:57
you pay for the test.
10:49
My son have all the fees with this phone and he uses only for our cell. So could you dry the eel grass directly on the beach like using pellets? You must not use energy to buy it. cigars for pillots and mappas. They must drive with the sun and the wind. It's the best.
11:30
And then when you ship it, does it have to be covered with the plastic or...
11:38
An...
11:39
A net.
11:40
A net.
11:41
It's not.
11:42
It's not so much plastic and so so Kalun so this commune has more money to spend than...
12:05
No.
12:06
So...
12:08
He used it for us ourselves.
12:12
Oh, this wedding ball can move.
12:16
Not...
12:17
Pay.
12:19
But don't they pay to get rid of it?
12:24
Like... It's not saying.
12:27
Ah, not saying.

12:28
Not saying.
12:29
Ah, yeah.
12:43
But in the past, like they had like, you'd have seasonal job, like where people could go
12:53
to the farm and collect and they would get paid when you create secrets, you watched things.
13:06
What way is the win?
13:09
Today, I think the numbers come in with power.
13:15
And you must grow and look and take it.
13:19
They cannot take it on today after.
13:47
cannot take it on today after it's not good. When it comes into this you must take it Yeah. Yeah. That is a picture I use. Uh, and what is that?
13:57
Danish law.
13:59
Like where you can get stuff from the sea if you saw the same like a waste coat on
14:09
U-turn
14:10
It's
14:12
The private
14:14
Strain
14:16
little piece
14:18
You can collect it if you want to collect see, you must ask the private owner or come on if it's like
14:35
owner. You cannot take it. You must have a See
14:46
The private
14:48
Oh, we have a cool
14:52
We have a piece of one bulk moon
14:56
Yeah, yeah
15:01
And... And like the profitability does it depend on how much comes in each year or...
15:27
- Okay, no.
15:29
- Sometimes we correct 30 times.
15:34
- Sometimes...
15:39
- 70 times.
15:41
- And...
15:43
- It's the best year we have, one hundred and fifty times.
15:48

And you do the same place.
15:51
But do you change the price when you get more or let know it's always stagnant? I guess there's not that much like competition from another...
16:07
No.
16:08
It cannot.
16:11
If you want to say it like C-G-A-T-N, so you cannot take in this year, same prona and next year, 15 prona.
16:27
It cannot.
16:55
But, and you contacted people around Shellen or like where did you put them? It was like marine and South Shellen. Oh, I have also connected the shilens.
17:07
Oh, yeah.
17:12
You're keeping shilens?
17:17
Ah, yeah.
17:18
In the north, you know.
17:20
Yes.
17:21
They are Danish time.
17:24
Yeah.
17:26
But they create dance guitars.
17:30
But they are very small and long.
17:33
Most for it.
17:35
Yeah, yeah.
17:37
And he said he sells maximum six kilos per person is for they have five from us and
17:50
I said it and what about you
18:05
come on. Does he collect a lot? Yeah. Here you go. New copying, but that's not voting.
18:12
Oh.
18:14
Oh.
18:17
And so you weren't able to get the people more involved or more, I try.
18:35
But if in the future there's more
18:49
eelgrass like through the planting and stuff
18:56
If they're able to do the magic you think more people will collect - It's quite a...
18:58
- No
19:00
- Yeah

19:03
- Yeah, it's a little bit of a - Ping - Huh - Anta They are... they are... they are... means that a Goka, Ping, for...
19:07
Anta, take money from us, like you take candy from Kila.
19:18
Is this the same?
19:20
It's not good. It's
19:29
Today if you want to
19:34
Money money money
19:40
You must make a
19:42
Planning score
19:44
Take the plants from the beads and show you care,
19:48
give a good story until I try to make a better sea.
19:58
The other one is quite hot, it's not good for everything.
20:06
The other one which you take from a good place and take the place.
20:13
I think it must maybe grow here, but it's growing well here.
20:22
is growing well here. Uh, yes, we don't know.
20:27
Yeah, it's quite up.
20:30
Oh, here he is.
20:32
Uh, and here,
20:34
longer is it paying?
20:40
Yeah. Sometimes I was on the camping place.
20:51
Field.
20:52
You knew it.
20:55
Field.
20:56
Field.
20:57
Is it around here?
20:58
A plaster.
20:59
A plaster.
21:00
A plaster.
21:01
At the bridge.
21:02
No.
21:03

