
# THE NORDIC OCEAN OPPORTUNITY

## The investment thesis for the Nordic Ocean Economy

Nordic Innovation

# Contents

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# FOREWORD

## The role of the Ocean in shaping the Nordics

What makes the Nordic countries *Nordic*? What unites Sweden, Norway, Denmark, Finland, Iceland, the Faroe Islands, Greenland, and Åland under a shared identity? What common traits bond them together under the name *Nordic*?

These eight nations share many defining characteristics that can be grouped into five key categories. First, they have a common history, shaped by shared origins and centuries of political alliances. Second, they uphold common values, including a deep commitment to fairness, equality, democracy, and social trust. Third, they share cultural elements, from closely related languages and religious traditions to similar economic models. Fourth, they are all located in the northern part of the globe, defined by a unique climate and weather conditions—marked by long, cold winters. And last but not least, the fifth, they share distinct geographical and topographical features, including long coastlines and ocean territories that often exceed their land areas.

All these factors are equally important. However, it is this last factor—the Ocean—that plays a particularly defining role. The Nordic countries are fundamentally ocean-based nations. On average, their combined ocean areas are twice the size of their land areas, with countries like Norway and Iceland pushing this ratio even further—six or seven times larger. The Ocean has not only shaped the region's geography—but it has been instrumental in the formation, development, and growth of Nordic societies in the first place. It made life and civilization possible in these northern lands.

The very term **Nordic** comes from *Norden*, meaning "the northern lands." In these extreme latitudes, it was the Ocean that made settlement possible in the Nordics. Here's how:

- The Ocean moderates the climate, thanks to the Gulf Stream, which warms much of the region's coastline. Without it, the Nordics would be significantly colder and less habitable.
- The Ocean provided a vital food source, particularly fish, which was essential in a land where large-scale farming was difficult.
- The Ocean enabled travel and connectivity, allowing Nordic communities to navigate across vast distances where boats provided a far more practical means of movement than overland routes.
- The Ocean fueled trade and economic activity, linking the Nordics to other regions, facilitating commerce, and generating wealth.

The Ocean has been an undeniable force in shaping the Nordic region and Nordic society for over a thousand years, defining their history, culture, economy, and how their societies have developed and evolved. More than just a resource or a geographical characteristic, the Ocean is the foundation on which these nations were built. It is not just part of the Nordic identity—it defines it. In essence, the Ocean is one of the strongest forces that bind the Nordic countries together, and it is a key part of what makes them truly Nordic.

## The Ocean Economy in the Nordics today

In 2025, when this document is written, the Nordic region is far more complex than the early societies of fishermen and Viking explorers navigating the world in wooden boats. Today, the Nordic countries are home to over 27 million people, and their combined economies rank as the 10th largest in the world. All eight countries also rank among the top 20 in GDP per capita. The region's success spans a wide range of industries—from gaming, fintech, and car manufacturing to energy production and healthcare—showcasing a highly diversified and competitive economy. Yet, while the Ocean and the Ocean Economy may no longer dominate the economic narrative as they once did, their significance has not disappeared.

In fact, the Ocean Economy still plays a crucial role in the Nordic region. It represents 15% of the region's annual GDP and remains the largest sector in Norway, both in terms of GDP contribution and export value. It is also a cornerstone of the economies of Iceland, the Faroe Islands, and Greenland, and has a smaller yet relevant contribution to the economies of Sweden, Denmark, and Finland. Beyond its direct economic contribution, the Ocean is a major energy source, not only for the Nordic countries themselves but also for neighboring nations and global markets. The region is a key player in offshore energy production, including oil, gas, and an increasing share of offshore wind energy.

Moreover, some of the most valuable companies in the Nordic region are ocean-based. Among the top 10 companies by market capitalization in each Nordic country, 32% operate within the Ocean Economy. In other words, nearly one-third of the region's largest companies are directly linked to the Ocean, reinforcing its continued economic significance.

The Ocean Economy has been a fundamental pillar of Nordic economic development for centuries. Today, it remains a key driver of economic activity, job creation, and social wealth. And looking ahead, the Ocean Economy has the potential to be one of the most transformative forces in shaping Nordic economic growth and progress in the years to come.

This report aims to highlight the global opportunities emerging from the Ocean Economy today and illustrate how the Nordics are uniquely positioned to lead and

capture them. Those who choose to take part in this new Nordic expedition stand to benefit from one of the most promising frontiers of economic growth and innovation. This is what we refer to as the Nordic Ocean Opportunity.

## The Nordic Ocean Opportunity

The Ocean covers 71% of the planet's surface, making it Earth's largest and most abundant resource. Yet, despite its vastness, it remains one of the least explored and least understood frontiers. For centuries, human limitations made it difficult, complex, and even dangerous to fully engage with the Ocean. As a result, much of its true economic potential remains unrealized.

Despite its enormous resources, the Ocean Economy accounts for only a small fraction of the global economy—but this is rapidly changing. Scientific advancements, engineering progress, and technological breakthroughs are revolutionizing how we interact with the Ocean. These innovations are enabling us to explore, understand, and utilize the Ocean like never before—uncovering new sources of value and laying the foundation for an entirely new wave of business opportunities that address some of the world's most pressing challenges. At the same time, the UN's declaration of 2020-2030 as the Ocean Decade has triggered unprecedented global momentum in ocean science, innovation, value protection and value creation, something that is accelerating even more the transformation of the Ocean Economy.

Given the Nordic countries' deep historical and economic ties to the Ocean, these global shifts are aligning with regional strengths, setting the stage for a true Schumpeterian revolution in the Nordics. Disruptive innovation, policy shifts, and a surge of investment are driving a generational opportunity—not just to modernize existing industries but to redefine the Ocean Economy, create new markets, industries, and long-term value.

Throughout this document, we present the investment thesis for the Nordic Ocean Economy, outlining in detail the Nordic Ocean Opportunity. Specifically, we explore:

- What the Ocean Opportunity is and what market shifts are making it particularly relevant today.
- Why the Nordics are uniquely positioned to lead and capture this opportunity.
- How the Nordic Ocean Economy innovation landscape looks today and what main opportunities are emerging in the space.

This document is designed specifically for investors of all types, offering a structured framework to understand, navigate and capture this opportunity

successfully. Think of it as a treasure map—not an exact blueprint, but a strategic guide that points toward high-value opportunities and promises exciting ventures for those bold enough to pursue them.

For investors—both Nordic and international—the Nordic Ocean Opportunity represents a chance to:

- Participate in the next wave of value creation and wealth generation and capture some of the value and wealth generated from it.
- Be in the frontlines of the next investment frontier, not just in the Nordic context, but also in the global context.
- Supporting the growth and being part of the journey of some of the most promising present and future Nordic solutions.

Beyond investors, this document also offers a new perspective for Nordic ocean entrepreneurs, policymakers, and other stakeholders to better understand their strengths and identify areas of future collaboration and focus.

For the Nordic themselves, the Nordic Ocean Opportunity is the chance to:

- Work closer together on a topic that unites them and defines them. The Ocean is one of the strongest forces that bring the Nordic countries together. Advancing the Nordic Ocean Economy is an opportunity to reinforce this shared strength.
- Find new ways to generate value from the Ocean and its assets, increasing income and wealth from their ocean resources. The Ocean Economy has been a key part of their past, it is a key part of their present, and it will be a key part of their future—if they choose to make it so.
- Continue being global leaders in the Ocean Economy and serve as role models for other countries and regions. By leading in new ocean solutions, innovation, and sustainable ocean industries, the Nordics can showcase the full potential of the Ocean Economy.

Welcome to the next great expedition. Welcome to the Nordic Ocean Opportunity.

Oslo, March 2025:

**Virginia E. Vegas**
Managing Director
FRONTTIER AS

**Thordur Reynisson**
Senior Advisor
Nordic Innovation

# 1. INTRODUCTION: The Nordic Ocean Investment thesis

## 1.1 Purpose of this investment thesis

### What is an investment thesis?

In the world of investments, opportunities are endless, but good opportunities are few. These opportunities span across geographies, sectors, stages, and technologies, creating a vast and complex landscape that is both exciting and challenging. Navigating this complexity requires more than intuition or luck; it demands a clear, disciplined, and structured approach. This is where an investment thesis comes in.

An investment thesis is a well-reasoned framework that helps investors identify where to find investment opportunities, understand why they are compelling and worth pursuing, and offer a strategic roadmap to determine what type of opportunities to prioritize. A strong investment thesis is built through a systematic process that combines insight, analysis, and strategic thinking. It involves assessing large and growing markets, understanding the timing created by emerging trends, analyzing the market landscape, and narrowing the focus to the most promising segments.

