ORIGIN BY OCEAN

2024

IMPACT REPORT

Washing the Oceans

At Origin by Ocean®, we are reimagining the chemical industry by ***transforming harmful algae into high-value, sustainable, 100% bio-based & biodegradable ingredients for consumer goods***. Our patented biorefining process produces materials traditionally sourced from fossil fuels, climate-sensitive plants, and land/water intensive renewable crops.

We are committed to regenerating ocean ecosystems while delivering products that are not only safe for the planet but also perform to the highest standards. By removing invasive algae and using it as a renewable resource, we're pioneering a zero-waste, circular economy model.

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1. Introduction

Leading the Way in Regeneration: A Message from Our CEO

2024 was a defining year for Origin by Ocean. From completing the pilot phase of our process scale-up to introducing market-ready innovations, we've taken tangible steps toward creating a regenerative future. Every milestone achieved in 2024 – whether in production, partnerships, or product development – brings us closer to our vision: *washing the oceans*.

What sets the past year apart is the proof of concept–showing that regenerative business is not just possible but scalable. By removing invasive seaweed, avoiding emissions, reducing resource use, and fostering biodiversity, we're building more than a business; we're creating a ripple effect of positive change.

As we prepare for the next phase, including the establishment of our first production site by 2027, the focus remains clear: scaling our impact, expanding our reach, and driving innovation. The achievements detailed in this report are not the culmination of our efforts – they're the foundation for what's next.

Thank you for being part of this transformative journey. Together, we're proving that regenerative action can lead to a brighter, cleaner future.

Warm regards,

Mari Granström
CEO, Origin by Ocean

Introduction

At Origin by Ocean, we are committed to transparency, innovation, and driving meaningful change. While we are still working towards commercial production, 2024 has been a year of significant progress – laying the groundwork for a future where our operations contribute to a regenerative, circular economy.

This report provides a comprehensive overview of our impact strategy on our efforts to date, the milestones we have achieved, and the path forward. Guided by international standards, methodologies, and frameworks, we aim to share not only our data but also the stories behind our journey. By highlighting the challenges, successes, and lessons learned, we remain honest about where we are today and ambitious about where we are headed.

Origin by Ocean was founded with a mission to transform invasive algae into valuable bio-based alternatives to fossil-based materials. Our approach is rooted in the principles of regeneration: restoring ecosystems, reducing emissions, and driving positive social and environmental outcomes. These values have shaped our partnerships, research, and pilot projects, positioning us as a leader in the emerging blue bioeconomy.

We recognize the growing urgency of the climate and biodiversity crises and our role in addressing them. Our impact is shared–with communities, industries, and ecosystems–and collaboration remains central to everything we do. By building alliances with like-minded partners, we aim to create scalable solutions that redefine value chains and contribute to the broader fight against climate change and resource depletion.

As we move closer to production and the establishment of our first facility by 2027, this report serves as both a reflection of our journey so far and a commitment to the future. Together, we're proving that it's possible to create a thriving, regenerative business model that benefits people, the planet, and prosperity.

VALUES & MISSION

At Origin by Ocean, our core values are sustainability, fairness, freedom, and commitment. We believe that by embedding these principles into our daily work, we create an environment that fosters innovation and empowers everyone to thrive. Our mission to wash the oceans and drive positive change is sustained through our shared commitment to long-term impact, fairness in all dealings, the freedom to grow and excel, and the unwavering dedication of every team member. Our team members, Oceansavers, are committed to making a positive impact, by protecting oceans and reducing the reliance on crude oil-based ingredients.

Together, these rules form the bedrock of a respectful, creative, and purpose-driven workplace.

2. Highlights of 2024

Highlights of 2024

OUR FROZEN PROCESS

In 2024, we, at Origin by Ocean, completed the pilot phase of scaling up. We were able to freeze our process, which is a milestone that we are incredibly proud of. This allows us to be able to scale up, starting our demo production in Finland in 2025.

Thank you to our amazing team at Origin by Ocean for all of the hard work and dedication that went into this!

DEVELOPMENT OF OUR REGENERATIVE ALGINATE OCEANTHIX™

In 2024, we showcased the potential of our Sodium Alginate, OCEAN**THIX**™, at Sepawa and Fi Europe. The official pre-commercial launch will be in the spring of 2025.

OCEAN**THIX**™ LV is a low viscosity anionic biopolymer extracted from Sargassum Natans/Fluitans, an invasive brown algae species through a highly-optimized patented biorefining process that uses the principles of Green Chemistry.

OCEAN**THIX**™ LV is a multi-functional texturizing agent and rheology modifier. In cosmetics, it creates unique sensorial effects, boosts viscosity, and enhances the sensorial properties of other biopolymers while smoothing, plumping, and improving skin hydration. In food preparations, it improves texture, mouth-feel, and stability.

In textile printing OCEAN**THIX**™ serves as an exceptional thickener and rheology modifier, delivering the viscosity and fluidity required for color inks and pastes, ensuring superior printing quality and precision.

*More information about OCEAN**THIX**™ LV can be found in the "Our Operations and Products" section*

Early customer cases utilizing OCEANTHIX™

OLE HYVÄ

Ole Hyvä Luonnontuote Oy manufactures its products in Finland, ensuring that its operations align with principles of moderation, locality, biodiversity preservation, and vegan values. Their range of home and personal care detergents is made with 100% plant-based, biodegradable, and environmentally friendly ingredients (Ole Hyvä, n.d.-b).

In 2024, Origin by Ocean partnered with Ole Hyvä to create the Ole Hyvä Meri series – a collection of sustainable personal care products enriched with OCEANTHIX™, our innovative algae-based ingredient. OCEANTHIX™ forms a protective film on the skin, helping to maintain moisture balance while also contributing to environmental restoration. (ObO, 2024a) By utilizing invasive algae, it removes excess nutrients from marine ecosystems, combats eutrophication, and lowers the chemical load and carbon footprint of the final products.

The Meri series includes a shampoo-shower gel, hair conditioner, and hand wash (Ole Hyvä, n.d.-a), all formulated with fully biodegradable, sulphate-free, and microplastic-free ingredients. The products are packaged in recycled plastic, reinforcing the commitment to circularity and sustainability.

NO NIIN COSMETICS

In 2024, Origin by Ocean partnered with No Niin Cosmetics, a novel skincare brand, to launch three serums as its first products. No Niin Cosmetics' serums are handmade in Finland, and are natural, fragrance-free, and free from fillers (No Niin Cosmetics, n.d.). The serums are made of 99 % Finnish organic ingredients.

The inclusion of OCEAN**THIX**™ reinforces the serums' natural efficacy, merging tradition and innovation, while supporting Origin by Ocean's mission to protect marine ecosystems and deliver eco-friendly alternatives to fossil-based ingredients.

No Niin Cosmetics' and Origin by Ocean's collaboration represents a new era of sustainable skincare. By utilizing groundbreaking innovations like OCEAN**THIX**™, they are proving that beauty can thrive without compromising the planet.

https://www.noniincosmetics.fi/en

Event Participation

RESPOND ACCELERATOR: DRIVING REGENERATIVE LEADERSHIP

In 2024, out of more than 350 applications, Origin by Ocean was selected as one of the top 10 startups to participate in the **RESPOND Accelerator** program by the **BMW Foundation Herbert Quandt**. The program focuses on responsible leadership and the transition toward a net-zero economy, providing founders with the tools and insights needed to build businesses that drive systemic change (BMW Foundation, n.d.).

For us, RESPOND was an invaluable experience—offering support in regenerative leadership, regenerative business, and the realities of being a founder. Leading in a regenerative way means prioritizing empathy and authenticity, fostering an environment where people feel heard and understood. A truly regenerative business must be built on a solid foundation, considering the entire ecosystem and recognizing the impact on nature. Effective marketing and communications then serve to amplify these messages, ensuring they drive broader change.

Our founder, **Mari Granström**, found the discussions on leadership particularly impactful.

> "One of the most valuable aspects of RESPOND was the space it created for honest conversations about what it really means to be a founder—the responsibilities, the challenges, and the expectations. It was refreshing to step outside the role and engage as a person first," she reflects.

Sessions like 'Have you become your company?' prompted deep discussions on personal and professional identity, while coaching sessions provided practical tools for maintaining a holistic and sustainable approach to leadership.

Beyond the structured sessions, RESPOND was an opportunity to connect with inspiring individuals, exchange meaningful ideas, and gain ongoing support in our journey of learning and growth.

https://bmw-foundation.org/respond

Photos taken by BMW Foundation

Event Participation

IN-COSMETICS GLOBAL 2024

April: 16.–18.4, 2024 Paris, France

in-cosmetics Global unites the global cosmetics industry to connect, inspire, share insights, and spark new collaborations.

We, Origin by Ocean, urged participants to visit our stand to learn more about high quality algae-based functional and active ingredients, and how they are opening a new era for cosmetics ingredients, through a regenerative value chain.

VITAFOODS EUROPE 2024

May: 14.–16.5, 2024 Palexpo, Geneva, Switzerland

Vitafoods Europe brings together the global nutraceuticals community every year, offering a platform for businesses to initiate critical conversations.

At our stand, we highlighted exclusive insights into the versatility and benefits of algae in nutraceuticals. We provided live demonstrations of our products, including our flagship bioactives. We engaged in great discussions about integrating sustainable, marine-sourced ingredients into potential customer formulations.

NYC CLIMATE WEEK 2024

September: 22.–29.9, 2024 New York, USA

Climate Week NYC is the largest annual climate event of its kind, bringing together over 900 events and activities across the City of New York. Each year, business leaders, political change makers, local decision takers and civil society representatives of all ages and backgrounds, from all over the world, gather to drive the transition, speed up progress, and champion change that is already happening.

Our CEO made wonderful and inspiring connections, by attending meetings, assemblies, events, and sessions. There was an exciting energy that sparked many ideas.

2ND EU-CARIBBEAN GLOBAL GATEWAY CONFERENCE ON SARGASSUM

October: 1.–2.10, 2024 Grand Anse, Grenada

The event aims to bring together governments, regional organisations, industry, academia, and financing institutions, to stimulate political discussion, take stock of the progress around sargassum valorisation, and determine actions towards building sustainable value chains.

The Sargassum Conference Grenada consisted of talks, meetings with ministers, and press conferences. Origin by Ocean will run a case study with the Government of Grenada on the feasibility of the value chain of a 4,000t/a biorefinery investment (this was announced on October 3rd).

SEPAWA 2024

October: 16.–18.10, 2024 Berlin, Germany

SEPAWA is a European trade association focused on the detergent, cosmetics, and fragrance industries, and hosts one of the largest annual congresses, the SEPAWA Congress.

Origin by Ocean attended SEPAWA for the first time with our own exhibition stand. Our aim was to introduce Origin by Ocean to the visitors and tell about our company and the upcoming products through our visual presence and the discussions held at our stand. We had reflective mirror paper inside of our logo, to invite participants to look at the impact.

TECH TOUR 2024

November: 14.–15.11,2024 Wuppertal, Germany

The Tech Tour Bio-based Industries 2024 programme is designed to foster meaningful connections, strategic partnerships, and (co-) investments within the bio-based sectors.

Our Communications Director Activist pitched Origin by Ocean's story in 1 minute and 5 minute pitches, and even in a short amount of time was able to create an impact. Origin by Ocean was named one of the 8 Company Winners at the Tech Tour Bio-based Industries 2024. Out of 110+ applicants, and 35 finalists, we were top-rated during the pitching sessions.

FOOD INGREDIENTS EUROPE (FI EU 2024)

November: 19.–21.11, 2024 Frankfurt, Germany

The leading global event for food ingredients, supporting exhibitors to enter new markets and showcase products.

At Fi EU 2024, we asked participants "Where do YOU think our regenerative alginate could make the biggest impact?" We showcased the potential of OCEAN**THIX**™ LV, a low-viscosity alginate that is setting new standards in food innovation. We created mockups for different types of food packaging, to show participants the versatility of our products. Our Application Team created samples for several of those mockups (sauces, smoothies, and gummies), to showcase OCEAN**THIX**™ LV's viscosity.

SLUSH 2024

November: 20.–21.11,2024 Helsinki, Finland

Slush annually hosts the world's leading startup event bringing together a curated crowd of European startups, world-class investors, and tech journalists.

Our CEO Activist & Founder, Finance Director Activist, and Analytical Manager Activist connected with strategic investors who are ready to drive an industrial revolution, where a new innovative ingredient can help replace oil in the chemical industry value chain. Origin by Ocean continued to make connections and to urge others to join in investing in the blue planet, not Mars.

LINKS *www.in-cosmetics.com/global/en-gb.html | www.vitafoods.eu.com/en/home.html | www.climateweeknyc.org/about-us | sargassumconference.eu | sepawa.com/congress/en | techtour.com/bio24 | www.figlobal.com/europe/en/home.html | slush.org/about/*

While preparing for these events, we took into consideration both the amount of and types of materials that we would use for our displays. We also factored in ease of transport, as these events were located all around the world. We wanted our displays to be simple, yet memorable, and unique to each event, inviting participants to engage in interesting conversations about the future of algae.