In plaster.
21:04
A plaster. A plaster., plaster, plaster. Yeah, yeah, a big
21:10
camping place. I want on your base and on one ten million plants you can take it no take it you can make a really good planning school
21:33
after storm take your plants take care of them and clean it out on the summer
21:47
I have talked with Tinken. Tinken.
21:48
How?
21:49
Yeah.
21:50
Oh, yeah.
21:51
Oh, yeah.
21:52
For two years, I see this.
21:55
It's quite a poor.
21:58
Now, I have connected the connected again.
22:03
And see, maybe, maybe. So, I will connect, collect it in the beginning and see maybe, maybe.
22:06
So I will connect the ting-dong hole again and I think we can make a clan to take the plants from the beach and then plant the make the school
22:30
yeah deep places so in that area in the channel in the slei sai hall channel Slee, seahol, chanol, you must make a moving people to moving.
22:51
I go with my dark on the piece.
22:55
Today, yes, you take the best of the plant and you can go to a sink up with them close the beads.
23:07
Yeah. So, another take care of it and take it to the planning school.
23:14
Yeah. It's good. Yeah.
23:18
The other thing is, it's...
23:22
Yeah, I think they are think poet scuba
23:27
Do you think on the office is not for a little bit we need to but they get the money to get the money there.
23:47
On the target. Yeah.
23:48
Many.
23:49
On the target.
23:50
When they plant it, they cost 10 crohnas for every plant.
24:01
It's cost now.
24:12
It's cost now. When you make some metals with plants inside, you can on the sea. Yeah. And so no Derba

24:28
with Snog
24:30
and no people to
24:32
plant as a nail
24:34
to the plant.
24:37
Nothing.
24:38
You have it.
24:40
You can
24:41
slice it down to the sea
24:43
and so.
24:43
You can slowly sit down to the sea. And so...
24:48
You say, "Yes, so they need a bit of school.
24:52
You have to do the school."
24:54
Yes.
24:56
It's the same.
24:59
And with the seeds,
25:02
they're not able with the seeds.
25:05
They didn't try it.
25:06
No, it's...
25:11
When the seeds...
25:15
When the seeds connect...
25:21
And when drum stuff.
25:23
Uh...
25:26
First flower,. - Yes.
25:27
- The first time they how wasting the sea
25:32
cause on the sea.
25:37
- Yeah.
25:39
- But yeah, not for
25:46
growing
25:48
Just before the sea guys on the other side on the border they connected
25:59
And so yeah, you can use the floor for plants, a show for you.

26:09
Not before.
26:11
You have to put the seeds in a certain, like when it flowers, your flowers must go upside to the water.
26:29
And so it's connected.
26:32
See a moon, moon, sea and earth, connected.
26:38
And so you can show you for, and so you can get a plant, not people.
26:47
So it's also hard to get the seeds.
26:56
You have to get the seeds in a certain disease.
27:00
This is difficult to make.
27:04
You must go to the water and you look...
27:08
Oh, here is...
27:11
Yes, some... [Pause] (footsteps) But nobody grows them like the plants inside of a lab or
28:36
They're not able to do it like on a large scale
28:41
No.
28:43
It's...
28:50
But you get money.
29:32
Lot of money. Why do you think now there's so few plants growing If you not get your food on your morning Yeah, you
29:36
Over time you'll get it
29:40
If sea guys not get quite stuff it's the same it's most No trans, many things there must be a lot of great stuff on the sea, but it is not this
30:18
we see.
30:22
It's not right. It's the same people coming not out from the office and for tell the people, you must do
30:34
much, you must, you must go out to see, look what to see, tell what you see.
30:42
It is not this.
30:49
Tail by your sea, from your office. Not from your sea. [silence] But like a hundred years ago, he on the beach here, they used to be seagrass or yes.
31:57
But then it disappeared.
32:00
Yes.
32:01
What do we think about our
32:07
kluaka? In Copenhagen, you put your skit in the
32:15