The primary goal of an investment thesis is to bring focus and clarity to the decision-making process, ensuring investment decisions are intentional and informed, rather than reactive, and aligned with long-term trends and objectives, rather than short-termed, maximizing the potential for success. In essence, an investment thesis guides investors to the opportunities with the highest potential and helps them dedicate most of their time and resources where they matter the most.

### Why do we need an investment thesis for the Nordic Ocean Economy?

The ocean economy is approaching a tipping point, driven by multiple factors that are setting the stage for the development of groundbreaking solutions, innovations, and new markets in this space in the coming decades. The ocean is Earth's largest resource, covering 70% of the planet's surface, holding 90% of its water, and sustaining 80% of all life. Yet, despite its scale, science estimates that over 80% of

the ocean remains unexplored, which means that what lies beneath the waves is the largest mystery on our planet and its true value is only beginning to be understood, offering untapped resources and possibilities.

But this is set to change quickly as new technologies and research allow us to explore the ocean, understand its ecosystems, and find new ways to create value. These advancements are opening doors to new industries, solutions, and innovations, making it possible to interact with the ocean and make use of their assets and resources in ways that before were not possible. As we learn more about the ocean, we will be able to engage with it more, create more value from it, and the greater its value will become, the more talent and capital will attract, and more efforts will be conducted to discover and build on this value. At the same time, this growing recognition of the ocean will drive efforts to protect and preserve its resources, ensuring its value is sustained for future generations.

In this context, the Nordics emerge as a natural leader in the ocean economy. This region has always been closely tied to the ocean—culturally, economically, and geographically-, they hold vast ocean assets, both explored and unexplored, and share a strong history and expertise in developing innovative ocean solutions, in leveraging their ocean resources in a way that creates significant value and in becoming category leaders in the ocean economy space. Their track record of innovation, expertise, and success in ocean-related industries places them at the forefront of this new ocean transformation and it seems almost inevitable that the Nordics will become one of the most dynamic regions in the world for creating groundbreaking companies in the ocean space.

And therefore an investment thesis for the Nordic Ocean Economy is needed, in order to provide the reader with the focus and clarity needed to understand the potential of the Nordic Ocean Economy, the factors driving it, and the frameworks and systematic thinking needed to effectively navigate the emerging segments and opportunities in this space.

## Scope of the investment thesis and limitations

This investment thesis aims to explore and define the opportunity presented by the Nordic Ocean Economy. It dives into what is the ocean opportunity, why the ocean economy is at a tipping point, why the Nordics are best positioned to capture its potential, how the ocean economy landscape looks today, and what are the main segments and emerging opportunities in space. In essence, this report highlights why the Nordic Ocean Economy is a compelling space for investment, provides the reasons to consider it as an opportunity, includes examples of real companies and success stories to illustrate its potential, and equips investors with the lenses to approach this space strategically.

This report is however not intended to prescribe what to invest in, identify exact opportunities, or predict specific returns. Rather than offering definitive answers, this report aims to guide investors toward understanding and navigating the broader opportunity. Additionally, rather than being directed towards a specific investor type, it is designed for a broad range of investors, regardless of their risk-return profiles or investment strategies. An investment thesis is part of every investment strategy, and ultimately, a successful investment strategy is built on four components:

1. WHAT: The investment opportunity.
2. WHY: The rationale for its potential.
3. HOW: The approach to capturing the opportunity.
4. WHO: The investor's positioning and ability to execute the strategy.

This report delivers the **what** and **why**, providing the foundation for investors to explore opportunities in the Nordic Ocean Economy. The **how** and **who** are left for the reader to define, allowing each investor to tailor their approach and positioning based on their unique goals, expertise, and strategies.

## AN INVESTMENT THESIS IS PART OF EVERY INVESTMENT STRATEGY

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **What to invest in** | **Why invest in it** | **Why you** | **How to do it** |
| Identify the invest opportunity | Explain why it is a good invest opportunity | Define what is your edge and value add | Define the process to invest in |

→ Our job with this thesis is help investors understand: 1) **what** is the Nordic Ocean Opportunity and 2) **why** it is a good investment opportunity

## 1.2 Methodology and approach

This thesis has been developed using FRONTTIER Investment Thesis framework, a structured process created after supporting over 500 investors in crafting their investment theses and strategies. The framework simplifies complex markets into clear and actionable investment theses, helping identify opportunities and guiding strategic decisions. It is a step-by-step process to define an investment opportunity, why it is compelling, and how to approach it strategically.

To develop the Nordic Ocean Economy thesis, the framework focuses on answering five key questions, which also structures the report:

- WHAT IS THE OPPORTUNITY? Identifying the value within the Ocean Economy.
- WHY INVEST NOW? Highlighting the trends and shifts that make this the right time to invest.
- WHERE TO FOCUS? Analyzing why the Nordics are uniquely positioned to capture this opportunity.
- WHAT IS THE LANDSCAPE? Understanding the current state of the Nordic Ocean Economy
- WHAT ARE THE KEY SEGMENTS? Pinpointing areas with the highest potential for investment.

The thesis development followed a two-stage process. First, country-specific analyses were conducted for Norway, Sweden, and Denmark to explore their unique strengths and contributions, while smaller-scale analyses for Finland, Iceland, Faroe Island, Greenland and Åland were included to capture their opportunities within the broader regional context. These insights were then combined to form a comprehensive Nordic Ocean Economy thesis, reflecting the collective potential of the region.

To validate the thesis, a survey of 200 Ocean Economy stakeholders was conducted, ensuring fair representation across all five Nordic countries. Half of the respondents were investors in the Nordic region, where 50 of them were categorized as ocean investors, defined as individuals who had completed at least one deal in the Ocean Economy space in the past three years. This was complemented with 40 interviews of both generalist as well as ocean focused Nordic investors, offering additional depth and insights to the findings.

Further, we analyzed a custom dataset of 500 Nordic ocean companies, covering businesses founded between 2000 and 2024 across different ocean sectors, subsectors, and business models. This dataset helped us analyze the quantity and quality of dealflow in the space, understand where new ocean solutions and innovation are being created, spot some of the most promising companies and success stories, and to map how the Nordic Ocean Economy landscape looks like today and what are the emerging opportunities in the space.

This work has been commissioned by Nordic Innovation and developed by a Nordic consortium, comprising the Danish Ocean Cluster, Port of Hirtshals, North Sea Science Park, RISE, Innovatum, and FRONTTIER, with the aim of highlighting the Nordic value add in the Ocean Economy and driving increased investment in Nordic ocean solutions. By looking at the Nordic Ocean Economy as a whole, rather than focusing on individual countries, its potential and value become much greater and together, the Nordics create a more compelling and competitive opportunity, with combined strengths that make the region far more attractive for investment and innovation than when viewed separately.

We hope this work serves as a catalyst for more investors to explore the Nordic Ocean Economy opportunity, and that further investment thinking is developed in the space to help investors successfully navigate the space and win from it. As the famous Norwegian explorer Roald Amundsen once said, "The hardest part of every expedition is taking the first step."

Embark with us on the Nordic Ocean Opportunity expedition.

# 2. THE OPPORTUNITY: What is The Ocean Economy Opportunity?

Step one in the investment thesis framework is to identify and assess what is the market opportunity worth pursuing and what are the factors contributing to making it a compelling investment opportunity.

In the context of this work, that means assessing the value and potential of the overall Ocean Economy. In this section, we will examine the projected value of the ocean and its assets, define what the Ocean Economy is, explore how the Ocean Economy is creating value today from the ocean, and articulate what we believe is the Ocean Economy Opportunity.

Ultimately, we aim to answer the key question:

WHAT IS THE OCEAN ECONOMY OPPORTUNITY?

Let's start by understanding the value of the ocean and its assets.

## 2.1 The projected value of the Ocean and its assets

### The Ocean and its assets

The ocean is the single largest feature of our planet, covering about 70% of our planet's surface and holding over 90% of its total water—an immense volume estimated at 1.386 billion cubic kilometers. This vast body of water is also home to roughly 80% of all life on Earth, highlighting the ocean's essential role in sustaining our planet's biodiversity and climate. Stretching across about 360 million square kilometers, the ocean reaches an average depth of 3,682 meters, with trenches plunging over 10,000 meters below the surface. It also has around 1.16 million kilometers of coastline—equivalent to traveling to the Moon three times—where 40% of the global population is estimated to live.[1]

Yet, the ocean is far more than just water and coastlines. It is home to a vast array of marine life, from microscopic plankton—key producers of the oxygen we breathe—to some of the largest animals on Earth, like whales. Scientists have identified around 242,000 marine species, with about 2,300 new species discovered each year. However, millions of species are believed to remain undocumented, as 91% of

1. https://www.un.org/esa/sustdev/natlinfo/indicators/methodology_sheets/oceans_seas_coasts/pop_coastal_areas.pdf

known ocean species have yet to be thoroughly classified. Estimates suggest there could be between 700,000 and 1 million species in total.[2] This rich biodiversity provides essential resources such as food, medicines, and materials.