RECOGNITIONS

EU Horizon Europe Missions, project consortium member FutureLakes

Invited to European Ocean Days

Finalist of Hello Tomorrow Global Challenge for Deep Tech startups (7 finalists out of 4,500 applicants)

Nominated for the Earthshot Prize 2024

Shortlisted at In-Cosmetics for the Rising Star and Green Ingredient awards

AWARDS

WINNER: The Chemical Industry of Finland Innovation Award

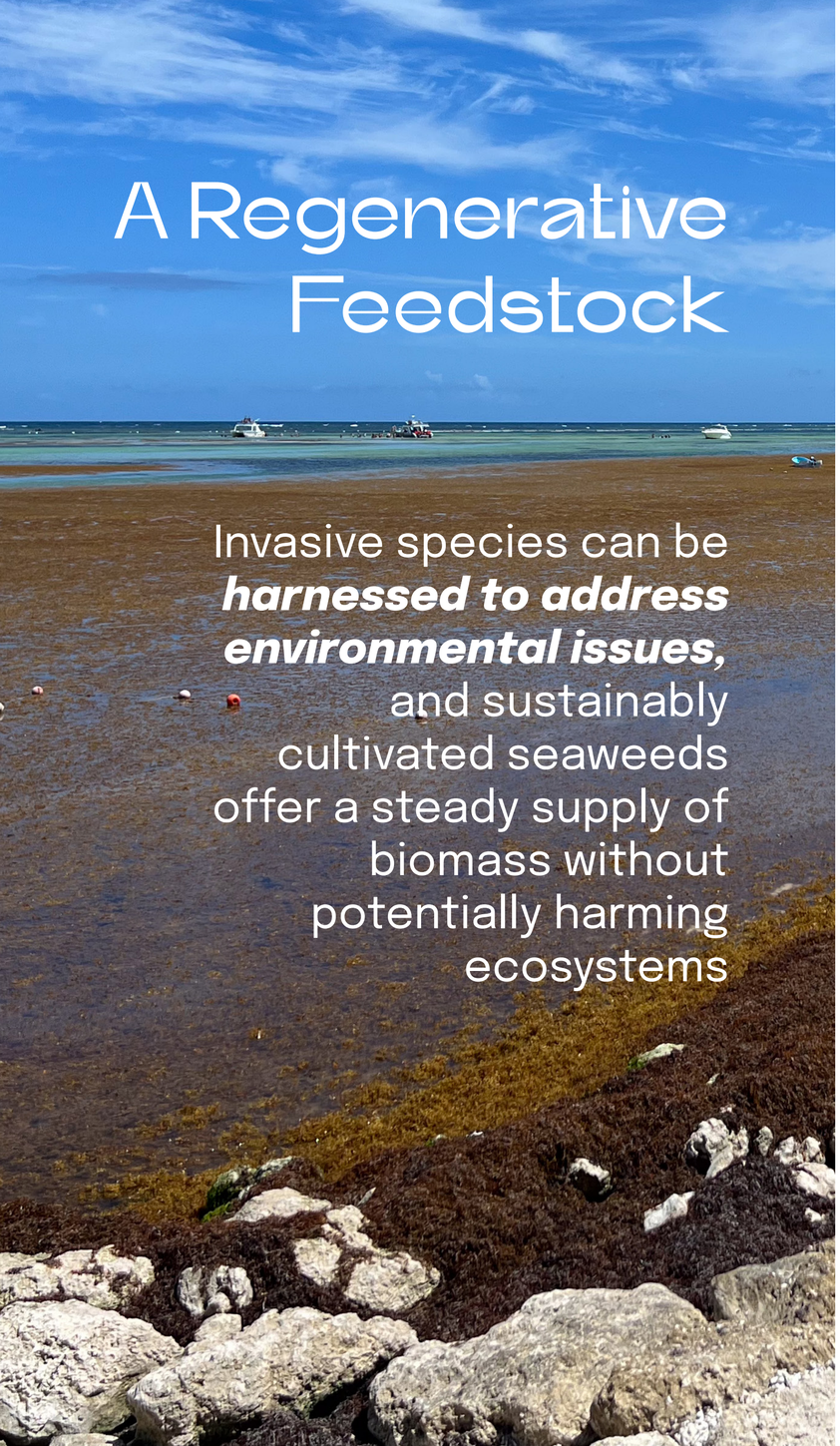
WINNER: For the Good of Chemistry Award - PhD Mari Granström

WINNER: Falling Walls Foundation Science Startup

WINNER: Tech Tour Bio Based Industries (one of 8 winners, out of 110+ applicants)

We are extremely proud to have been part of these events and projects, and to have been nominated and selected for these awards. We have made incredible connections in 2024, and are excited for the future, as we work towards creating a regenerative and sustainable future together. Together, we can wash the oceans.

3. Regenerative Feedstock



A Regenerative Feedstock

Invasive species can be ***harnessed to address environmental issues,*** and sustainably cultivated seaweeds offer a steady supply of biomass without potentially harming ecosystems

photo taken by Heikki Heiskanen

THE POTENTIAL OF ALGAE AS FEEDSTOCK IN THE CHEMICAL INDUSTRY

Seaweeds are emerging as a promising feedstock for biorefineries, with various types offering unique advantages and challenges. Among these, invasive seaweeds stand out for their rapid proliferation and disruptive impact on local ecosystems. Species, such as Sargassum, are a prime example of invasive seaweeds that can be harvested abundantly. This presents a dual opportunity: not only can these seaweeds be transformed into bio-based products, but their harvesting can also help mitigate their environmental impact, turning a problem into a resource.

Algae chemistry varies across species due to factors like growth stage, climate, water temperature, and nutrient levels. ***Origin by Ocean has chosen Sargassum as its primary feedstock while also exploring the potential of blue-green algae and responsibly farmed Fucus vesiculosus.***

Wild harvested seaweeds are collected from their natural habitats without any cultivation. Popular species in this category include Nori (Porphyra spp.), Dulse (Palmaria palmata), and Kelp (Laminaria spp.). While they are often high in nutrients and hold potential for use in biofuels, pharmaceuticals, and food products, the key challenge lies in ensuring that harvesting practices do not deplete wild populations or damage their ecosystems. The growing demand for seaweed cannot be sustainably satisfied solely with wild harvesting. Wild harvesting involves the collection of kelp from natural kelp forests in the ocean. While this method has been sustainably practiced by coastal and Indigenous communities for generations, it is unable to sustain the rising global demand for seaweed.

Sustainably cultivated seaweeds provide another compelling option for biorefineries. These seaweeds are grown in controlled environments or farms that adhere to sustainable practices, minimizing environmental impact. Commonly cultivated species include Kelp (Laminaria), Nori (Porphyra), and Wakame (Undaria). This method offers a consistent and reliable feedstock for biorefineries, allowing for the production of biofuels, bioplastics, and other value-added products. Moreover, sustainable cultivation promotes environmental health and biodiversity, making it a favorable approach for both industry and ecology.

On the other hand, monoculture seaweeds are grown in single-species systems, primarily for economic efficiency. Species like Kappaphycus alvarezii and Gracilaria spp. exemplify this practice. While monoculture farming can lead to higher yields, it raises concerns about reduced biodiversity and increased vulnerability to diseases. In biorefineries, these seaweeds serve as a concentrated source of biomass for biofuel production. However, careful management practices are essential to mitigate potential ecological impacts and ensure sustainability.

The vast majority of seaweed production in the EU currently depends on wild-stock harvesting, which has pushed the European Commission to promote seaweed cultivation in EU marine regions (Macias et al., 2024). Most EU seaweed farms are currently small and are “manually cultivating a limited number of seaweed species” (European Commission, 2022). Cultivating in European waters presents many challenges, including the “short growing season, low salinity, and lack of tradition” (Camarena-Gómez et al., 2022). The low salinity limits the growth of the seaweed species (Camarena-Gómez et al., 2022). Climate change and human activities also negatively impact seaweed species and coastal habitats, placing strain on native species (European Commission, 2019). In order to try and protect wild seaweeds and meet the market demands, aquaculture production has grown. However, the introduction of non-native species can have harmful environmental consequences and can even affect the dynamics within the ecosystem (European Commission, 2019). Additionally, much is unknown about cultivation in European coastal waters, including the carrying capacity for seaweed aquaculture (Seaweed for Europe, n.d.). While the potential is great, many questions and unknowns must be assessed prior to largely expanding seaweed cultivation in EU waters.

The diverse types of seaweeds available for biorefinery feedstock each present distinct opportunities and challenges. Invasive species can be harnessed to address environmental issues, while sustainably cultivated seaweeds offer a steady supply of biomass without potentially harming ecosystems. Wild harvested seaweeds require diligent management to avoid over-exploitation, and monoculture systems necessitate strategic oversight to prevent negative ecological consequences. Invasive algae, often regarded as a nuisance in aquatic ecosystems, can be a sustainable feedstock for the chemical industry. These algae, which proliferate rapidly in nutrient-rich environments, possess several advantages that can be harnessed for biofuel production, bioplastics, and other biochemicals, thus contributing to a more sustainable circular economy.

Invasive algae, such as sargassum, can grow in various conditions and produce biomass at an ***accelerated rate compared to traditional crops***

HIGH BIOMASS PRODUCTION

The ability of invasive algae, such as sargassum, to thrive in eutrophied waters allows for efficient biomass accumulation, often yielding over 20 tons per hectare per year (Huisman et al., 2006). This high productivity makes them an attractive option for large-scale cultivation, particularly in regions where agricultural land is limited or unsuitable for conventional crops.

VERSATILE CHEMICAL FEEDSTOCK

Invasive algae contain a range of valuable compounds, including polysaccharides, proteins, and lipids, which can be converted into various bio-based chemicals. For example, algal carbohydrates can be processed into biofuels such as bioethanol and biodiesel, while lipids can serve as precursors for biodiesel production (Mata et al., 2010). Furthermore, algal biomass can be transformed into bioplastics, fertilizers, and high value biochemicals, offering diverse applications in the chemical industry.

4. Sargassum

Sargassum

Sargassum is a brown algae found in the ocean. Sargassum has leafy appendages, branches, and round gas-filled structures. The round structures, which are called pneumatocysts, are mostly filled with oxygen, allowing the sargassum to float on the surface of the water (NOAA, 2018).

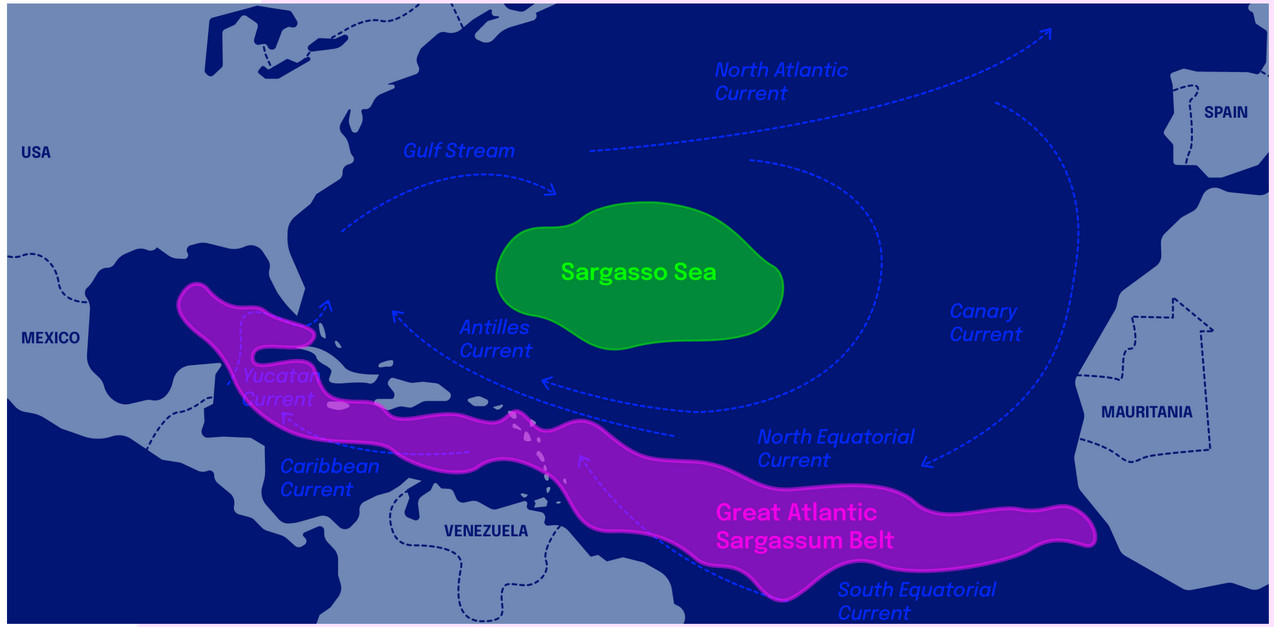
The Sargasso Sea is a high seas ecosystem that is around 5 million square kilometers. It is located in the Atlantic Ocean and is home to many species, including ten endemic species. The endemic and migratory species all contribute to the high biodiversity. Climate change, pollutants, shipping, and fishing are all impacting the Sargasso Sea, endangering the health of the ecosystem and of the species that rely on it heavily (FAO, 2024).

While the Sargasso Sea is beneficial to the environment, a large problem started occurring south of the Sargasso Sea in 2011. The Great Atlantic Sargassum Belt stretches around 8,850 kilometers in length, and breaks apart in the currents into sargassum mats (Wang et al., 2019). The Great Atlantic Sargassum Belt contains lower biodiversity than the Sargasso Sea, and the mats wreak havoc on coastal communities as they reach the shores (Smallman, 2022). These sargassum mats can reach 70-80cm in thickness (EPA, 2023a). During respiration, the sargassum uses large amounts of oxygen (EPA, 2023b). This leads to hypoxic or anoxic conditions, where there are, respectively, either low levels of dissolved oxygen or no dissolved oxygen at all in the water (EPA, 2023b). As the large mats of sargassum float towards the shore, they harm or kill marine life that is in the water below, from coral reefs to fish. After 48 hours of reaching land, sargassum begins to rot, releasing harmful gases called hydrogen sulfide, methane and ammonia (Nibbs, 2024).

Sargassum Inundation Events (SIEs) are when massive amounts of sargassum float to the shores from the Great Atlantic Sargassum Belt (EPA, 2023d). SIEs have become a growing issue due to climate change, nutrient-rich waters, and changes in winds and currents, which create an environment where the sargassum blooms at large rates and then is carried to the coasts by the currents (EPA, 2023d).

To put the scale into perspective, the **8,850 KM-LONG** Sargassum Belt is the equivalent of around **632,143 CITY BUSES** (assuming bus length to be 14 meters), or around **1,770,000 CARS** (assuming car length to be 5 meters), back-to-back.