clock, those out to a big place. And if it's rain, it's going over. It goes in the sea. Yes, directly. Not
32:31
cleaning. Yeah, medicine rest and soap and k-Kad goes directly out to the sea.
32:54
It is not good, but it's the fault of the farmer because the farmer uses
33:09
the stuff that the farmer is used to the plant.
33:15
Is for the growing base? based here on the van the tailing outside the sea is not off this stuff it is not the right
34:08
One taste on the O-Hose University, they have made Nour, comma 11, comma, uh, dressed up, paledita, vent.
34:12
Well, uh, test on, yeah, uh, from the fields, uh, voice, Nour, comma, Nour, boys. Newer? Common. Newer? Yeah.
34:26
Uh,
34:29
so was cleaner on the field. Yes, but in much more than the drinking water.
34:34
Yes.
34:35
The thing was, my school up to zero.
35:07
So the drinking water has more bad stuff can have So it's like the chlorine in the drinking water the
35:11
stuff the stuff to clean like to make it drinkable
35:19
Like they add stuff to the drinking water twist off the inside
35:23
Is
36:12
2 1/2 3 and more behind this. [Pause] You can see as sea guys flowing on the sea. Here, we do can make sea from this in jule, jule or burst.
36:21
Yeah.
36:22
Not on the ground of the sea.
36:26
When the sea goes rolling on the order, they connect and so it's good.
36:39
You can so the sea and do it get some plan.
36:45
Yeah, yeah.
36:47
Not before.
37:00
So I must work.
37:02
Yeah, I think I had enough. I don't have any other questions.

Schierup K. (19/03/2025) interview with Møn Tang owner 12:30 (the questions were answered by email) interview done by Denys Fox Hopper

Hi Kurt,
we spoke on the phone yesterday and I found out that Dormiente ,the mattress company you supply the raw material to also gets some eelgrass from Germany, thus I was wondering If you know the name of the other supplier/s. and if they encur in similar problems as in Denmark with legislation and increasing the amount collected.
I also read that northern Germany used to export eelgrass to samuel cabot inc. before the war. Do you know anything about wich area in northern germany was involved?
Also, you mentioned another company you supply to in Germany,what was its name?
Best regards,
Denys

Hi Denys,

It is a misunderstanding, we do not deliver to Dorminente.
That is our dealer Seegrashandel by Lübeck who delivers in Germany.

You can contact them on www.seegrashandel.de

Kind regards
Kurt
Møn Tang

Mau ,L.(28/04/2025) interview with Tængetangen Hav student worker 10:05-10:43(The interview took place on Teams)

00:00
If you want to add some very technical questions about the figures and stuff you have to talk to.
00:07
Sorry.
00:12
Who can you hear me? Okay, so you said to send the very technical stuff to to pass like SDS scientists.
00:47
You can take the first 15 questions that you sent me.
00:57
And talk about those.
01:00
Okay.
01:01
Yeah.
01:02
So the ones that you
01:08
You already kind of
01:11
responded to with the red or
01:16
Oh
01:20
The first one