The ocean holds vast geological resources, with seabed deposits like manganese nodules, cobalt-rich crusts, and polymetallic sulfides containing high concentrations of cobalt, nickel, copper, and gold—often surpassing land-based reserves. Manganese nodules alone span millions of square kilometers and hold significant quantities of critical metals, including cobalt, compared to roughly 15 million tons of global land reserves. Offshore resources also contribute significantly to global energy production, accounting for nearly 30% of the world's oil and a substantial share of natural gas output, with geologists predicting that 40% of all new petroleum discoveries will be offshore.[3] Beyond energy and metals, the ocean supplies millions of tons of sand and gravel each year, along with phosphates that are crucial for fertilizers.

Finally, the ocean's dynamic movements and climate interactions play a pivotal role in regulating our planet's environment. Scientists estimate that 50–80% of Earth's oxygen is produced by oceanic plankton—tiny drifting plants, algae, and bacteria that convert sunlight into energy. The ocean also absorbs nearly 30% of human-produced carbon dioxide ($CO_2$) emissions and contains about 60 times more carbon than the atmosphere. By storing heat, circulating nutrients, and driving weather patterns, the ocean shapes the climate and supports life on a global scale.

## The projected value of the Ocean and its assets

Despite its scale, significance and importance, the ocean remains largely mysterious. Countless species, minerals, and natural processes are still poorly understood or completely unknown, making the ocean one of humanity's greatest frontiers for discovery and innovation.

As of June 2024, only 26% of ocean seafloor has been mapped.[4] While we can measure the extent of the mapped seafloor and count the species discovered and described, it's much harder to determine how much of the ocean—including the seafloor and water column—has truly been explored. Scientists estimate that more than 80% of our ocean is unmapped, unobserved, and unexplored. Given that the ocean covers the majority of the planet, this means that over half of Earth—about 56%—is effectively unknown territory. The true and exact value of the ocean and its assets remains impossible to determine. However, estimates provide a glimpse into its immense potential. In 2015, the United Nations conservatively valued key ocean assets at US$24 trillion.[5] Adjusted for inflation, this equals approximately US$32 trillion in 2025.

2. https://oceanservice.noaa.gov/facts/ocean-species.html
3. https://worldoceanreview.com/en/wor-3/
4. https://oceanexplorer.noaa.gov/facts/explored.html
5. https://wwfint.awsassets.panda.org/downloads/revivingoceaneconomy_summary_high_res.pdf

Importantly, this estimate is based on a very limited understanding of the ocean, as more than three-quarters of it remains largely unexplored. If only a small portion of the ocean that we know today is already valued at US$32 trillion, then it is reasonable to assume that the full value of the ocean, including the vast areas that remain unknown, is significantly higher. Even with a highly conservative approach, assuming that the unexplored portion holds at least three times the value of what is currently known, the total estimated worth of the ocean would exceed then US$128 trillion. To put this number into perspective, this is comparable to the total value of all the world's stock markets, which are currently valued at around US$127 trillion.[6] In other words, if the ocean's assets were fully discovered and utilized to their fullest potential, their total value could be as large as the combined worth of all publicly listed companies worldwide today.

These estimates, while not exact, help us illustrate the ocean's immense untapped potential, the scale of opportunities it offers to the global economy, and why unlocking its value could represent one of the biggest investment opportunities of our time. This simple projection allows us to understand how large the Ocean Economy could become and emphasize the importance of continued exploration and sustainable use of ocean resources. As we map its depths, study its ecosystems, and uncover practical applications, the discoveries we make can transform industries, drive economic growth, and address critical global challenges. Simply put, beneath the waves lies one of the greatest mysteries of our planet, holding resources and possibilities yet to be realized.

With this understanding of the ocean's value potential, let's now explore what the Ocean Economy is, how it is currently creating value from the ocean and its assets, and the opportunities it holds for the future.

## 2.2 The Ocean Economy as a system to create value from Ocean assets

### Defining the Ocean Economy

When people talk about the ocean economy, most of the time, they think about two things:

1. What we can take from the ocean, like fish, oil, or gas.
2. Activities that happen in or near the ocean, like shipping, coastal tourism, or even people enjoying the beach.

6. https://www.marketwatch.com/story/after-u-s-and-china-panic-world-market-cap-set-to-hit-new-record-says-bank-of-america-aa108ae4?utm_source=chatgpt.com

This is how the OECD defines the ocean economy:

*"All activities that occur on the ocean, depend on its natural resources, or benefit from its proximity."*

This definition is useful because it captures much of what we currently associate with the ocean economy today. However, it is also limiting as it overlooks many emerging and innovative ways in which the ocean can generate value. The ocean economy is more than just a collection of industries, and it is not solely about resource extraction or transportation. It is a dynamic system where the ocean's raw elements—its water, ecosystems, seabed, and natural movements—are transformed into products and services that meet human needs and create significant economic value.

To fully understand the Ocean Opportunity, we need to approach the Ocean Economy with a broader perspective. Instead of focusing solely on extracting resources or traditional activities near the ocean, we should consider the ocean's fundamental assets—such as its water, the life within it, the seabed, and its depths or and its tides and currents—and explore how these assets can be used to create value. For example using the ocean's wind and waves to generate energy, studying its ecosystems to develop medicines, or relying on its data for navigation, weather prediction, and industry improvements.

Building on this broader perspective, we propose an extended definition:

*"The Ocean Economy is the system to create value from Ocean Assets and include all business activities that directly create value from ocean assets or contribute to the process of value creation."*

Let's break down the elements in this definition:

### 1. THE OCEAN ECONOMY AS BUSINESS ACTIVITIES THAT RELY ON OCEAN ASSETS.

We define the Ocean Assets as the natural features, resources, and processes of the ocean that enable economic activities. These assets are the natural components of the ocean—its physical features, movements, biodiversity, and resources—that provide the foundation for economic activity. We have boiled them down into four main Ocean Assets:

- PHYSICAL FEATURES: These are the structural elements of the ocean—its "container." This includes the ocean's surface, its depths, the seafloor, and coastal areas where the land meets the water. It also includes icy features like glaciers, icebergs, and sea ice. These physical features create the environment where marine life lives and ocean processes take place.
- MARINE LIFE AND ECOSYSTEMS: These are the living resources found in the ocean, the marine flora and fauna. Marine flora includes plants like

seagrasses, seaweed, algae, and mangroves, which play critical roles in producing oxygen, storing carbon, and providing shelter for marine animals. Marine fauna includes all the animals that live in the ocean, from tiny plankton and shellfish to fish, dolphins, whales, and other large creatures. Together, these plants and animals create ecosystems that are vital for marine biodiversity and provide resources like food, medicines, and livelihoods for humans.

- GEOLOGICAL AND CHEMICAL COMPONENTS: These are the non-living resources found in the ocean, both in the water and on the seafloor. Geological resources include minerals, sediments, oil, gas, and sand, which are valuable for industries like energy, construction, and technology. Chemical resources include dissolved elements like salt and nutrients, which are essential for marine ecosystems and global processes such as the carbon cycle. These components are critical for both economic activity and the functioning of marine life.
- MOVEMENT, DYNAMICS, AND CLIMATE INTERACTIONS: These are the natural processes that keep the ocean in motion and connect it to the planet. Movements like waves, tides, currents, and streams are driven by forces such as wind, the moon's pull, and differences in temperature and salinity. They also include global cycles like the carbon cycle, where the ocean stores carbon, and the heat cycle, where it transfers energy to the atmosphere. Together, these systems regulate Earth's climate, drive weather, and distribute nutrients, making them essential ocean assets.

Ocean assets are the foundation and building blocks of the Ocean Economy, but their value depends on how they are used. For instance, sediments in the ocean have little inherent value on their own. However, when transformed into materials like concrete for construction, they become essential resources for solving human problems and meeting needs. This ability to transform and utilize ocean assets is what makes ocean assets as value creators.