During an inundation event, as much as **100 METRIC TONNES** of sargassum per km of beach per day can wash up on the shores of the Caribbean territories (UNDP, n.d.). That is the equivalent weight of around **7.5 BUSES** worth of sargassum per kilometer of beach per day.

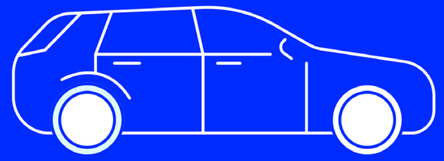


The Great Atlantic Sargassum Belt extends 8,850 km-long

WHICH IS THE EQUIVALENT OF EITHER:

632,143
city buses

OR



1,770,000
cars

What is Causing the Sargassum Belt to Grow?

- Changes in ocean circulation patterns
- Sea surface temperatures
- Strong converging winds
- Increased flow of nutrients (farming, Amazon River floods, hurricanes, etc.)
- Increase in atmospheric CO2

If left unaddressed, the SIEs will continue to cause issues

HUMAN HEALTH ISSUES

- skin irritation (due to organisms that live in the algae)
- burning of the eyes
- respiratory impacts
- cardiovascular impacts
- neurological impacts
- early onset preeclampsia in pregnant people (if exposed to hydrogen sulfide)

WILDLIFE HEALTH ISSUES

- animal deaths (especially fish, bottom-dwelling organisms, and turtles)
- disruptions to the foodweb
- lower biodiversity
- hindering sea turtles' access to lay eggs on beaches, nesting success, and turtle hatchlings' ability to reach the ocean

HABITAT ISSUES

- coral bleaching/acidification
- dying seagrass species
- heavy metals leaching (such as arsenic)
- decreased availability of oxygen in the water (hypoxia)
- erosion
- methane release
- changes in water quality
- decreased availability of shelter for wildlife

ADDITIONAL ISSUES

- decreased tourism
- hundreds of millions of dollars in economic losses annually
- mats clog waterways, and entangle fishing gear and boats (clogging water intake pipes used in critical infrastructure, such as desalination plants used for drinking water)
- corrosion of boats, breakwaters, and other infrastructure

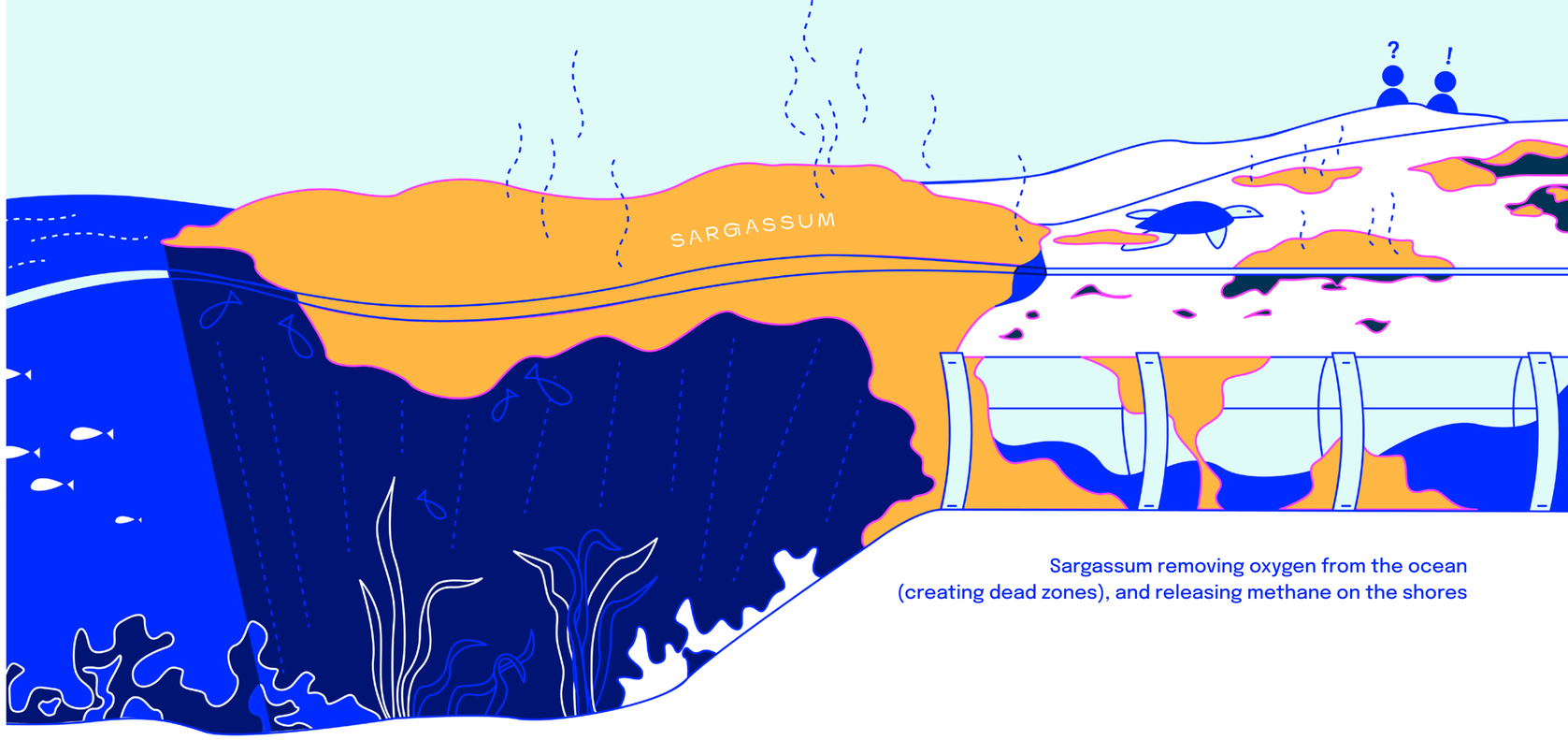
Harmful Impacts of Sargassum Inundation Events

ENVIRONMENTAL, HEALTH, & ECONOMIC IMPACTS

When the sargassum reaches the shorelines, it has widespread negative effects on local communities. Since around 2011, the Caribbean shores have experienced annual SIEs, having to find ways to recover from the environmental, health, and economic impacts (NOAA, 2024).

If left unaddressed, the Sargassum Inundation Events will continue to cause issues, including those that impact human health, wildlife health, habitats, infrastructure, and the economy. Human health issues can vary from mild to serious, and are particularly harmful to pregnant people, the elderly, and immunocompromised people. Rotting sargassum creates hydrogen sulfide gas, which can cause early onset preeclampsia in pregnant people (EPA, 2023c). The gas can also cause other health issues in the general population, including skin irritation, burning of the eyes, respiratory impacts, cardiovascular impacts, and neurological impacts. Along with that, the health issues impact students and their education, as the children who feel sick (headaches and nausea) are sent to the school nurses, and other children may also have difficulty focusing in the classroom (Schmidt, 2023). This results in students and teachers being left with little to no time to focus on learning and schoolwork.

Sargassum-related health issues extend outside of human health issues. Wildlife health issues include animal deaths, disruptions to the food web, growth of invasive species, and lower biodiversity (EPA, 2023d). The sargassum is especially harmful to turtles, as the excess amounts of algae hinder their access to lay eggs on the beach, their ability to nest successfully, and for their hatchlings to reach the ocean. Habitat issues include coral bleaching, dying seagrass species, heavy metals leaching into the environment, decreased availability of oxygen in the water (hypoxia), erosion, methane release, changes in water quality, and decreased availability of shelter for wildlife (Smallman, 2022). The Sargassum Inundation Events have far-reaching impacts, disrupting and harming humans and wildlife.



Sargassum removing oxygen from the ocean
(creating dead zones), and releasing methane on the shores

When sargassum starts to rot on beaches, it releases methane. We aim to avoid those methane emissions and harmful health impacts by gathering the sargassum before it reaches the shore. This type of sargassum collection is also safer for the workers who are gathering it, as they are less likely to be exposed to the harmful impacts (DCNA, n.d.).

Additional issues that come from the rotting sargassum are related to the local economies and infrastructure. As the sargassum gathers on the beaches and creates both an unsafe and unappealing environment, it results in decreased tourism. Many of these islands rely on tourism to support their economy and local businesses. This results in compounded negative economic impacts, as the cleanup and the loss of tourism lead to hundreds of millions of dollars in economic losses annually (DCNA, n.d.). The sargassum mats end up clogging waterways, and entangling fishing gear and boats. This also clogs water intake pipes that are used in critical infrastructure, such as in desalination plants which are used for drinking water (NOAA, 2024). When those pipes get clogged, the locals get directly impacted, losing access to vital resources. The Sargassum Inundation Events also corrode boats, breakwaters, and other infrastructure (Gray et al., 2021).

Actions that help gather the sargassum, utilise that sargassum, and support local communities, will, in turn, help significantly lessen the negative impacts of the SIEs.

SAFETY OF SARGASSUM IN PRODUCTS

While "arsenic is an element found naturally in seawater in both inorganic and organic forms," it is considered a heavy metal and is toxic to varying degrees (Cisneros-Ramos et al., 2024). All types of seaweeds accumulate arsenic (Alleyne et al., 2023). Inorganic arsenic is considered toxic when exceeding certain levels, and it is a more toxic form of arsenic than organic arsenic (Alleyne et al., 2023).

Arsenic is first taken up by primary producers, such as phytoplankton or seaweed, and then bioaccumulates and transforms as it makes its way up the food chain (Cisneros-Ramos et al., 2024). Due to the bioaccumulation of toxins, it is also advised to avoid excessive consumption of seafood, such as fish.

Sargassum is a brown seaweed, and brown seaweeds "tend to contain higher quantities of arsenic than green or red seaweeds" (Cisneros-Ramos et al., 2024). However, treatments, which remove the arsenic from the sargassum, have been developed. These treatments significantly bring down the arsenic levels, ensuring that they are well below maximum arsenic limits and ensuring that the ingredients from the biorefinery process are safe for use.

Through our biorefinery process, substances can be extracted from the sargassum, ***turning them into valuable and safe ingredients,*** which can be utilized in a variety of products and use cases.

9. Our Environmental Impact

Environmental Impact

Invasive seaweeds like Sargassum pose significant challenges and provide an opportunity due to their overabundance. These species can form dense mats that disrupt local ecosystems, outcompeting native flora and altering habitats.

The rapid proliferation of Sargassum has been documented to produce vast quantities, with beach accumulations reaching millions of tonnes in some regions, particularly in the Caribbean and Gulf of Mexico. This overabundance presents a potential feedstock for biorefineries, which could help alleviate some of the pressures on native ecosystems.

While harvesting invasive seaweeds can provide immediate biomass to biorefineries, it requires rigorous management to ensure that removal does not inadvertently harm native ecosystems or disrupt the natural balance. The operations of Origin by Ocean are fully based on biomass processing.

THE THREEFOLD ENVIRONMENTAL IMPACT OF OUR OPERATIONS

1

CO_2 and excess nutrients, which cause eutrophication, are captured into the harvested invasive seaweed species.
This is beneficial and regenerative for the ecosystem and biodiversity.

2

Harvesting, transporting, and producing valuable chemical components causes negative impacts (i.e. emissions), which are mitigated by using green non-toxic process chemicals, renewable energy, and process optimization. This means that it is a sustainable process compared to the industry standard.

3

When Origin by Ocean's products substitute contemporary oil-based chemical-components with algae, they help decarbonize those consumer goods. The impact of the substitution is positive for the environment.

NUTRIENT RECYCLING & ENVIRONMENTAL REMEDIATION

Utilizing invasive algae as feedstock can aid in mitigating nutrient pollution in aquatic ecosystems. By harvesting invasive algae, the chemical industry can contribute to nutrient recycling while simultaneously addressing environmental challenges associated with nutrient over-enrichment.

ALGAE UTILIZATION 2024

During 2024, algae harvested and processed by and for Origin by Ocean was mainly for R&D and production development purposes. In 2024, Origin by Ocean utilized 28 tonnes of sargassum. The positive impact of our operations is based on reaching commercial production levels.

Our overall plan is to increase our impact through commercial production. Our first-of-a-kind (FOAK) factory in Finland in 2027 will process 4,000 tonnes of sargassum. By 2035, this amount will ramp up, through international biorefineries, to an estimated feedstock consumption of 220k tonnes per year.

CARBON NEUTRAL & RENEWABLE RESOURCE

The use of invasive algae as feedstock contributes to carbon neutrality in chemical production. As these algae absorb carbon dioxide during photosynthesis, they help mitigate greenhouse gas emissions, making them a renewable resource for biofuel and chemical production. The integration of algal feedstock into chemical processes can significantly reduce the carbon footprint compared to traditional fossil fuel-based feedstocks (Naylor et al., 2021).

When sargassum drifts to the coastal areas, it dies and starts to rot, resulting in high methane emissions.

WHEN COLLECTING SARGASSUM PRIOR TO ROTTING, THE ***AVOIDED*** **EMISSIONS** RANGE FROM

300 kgCO2e
per 1,000 kg
of sargassum

TO EVEN AS HIGH AS

600 kgCO2e
per 1,000 kg
of sargassum

(Gray et al., 2021)

The ***average biogenic CO2 content**** that can be extracted into products is on average 182 kgCO2e per 1000 kg of fresh weight sargassum (McGilliguddy et al., 2023). This amount will be eventually released back into the atmosphere once the product is consumed.

This means that the environmental benefits of avoiding CO2 emissions is greater when sargassum is biorefined into products than leaving the sargassum outbreaks unutilized.