01:22
when the
01:24
replanting begins
01:27
yeah you can read about this in the website but it's 3 years from 2024 to 26 and the first
01:38
replanting or the first planning day was last year on the big ocean day on the 8th of June, 20th, 24th and we will do the same this year
01:52
on the 15th of June. So it's almost the same day.
02:01
Oh yeah.
02:03
Oh, yeah. And then we'll do it again next year and then the project will be finished in that kind of way.
02:10
And hopefully they will do some more initiatives, but they are working on this right now actually.
02:19
But the project is being funded by a bank or
02:27
Norga and
02:36
Okay, so they're doing it for their ESG for their company and
02:44
So yeah, they are funding this project for three years and maybe they will do it even longer.
02:45
But right now it's this three years and you know the big organization organizing this project is Tink Attack on how?
02:58
Yeah, yeah.
02:59
Which is also funded by an ODF on...
03:06
Yeah, so they work together.
03:10
Yeah.
03:13
And then you ask if the plants are taking from the locations close to the planting area.
03:20
And they are there taking from this donor plant area.
03:24
But you can also read about this in the file that I sent you.
03:28
But there's a lot of criteria that needs to be fulfilled.
03:32
And actually our volunteers, in this project, are sent out to the donor plant area to see if they are fulfilling all these criteria.
03:43
So if it's big enough and if it's sustainable enough to harvest
03:48
up and actually a lot of our volunteers are doing this right now. In the new test areas they are telling the volunteers to go out and check if they can find this big donor plant area where they can take the plants from. These are... This is exactly... Also, a lot of these criteria needs to be fulfilled.
04:28
And they also need to take maximum 10% of the donor plants and stuff.
04:38
Yeah.
04:39
And then you ask if the plants are increasing in number,

04:48
so we have they planted around 30 places, locations last year,
04:51
and we're going to plant 30 locations again this year.
04:56
And some of them are like a big scale,
04:58
which mean that they are growing and have been growing in the right amount
05:03
to call it a big scale but this is actually only
05:08
three places
05:10
in the library now so it's
05:13
in Croatia and in
05:16
Croatia as layers and then in the north of Jetland as all which we are calling these big scale locations.
05:27
And then it's because they have been cruel enough from last year to that way they
05:32
fulfilled the Kateria to call it a big scale. But then I have also sent you the link from
05:39
Cinder from Marine. Cinder from the two, moving to the building and you're seeing them.
05:45
Yeah.
05:46
And that is like the recent updates,
05:50
the most recent updates.
05:54
Yeah, yeah.
05:56
Because they are monitoring them all the time.
05:59
So it's here where the volunteers go out
06:04
and check the plants.
06:06
So if there's any more new shoots and they put them in these plant rings,
06:13
so these are the many shoots that are in the rings.
06:16
Yeah, and I read that they use also buckets.
06:22
I didn't understand how the buckets were being used.
06:27
Like buckets? I think it's just for collecting stuff when they're like planting, but I don't
06:34
really know which buckets you refer to. I think they have some buckets out in the water
06:40
when they have the shoots and they need to repl-plant them, then they have them in buckets.
06:47
Oh, it's like to protect the shoots.
06:52
Yeah, and have them in water.
06:55
Oh, okay.
06:57

Yeah.
06:58
Yeah.
06:59
And then, yeah, I think you need to talk with SDU if you need to have some more detailed answers on how exactly they choose these areas because this is not us that are doing this.
07:17
This is like our scientific partner which is SDU that is handling all these stuff. I would recommend you to tell them about these stuff.
07:29
I think a lot of criteria that need to be fulfilled and they check these every year.
07:36
But we actually have a lot of...
07:39
like, as the year made a lot of recommendations where we could plant, for example, in tree and some places
07:46
in all land and stuff like that. But because we didn't recruit enough volunteers to
07:52
plant in these areas, they are not becoming a location this year. But we have the...
07:57
Oh, yeah.
07:59
...as do you have recommended that this area is has the potential to rule here. So it also depends on if we have enough volunteers
08:09
that can do the planning.
08:11
Otherwise the location will not become nothing.
08:15
- Okay, but you're doing-- - It's also a part of it.
08:18
- You're doing also one near Copenhagen, you know?
08:24
- Yeah, we are not doing so many
08:26
planning in Copenhagen, the closest to Copenhagen is in the law.
08:32
Oh yeah. Yeah. And then we also had one in Hensinger, which is, I think, like 45 minutes
08:42
from Copenhagen or something. Yeah to the north.
08:45
Then one is actually not going to happen this year because the eel grass is dead over there.
08:52
Oh that's sad. But we had it was actually supposed to be this big scale planting.
09:03
But because of all the wind and current this year then it was gone
09:07
unfortunately so they're not planting in the earth this year
09:13
oh yeah but the one is in v-law is close to the bridge no it's actually if you go on a website.
09:27
Yeah, I look at it.
09:30
It seems like it's...
09:34
You can see that I just updated all the maps and there I don't know if you've seen it,
09:39
but then you can click on all the...
09:43