# THE OCEAN ASSETS

- Currents
- Streams
- Waves
- Tides
- Evaporations

- Percipitations
- Heat exchange
- Gas exchange

**1**

Ocean physical features

**2**

Marine life & ecosystems (Living resources)

- Ocean water
- Ocean surface
- Polar and ice features
- Ocean seafloor

- Coastal areas
- Ocean layers
- Subsurface layers

- Minerals and Metals
- Fossil fuels
- Sand and Gravel
- Hydrothermal Vent Deposits
- Carbonate sands

- Salt
- Dissolved Minerals
- Nutrients
- Carbon dioxide
- Hydrothermal Vent Gases

**4**

Movements, dynamics & climate interactions

**3**

Geological & chemical components (Non living resources)

- Phytoplankton
- Seagrasses
- Kelp (Seaweed)
- Mangroves
- Coraline Algae
- Corals
- Fish
- Crustaceans
- Mollusks and Shellfish

- Sharks and Rays
- Marine mammals
- Sea turtles
- Corals and Coral Reefs
- Zooplankton
- Bachteria and Archaea
- Microbial ecosystems

## 2. THE OCEAN ECONOMY AS THE SYSTEM TO CREATE VALUE FROM OCEAN ASSETS.

To understand the ocean assets as value creators, we need to see the Ocean Economy as a source of solutions for many problems and needs, where ocean assets realize their value when they are transformed or utilized to meet these needs and solve problems. These assets often have multiple uses, depending on how they are leveraged within the Ocean Economy. The Ocean Economy acts as the system that enables this transformation, creating value through innovative or different uses of these natural components. For example:

- FISH FOR FOOD OR FERTILIZERS: Fish in the ocean have limited inherent economic value, but they become valuable when fishermen catch them, seafood processors prepare them, and retailers sell them as food. Additionally, fish byproducts can be processed into fertilizers or animal feed, supporting agriculture and livestock industries. These are just two examples of how fish can be utilized, with other applications spanning pharmaceuticals, cosmetics, and more.
- OCEAN WATER FOR DRINKABLE WATER OR ENERGY PRODUCTION: Saltwater cannot be consumed directly, but desalination plants transform it into drinkable water to regions in the world with water scarcity. It can also be harnessed for energy generation, such as tidal power or wave energy systems. Beyond these uses, ocean water can play a role in industrial cooling, aquaculture, and even the extraction of minerals.
- OCEAN SURFACE FOR SHIPPING OR RENEWABLE ENERGY: The ocean surface serves as a transportation route for global shipping and trade. Additionally, it provides space for renewable energy projects, like offshore wind farms or floating solar panels. These are just a few of the ways the ocean surface is utilized, as it also supports tourism, military operations, and scientific research.

These examples are just a few of the many ways ocean assets can be transformed and utilized. Through value chains and transformation processes, these assets are converted into solutions that address human needs, making them contributors to economic activity and value creation.

## 3. THE OCEAN ECONOMY AS THE COMPOSITION OF ALL BUSINESS ACTIVITIES THAT DIRECTLY CREATE VALUE FROM OCEAN ELEMENTS OR CONTRIBUTE TO THE PROCESS OF VALUE CREATION.

The Ocean Economy includes all business activities that directly or indirectly utilize ocean assets to solve problems and generate value. It is not limited to activities that directly extract or use ocean resources, such as fisheries, shipping, or wave energy production. Instead, it also encompasses the broader system of businesses and technologies that support, transform, or enable value creation from ocean elements. This perspective expands the scope of the Ocean Economy to include:

- DIRECT UTILIZATION OF OCEAN ELEMENTS: Business activities that derive value directly from ocean resources. These include harvesting fish through fishing fleets, transporting goods via shipping companies, or generating renewable energy through offshore wind farms. These are just a few examples of businesses that rely on ocean assets for their operations, but there are many more, such as aquaculture, seabed mining, and coastal tourism, among others.
- ENABLING VALUE CREATION: These are businesses that do not directly derive value from ocean resources but are essential to the process of creating value from them. They provide the tools, technology, and services that support, optimize, or enable direct ocean-related activities. Examples include satellite systems for ocean monitoring, digital tools for shipping logistics and safety, and marine equipment manufacturing. These examples highlight the wide array of enabling activities that support the creation of value from the ocean.

This broader definition highlights the interconnected nature of the Ocean Economy, where both direct users and enablers contribute to solving human problems and creating value from ocean assets. Understanding this broader scope is key to fully recognizing and exploring the ocean's potential.

Now that we understand the Ocean Economy as the system for creating value from ocean assets, let's explore how value is being generated today and the additional opportunities for value creation—what we call the ocean opportunity.

## 2.3 How the Ocean Economy is creating value today and its growing importance

While the Ocean Economy is creating significant value today, it still represents only a small fraction of the global economy's added value. Estimates suggest that the Ocean Economy generates between USD 3 trillion and USD 6 trillion annually, contributing just 3%–5% of global GDP.[7] Given the vast projected value of the ocean assets, we can say that much of their economic value is still to be realized and that Ocean Economy Opportunity as of today remains vastly untapped.

### How the Ocean Economy is creating value today

Despite its small GDP contribution to the global economy, the Ocean Economy plays a critical role today in meeting fundamental human demands, such as energy production, food supply, and global transportation. The four most important Ocean Economy sectors today are:

7. https://www.oecd.org/content/dam/oecd/en/publications/reports/2016/04/the-ocean-economy-in-2030_g1g6439e/9789264251724-en.pdf

- MARITIME TRADE: Around 90% of global goods by volume—valued at USD 14 trillion annually—are transported by sea.[8] From raw materials like oil and metals to consumer goods like electronics and clothing, shipping routes ensure the smooth operation of supply chains that connect continents and drive global commerce.
- ENERGY PRODUCTION: It is estimated that the ocean provides 18% of the world's energy supplies, 28% of natural gas production, and over 30% of crude oil output.[9] As the world transitions to low-carbon energy, the ocean's role is expanding. Offshore wind capacity, while currently contributing less than 1% of global energy, is projected to supply 13% of global electricity by 2050.[10]
- FOOD PRODUCTION: [11] Nearly 20% of global animal protein consumption and 7%–8% of total protein intake come from marine resources. Aquaculture, which has grown by over 300% since 2010, is emerging as a critical solution to meet rising global demand for sustainable seafood. Seafood accounts for about 17% of the world's protein intake, with the figure reaching as high as 50% in parts of Asia and Africa.
- COASTAL TOURISM: Coastal and marine tourism represents at least 50% of total global tourism, a $9.5 trillion revenue industry that generates 1 in 11 jobs worldwide.[12] For many small island developing states, it is their largest economic sector, driving local economies and creating significant employment opportunities. Activities such as beach tourism, diving, and cruise travel attract millions of visitors globally, underscoring the vital role coastal tourism plays within the Ocean Economy.

## How the Ocean Economy can create value tomorrow

Perhaps the most compelling aspect of the Ocean Economy is not how it creates value today, but how much more value it can generate in the near future. As the global population grows and purchasing power rises, the demand for ocean solutions will increase to meet the world's needs for food, energy, and transportation. At the same time, as the value of ocean assets becomes more widely recognized, global competition for access to these resources will intensify, driving the emergence of new industries focused on the exploration, utilization, and protection of these resources, completely transforming the Ocean Economy landscape as we know it today. The ocean's present and future solutions are becoming more important than ever. Key reasons for this include:

8. https://www.weforum.org/stories/2021/10/global-shortagof-shipping-containers/
9. https://www.iea.org/reports/world-energy-outlook-2023
10. https://www.dnv.com/oceansfuture/energy/#:~:text=By%202050%2C%20offshore%20wind%20will,growth%20between%202019%20and%202050.
11. https://www.fao.org/interactive/state-of-fisheries-aquaculture/2020/en/?utm_source=chatgpt.com
12. https://www.weforum.org/stories/2023/10/why-the-tourism-industry-should-care-about-the-state-of-the-ocean/

1. Meeting global demand for food, energy, and transportation. With the world's population projected to reach 10 billion by 2050,[13] the need for sustainable food sources, renewable energy, and efficient transportation systems will grow exponentially. The ocean offers unique solutions, from aquaculture to offshore wind energy, and remains a critical artery for global trade and logistics.

2. Reducing pressure on land resources. As land becomes increasingly scarce, more activities will move to the ocean. Coastal regions, home to 40% of the world's population,[14] will need expanded infrastructure and solutions. For instance, floating cities, offshore energy platforms, and seawater desalination plants could address challenges like urban density, resource shortages, and clean water access.