**Biogenic CO2 content means "carbon dioxide released as a result of the combustion or decomposition of organic material, that is biomass and its derivatives. Examples include carbon dioxide released during the combustion of wood and biogas generated by decomposition" (Sitra, n.d.).*

6. Our Operations & Products

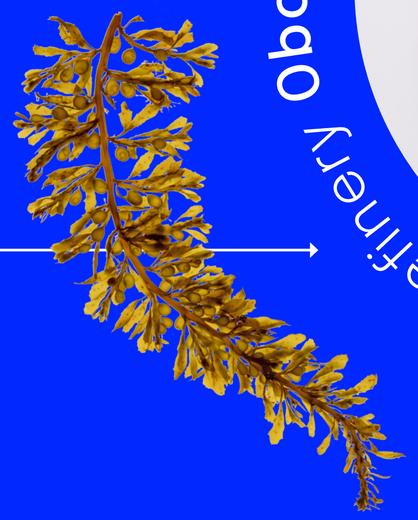
Our Operations

Our patented biorefining process produces materials traditionally sourced from fossil fuels, climate-sensitive plants and land/water intensive renewable crops.

We are committed to regenerating ocean ecosystems while delivering products that are not only safe for the planet but also perform to the highest standards.

We remove nutrients from the oceans by harvesting invasive algae, reducing harmful emissions and unlocking the value of this unused resource. Our operations support local economies.

By removing invasive algae and using it as a renewable resource, we are developing a zero-waste, circular economy model.



Obo Biorefinery Obo Biorefinery Obo Biorefinery Obo Biorefinery

Transforming nearly 100% of the biomass into bio-based ingredients.

Residuals are being repurposed into products and materials, capturing carbon.

Through our patented biorefinery process, we create multiple high-value ingredients like alginate and fucoidan.

Sustainable 100% bio-based & biodegradable ingredients reduce the carbon footprint of consumer goods.

Our Products

Through one industrial process, we create multiple high-value products, each derived from our patented biorefining technology.

OUR SIX KEY PRODUCTS INCLUDE:

OCEANTHIX™
Sodium Alginate

A multi-functional texturizing agent and rheology modifier.

OCEANBOOST™
Fucoidan

A bioactive ingredient known for its antioxidant, anti-inflammatory, and skin-hydrating properties.

OCEANSHIELD™
Mycosporine

A natural UV-protective compound.

OCEANFX™
Fucoxanthin

A bioactive carotenoid with antioxidant and metabolic benefits.

OCEANSYRUP™
Sugars

A marine polysaccharide with immunomo-dulating proper-ties.

OCEANRESIDUE™
Seaweed Residue

A versatile biomass for further material applications.

As we move toward commercialization, the first phase of our market entry will focus on OCEAN**THIX**™ and OCEAN**BOOST**™

By focusing on these two products initially, we establish a strong foundation for future market expansion while maximizing the regenerative impact of our biorefinery process.

SODIUM ALGINATE

OCEANTHIX™

OCEAN**THIX**™ is a multi-functional texturizing agent & rheology modifier, that can be used in cosmetics, food, packaging and materials, detergents, and textiles.

In the cosmetic and textile industries, conventional alternatives often rely on synthetic petrochemical polymers, such as acrylates, which are typically non-biodegradable. OCEAN**THIX**™ offers a regenerative alternative, sourced from invasive Sargassum algae, supporting both high-performance formulations and environmental responsibility.

IN COSMETICS, OCEAN**THIX**™ enhances skin hydration in both leave-on products like skincare and rinse-off products like shampoo and body wash. Its film-forming properties make it valuable in cosmetics, textiles, and packaging, contributing to product stability and functionality.

IN THE FOOD INDUSTRY, OCEAN**THIX**™ synergizes with other natural thickeners, improving texture and mouthfeel, while also serving as a vegan alternative to animal-derived gelatin.

FOR TEXTILE APPLICATIONS OCEAN**THIX**™ functions as a rheology modifier and thickener in textile printing, ensuring optimal viscosity, fluidity, and precision in color application. It helps prevent capillary action, enhances line-width precision, reduces bleeding on fabrics, and delivers deeper color saturation, making it a superior alternative to synthetic thickeners.

IN PACKAGING, alginate provides a natural alternative to petrochemical-based resins & coatings.

By integrating OCEAN**THIX**™ into formulations, brands across multiple industries can adopt high-performance, regenerative solutions that prioritize both functionality and environmental impact.

FUCOIDAN

OCEANBOOST™

OCEAN**BOOST**™ LF is a Low Molecular Weight Fucose-Containing Sulfated Polysaccharide (FCSP), also known as Fucoidan. It is extracted from Sargassum Natans/Fluitans through a highly optimized, patented biorefining process that uses the principles of Green Chemistry.

OCEAN**BOOST**™ can be used in cosmetics, offering powerful antioxidant, anti-inflammatory, and hydrating benefits for the skin. As a naturally derived bioactive, it provides an innovative and responsible alternative to commonly used moisturizing ingredients, such as hyaluronic acid.

Many traditional hydrating agents, including hyaluronic acid, are produced through large-scale sugar farming–practices that often contribute to deforestation, biodiversity loss, and increased land and water use, while also competing with the global food supply chain. OCEAN**BOOST**™ LF, in contrast, is sourced from invasive sargassum – a seaweed not used for human consumption – ensuring it does not compete with food production.

OCEAN**BOOST**™ LF can be used as a standalone hydrating ingredient or as a booster, enhancing the efficacy of popular skin-moisturizing compounds such as hyaluronic acid, beta-glucans, and niacinamide.

7. Partnerships & Ecosystem Development

Collaborations & Partnerships

GRUPO PUNTACANA, SOS CARBON, AND INTERLOGISTICA

To collect and load sargassum in the Dominican Republic, we worked with Grupo Puntacana Foundation (Jake Kheel), SOS Carbon and Interlogistica. Through the non-profit Grupo Puntacana Foundation, Grupo Puntacana works to improve the well-being of locals in the Punta Cana area, and promotes innovative solutions for the preservation of the region's ecosystem (Grupo Puntacana Foundation, n.d.). Grupo Puntacana is our key partner in developing sargassum supply chains in cooperation with the locals, and Marcos Diáz is Origin by Ocean's representative in the Dominican Republic. Origin by Ocean has also collaborated with several different entities in terms of small-scale procurement of sargassum, and the development of the supply chain in other regions in the Caribbean as well. SOS Carbon aims to "provide the most cost-effective & responsible solutions for sargassum collection, disposal and transformation, minimizing sargassum's economic, ecological, human health and environmental impacts" (SOS Carbon, n.d.). Interlogistica is a transport and logistics company, including services such as sea freight shipments, trucking, and distribution (Interlogistica, n.d.).

UNIVERSITY OF HELSINKI

Cyanobacteria, or blue-green algae, thrive in warm, nutrient-rich waters, posing risks to ecosystems, human health, and wildlife. Since 2021, Origin by Ocean has collaborated with the University of Helsinki to advance research on cyanobacteria–starting with sample collection and evolving into dewatering and biomass harvesting.

In summer 2021, Origin by Ocean launched Levähavainto.fi, a citizen science platform for reporting cyanobacteria blooms in the Baltic Sea (STT, 2021). This initiative enables the public to submit geotagged observations and images of cyanobacteria blooms, contributing valuable data for scientific analysis. Researchers at the University of Helsinki studied the collected samples to identify cyanobacteria species and the natural compounds they produce. To ensure safety in the field, Origin by Ocean developed a fieldwork manual and related safety protocols.

A key milestone in 2022 was Origin by Ocean's collaboration with Dr. David Fewer's research group at the University of Helsinki (ObO, 2022b), supported by the Nessling Foundation. Their research, running from May 2021 to October 2022 (University of Helsinki, 2021), explored the potential of Baltic Sea algal blooms as biorefinery feedstock. The team's efforts enabled in-depth analysis of cyanobacteria species and their chemistry. During this time, we also tested technologies to locate the densest bloom areas, ensuring efficient biomass collection–maximizing algae yield while minimizing water transport.

The summer of 2022 marked a pivotal step in scaling cyano-bacteria harvesting. Heat waves across the Nordics intensified eutrophication, leading to widespread blooms. We harvested thousands of liters, removing phosphorus from the sea while advancing our process for turning cyanobacteria into valuable, functional ingredients. Every bloom we remove contributes to both marine restoration and the development of bio-based alternatives to fossil-derived products.

PODOCO

PoDoCo is a program that brings doctoral researchers and Finnish companies together, to promote academic research, supporting the long-term competitiveness and strategic renewal of Finnish companies, all while employing young doctors in the industry (PoDoCo, n.d.).

Through the PoDoCo program, Origin by Ocean has found several employees, contributing to the growth and development of the company and company culture. Origin by Ocean CEO, Mari Granström, stated that "during PoDoCo, both the company and the PhD get to know each other very closely. For those coming from the academy, it is an opportunity to see how working in industry differs from the university world. During the year, one learns the commercial side and industrial activities, and can figure out if that is the kind of work one wants to do" (PoDoCo, 2023). This idea of collaboration and continuous learning is what allows employees at Origin by Ocean, as well as the company itself, to grow.

CHEMPOLIS

Chempolis provides biorefining technologies for energy, biofuel, oil, paper, and chemical industries (Chempolis, n.d.). In 2022, Origin by Ocean and Chempolis started collaborating together, utilizing the biorefinery process created and patented by Origin by Ocean for successful piloting tests (Chempolis, 2022).

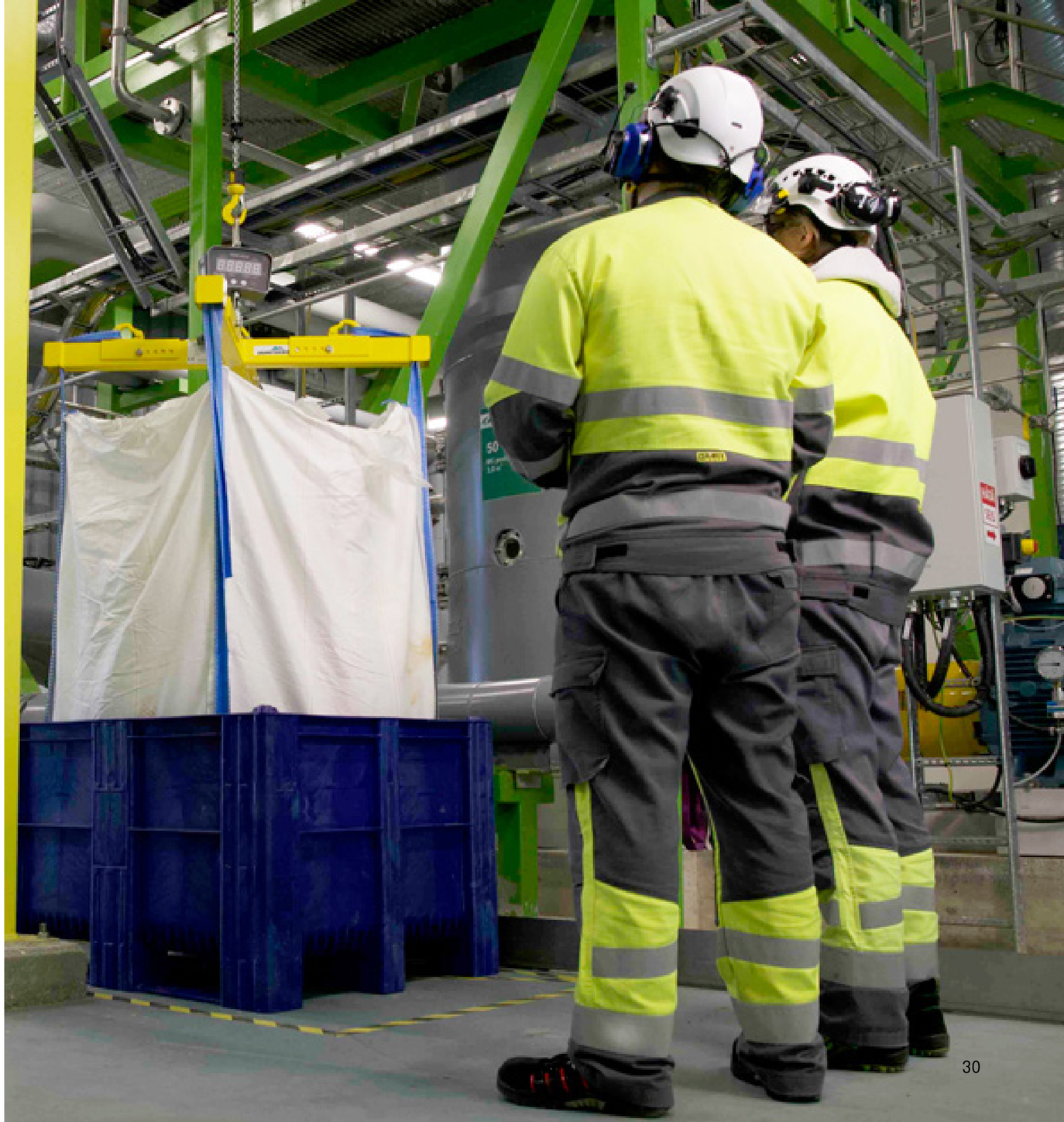
In 2023, Origin by Ocean launched an industrial pilot in Oulu, in collaboration with Chempolis. The collaboration with Chempolis allowed us to develop our processes within Chempolis' expertise and infrastructure, leading to a collective development. In 2024, Origin by Ocean continued working with Chempolis on piloting, resulting in lessons learned, which will be beneficial to take into account and make adjustments to in the future.

By scaling the biorefinery process and products, we are able to initiate more customer-driven development projects and products. Our clear focus is, at this point, in products and applications where our functional ingredients provide great value to our customers, the consumer and the environment (ObO, 2022a).

CLIMATEPOINT

Starting in 2023, Origin by Ocean began working with ClimatePoint, creating more detailed life cycle assessments, focusing on sargassum from the Caribbean. This helped create a base for our LCA findings. It showed us how our overall carbon footprint will decrease significantly as the production scale grows, thus becoming carbon neutral or carbon negative. Since we have now frozen our process, which impacts the calculations, we will provide updated and more accurate information to ClimatePoint for our life cycle assessments in the future.

Our new calculations will be based on our data from our feasibility study for our first-of-a-kind (FOAK) factory in Finland. The larger production scale will be valuable in seeing our current impact and calculating our potential impact.