It's because our website has been down the last couple of days.
09:47
And if you go in there now, then there's a there's a map where you can click on all the locations.
09:54
And we just updated this.
09:56
So don't know if you've seen it yet.
09:59
And but then you can click on the address.
10:02
And then you actually get like a Google maps.
10:07
Location. Then you can click on the address and then you actually get like a Google Maps location.
10:09
Oh yeah, I'm seeing it.
10:10
No. Yeah.
10:12
So that's really good to see like where we're we're planning.
10:17
Yeah.
10:18
No.
10:18
No. No.
10:19
It's it's close to
10:23
see how much of a high. Yeah. Yeah. Yeah, it's close to See what?
10:28
Yeah, yeah
10:32
And
10:37
Yeah, you ask what is going to happen this summer?
10:42
So yeah, we're planning again
10:44
as I just said and some of these are like re-planding
10:49
as you also mentioned which when we planned it last year, for example was in You Can
10:57
Make Shiller and Shiller's all and stuff like that. But then they didn't fulfill the criteria for becoming a big scale.
11:06
So we're just planning the same area but a little close by. Because they're growing but they're
11:15
not going as much as what would like to as for them because we come like a big scale planning.
11:22
So for example in the one in in COSUOSL, which was supposed to be like a big scale planting. So for example, in the one in
11:25
in Cuschia, it's later
11:28
which was supposed to be like a big scale
11:30
planting.
11:32
The volunteers playing in them in like a

11:35
little too shallow water and like in a current area.
11:39
So this year they would try to move the
11:41
planting a little bit and see if that
11:44
will hopefully get the
11:46
them to grow even more.
11:49
Oh yeah, yeah.
11:51
Just that makes sense.
11:54
Yeah, but you're talking about nuke being a filester or...
12:00
Yeah, actually the one I was just referring to is in question.
12:07
If you are in the map, let me see.
12:14
It's like West.
12:18
Oh, yeah.
12:20
Yeah.
12:21
So they're becoming like a big scale event this year.
12:29
And they're just trying to move the location a little bit to see if they can avoid all these currents.
12:39
Yeah.
12:50
And then we have also some like entirely new planning areas which is called like a test planting because they're planning for the first time.
12:53
So they're just taking out some shoots and then they're monitoring them and seeing
12:58
it.
12:59
It's possible to put them to grow it there. And that is for example in Lola, if you can also see big scale, you could do the test planning or you could
13:29
do the replanting.
13:30
So we have like three different categories, you can call them that.
13:37
But the big scale is just the same as replanting but on a larger yeah exactly so they need to fulfill different
13:49
criterias so on the big scale they need to be
13:51
even more shoots and it's actually only one
13:56
location which fulfilled this criteria
13:59
this year and that's for the ship
14:04
which where is that?
14:07

It's like a little south of
14:14
oops
14:17
Oh yeah
14:19
Yeah, so that's like a big event this year
14:25
But yeah, it's a bit sad that it's not more big scale, but
14:31
that's just how it is.
14:33
That's really tricky to replant.
14:40
It's, but this one is actually doing really well.
14:44
The one of the one for us yeah so that's good
14:47
yeah
14:51
and yeah you also ask if we're replanting in moon yeah you're also doing that it's
14:58
the one called staenor the north yeah
15:07
inside the field
15:10
yeah exactly
15:16
and yeah I hope you can see like the
15:18
the graph on the center for moving a truck and a button then you can look at all the locations and see how they're doing.
15:30
That's good to look at.
15:37
But the graph you're talking about is a one called
15:43
Ginnam's "Nid League" "Antal School". It's neat to leak untal school. Yeah, I think so.
15:47
I'll just find it so I don't see anything.
15:54
It's like it has a map and it has some green stars.
16:07
Yeah, exactly.
16:08
Yeah, we'll just find one so I can see.
16:11
Yeah, exactly.
16:12
Then they count how many shoots there is in the rings.
16:18
So, like it says here in July there were fewer shoots and then
16:30
Yeah, which one are you looking at?
16:39
It's I thought there was only one graph
16:46
Yeah, that's the one in...
16:52
I don't know.