3. Discovering new materials and resources. The ocean holds untapped reserves of minerals like manganese, cobalt, and rare earth elements, essential for electronics and clean energy. It also provides bio-products for pharmaceuticals, cosmetics, and biodegradable materials. With rising demand and limited land-based options, the ocean will be a key source of critical resources.
4. Strengthening defense and security. Geopolitical tensions and increasing trade reliance on maritime routes will drive nations and corporations to invest in ocean defense and security. Protecting trade corridors, critical infrastructure, and natural resources will become paramount, amplifying the strategic importance of the ocean economy.

5. Combating climate change and protecting ecosystems. The ocean is central to mitigating the effects of climate change, from carbon sequestration to regulating the planet's temperature. Innovative solutions like carbon capture through ocean ecosystems, wave energy, and coastal restoration will play critical roles in safeguarding the environment while creating economic opportunities.

These factors highlight why the Ocean Economy is more important than ever and how its assets will play a crucial role in addressing tomorrow's global challenges. We will explore these and other related factors in detail in Section 3 (Emerging Trends).

13. https://www.un.org/en/global-issues/population#:~:text=The%20world%20population%20is%20projected,and%2010.4%20billion%20by%202100.
14. https://www.oecd.org/content/dam/oecd/en/publications/reports/2021/04/adapting-to-a-changing-climate-in-the-management-of-coastal-zones_0f30d847/b21083c5-en.pdf

In summary, while the Ocean Economy provides significant value today, it is underdeveloped and far from realizing its full potential. The real Ocean Opportunity and its true potential lies in exploring how ocean assets can be used in new ways to solve global challenges or in the development of new solutions that can improve how value is being created today from the ocean. Let's dive into what is the actual Ocean Economy Opportunity.

## 2.4 The Ocean Economy Opportunity as the discovery of new ways to create value from Ocean assets

If the Ocean Economy is the system for creating value from Ocean Assets, and these assets are among the most valuable yet underutilized resources on our planet, then the heart of the Ocean Economy Opportunity lies in finding new and better ways to use these assets and capture more value from them. The Ocean Economy Opportunity is about exploring how we can use Ocean Assets in innovative ways to solve problems or improve how value is created today and it is a chance to enhance existing businesses or develop entirely new ones. This requires mapping, observing, and exploring the ocean more thoroughly to generate solutions for human needs, open new markets, and sustainably expand the global ocean economy.

The opportunity ahead then is to fully map, observe, and explore the ocean's potential—to get to know the ocean better— to discover new ways of creating value from it, and to manage and protect its growing value. This opportunity will unfold through three main pillars or pathways:

### OPPORTUNITY 1. THE EXPLORATION OF THE UNKNOWN 80%.

If a significant portion of the ocean remains unexplored, and the more we explore, the more value we can generate from ocean assets while increasing the ocean's intrinsic value, then one of the biggest opportunities is the exploration of the unknown 80%. This is not a distant possibility—it is already happening. A new global race is underway to explore and better understand the ocean, uncovering its value and the opportunities it holds. We call this the "Ocean Rush" era.

This opportunity will drive advancements in maritime infrastructure, enabling deeper exploration and expanding ocean activities. It will accelerate science and research, improving our understanding of marine ecosystems, biodiversity, and resources. It will also lead to the development of better data capture and analysis technologies, using AI, sensors, and satellites to monitor and predict ocean conditions. Engineering technologies will continue to evolve, pushing the boundaries of deep-sea exploration, resource extraction, and ocean-related industries. In essence, anything that will allow humans to understand the ocean more and engage more with it will play a role in shaping its future economic and scientific potential.

### OPPORTUNITY 2. THE DISCOVERY OF NEW WAYS TO CREATE VALUE FROM OCEAN ASSETS.

If the ocean is the largest resource on Earth, but the ocean economy—the system that creates value from ocean assets—only contributes 3–5% of global GDP, we can conclude that most of its economic potential remains unrealized and its assets are underutilized.

With so much room for growth, then another obvious investment opportunity is to find new ways to generate value from ocean assets—either by discovering new applications or optimizing existing industries. This opportunity will translate into an unparalleled new wave of ocean innovation dedicated to:

- FINDING NEW APPLICATIONS AND INNOVATIVE WAYS TO CREATE VALUE FROM THE OCEAN ASSETS WE KNOW TODAY AND THOSE YET TO BE DISCOVERED. This will lead to the development of new ocean economy value chains by utilizing ocean elements for new markets and applications. For example, $CO_2$ from the atmosphere and ocean can be transformed into sustainable materials, addressing climate change while creating new markets. Ocean surfaces can host solar panels, reducing land use and providing renewable energy. Arctic waters can naturally cool data centers, cutting energy costs. Marine biodiversity holds potential for new medicines, and wave energy offers a renewable power source in regions with limited alternatives.
- IMPROVING THE WAY VALUE IS BEING CREATED TODAY FROM OCEAN ASSETS THROUGH THE OPTIMIZATION OF EXISTING OCEAN ACTIVITIES. This means improving and optimizing current ocean economy value chains using new innovations and technologies to create more value and address the problems they solve better. For example, autonomous ships can reduce human error, optimize routes, and lower fuel use. In aquaculture, AI-powered monitoring systems can instantly detect water quality changes, preventing fish losses and boosting efficiency. Advanced desalination technologies can cut energy use while increasing freshwater production, addressing water scarcity. Precision tracking in fishing enables sustainable harvesting by targeting specific species and reducing bycatch.

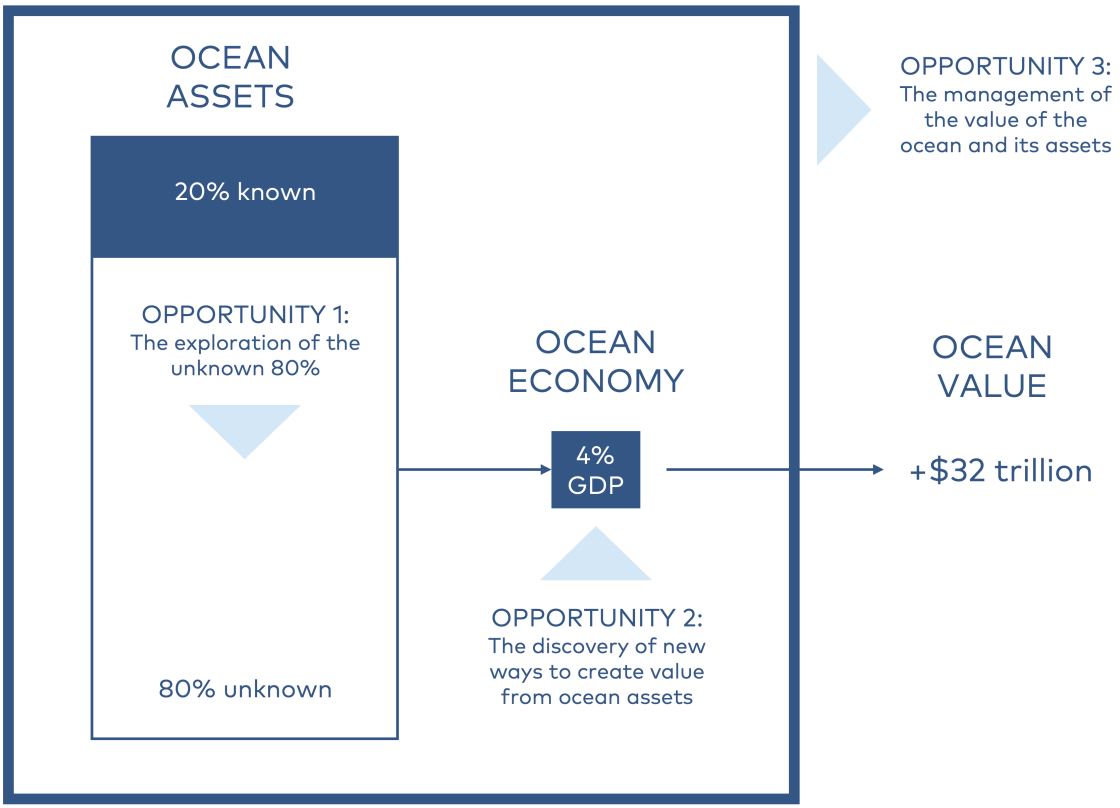
### OPPORTUNITY 3. THE MANAGEMENT OF THE VALUE OF THE OCEAN AND ITS ASSETS.

If we recognize the ocean as a valuable asset with enormous potential, and the more we explore it, the more value it holds and the more value we can generate from it, then the third clear opportunity lies in preserving and managing this value.