Origin by Ocean is involved in several algae-related projects, two of which are funded by EU-Horizon. The two projects are called LOCALITY and AlgaeProBANOS.

LOCALITY

Origin by Ocean is part of Horizon Europe's LOCALITY project, granted by the European Climate, Infrastructure and Environment Executive Agency (CINEA), under the powers delegated by the European Commission. The project is coordinated by Norsk Institutt for Vannforskning (NIVA), and has brought together over 27 partners, including Origin by Ocean, to participate in helping create positive change in three regional ecosystems.

The project focuses on nature-positive algae-based food, agriculture, aquaculture and textile products made in North and Baltic Sea ecosystems, by implementing local, innovative, and sustainable value chains. By working together, innovative processes and algae-based products will be developed, consumer readiness will be tested, and potential challenges will be identified. This will help create a plan for successful implementation, outreach, communication, and engagement, all while moving towards circularity.

The LOCALITY project started in June of 2023, and is set to end in May of 2027. While Origin by Ocean is a partner for several of the other work packages, we are the leader for the nutraceutical product development section. The cyanobacteria blooms are wild harvested along Finland's coastline. The harvesting results in excess nutrients being removed from the North and Baltic Seas, along with producing sustainable and valuable products. Some of the main objectives for the section include developing innovative algae-based nutraceuticals, and characterizing the quality and safety of said products.

ALGAEPROBANOS

Origin by Ocean is also part of the AlgaeProBANOS EU-project, which is funded by Horizon Europe as well (AlgaeProBANOS, n.d.). AlgaeProBANOS (APB) aims to accelerate the development of and market access to algae-based solutions. Through six business pilots, the project will introduce eight algae products, ranging from food to cosmetics, fostering a sustainable industry that preserves precious resources while meeting consumer demands. The project period is from 2023 to 2026 (36 months) and is coordinated by the German Submariner Network for Blue Growth. The core mission of APB is to support the development and market accessibility of algae-based products, aiming to position the EU as a global leader in this domain (AlgaeProBANOS, n.d.). This initiative strives to not only foster industry growth but also support coastal societies and stimulate local economies.

PIDÄ SAARISTO SIISTINÄ

Blue-green algae, or cyanobacteria, are microscopic organisms that occur naturally in bodies of water around the world. When the water is warm and nutrient-rich, it can cause the blue-green algae to multiply, forming blue-green algae blooms (Minnesota PCA, n.d.). In Northern Europe, strong deposits of blue-green algae disturb the ecosystem of the Baltic Sea, causing harm to the water quality, biodiversity, economy/tourism, and health of humans and animals. If people, especially children, or animals touch, ingest, or inhale water that contains blue-green algae, it can cause them to become sick (YLE, 2023).

Roska-Roope, a solar-powered boat, was originally designed by Pidä Saaristo Siistinä (Keep the Archipelago Tidy Association) in 2019 to collect trash from lakes and the sea (YLE, 2019). It started as a way of not only cleaning up the waterways, but also educating people about the littering problem in Finland (YLE, 2019). The vessel, Roska-Roope, is able to sail on shallow waters, meaning that it can collect trash in areas that are generally harder to reach or are completely unreachable by larger boats (Ahonen, 2019).

In the summer of 2024, Origin by Ocean collaborated with Pidä Saaristo Siistinä ry in order to create Levä-Roope. The customized Roska-Roope, called Levä-Roope, is a solar-powered vessel that collects the blue-green algae, both from the surface of the water and a bit deeper than the surface. Levä-Roope was piloted in 2024 as it collected blue-green algae in the Turku archipelago during the algal bloom season (ObO, 2024b). Collecting this blue-green algae helps clean beaches, reduce environmental harm, and remove excess nutrients from the Baltic Sea - while also creating useful biochemicals for industrial use (ObO, 2024b). When looking to the future, the goal is a network of algae collectors and business scaling, which could allow us to purchase and utilize the collected algae (ObO, 2024b).

Pilot Production

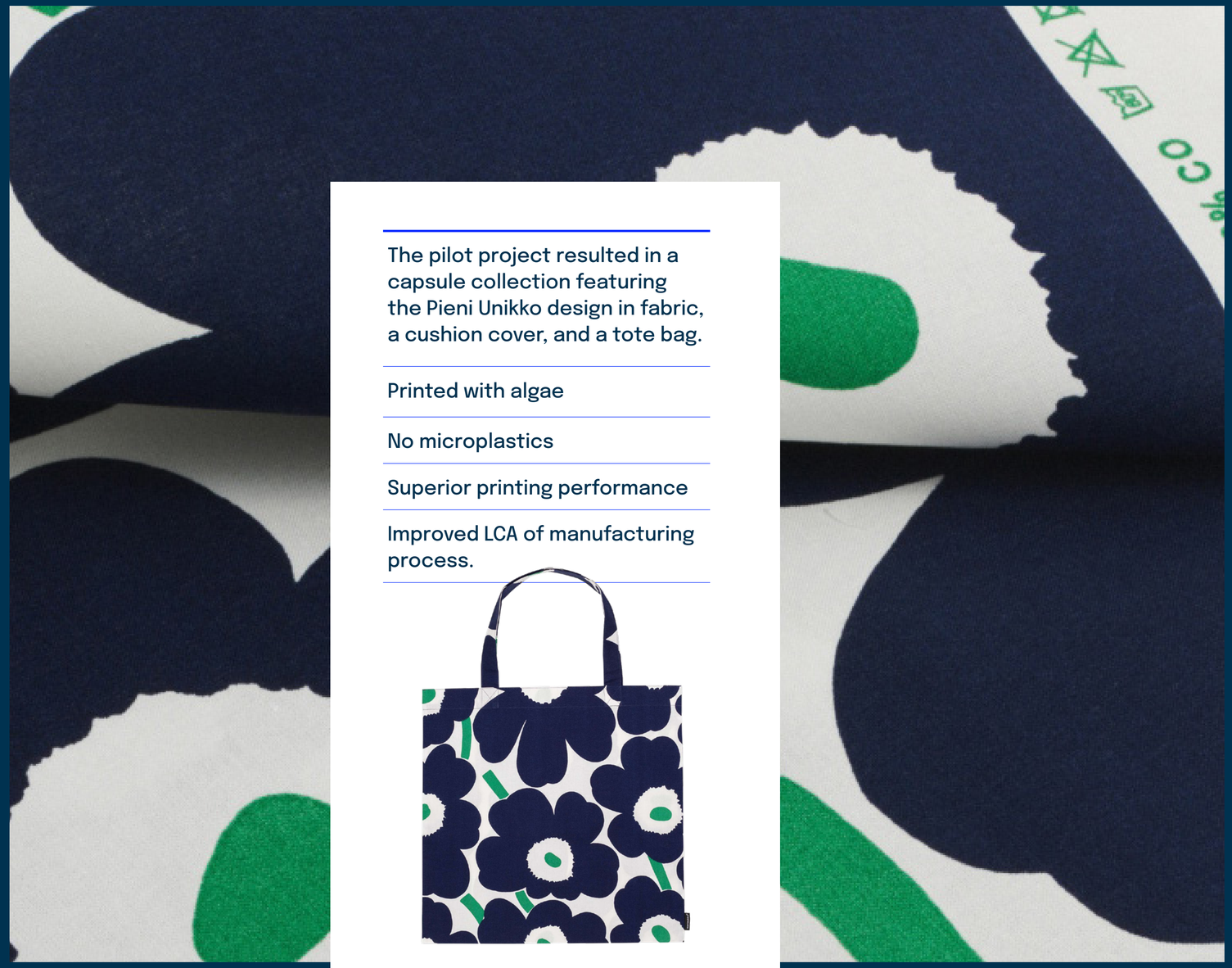
In 2023, Marimekko and Origin by Ocean joined forces in a pilot project which substituted a synthetic thickener within the print paste with Origin by Ocean's algae-based thickener.

A set of textile products was printed with OCEANTHIX™ alginate, a print paste thickener that was made from sargassum from the Dominican Republic. Thickeners play a crucial role in the textile printing process, as they are the main component in the paste. Testing the use of bio-based thickeners in Marimekko's printing process was a step towards their company's goal of reducing the amount of chemicals used in their supply chain.

The collaboration between our company and Marimekko led to an improved LCA of the manufacturing process, with no microplastics, and superior printing performance.

https://www.marimekko.com/com_en/sustainability/caerulo

https://www.originbyocean.com/our-products



The pilot project resulted in a capsule collection featuring the Pieni Unikko design in fabric, a cushion cover, and a tote bag.

Printed with algae

No microplastics

Superior printing performance

Improved LCA of manufacturing process.

8. Looking Ahead

Looking ahead

As we continue our journey from innovation to impact, our focus remains on scaling up our operations that is the key to unlocking our impact.

By taking these critical steps, we are not just scaling a business — we are redefining how industries source sustainable, ocean-based ingredients while driving regenerative economic growth.

OUR KEY PRIORITIES FOR THE COMING PHASE INCLUDE:

MOVING TOWARD COMMERCIALIZATION

Advancing our proprietary biorefining process, ensuring a seamless transition to market-ready products.

Executing a strategic, phased approach to scale-up, from demo to First-of-a-Kind (FOAK) commercial production, ensuring long-term viability and market adoption.

BUILDING THE FOUNDATION FOR THE FIRST COMMERCIAL BIOREFINERY

Laying the groundwork for our First-of-a-Kind (FOAK) biorefinery, optimizing technology, infrastructure, and making investment decisions to achieve industrial-scale production.

EXPANDING SUPPLY CHAIN PARTNERSHIPS

Strengthening collaboration with partners to secure sustainable and scalable raw material streams while reinforcing the positive impact on individuals and economies affected by the Sargassum problem. Researching opportunities to transfer from wet sargassum as our raw material to a locally (at source of collection) dried biomass.

So far our sourcing efforts have primarily supported R&D and pilot projects as we refined and stabilized our process. In 2025, with the transition to demo production - and during ramping-up for full-scale production – we recognize the growing importance of developing and maintaining sustainable, transparent sourcing practices throughout the supply chain.

Unlocking the Potential of Seaweeds in the Baltic Sea

In addition to Sargassum, we are exploring the potential of other algae species, such as blue-green algae and responsibly farmed fucus, expanding our ability to produce sustainable materials while promoting ocean health.

FUCUS VESICULOSUS is a type of brown algae that can generally be found in northern temperate regions (The Editors of Encyclopaedia Britannica, 1998). Bladderwrack (Fucus vesiculosus), the largest brown seaweed in the Baltic Sea, forms underwater forests that foster biodiversity, protect against coastal erosion, and improve water quality. As a natural biofilter, it absorbs excess nutrients, mitigating eutrophication and harmful algal blooms (HABs), which threaten marine ecosystems and human health. The health of bladderwrack ecosystems serves as a key indicator of the Baltic Sea's overall ecological status.

RESTORING THE BALTIC SEA

Cultivating bladderwrack can help counteract HABs by outcompeting harmful species for nutrients and light. Additionally, bladderwrack acts as a carbon sink, capturing CO_2 and contributing to climate change mitigation. Its underwater forests provide habitats for marine life, strengthening ecosystem resilience and restoring the natural balance of the Baltic Sea.

A KEY INGREDIENT FOR INNOVATION

Bladderwrack is rich in bioactive compounds, making it an ideal feedstock for Origin by Ocean's regenerative value chain. Harnessing this seaweed, we are aiming to resuscitate the Baltic Sea and unlock a spectrum of functional, organic chemical ingredients through our biorefinery technology. Due to its rich composition of bioactive compounds, bladderwrack is highly valued across various industries. Its extracts are sought after for their anti-inflammatory, antioxidant, and skin-hydrating properties.

A REGENERATIVE FARMING MODEL

We envision large-scale bladderwrack cultivation in symbiosis with fish farms and offshore wind farms. This integrated approach would benefit both aquaculture and marine biodiversity while leveraging existing infrastructure for sustainable seaweed farming.

Bladderwrack farming requires no freshwater, fertilizers, or pesticides, making it a sustainable alternative to land-based agriculture. Our freestanding cultivation technologies ensure stable growing conditions, maximizing environmental benefits.

It supports circular economy initiatives, creates green jobs, and supplies raw materials for various industries–all while improving the health of the Baltic Sea. By leveraging the power of brown seaweeds, we are driving environmental restoration and economic opportunities, paving the way for a more regenerative future.

PIONEERING SUSTAINABLE SEAWEED FARMING

Origin by Ocean is leading the way in bladderwrack farming in Northern latitudes. While large-scale seaweed farms are planned across European waters by organizations like North Sea Farmers (of which we are a member), our initiative marks the first-ever seaweed farm in Finnish waters. We secured Finland's first seaweed farming license in 2021, setting the stage for a new era of regenerative marine agriculture.

TANGIBLE IMPACT ON THE BALTIC SEA

Farming bladderwrack actively removes nitrogen and phosphorus, the primary drivers of eutrophication. As an example, a biorefinery processing 20,000 tons of bladderwrack annually could eliminate approximately 125 tons of nitrogen and 5 tons of phosphorus, meeting 4% of Finland's nitrogen reduction targets and 2% of phosphorus reduction goals under the EU Baltic Sea Action Plan.

We are committed to further exploring cyanobacteria as a feedstock in our biorefinery.

We are seeking partners to scale up the collection of cyanobacteria from the Baltic Sea, with a demonstration harvest planned for summer 2025. Establishing a functional harvesting protocol is a critical step in converting cyanobacteria into a viable biomass feedstock for our operations.

Our approach involves deploying a vessel equipped with a prefilter net to collect and channel blue-green algae into an onboard filtration system. In addition to our own harvesting operations, we aim to establish partnerships to procure third-party harvested cyanobacteria, creating a scalable model for nutrient removal and biomass utilization.

Harvesting cyanobacteria removes nitrogen, phosphorus, and biogenic carbon from the Baltic Sea, mitigating eutrophication.