16:53
Yes, that's the one with 25, and then it's...
16:57
in April, it's around 10, right?
17:01
At the one?
17:27
I don't know it says then there's this graph with...
17:34
There you can see what I mean.
17:37
Just send you a link.
17:42
Is this one here?
17:44
Can you see?
17:45
Let me see.
17:48
Yeah, I see.
17:50
Is that one?
17:51
Okay, but what does this mean here?
17:54
It goes up and down.
17:56
Yeah, that's when it's down to zero, then it's dead.
18:01
And there's not anymore shoots.
18:04
So which one did you click on here?
18:07
Oh I didn't know you could click on so if you click it gives you a click on this
18:14
task then you see which location it is. Okay and so in some places it died and some places it was very good
18:28
No I think this is like time so on the X axis then you can see in some areas around or in some places in July it was good, it was over 50 shoots but then in 25 I think in my computer I
18:51
can see it's in April then they monitored it and then there was no more
18:56
left and that's probably because of the the window so it didn't survive the window.
19:05
Oh, okay.
19:07
Yeah, but that is like, that was for example the issue for enhancing it.
19:14
So we see that it did very well in October and then after the window time then it disappeared.
19:24
Oh, yeah. the winter time then it disappeared. Okay.
19:25
Yeah, so winter is down to several then there's no more shoots.
19:32
So, Helsinki is here in northern Yulend.
19:41
In northern Chile.
19:42
Yeah, northern Chile is here.

19:44
Yeah. But actually it seems like you can really see all the monitoring in here.
19:51
It seems like there's only one from Shilah, right?
19:55
Yeah, there's only the one, I guess, in Nuke being.
20:00
Yeah, and I think it's because they just figured out this
20:07
enhancing it out so they probably haven't like
20:10
Put it in the data bay the data bay see it
20:12
but it will be
20:19
But are there do you know of any other plants that are so
20:31
hard to plant? Like sea plants on what? Like in general?
20:37
Yeah, in general.
20:39
No, I don't believe. I don't think they really do it with other, like, in this kind of way with other plants.
20:52
But I guess there can be like some more protection of the plants as you also mentioned, like, if they're protected from crabs and curd. I think they talked about using maybe some more scones around the
21:10
bed, the bed in bed. So they can be more protected because I think the real issue is and the window and also as mentioned like nutrient load.
21:30
Yeah, and you can't use the seeds also to plant.
21:40
Yeah.
21:41
Yeah, not only. Yeah, there's like a lot of technology happening right now, right?
21:48
With the machines doing all the planning instead of like in our project, it's volunteers that are planning them.
21:57
Yeah.
21:58
And so they're taking the shoots from the donor bed and then they're placing them on this little metric
22:07
and then they're putting them in the bottom, the C-bottom bottom.
22:14
Well yeah there's a lot of happening right now with like technology doing this instead and can
22:20
do it even better and even higher scale. And there's a lot of happening in that area right now
22:27
But what do you know more about that?
22:31
No, I didn't know about this. What where did you hear about this?
22:37
Actually, they am this tingentang how just did I interview with someone called grief
22:43
you You send it to you
22:48
which is like an American