This represents a paradigm shift in how the ocean is perceived, where it is no longer considered just a vast natural resource but an asset that requires active management to preserve and grow its value. This shift is leading to the

development of a comprehensive system dedicated to ocean value protection, preservation, and generation—essentially forming what we have called a new "Ocean Asset Management" industry. This shift will lead to the development of structured frameworks for managing and protecting ocean assets, ensuring they are used responsibly and remain valuable over time. It will create new value chains focused on preservation and restoration, securing key ocean assets for future generations while enabling continued economic growth. It will also drive the rise of an industry dedicated to maintaining and increasing ocean value, attracting investment into sustainability, marine biodiversity protection, and resource optimization.

## THE OCEAN ECONOMY OPPORTUNITY FRAMEWORK



# 3. THE EMERGING TRENDS: What is changing about the market that is creating new opportunities in the ocean economy?

Step two in the investment thesis framework is about understanding **why now** is the right moment to invest in the Ocean Economy. Opportunities emerge when markets shift—when established systems no longer function as they once did, when external pressures force industries to adapt, and when new solutions become possible. Identifying these moments is key to knowing **why certain investments will succeed today, when they may not have been viable before.**

At its core, this step is about answering the question:

### WHY IS NOW THE RIGHT TIME TO INVEST?

To determine this, we need to assess:

- What is broken in the market that needs to be fixed?
- Where is the market showing discontinuity, creating space for new solutions?
- Why would startups or new solutions succeed today when they may not have in the past?

The Ocean Economy is undergoing major changes, shaped by multiple global trends. With so much happening, we have distilled these shifts into four key reasons that explain why now is the right time to explore opportunities in this space:

- Increase in global demand is making the world look more into the ocean for solutions
- Environmental degradation and limitations is forcing a re-think and redesign on how value is being created and protected today from the ocean
- Increase in geopolitical tensions will put more pressure on the protection, exploration, and extraction of ocean key assets
- New technologies and advancements in science and engineering are making new ocean solutions possible

# MAIN FACTORS CREATING NEW OPPORTUNITIES IN THE OCEAN ECONOMY

## 3.1 INCREASE IN GLOBAL DEMAND IS MAKING THE WORLD LOOK MORE INTO THE OCEAN FOR SOLUTIONS

- There are more people in the world with more purchasing power and that will require an increase of productivity in the ocean food and water industry to meet the demand for fish proteins, alternative seafood proteins and fresh water
- The world is in need of new sources of energy and green energy and that will require the development of offshore energy production and infrastructure and the exploration of new low carbon energy sources
- The growing global trade of goods transported by sea will require a significant increase of productivity and capacity of the maritime transportation industry

## 3.2 ENVIRONMENT DEGRADATION AND LIMITATIONS WILL FORCE A RE-THINK AND REDESIGN ON HOW VALUE IS BEING CREATED AND PROTECTED TODAY FROM THE OCEAN

- The current methods of creating value and interacting with the ocean are unsustainable, and existing ocean industries will need to adapt their practices to comply with stricter regulations and meet the rising demand for sustainable solutions
- Rising global temperatures are reshaping marine environments and coastal areas, forcing ocean industries and governments to confront new challenges and adapt to the realities of a changing climate
- The scarcity of land and increasing global demand for resources are driving a shift toward offshore environments, positioning the sea as an increasingly important space for energy production, urban development, and food systems

## 3.3 INCREASE IN GEOPOLITICAL TENSIONS WILL PUT MORE PRESSURE ON THE PROTECTION, EXPLORATION AND EXTRACTION OF OCEAN KEY ASSETS

- Rising geopolitical tensions are reshaping maritime security, leading nations and industries to strengthen their defense efforts to protect ocean areas, trade routes, and critical infrastructure
- The race to secure critical materials is driving countries and industries to focus on ocean-based exploration, extraction activities, and innovations to ensure self-sufficiency and reduce reliance on traditional supply chains

## 3.4 NEW SCIENTIFIC AND TECHNOLOGICAL INNOVATION BREAKTHROUGHS IS MAKING NEW OCEAN SOLUTIONS POSSIBLE

- Advancements in technology are unlocking new capabilities in ocean exploration, monitoring, and utilization, transforming how industries interact with the marine environment
- Advances in research and science are revealing new ways to harness the ocean's natural elements, driving practical applications across industries like biotechnology, energy, manufacturing, and medicine
- Innovative engineering is unlocking new possibilities for resource exploration, management and energy production

While these are not the only forces at play, they represent the most critical shifts shaping the Ocean Economy today. In the following sections, we will break down each of these forces in detail, outlining how they are shaping the market today and what specific opportunities they are creating.

## 3.1 Increase in global demand is making the world look more into the ocean for solutions

### THERE ARE MORE PEOPLE IN THE WORLD WITH MORE PURCHASING POWER AND THAT WILL REQUIRE AN INCREASE OF PRODUCTION CAPACITY AND EFFICIENCY IN THE OCEAN FOOD AND WATER INDUSTRY TO MEET THE DEMAND FOR FISH PROTEINS, ALTERNATIVE SEAFOOD PROTEINS AND FRESH WATER.

The global population recently surpassed 8 billion and is projected to reach nearly 10 billion by 2050, with economic growth in Asia and Africa driving significant shifts in consumption patterns. Rising disposable incomes are pushing dietary preferences toward higher-protein and sustainable options, with seafood consumption growing at 3.1% annually. Seafood already accounts for 17% of global protein intake, and in some regions, such as parts of Asia and Africa, this figure exceeds 50%.[15] The OECD estimates that global fish consumption will rise to 180 million tons by 2030, up from 158 million tons in 2020. To keep up  the ocean food and water industry will need to expand and explore new ways to meet these growing demands.

Fish farming, the fastest-growing form of food production, is central to meeting this demand. Aquaculture production is expected to more than double by mid-century, approaching the levels of wild catch. At the same time, alternative proteins, such as algae-based and lab-grown seafood, are gaining traction, creating new markets, and addressing sustainability concerns. The alternative protein market, encompassing sources like microalgae, cultured meat, and fungi-based proteins, is projected to reach USD 290 billion by 2035.[16] Water scarcity is another critical challenge.[17] Only 2.5% of Earth's water is fresh and usable, and by 2050, up to 5 billion people—over half the global population—could face severe water shortages. This makes ocean desalination an increasingly vital solution, alongside ongoing research into vast deposits of freshwater beneath the seabed.

### THE WORLD IS IN NEED OF NEW SOURCES OF ENERGY AND GREEN ENERGY AND THAT WILL REQUIRE THE DEVELOPMENT OF OFFSHORE ENERGY PRODUCTION AND INFRASTRUCTURE AND THE EXPLORATION OF NEW LOW CARBON ENERGY SOURCES.

15. https://openknowledge.fao.org/server/api/core/bitstreams/9c3ed6a3-c2de-4e4b-b315-9ad6891d8d11/content#:~:text=We%20are%20eating%20more%20aquatic,countries%20in%20Asia%20and%20Africa.
16. https://www.sciencedirect.com/science/article/pii/S2666833524000248
17. https://www.scientificamerican.com/article/5-billion-people-will-face-water-shortages-by-2050-u-n-says/

The world is facing a growing need for energy, driven by rapid industrial expansion, urbanization, and the increasing energy demands of modern technologies. Global energy consumption is expected to grow by 50% by 2050, fueled by sectors like electric vehicles, AI systems, data centers, and hydrogen production.[18] At the same time, there is a parallel demand for cleaner, low-carbon energy solutions to address a warmer planet due to increasing carbon emissions and other environmental and sustainability challenges.

The energy industry will have to find new ways to increase the production of cleaner energy sources  to meet growing energy demand and new ways to replace the traditional sources of energy. The shift toward low-carbon energy is significant, with projections showing it could supply 65–80% of global power generation by 2050, up from just 32% today. Offshore energy will be a cornerstone of this transition, requiring significant investment in infrastructure and technology. Offshore wind, in particular, is set to play a leading role, with capacity forecasted to grow at 15% annually, potentially reaching 2,465 GW by 2050—a sharp increase from 40 GW in 2020. Emerging technologies like wave and tidal energy further enhance the potential, with estimates suggesting they could add 60–300 GW of capacity.

### THE GROWING GLOBAL TRADE OF GOODS TRANSPORTED BY SEA WILL REQUIRE A SIGNIFICANT INCREASE OF PRODUCTIVITY AND CAPACITY OF THE MARITIME TRANSPORTATION INDUSTRY.