Following the pilot-harvesting projects, we will refine processing methods through R&D, advancing toward industrial-scale harvesting. As our biorefinery capacity expands, cyanobacteria will be integrated into our processes for the extraction of high-value Mycosporine compounds (OCEAN**SHIELD**™ in our product portfolio).

9. Innovation & Market Potential

Innovation & Market Potential

R&D ACHIEVEMENTS

In 2023 and 2024, more Oceansavers joined the team, bringing new expertise and expanding our collective capabilities at Origin by Ocean. Despite challenges, such as limited space and equipment, our R&D team has continually leveraged their skills to drive innovation and keep progress on track.

A key focus in 2024 was optimizing non-toxic solvent use. Through process improvements, the R&D team successfully reduced chemical consumption by enhancing solvent recycling. At the same time, the Analysis team refined one of its methods, leading to lower solvent waste while improving both efficiency and performance – making the process not only more effective but also more environmentally sustainable.

A major milestone in 2024 was freezing our process. This means our biorefining method is now locked in and will remain unchanged as we scale up to larger production volumes in the coming years.

MARKET OPPORTUNITIES & DRIVERS

The growth potential within the markets is huge. The total available market is $453 billion, and it includes the markets for textile printing, food texturizing, cosmetics, and personal care.

The serviceable available market, which is the portion that can technically switch to bio-based ingredients, totals around $220 billion. Origin by Ocean is targeting around 10% of the $10 billion serviceable obtainable market, which is then $1 billion. The serviceable obtainable market includes the portion that is ready for Origin by Ocean's products.

THE MARKET IS DRIVEN BY THREE MAIN FACTORS

1. There is an increasing market interest in products that address global sustainability trends, which then impacts purchase decisions, as consumers prioritize sustainably produced goods.

2. The demand for products with reduced chemical loads is driving innovation in functional, bio-based ingredients that serve multiple purposes. An increased focus on bio-based content also aligns with decarbonization strategies and enhances product end-of-life sustainability.

3. The EU's directives on sustainability (EU Chemicals Strategy for Sustainability and EU Plastics Strategy) are reshaping industries and supporting regenerative practices.

These market drivers will continue to increase both the interest in and the need for sustainably produced goods from companies with sustainable business models. Our solutions can help meet the needs of consumers, while also helping the planet.

Pioneering a zero-waste, regenerative economic model.

Developed countries have disproportionately contributed to the emissions and pollution that are fuelling climate change (UN, n.d.). Climate change has been causing rising temperatures in the sea, higher levels of dissolved CO2 in the water, an increase in nutrients in the sea (from farming, flooding, hurricanes, and more), and changes in winds and currents, resulting in the sargassum issue to grow (Copernicus Marine Service, 2023). As the sargassum inundation events have increased in size, so have their negative impacts on local communities. This means that countries, which have least contributed to climate change, are the ones who are paying the highest price for it. Developed countries have a responsibility to use their own resources to clean up the messes that they have caused. This idea, of accountability and action, is applicable across all industries since value chains, networks, and systems are so interconnected (UNDP, 2023).

However, this does not just mean cleaning up past messes, but instead also working on avoiding these same mistakes and unsustainable outcomes in the present and future. Frameworks, policies, and agreements must be in place in order to ensure that everyone is on the same page and are working up to standard. It is unsustainable and unethical for developed countries to grow while they are harming other countries and environments. The EU, for example, must take accountability and take meaningful short-term and long-term actions to ensure positive change (European Commission, 2021).

By creating a supportive network, innovative ideas can grow and form solutions for wicked problems. Since change cannot be done alone, organisations and companies can play an important part in the larger picture. This want to create change needs to be genuine and thought out in order for it to actually help make a change within the climate crisis. There is room for realistic optimism in the climate crisis, if innovative ideas are supported, and sustainability-related information is spread. Many countries are already heavily feeling the impacts of the climate crisis, but we can still slow down, stop, or reverse some of those effects. Origin by Ocean aims to be part of that change, helping local communities who are directly feeling the impacts of the sargassum inundation events, and by preventing current and future emissions through ingredient substitution throughout various industries. Change is possible, and optimism is required in order to achieve that. As our processes scale up in size, so do the positive impacts. This means that, in this case, we are able to have a more positive and more sustainable impact once we are operating our biorefineries at larger scales in Finland and abroad.

Origin by Ocean aims to be part of the change, by helping communities impacted by SIEs, and by preventing emissions through ingredient substitution

At Origin by Ocean, we have a regenerative business model. This means that we want our business to promote environmental, social, and economic sustainability, while creating a beneficial product from an invasive feedstock (sargassum). By utilizing the feedstock, we are helping lower the negative impacts that the large quantities of sargassum would have on coastal communities. Our regenerative business model can be broken down into three main sections: feedstock, process, and output.

FEEDSTOCK

We clean oceans by harvesting invasive algae, reducing harmful emissions and unlocking the value of this unused marine biomass. Our operations support local economies and turn environmental waste into highly profitable, low-carbon ventures.

PROCESS

Our patented biorefinery turns harmful marine biomass into valuable bio-based products, while addressing environmental degradation, industrial fossil fuel reliance, and economic challenges. Every part of the biomass is utilised, with residuals being repurposed into products and materials, capturing carbon.

OUTPUT

Our high-value functional bio-based ingredients decarbonise oil-based manufactured goods across industries like cosmetics, textiles and food. Our ingredients bring functionality and profitability, regulatory compliance, and enhanced market competitiveness, whilst helping manufacturers decrease their carbon emissions.

By reimagining the value chain and by viewing the environment as an ecosystem instead of a resource, we can turn massive problems into opportunities. We can address sustainability-related issues from start to finish, from feedstock to output. Positive feedback loops in climate change cause that trend to speed up, resulting in compounded impacts. However, our business model helps disrupt those feedback loops at multiple points.

FEEDSTOCK: SARGASSUM COLLECTION

Collecting sargassum before it decomposes avoids the release of CO_2 and methane - potent greenhouse gases that would otherwise contribute to climate change. This means avoided emissions, as these gases are never released into the atmosphere in the first place. Additionally, early collection reduces the strain on local wildlife and communities by minimizing health risks, economic losses, and environmental damage immediately, but also contributing to long-term climate mitigation.

PROCESS: PRODUCTION

Our patented biorefinery technology transforms seaweed into multiple high-value products in a single industrial process, replacing oil-based chemicals with a sustainable alternative. By leveraging algae, we not only reduce reliance on fossil fuel based resources, but also prevent CO_2 emissions associated with fossil fuel-derived chemicals. Algae feedstocks can create direct pathways to specialty chemicals, bypassing traditional primary chemicals, eliminating multiple steps in the conventional chemical industry value chain. For example, replacing oil-based acrylates with our alginate, OCEAN**THIX**™, avoids both CO_2 and microplastic emissions.

OUTPUT: LIFECYCLE OF THE PRODUCTS

We are reimagining the chemical industry by transforming harmful algae into high-value, sustainable, 100% bio-based & biodegradable ingredients for consumer goods. In 2025, we plan to conduct assessments of our ingredients in various products, to more clearly identify the scale at which our ingredients can make a difference. Substituting oil-based ingredients with algae helps lower the footprint of the product.

We aim to build, maintain, and strengthen our relationships with sustainable suppliers, partners, and stakeholders. Building a regenerative value chain and working towards a circular economy require the support of others. Together, we can grow sustainably, protect our environment, and challenge the idea of business as usual.

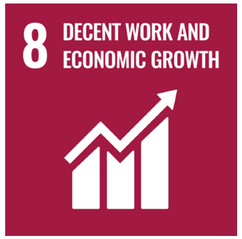
10. Sustainable Development Goals

Sustainable Development Goals

In 2022, Origin by Ocean became a member of the UN Global Compact. Joining as a member means supporting the Ten Principles of the United Nations Global Compact on human rights, labour, environment, and anti-corruption.

Part of that commitment involves submitting an annual report in the form of a Communication on Progress (COP). In order to reach our sustainability goals, and to create lasting change, we have chosen to focus on five Sustainable Development Goals (SDGs), along with related targets and indicators. The five SDGs are 8, 12, 13, 14, and 17. These are SDGs that we can implement at smaller and larger scales, as we are working towards ramping up production in the coming years.

As we scale up and track our current and potential impacts, our targets may change.



THE GOAL OF SDG 8 is to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.

At Origin by Ocean, we utilize a regenerative business model and sustainably-sourced feedstock, in order to help with environmental and social issues. As our company scales up, our positive environmental impact grows. Production ramp up will take place in the next few years, which will mean setting up and enforcing comprehensive plans and policies throughout our value chain. Growth can be both sustainable and profitable, without being extractive.

We want to work with locals, creating meaningful and mutual relationships, where we can promote and advocate for sustainable development and safe working practices. This means that when we will be creating our commercial production plan in the Caribbean, we aim to have clear communication and coordination with local businesses (especially local crew), and people living in the Caribbean who may be impacted by the construction or may have sustainability-related advice regarding the construction. Working with the community allows for valuable input, especially in terms of environmental, infrastructural, and social risks and opportunities. This collaboration is particularly important for environmental input, due to climate change risks that can be site-specific. Listening to what the indigenous and local populations want and need, in order for Origin by Ocean's presence and operations to be sustainable and welcomed in the Caribbean, both short term and long term, is a valuable part in creating long-lasting sustainable change.

Part of the local collaboration will also be in the form of sargassum hubs. The sargassum hubs will be open to everyone to source and use, since the abundance of invasive sargassum can be utilized for such a wide range of products. We will help spread information and resources, since these shared/collective resources allow people to work together to create change. The collective actions help create sustainable jobs for local communities, and provide feedstock that is more accessible, all while helping wash the oceans.

THE GOAL OF SDG 12 is to ensure sustainable consumption and production patterns.

As Origin by Ocean grows, we will continue to focus on sustainable consumption and production, seriously taking into consideration who we will partner/collaborate with in order to reach our shared goals and vision. We are focusing on sargassum for our feedstock, due to its immense volume, impacts on local communities and habitats, and its versatility. There is a lot of feedstock to harvest, as Sargassum Inundation Events overwhelm coastal communities in the Caribbean annually. If left untouched, the rotting sargassum will continue to wreak havoc environmentally, socially, and economically, on small island nations. However, luckily, the algae can be used in products across industries (from detergents to cosmetics), and it can be used to form various viscosities in products (from mists to gels). Turning sargassum into products helps prevent methane release, and lowers the footprint of said products, due to the feedstock, collection method, and unique process.

Working towards a circular economy, we intend to have a zero waste process, and to work with other companies that also believe in and operate within a circular economy. In our process, every part of the biomass is utilized, with residuals being repurposed into products and materials, capturing carbon.

We want these values of circularity to also be at the forefront of our future biorefinery construction and production, being taken into account when making decisions. While, at this stage, we cannot guarantee that everything will be recycled or reused during construction, we will make decisions in a way that focuses on waste prevention and reduction. This will help us in terms of making both short term and long term sustainable choices.

THE GOAL OF SDG 13 is to take urgent action to combat climate change and its impacts.

In order to help raise awareness of climate-related issues surrounding the oceans, Origin by Ocean created Origin by Ocean Academy, which provides hands-on experience for participants to learn about and discuss related topics. We want to bring climate change issues to the forefront, by engaging locals and by being part of political discussions. Some of those political discussions are accessed through speaking engagements and conferences, having a chance to both share our story and hear others' stories.

Since small island nations are some of the first places that will be impacted strongly by climate change, their voices need to be uplifted. Policies with climate change measures must be implemented throughout the world, to help mitigate the impacts, adapt to current situations, and to prevent situations from worsening.

If we continue to teach participants through Origin by Ocean Academy in Finland, then we can provide interesting opportunities and create more discussions about the ocean, climate change, and impacts. In the future, we could continue these discussions and learning opportunities in the Caribbean, collaborating with local organizations. These could also consist of shorter workshops, in order to get more of the community involved. By learning more about climate change and how sargassum adds to the positive feedback loop, this can also be a way for locals to be provided with information about jobs related to sustainable development in the area.

THE GOAL OF SDG 14 is to conserve and sustainably use the oceans, seas, and marine resources for sustainable development.

By using invasive sargassum as our feedstock, we are helping to wash the oceans, lowering the environmental harm that the marine ecosystems face when dealing with Sargassum Inundation Events. Removing the excess sargassum helps minimize or avoid harmful impacts, such as ocean acidifi cation, death of seagrass species, and animal dead zones.

As the eutrophication levels decrease, and the oceans become less overwhelmed, it opens up space for marine ecosystems to start to heal. At that point, marine resources can then be used sustainably, at smaller scales and with management plans in place. This would be especially useful and important for small-scale fishers, locals using the ocean for recreational activities, and locals who value the ocean for its cultural and environmental significance. Conserving and protecting the ocean allows for sustainable growth environmentally, socially, and economically.

We support coastal entrepreneurs, working with local partners to source our feedstock sustainably. Through our business ecosystem, we also want to provide sidestream work and revenue opportunities for people and businesses, such as fishermen, boat operators, offshore wind park operators, maintenance crews, and so on. With future plans to build biorefineries in Finland and in the Caribbean, we are paying extra attention to the wastewater treatment, including process wastewater, storm water, and sanitary wastewater. The wastewater will be treated in a way that it can be discharged safely, according to general regulations, permit requirements, and municipality agreements. By managing the wastewater safely, we can help prevent and reduce some of the land-based pollution that ends up in waterways. We minimize waste and maximize impact by recycling chemicals and water.

THE GOAL OF SDG 17 is to strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

With plans to set up and run biorefineries in the Caribbean comes the responsibility to respect, learn from, and work with locals. This includes working with local governments and organizations, in order to support sustainable development and encourage participation. Through meaningful discussions, especially surrounding policies and sustainable development, Origin by Ocean can learn how to support local needs regarding sargassum and its impacts.