22:52
was doing this
22:55
bit of robot that are planning
22:58
I can just send you a link here Yeah
23:10
See them there, check
23:14
Yeah, yeah Oh yeah, they're developing this little robot that can do the planning instead.
23:30
Okay, reef gen. Because I heard that they were doing replanting in the US and Florida and they were able
23:49
to use the seeds.
23:51
Exactly.
23:52
Yeah, I think that's a lot of research happening in that area right now.
24:01
But it's also important to mention that this store all across the city,
24:06
or then my cleaning egress is more about connecting the citizens with the ocean.
24:12
And that's a big part of the project also.
24:17
And not just the scientific part of it, if that makes sense.
24:21
Oh, yeah, creating awareness and...
24:30
but we also have like this scientific partner which is as to you that are handling all these stuff but
24:37
we also doing a lot to like getting awareness of the ocean and getting assistance and then actually be more
24:46
connected with the ocean.
24:48
So a lot of the project is also about that and creating activities on the 15th of June. Yeah, yeah.
25:16
Yeah, let me see if I can see some.
25:25
And then you have as this question about the coastal areas would farming have less plants I think that's very interesting to look into
25:31
but I don't know if anyone actually looked really into that
25:35
because I guess that would be a lot of nutrient loading in these areas
25:41
so they would have more difficult time surviving.
25:45
Yeah.
25:46
In these areas.
25:49
Because I went to a moon tank, is a company that collects the eograss and the guys are farmer and his family has been collecting like since the beginning of the 1900s and
26:14
yeah his coast used to be full of eelgrass but now it's all desert there.
26:26
Yeah exactly.

26:28
Yeah.
26:29
I think there are a lot of, I think it's true out of three parts of the ingress have been lost.
26:37
So it is a sign that something is not doing well in the ocean.
26:45
Yeah.
26:51
But what did he collect it for? Was it like for isolating stuff?
26:55
Yeah, it's for...
26:57
What did he use then?
26:58
Because now he collects it from another place in Minh, like close to the channel with Shelyn and so he has to drive like a big truck
27:27
telling Brown this stuff
27:33
but yeah he sells it for installation and
27:38
he had also to make mattresses and stuff
27:42
yeah you can use it in a lot of different ways
27:49
actually we just my colleague just talked about that we are in,
27:55
we're telling you what a guy maybe wants to do a little talk on one of our locations because he had designed this drone that are flying above the ocean
28:01
and then the text in the ocean where there is like you grass that is just in the
28:09
top of the ocean instead of just coming into land, so it can like to take these areas and collect
28:16
it so we don't have to wait until it's coming washed into the land so that's also kind of cool.
28:24
into the land so that's also kind of cool. I can also send you the information on him if you want.
28:29
Yeah, yeah.
28:31
Yeah.
28:32
I think he's called "Sharon" or something.
28:35
But I will just write back on that one.
28:40
Yeah.
28:41
So we have a lot of technology happening in this area right now.
28:47
But also I see that in Denmark there's lots of people called Tang, like as their last name is it connected to this practice that was
29:11
no no that's just a regular think. Because it seems like the...
29:26
The collect...
29:27
Like lots of people used to collect in the past.
29:30

Yeah.
29:31
It was very...
29:32
I think you write all that.
29:34
But I guess it's difficult when there's not so much left to do it as like a...
29:41
a job and that kind of wave.
29:44
Yeah, yeah. it as like a a job and that kind of wave. Yeah.
29:49
So when are you handling in your thesis?
29:52
At the end of May like 28th of May or something.
30:18
Yeah, yeah.

Rohden, L. (29/04/2025) interview with operations coordinator at Odsherred commune (the interview took place via email)

Hi,
I am a student at Aalborg university in Copenhagen and I am doing my thesis on eelgrass as a building material.
I heard that you guys used to collect the material to be used in the fields but then stopped recently and just started to send the seagrass back to sea.
What happened? Were the tests for heavy metals too costly?
Could I use your reply in the thesis?
Best regards,
Denys

29/04/2025 9:20

Dear Denys.

Thank you for your email. Feel free to use my answer.

Actually, the eelgrass passed all tests regarding PFAS, heavy metal etc. Though, concerns regarding PFAS just before the summer 2023 – before we made thorough analysis – made us change the way we were handling the eelgrass and forced us into taking strict precautions, limiting the amount of eelgrass we took away from the coastal line.

In combination with other factors such as costs, the fact that we actually had no complains from our citizens or summer guests etc. has underlined, that we can do fine without removing tons of eelgrass. Summer season 2024 confirmed this.

We believe that the paradigm shift benefits the nature as well and that we, by scraping the eelgrass a side, still support the intend of having sandy, white beaches for the bathing season.

I hope you can use my answer. Wishing you a nice day!

Med venlig hilsen

Lise Rohden

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