Today, 90% of global goods, valued at USD 14 trillion, are transported by sea. Seaborne trade is expected to grow 35% by 2050, driven by rising consumer demand as global economic expansion, population growth, and increasing disposable incomes reshape consumption patterns—particularly in emerging markets.[19] To keep up with this growing demand, the shipping industry will have to transform to significantly expand capacity and efficiency in a sustainable way.

And the industry is already doing it. In 2023, shipbuilding activity hit record levels, with the global fleet adding 2.3 million TEUs (twenty-foot equivalent units), a 37% increase over the previous record. By April 2024, another 1 million TEUs had been added.[20] However, meeting the growing demands of global trade will require more than just building more ships. The industry will need to focus on developing vessels with larger cargo capacities and implementing optimized shipping routes and logistic systems to maximize efficiency. The urgency for increased maritime capacity is evident. For instance, U.S. container imports grew by 10% year-on-year in May and June 2024, far surpassing forecasts and highlighting the immediate need for enhanced productivity in maritime transport.

18. https://www.mckinsey.com/industries/energy-and-materials/our-insights/global-energy-perspective
19. https://www.dnv.com/oceansfuture/
20. https://www.economist.com/business/2024/06/27/boom-times-are-back-for-container-shipping

## 3.2 Environmental degradation and limitations is forcing a re-think and redesign on how value is being created and protected today from the ocean

### THE CURRENT METHODS OF CREATING VALUE AND INTERACTING WITH THE OCEAN ARE UNSUSTAINABLE, AND EXISTING OCEAN INDUSTRIES WILL NEED TO ADAPT THEIR PRACTICES TO COMPLY WITH STRICTER REGULATIONS AND MEET THE RISING DEMAND FOR SUSTAINABLE SOLUTIONS.

Traditional ocean industries—fisheries, shipping, and energy—are reaching critical limits. Over 90% of global fisheries are fished beyond capacity or classified as overexploited, threatening marine biodiversity and livelihoods.[21] Shipping, responsible for 90% of global trade by volume, produces 1 billion metric tons of $CO_2$ annually and increases underwater noise pollution by 3.3 decibels per decade.[22] Offshore energy activities further degrade marine habitats, while plastic pollution adds to the strain. Each year, 11 million metric tons of plastic enter the ocean, potentially rising to 29 million by 2040, causing severe harm to ecosystems and food webs.[23]

Regulatory frameworks and sustainability initiatives are driving significant changes across ocean industries. Fisheries are adopting stricter quotas and advanced monitoring to ensure sustainable practices. Offshore renewables, supported by policies like the EU Offshore Renewable Energy Strategy, are scaling rapidly. The shipping industry is transitioning to cleaner fuels and efficient vessel designs under the IMO Greenhouse Gas Strategy, while mechanisms like the EU Carbon Border Adjustment enforce decarbonization in supply chains. Innovations in aquaculture are improving efficiency and reducing waste, and efforts to address plastic pollution are advancing with biodegradable materials and better waste management. These changes not only address the urgent need for more sustainable practices but also will require the ocean industries to fundamentally rethink and transform their business operations and value chains to align with a greener and more regulated ocean economy.

### RISING GLOBAL TEMPERATURES ARE RESHAPING MARINE ENVIRONMENTS AND COASTAL AREAS, FORCING OCEAN INDUSTRIES AND GOVERNMENTS TO CONFRONT NEW CHALLENGES AND ADAPT TO THE REALITIES OF A CHANGING CLIMATE.

Rising global temperatures are significantly altering marine ecosystems worldwide. As an example, over the past decade, the Arctic alone has warmed by 0.75 °C,

21. https://datatopics.worldbank.org/sdgatlas/archive/2017/SDG-14-life-below-water.html
22. https://www.economist.com/science-and-technology/2024/10/10/noise-dampening-tech-could-make-ships-less-disruptive-to-marine-life
23. https://www.unep.org/interactives/pollution-to-solution/

leading to a 17% drop in summer sea ice between 2013 and 2019.[24] By 2035, the Arctic Ocean is projected to experience ice-free summers, creating opportunities for new shipping routes and resource extraction but intensifying ecological risks. Simultaneously, warming oceans could slow the Atlantic Meridional Overturning Circulation (AMOC), potentially altering weather patterns, accelerating sea-level rise, and increasing the risk of coastal flooding.[25] Currently, global sea levels are rising by 3.4 millimeters per year, threatening communities, and infrastructure across the globe.[26]

To address these challenges, industries and governments must focus on a combination of climate adaptation, mitigation, and protection. This includes resilient infrastructure, improved coastal planning, and robust flood defenses to safeguard populations and economic assets. Early warning systems and disaster preparedness will help manage the impacts of storm surges and other climate-related extremes. Simultaneously, advancing climate change mitigation solutions, such as carbon capture and storage (CCS) technologies, will be critical for reducing emissions and combating the root causes of climate change. These challenges and opportunities are driving the development of a new market dedicated to climate adaptation, mitigation, and protection and will require ocean industries to adopt innovative, climate-resilient practices to balance economic development with environmental protection.

THE SCARCITY OF LAND AND INCREASING GLOBAL DEMAND FOR RESOURCES ARE DRIVING A SHIFT TOWARD OFFSHORE ENVIRONMENTS, POSITIONING THE SEA AS AN INCREASINGLY IMPORTANT SPACE FOR ENERGY PRODUCTION, URBAN DEVELOPMENT, AND FOOD SYSTEMS.

As land becomes scarcer and global demand for resources grows, offshore environments are emerging as essential alternatives for scaling energy, infrastructure, and agriculture. Coastal regions, pressured by rising urbanization and climate challenges, are increasingly turning to the sea to reduce competition for land. This shift is global: in the Indian Subcontinent, demand for offshore space for aquaculture and energy is projected to grow 50-fold, while in North America and the Middle East and North Africa, similar needs are expected to rise 30-fold.[27]

Energy production illustrates this shift. Onshore energy infrastructure requires substantial land, with 1 GW of power—enough for a city of one million people—needing around 10,000 hectares for solar farms or 33,000 hectares for wind farms. As land becomes harder to secure, the ocean is being explored as a scalable solution for energy production. Emerging technologies like floating solar panels and tidal or wave energy are being developed to reduce reliance on land-based systems. This exploration extends beyond energy. Urban development and food systems are also

24. https://www.science.org/doi/10.1126/sciadv.aaw9883
25. https://www.science.org/doi/10.1126/sciadv.adk1189
26. https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level
27. https://www.dnv.com/oceansfuture/

turning to the sea for solutions. With 40% of the global population living in coastal areas,[28] floating infrastructure is being explored to expand urban capacity and address rising sea levels. Similarly, offshore aquaculture and vertical farming are exploring ways to increase seafood, algae, and sustainable feed production, addressing land and water constraints while meeting growing global food demands. These are just a few examples of how industries are adapting to land scarcity and rising consumer demands.

## 3.3 Increase in geopolitical tensions will put more pressure on the protection, exploration, and extraction of ocean key assets

### RISING GEOPOLITICAL TENSIONS ARE RESHAPING MARITIME SECURITY, LEADING NATIONS, AND INDUSTRIES TO STRENGTHEN THEIR DEFENSE EFFORTS TO PROTECT OCEAN ASSETS, TRADE ROUTES, AND CRITICAL INFRASTRUCTURE.

Key maritime chokepoints remain vulnerable, with the Suez Canal blockage in January 2024 delaying USD 10 billion worth of goods daily and highlighting the fragility of global trade routes.[29] High-risk areas like the Strait of Hormuz, responsible for 20% of global oil and gas flows,[30] and piracy near the Horn of Africa, costing more than USD 7 billion annually, emphasize the urgency of addressing these threats.[31] The melting Arctic ice adds another layer of complexity, opening new shipping routes such as the Northern Sea Route, which reduces Europe-Asia shipping distances by up to 40% but introduces territorial disputes and ecological concerns. Meanwhile, the Russia-Ukraine conflict has escalated tensions, particularly in the Baltic and Black Seas, further exposing vulnerabilities in global maritime security.