The local rules and regulations will impact Origin by Ocean's operations and ability to execute plans according to the schedule in our roadmaps and timelines. To prevent and mitigate challenges regarding construction, timelines, and operations, we aim to maintain and strengthen our relationships with locals (businesses, organizations, government, and more). Through open dialogue, we can work together to advocate for policy change that promotes sustainable development, putting the environment and people over profit.

11. Economic & Social Impact

Economic & Social Impact

ECONOMIC OPPORTUNITIES

Invasive algae present a valuable yet underutilized resource for the chemical industry. Their rapid biomass production, ability to mitigate nutrient pollution, and versatility as a feedstock position them as a sustainable alternative to conventional raw materials. Beyond environmental benefits, their large-scale utilization can generate significant economic opportunities, particularly in regions heavily affected by invasive seaweeds.

Investing in invasive algae as feedstock can drive economic growth and create new job opportunities in local communities. The harvesting, processing, and development of algae-based products contribute to emerging industries and support innovation in biotechnologies, aligning with the circular economy principles of resource efficiency and sustainability.

(Ellen MacArthur Foundation, n.d.)

SCALING SARGASSUM HARVESTING IN THE CARIBBEAN

Harvesting 100,000 tons of invasive Sargassum in the Caribbean could create between 260 and 760 jobs across multiple sectors:

Harvesting operations:
100–200 jobs, with 20–34 large-scale boats, each employing 5–10 workers.

Processing & biorefineries:
50–200 jobs in conversion facilities.

Logistics & transportation:
100–200 jobs to support supply chains.

R&D and education programs:
20–40 specialized positions in sustainable harvesting and processing techniques.

This model demonstrates how addressing the Sargassum crisis can bring economic benefits to affected regions, particularly in the Caribbean, where vast algal blooms disrupt ecosystems and coastal economies.

UTILIZING RUGULOPTERYX OKAMURAE IN EUROPE

Rugulopteryx okamurae, an invasive brown algae species native to the Northwest Pacific but now disrupting ecosystems in the western Mediterranean, also presents a bioeconomic opportunity. Though smaller in scale, its fermentation-derived sugars can be used to produce high-value bioproducts.

For a 25,000-ton harvest of Rugulopteryx okamurae, job creation would be relatively lower:

Harvesting: 100–200 jobs, using around 10 boats over 60–100 days.

Processing & biorefineries: 20–50 jobs.

The economic impact of Rugulopteryx okamurae is more limited than Sargassum, but both cases highlight how invasive algae management can be transformed from an environmental challenge into a regenerative industry. By leveraging marine biomass for industrial applications, these initiatives foster resilient economies while promoting environmental stewardship.

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JOB CREATION (2024)

Our sargassum is collected in the Caribbean. We worked with multiple stakeholders in the area to develop the harvesting of sargassum, and to establish a value chain where sargassum is harvested by the local caribbean nations. This employs and supports local workers, contributing to their local economy.

SOS Carbon collected the sargassum, and Interlogistica handled the logistics. All of the sargassum collection took place on one beach in Punta Cana in the Dominican Republic. It is estimated that around 15 people were involved in the collection and loading of the sargassum.

Origin by Ocean provides a safe and fair working environment for all employees, and strives to consistently make improvements and updates, to ensure a thriving environment. For employees in Finland, we adhere to Finnish laws and regulations.

OUR TEAM (2024)

At the end of 2024, the Origin by Ocean team in Finland consisted of 29 Oceansavers. Out of the 29 Oceansavers, 16 employees identified as women, 12 identified as men, and 1 identified as non-binary. Origin by Ocean's board consists of 4 members, 2 of which identify as women, and 2 of which identify as men.

To strengthen leadership and self-leadership at Origin by Ocean the team leaders participated in several training and coaching sessions, leading to distributed responsibilities between the team leaders and the Management Team.

In the fall of 2024, all employees participated in a leadership workshop led by Laura Vargas. During the workshop, we discussed what leadership meant to us individually and collectively, and came to an agreement about what good leadership at Origin by Ocean is. We agreed that part of being a leader includes taking accountability and responsibility, and communicating openly and clearly.

The journey led to establishing joint House Rules that were signed by every Oceansaver at the end of 2024.

Policies

PREGNANCY & PARENTAL LEAVE

Employees in Finland are allotted pregnancy leave according to Finnish law. An employee can be granted special pregnancy leave if there is a chemical agent or another equivalent issue that poses a risk to the employee's health or that of the fetus, and cannot be avoided in the work for the duration of the pregnancy.

New parents in Finland are entitled full-time or part-time parental leave, according to Finnish law.

OCCUPATIONAL HEALTHCARE

The operation of occupational health care is based on a workplace survey, which is used to assess the health and safety of work, possible health risks and their importance for health and work ability. After reviewing the results from the survey and workplace discussions, our company (Origin by Ocean) and our chosen service provider (Mehiläinen Oy) create an occupational health care action plan, which is then revised annually in connection with the annual planning of the operation. The goals, content and follow-up of occupational health care activities are recorded in the action plan.

Occupational health care actively monitors sickness absences and supports employees' work ability, according to Mehiläinen's Työkuntoon early support model. The model guides the activities and the cooperation of occupational health care and the employer in order to reduce sickness absences. Occupational health care also supports supervisors in managing their ability to work.

Employees are also provided dental care through Hammas Mehiläinen. There is a fixed annual amount that employees can use for dental care.

Specifics for what is or is not included in the medical and dental care contracts for employees can be found by all Origin by Ocean employees in the company's Occupational Health and Safety Action Program document.

SAFETY MEASURES

At Origin by Ocean, we are all dedicated to keeping each other safe and to maintaining our overall well-being as a team. We are all part of creating the culture of occupational health and safety, where everyone strives to make improvements, be positive, and be transparent.

Together, we can create and maintain a thriving workplace for all of us. We are committed to following safe working practices and reporting unsafe practices, while also actively proposing improvements. Occupational health and safety is our company's basis for everything we do. We have zero tolerance for unsafe work practices, and we want to lead by example. We, as individuals, and as a team, actively contribute to fostering this safe and healthy work environment.

We have set clear targets as a company in order to ensure our health and safety.

We:

- aim for zero accidents
- have safe working procedures in place
- are experts in safe working practices
- take care of each other and remember to ask for help when needed
- take the health and safety of each other and ourselves seriously
- conduct regular health and safety trainings
- are all active in building the health and safety culture

At Origin by Ocean, we take safety protocol seriously and ensure that all employees are aware of the safety rules, regulations, and expectations. The obligations, standards, and responsibilities in terms of health and safety are detailed for the employer, supervisors, and the employees in a policy plan.

Eyewash stations and first aid kits are located in every lab. Emergency showers, eyewash stations, and a first aid station are located in the hallway. Employees are shown where safety equipment (including safety goggles, lab coats, etc.) is located and told when/how to use it. Safety measures include fire safety, with fire extinguishers in easy to access locations and clear evacuation plans in place, so that employees are well prepared in case of a fire. Guests are held to the same safety standards when visiting the labs, to ensure that everyone remains safe.

When working with chemicals and lab equipment, employees are given the proper instructions on how to handle them, their risks, and what to do in case of an emergency. In case of an accident, the work-related incident must be reported. The employee must report the incident to their supervisor, and must make a report by filling out a reporting form. All personnel are required to report any incident and close-call situation with said reporting form. There are policies in place for incidents that occur during commutes to and from work.

The Occupational Health and Safety Committee consists of an Occupational Health and Safety Manager, an Occupational Health and Safety Representative, a 1st Deputy, and a 2nd Deputy. A separate safety team will be established in February of 2025. The occupational safety team will also continue to follow up and provide suggestions, but will not be as active as the new safety team. This will allow for more of the responsibilities to be shared, and for more attention to detail, which will help increase safety measures and enforcement.

Origin by Ocean follows and enforces Finland's Occupational Safety and Health Act.

DATA PROTECTION & MANAGEMENT

There is a Data Protection and Privacy Policy that is available to employees. It covers the reasons for data protection and management which are specific to the needs of Origin by Ocean. The document also provides further information regarding policies related to trade secrets, personal data processing, data management, and data security.

Origin by Ocean adheres to Finnish legislation.

INGREDIENT SOURCING POLICY

In 2024, an ingredient sourcing policy was developed by the Application team, taking into account the quality of the ingredients, the feedstock and transparency of a vendor's supply chain, and if Origin by Ocean's values align with the findings.

CODE OF CONDUCT & HOUSE RULES

Origin by Ocean's Code of Conduct and House Rules includes our values, and how that translates to different policies, practices, or expectations in the company.

At Origin by Ocean, we are committed to conducting our business in an ethical, responsible, and sustainable manner. The values guiding our actions are sustainability, fairness, freedom and commitment. Our Code of Conduct sets forth the principles and standards that guide our behavior and decision-making. All employees, contractors, suppliers, and stakeholders are expected to adhere to these principles.

SUSTAINABILITY IS IN OUR NATURE: Long-term thinking forms the foundation of our company. We evaluate all internal and external decisions based on sustainability. We generate value by improving our habitat through innovation and by using biomass and other resources sustainably.

FREEDOM WORKS WONDERS: Freedom is the cornerstone of our workplace and employer philosophy. Origin by Ocean is a platform for experts to grow in knowledge, skills, teamwork, responsibility, and scope. We believe that people will exceed expectations when given the freedom to do so.

FAIRNESS IS OUR DEFAULT SETTING: A sustainable business is based on fairness, throughout. This is our default setting as human beings, colleagues, business partners, and civil society activists. Equally, we expect those we interact with to demonstrate fairness in their practices and discussions.

WE EMBRACE OUR COMMITMENT: We are committed to our cause of washing the oceans and raising awareness. Commitment is the mindset of the activist. We dare to talk and act, even when others remain silent.

Origin by Ocean's Code of Conduct consists of seven main sections, some of which have sub-sections. These sections are:

- **ETHICAL CONDUCT** (Integrity and Honesty, Conflicts of Interest, Fair Competition, and Anti-corruption)
- **SUSTAINABILITY** (Sustainability in Practice, Compliance with Environmental Laws, and Responsible Sourcing)
- **SAFETY** (Employee Safety and Well-being, Process Safety, and Ocean Safety)
- **SOCIAL RESPONSIBILITY** (Community Engagement, Diversity and Inclusion, and Human Rights)
- **DATA AND INFORMATION** (Confidentiality, and Accuracy and Transparency)
- **REPORTING VIOLATIONS**
- **CONSEQUENCES OF VIOLATIONS**

Origin by Ocean follows Finnish legislation and will adhere to the rules and regulations of the countries in which it operates.

We are committed to fostering a diverse and inclusive workplace, respecting all individuals regardless of their identity or background. We will uphold and respect human rights and will not engage in or support activities that violate these rights. Human rights, defined in the UN Declaration of Human Rights, include, for example, freedom of opinion and religion, equality of people, and prohibition of discrimination. We will respect the rights and well-being of our workers and partners, ensuring fair wages and safe working conditions.

Our Code of Conduct mentions engaging with the communities where we operate. We aim to work with communities, for ethical and sustainable outcomes, while protecting the environment. Community engagement can look different depending on the location, time of year, etc., however, in general, we plan on having local workshops, courses, and/or discussions with local and indigenous communities in the future.

Our Code of Conduct *reflects our commitment to responsible and ethical business practices.*

Adhering to these principles is essential to achieving our mission, serving our stakeholders, and contributing positively to society. We acknowledge that we are not perfect and we will commit to improving our impact by means of employee, supplier and other relevant stakeholder training, communication, audits and assessments, and reporting.

FUTURE POLICIES

We plan to review policies on a regular basis, and update them when necessary. In the near future, we will add more policies and guidelines, in order to ensure that Origin by Ocean's work environment remains safe, transparent, ethical, and sustainable. A whistleblower policy is one of the policies that will be added, as it will allow for any concerns to be brought up safely and anonymously.

Finland's Non-Discrimination Act states that "employers may not discriminate against employees on the basis of age, origin, nationality, language, religion, belief, opinion, political activities, trade union activities, family ties, health, disability, sexual orientation, gender, or other personal characteristics" (MEAE, n.d.). While the Act is quite comprehensive, some people in Finland still do experience discrimination during recruitment processes (Ramsila, 2023). To guarantee that the hiring process is fair, some companies have created non-discrimination recruitment policies (Ramsila, 2023).

As Origin by Ocean grows, we want to keep non-discrimination and fair hiring practices as one of our top priorities, which is why we will be creating a Fair Hiring Practices Policy. This way, anyone in charge of recruitment, regardless of biorefinery location, will be able to easily follow the steps involved in fair recruitment.

In Q1 of 2025, as the demand for outsourced services increases, Origin by Ocean will create a Supplier Code of Conduct, so that our suppliers will be aware of and adhere to our standards. The Supplier Code of Conduct will cover fair and non-discriminatory treatment of all employees, as well as working practices and conditions that are safe, ethical, and sustainable. The Supplier Code of Conduct will include information about how the various aspects of the arrangement will be monitored and reviewed. This will allow both parties to see which aspects are aligning and which need to be addressed. Working towards a regenerative value chain requires all suppliers to be on the same page, with sustainability at the forefront.

Origin by Ocean Academy aims to raise awareness about marine ecosystems and highlight the efforts dedicated to their protection and restoration.

Educational Initiatives

ORIGIN BY OCEAN ACADEMY began as a free, multidisciplinary program by Origin by Ocean, and is growing into a collaborative community of individuals, organizations, and companies committed to safeguarding the future of our oceans. Its mission is to raise awareness about the critical state of marine ecosystems and highlight the efforts of projects, companies, and people dedicated to their protection and restoration.

LAUNCHED IN FEBRUARY 2024, the Academy's first phase ran workshops through April, engaging a carefully selected group of participants. The program offered hands-on learning and research focusing on the physical, chemical, biological, and ecological aspects of marine environments, with a particular emphasis on the Baltic Sea. Through on-site activities, participants deepened their understanding of nutrient cycles, marine habitats, and coastal conservation while exploring innovative solutions to restore the Baltic Sea's fragile ecosystem.

From understanding nutrient cycles, to safeguarding marine habitats, every insight gained brings us one step closer to a healthier Baltic Sea ecosystem. Through lectures, conversations, and microscopes, important topics were thoroughly examined. Some of the discussions included topics, such as, the impact of agriculture and forest industry to the Baltic Sea ecosystems, benthic fauna, protecting coastal areas and nitrogen dominance in the Baltic Sea.

IN AUGUST 2024, the Academy expanded with the "Academy by the Sea," a two-day program that immersed participants in the Baltic Sea's underwater world.

The participants snorkeled through marine ecosystems, observing firsthand the delicate interplay between autotrophs (organisms that harness solar energy) and heterotrophs (organisms relying on others for energy). They marveled at the Baltic Sea's distinctive green hue, explored how wave energy shapes coastal ecosystems, and studied key species (like bladderwrack), all while reinforcing the importance of observing without disturbing marine biodiversity.

The program's snorkeling demos allowed participants to discover the effects of wave energy on coastal ecosystems, observing how algae moves with the waves, and how the sea's natural processes shape the shoreline. While snorkeling, bladderwrack floated to the surface, where students examined its structure and anatomy. The hands-on experience showed the importance of observing without harming nature, highlighting our commitment to protecting the environment.

Both programs were led by marine biologist PhD Ari Ruuskanen, the Lead Biomass Activist at Origin by Ocean.

The Origin by Ocean Academy embodies the company's mission to share knowledge and empower individuals to take meaningful action. By transforming eutrophication challenges into sustainable opportunities, the Academy is not just about education–it's about activation. It welcomes all who are passionate about the oceans to join in restoring marine health and advancing regenerative solutions for our shared waters.

photo: Stefan Sjöholm

Our Activism

DRIVING CHANGE BEYOND THE LAB

Our Oceansavers have been making a positive change outside of the lab as well, advocating for ocean restoration, climate action, building community, and regenerative practices. Every year, Oceansavers participate in a volunteer day, helping in different parts of Finland.

IN MAY OF 2022, Oceansavers went to Tuulispää, located in Somero. Eläinsuojelukeskus Tuulispää is a sanctuary and forever home for farm and production animals (Tuulispää, 2021). We helped by cleaning the barns that the animals live in, making space for fresh hay and happy animals.

IN 2023, Oceansavers went to the archipelago in Turku. There, we removed harmful plant species growing on the island, to allow for the native plants to thrive.

IN EARLY 2024, Oceansavers took part in a volunteering day to support the endangered Saimaa ringed seals by helping ensure adequate nesting conditions in Lake Saimaa. Organized by Suomen luonnonsuojeluliitto (the Finnish Association for Nature Conservation), this initiative addresses biodiversity loss and climate change challenges (FANC, n.d.).

With only around 480 seals left in Lake Saimaa, ringed seals face significant threats. Pups are at risk of drowning if entangled in fishing nets, while diminishing snow and ice caused by climate change make it increasingly difficult for seals to build natural nests. These challenges contribute to population declines, putting this unique species under even greater pressure.

To mitigate these risks, stricter fishing regulations have been imposed, and human intervention through nest-building has become an essential way to support the seals during their critical breeding season. Together with Suomen luonnonsuojeluliitto, our Oceansavers rolled up their sleeves and built four large artificial nests, providing a safe space for the seals to raise their pups.

12. Challenges & Lessons Learned

Challenges & Lessons Learned

Over the years, teams have grown and changed. In order to improve safety measures, many steps were taken in 2024, however, there is still more work to be done in terms of that. In 2025, we will continue improving safety measures and ensure that everyone takes safety seriously. Some teams have also been paying more attention to employee well-being, and will continue working on making that a higher priority. Open communication is key to listening to and understanding employee needs and wants, to make sure that they are growing but are not burnt out.

We prioritize hygiene and safety in our labs, which often requires the use of single-use plastics or other similar supplies. This means that, sometimes, usability and price are factored in more during decision-making in the labs. However, in other scenarios, where sustainability can be taken into consideration more, different teams find various ways of incorporating sustainability-related decisionmaking. For example, some teams use recyclable or recycled materials when possible. For prototype samples and for all products going to trade shows, our Application team strives to use packaging that can easily be recycled (e.g. monomaterial), or is made from post-consumer recycled plastics (PCR) or biobased plastics.

IN 2024, TEAMS AT ORIGIN BY OCEAN MADE SOME CHANGES THAT RESULTED IN BEING MORE SUSTAINABLE

An analysis method was modified, producing less solvent waste

The process was optimized by recycling solvents and using less chemicals

More of a focus was placed on listening to employees and paying more attention to their wellbeing at work

A lab was reorganized to be both more efficient and safe

Packaged our Origin by Ocean material samples in recyclable material

Developed an ingredient sourcing policy

Purchased second hand furniture

Repaired lab equipment instead of buying new equipment

13. Conclusion & Acknowledgement

Conclusion

As our first impact report, this aims to be a starting point in sharing our annual progress. As we grow and proceed to commercial production over the upcoming years, we plan to implement more comprehensive sustainability-related plans and methods for tracking, so that we can meet our Sustainable Development Goals, while simultaneously scaling up our production.

We are eager to grow, as we shift into demo production, and, along the way, we will be transparent about the progress that we are making.

The feasibility study and the final investment decision for Origin by Oceans first commercial production site in Finland will set the pathway for sustainability in our operations. The impact of these decisions grows as the blueprint of the production will be replicated when scaling up operations according to our business model.

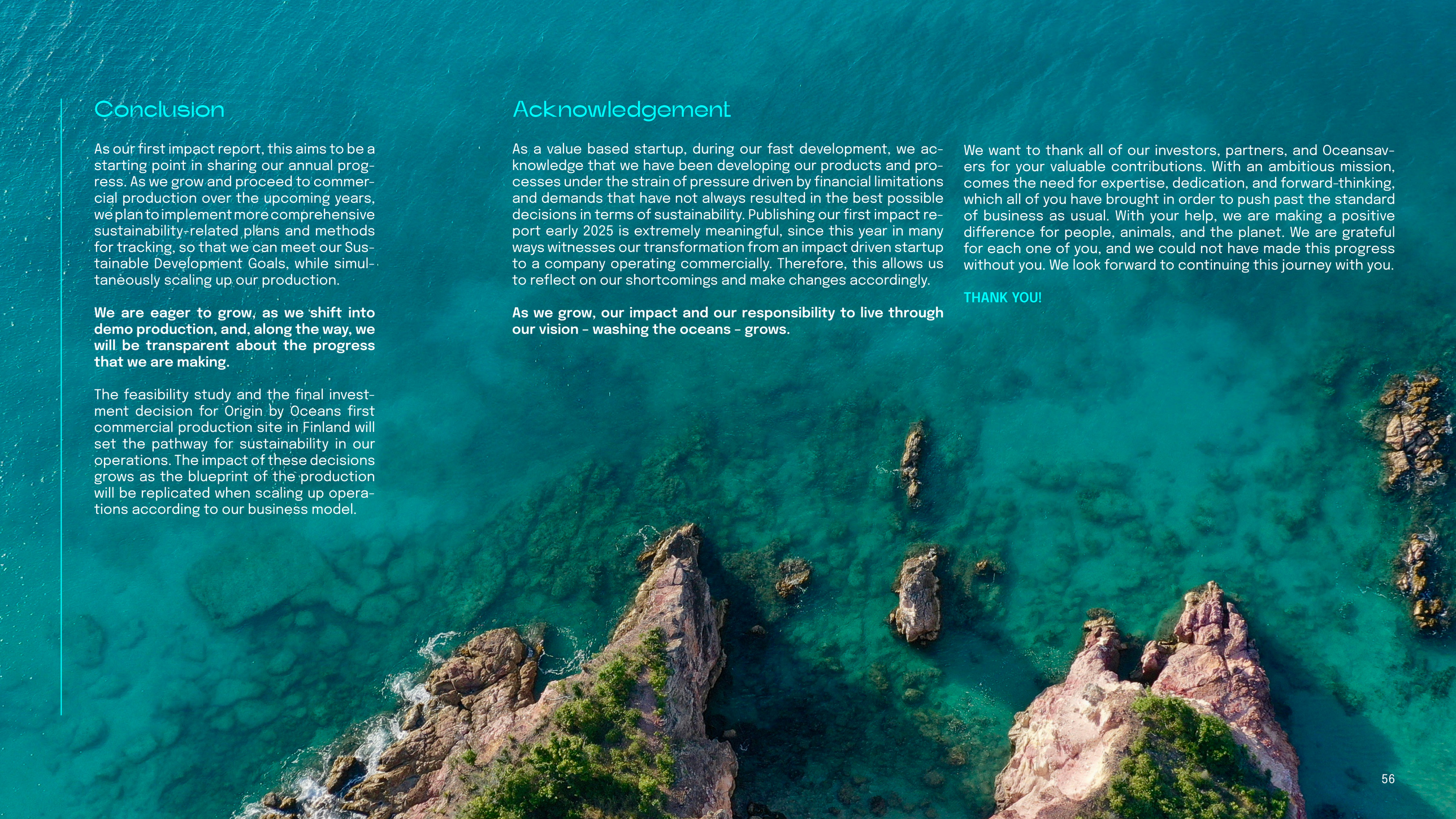
Acknowledgement

As a value based startup, during our fast development, we acknowledge that we have been developing our products and processes under the strain of pressure driven by financial limitations and demands that have not always resulted in the best possible decisions in terms of sustainability. Publishing our first impact report early 2025 is extremely meaningful, since this year in many ways witnesses our transformation from an impact driven startup to a company operating commercially. Therefore, this allows us to reflect on our shortcomings and make changes accordingly.

As we grow, our impact and our responsibility to live through our vision – washing the oceans – grows.

We want to thank all of our investors, partners, and Oceansavers for your valuable contributions. With an ambitious mission, comes the need for expertise, dedication, and forward-thinking, which all of you have brought in order to push past the standard of business as usual. With your help, we are making a positive difference for people, animals, and the planet. We are grateful for each one of you, and we could not have made this progress without you. We look forward to continuing this journey with you.

THANK YOU!



14. FAQ & Abbrevations

Frequently Asked Questions

WHAT IS INVASIVE SEAWEED?

“Seaweed” is the common name for countless species of marine plants and algae that grow in the ocean as well as in rivers, lakes, and other water bodies (NOAA, n.d.).

Invasive seaweed is seaweed that is not native to the area in which it is growing (Mancuso et al., 2022). Invasive/non-native plants, including seaweeds, often can reproduce, grow, and spread quickly since they are able to outcompete native plants (City of Portland, n.d.). They often use up resources that native plants rely on.

WHAT IS SARGASSUM?

Sargassum is a brown algae found in the ocean. Sargassum has leafy appendages, branches, and round gas-filled structures. The round structures, which are called pneumatocysts, are mostly filled with oxygen, allowing the sargassum to float on the surface of the water (NOAA, 2018).

Outside of the Sargasso Sea, sargassum is an invasive species. It grows rapidly in the Great Atlantic Sargassum Belt, causing environmental, economic, and health-related issues when it reaches the shores.

WHAT IS HYDROGEN SULFIDE? DOES IT IMPACT ORIGIN BY OCEAN’S PRODUCTS?

Hydrogen sulfide is described as a “colorless gas known for its pungent ‘rotten egg’ odor at low concentrations” (OSHA, n.d.). The gas is toxic and exposure to it can cause a range of health issues, from mild to severe. After 48 hours of reaching land, sargassum begins to rot, releasing harmful gases called hydrogen sulfide and ammonia (Nibbs, 2024).

This means that hydrogen sulfide is not present in the sargassum itself. The hydrogen sulfide is only released as a reaction when the sargassum is decomposing.

No, the hydrogen sulfide does not impact our products. Our sargassum is collected before it begins to rot, and is stored safely for transportation, meaning that the hydrogen sulfide is neither released nor present in our products.

ARE ORIGIN BY OCEAN’S PRODUCTS SAFE?

Yes, Origin by Ocean’s products are safe.

Sargassum can accumulate pesticides and heavy metals (including arsenic), so, in our biorefining process, we treat the sargassum in a way that removes the pollutants, ensuring that it is safe to use. Due to this process, our ingredients are safe and purified.

The heavy metals (including arsenic) that are removed from the sargassum are disposed of properly, according to our safety guidelines and local regulations.

ABBREVIATIONS

CEO: Chief Executive Officer

CINEA: European Climate, Infrastructure and Environment Executive Agency

COP: Communication on Progress

CO2: Carbon Dioxide

EU: European Union

FCSP: Fucose-Containing Sulfated Polysaccharide

FOAK: First-of-a-kind factory

Fucus vesiculosus: Bladderwrack

GDP: Gross domestic product

HAB: Harmful algal bloom

kg: Kilogram

kgCO2e: Kilograms of carbon dioxide equivalent

km: Kilometer

LCA: Life cycle assessment

NIVA: Norsk Institutt for Vannforskning

Oceansavers: Origin by Ocean employees

SDG: Sustainable development goal

SIE: Sargassum Inundation Event

UN: United Nations

PRODUCT NAMES

OCEAN**THIX**™: Sodium Alginate

LV: Low Viscosity (Low viscosity anionic biopolymer)

OCEAN**BOOST**™: Fucoidan

LF: Low Fucose (Low Molecular Weight Fucose-Containing Sulfated Polysaccharide)

OCEAN**SHIELD**™: Mycosporine

OCEAN**FX**™: Fucoxanthin

OCEAN**SYRUP**™: Laminarin

OCEAN**RESIDUE**™: Seaweed residue

PATENTS

Origin by Ocean's IP portfolio currently consists of two granted patents in Finland: process technology patent and brown algae cultivation patent. For the process technology patent there are active extension applications pending for six different patent regions (USA, Canada, EPO, Mexico, Dominican Republic, Brazil). Additionally, two other process related patents are currently pending, and several are in development in areas of our ingredient formulations.

In addition to patents, we own the trademarks of our products, and our company name and logo is registered.

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