In response to these challenges, a new wave of maritime defense surveillance and monitoring  innovation is underway. Nations and industries are ramping up military activity and investing in advanced technologies to protect critical infrastructure and secure trade routes. Autonomous surveillance systems are being deployed to monitor vast ocean territories, while ice-class vessels are enabling safer navigation in Arctic waters. Enhanced cybersecurity measures are being implemented to safeguard undersea telecommunications cables and other critical networks from cyber threats. Naval deployments have increased significantly, with defense budgets rising across Europe, particularly in the Nordic and Baltic regions. These increases are largely driven by the Russia-Ukraine war and NATO's requirement for

28. https://www.oecd.org/content/dam/oecd/en/publications/reports/2021/04/adapting-to-a-changing-climate-in-the-management-of-coastal-zones_0f30d847/b21083c5-en.pdf
29. https://www.imf.org/en/Blogs/Articles/2024/03/07/Red-Sea-Attacks-Disrupt-Global-Trade
30. https://kpmg.com/kw/en/home/insights/2024/07/oil-and-gas-insight-anatomy-of-an-oil-shock.html#:~:text=%E2%80%9CAbout%2020%25%20of%20the%20world's,a%20major%20impact%20on%20prices.%E2%80%9D
31. https://www.un.org/africarenewal/web-features/somali-piracy-search-remedies-global-malady

member countries to allocate at least 2% of GDP to defense by 2025. Furthermore, public and private investments in the space, including a EUR 1 billion Innovation Fund for dual-use technologies, are accelerating the development of next-generation maritime defense systems.

THE RACE TO SECURE CRITICAL MATERIALS IS DRIVING COUNTRIES AND INDUSTRIES TO FOCUS ON OCEAN-BASED EXPLORATION, EXTRACTION ACTIVITIES, AND INNOVATIONS TO ENSURE SELF-SUFFICIENCY AND REDUCE RELIANCE ON TRADITIONAL SUPPLY CHAINS.

Geopolitical tensions, trade wars and rising protectionism are intensifying the focus on securing critical materials and countries' self-sufficiency. Resources such as lithium, cobalt, and rare earth elements—essential for renewable energy technologies, batteries, and ocean-related industries—are increasingly under pressure due to overdependence on processing hubs like China. These materials have become focal points in trade disputes, amplifying concerns over resource security and prompting new strategies to diversify sources.

The ocean is emerging as a vital frontier in this race for critical materials. Countries and industries are turning to deep-sea exploration and extraction to tap into vast reserves of essential minerals found on the ocean floor, such as polymetallic nodules rich in cobalt, nickel, and manganese. Innovations in technology and engineering are enabling more efficient and sustainable access to these underwater resources, though environmental considerations remain a challenge that must be addressed. This focus on ocean-based resources is also driving efforts to develop new technologies for exploration and processing, reduce dependencies on traditional supply chains, and discover alternative materials.

## 3.4 New technologies and advancements in science and engineering are making new ocean solutions possible

ADVANCEMENTS IN TECHNOLOGY ARE UNLOCKING NEW CAPABILITIES IN OCEAN EXPLORATION, MONITORING, AND UTILIZATION, TRANSFORMING HOW INDUSTRIES INTERACT WITH THE MARINE ENVIRONMENT.

Breakthroughs in Artificial Intelligence (AI), Internet of Things (IoT), satellites, sensors, Remotely Operated Vehicles (ROVs), and Autonomous Underwater Vehicles (AUVs) are enabling unprecedented access to ocean data and operations. These technologies are driving innovation across marine industries, enhancing efficiency, sustainability, and precision in activities ranging from energy production to aquaculture and conservation.

For example, AI is transforming decision-making in ocean industries by analyzing vast datasets to predict fish stocks, optimize maintenance schedules for offshore wind farms, and improve precision aquaculture systems. IoT-enabled sensors

provide real-time monitoring of ocean conditions such as temperature, salinity, and currents, enhancing climate modeling and improving operations in aquaculture and marine logistics. Satellites offer high-resolution mapping of the ocean floor, supporting better planning for seabed mining, offshore infrastructure, and monitoring illegal activities such as unregulated fishing and oil spills. ROVs and AUVs are extending the reach of ocean exploration, enabling detailed studies of marine biodiversity, and conducting environmental impact assessments with greater accuracy. These are just a few of the many ways technology is reshaping ocean industries. From next-generation materials for underwater construction to new methods of deep-sea mining, tech advancements will continue to unlock new possibilities.

ADVANCES IN RESEARCH AND SCIENCE ARE REVEALING NEW WAYS TO HARNESS THE OCEAN'S NATURAL ELEMENTS, DRIVING PRACTICAL APPLICATIONS ACROSS INDUSTRIES LIKE BIOTECHNOLOGY, ENERGY, MANUFACTURING, AND MEDICINE.

Advances in science are revealing innovative ways to harness marine resources—such as algae, microorganisms, minerals, and sediments—spurring new applications in industries like pharmaceuticals, biotechnology, energy, and manufacturing. This research is increasing the value of ocean assets by enabling their practical and efficient use.

Algae, for instance, is emerging as a versatile resource for producing biofuels, bioplastics, and high-protein food products, reducing reliance on land-based alternatives. Marine fungi and microorganisms are showing potential in developing treatments for antibiotic-resistant infections and cancer, expanding possibilities in medicine. Ocean sediments are being studied for their natural ability to sequester carbon dioxide, offering a promising tool for mitigating climate change. Advances in marine biotechnology are also enabling the extraction of valuable enzymes and biochemicals for industrial processes, while ocean-degradable bioplastics are helping tackle plastic pollution. Additionally, materials derived from captured $CO_2$ are opening new opportunities to address emissions while adding economic value. These are just a few examples of how scientific advancements are unlocking new ways to harness ocean resources. As research continues, more applications will emerge, further integrating marine-derived materials and processes into industries beyond biotechnology, energy, and manufacturing.

INNOVATIVE ENGINEERING IS UNLOCKING NEW POSSIBILITIES FOR RESOURCE EXPLORATION, OCEAN ENGAGEMENT AND THE DISCOVERY OF NEW WAYS OF CREATING VALUE FROM THE OCEAN ASSETS.

Breakthroughs in engineering are transforming how we utilize the ocean, addressing challenges that were once considered as impossible. Floating wind turbines now enable wind farms to operate in deep waters, far from the coast, accessing stronger and more consistent winds while eliminating the need for

seabed structures. Underwater desalination systems are addressing global water scarcity by using natural ocean pressure to reduce energy consumption. Modular nuclear reactors on floating platforms provide reliable power to remote or offshore locations where traditional energy solutions are impractical.

Wave and tidal converters are leveraging ocean movements to generate renewable energy, filling gaps where wind or solar power is inconsistent. Corrosion-resistant materials are improving the longevity and efficiency of underwater infrastructure, supporting projects like offshore pipelines and tidal energy systems. Advanced 3D mapping technologies are enabling precise exploration of the ocean floor, streamlining infrastructure development, resource extraction, and environmental monitoring. Additionally, robotics, autonomous systems, and specialized vessels are unlocking access to previously inaccessible ocean resources, including oil, gas, and minerals in extreme environments. These innovations are just a glimpse of how engineering is redefining what is possible in the ocean. As engineering advancements progress, new methods for exploration, energy production, and resource utilization will continue to emerge, expanding the economic and strategic value of ocean assets.

# 4. THE MARKET FOCUS: Why is the Nordic region best positioned to capture this opportunity?

After defining the Ocean Economy opportunity and why the timing is right, the next step is to determine **where** to focus. Identifying the right market is critical—not all regions are equally positioned to capitalize on this shift, and investors must assess which geographies provide the strongest foundation for success.

Step three in the investment thesis framework is about **market focus**. It is not just about recognizing a global opportunity, but also about identifying where the conditions are best for startups and investments to succeed. This means answering key questions:

- IS THERE A SIGNIFICANT UNFAIR ADVANTAGE? Does the region have access to unique resources, infrastructure, or regulatory advantages that make it a natural leader in this space?
- WHAT IS THE LEVEL OF EXPERTISE AND PAST EXPERIENCE? Have industries and institutions already built capabilities in this sector, providing a foundation for new ventures?
- WHAT IS THE QUALITY AND QUANTITY OF DEAL FLOW? Are there enough strong startups emerging in this space, and is the pipeline of new companies deep enough to sustain investment?
- IS THERE A STRONG INVESTMENT ECOSYSTEM? Are there enough co-investors and follow-on investors to support companies beyond the early stages and drive long-term growth?
- WHAT IS THE TRACK RECORD? Has the region successfully built and scaled companies in related sectors before?

By analyzing these factors, investors can determine where the most promising companies are likely to emerge and which markets offer the strongest conditions for scaling new solutions.

In this section, we explore why the Nordics stand out as one of the best-positioned regions to capture this opportunity. Four key factors explain why this region stands out, each of which will be explored in the following sections:

1. A region rich in ocean assets
2. A region with high expertise in creating value from ocean assets today
3. A region with favorable factors supporting the development of new ocean solutions
4. A region with proven capacity to generate returns for investors in this space

## 4.1 A region rich in ocean assets

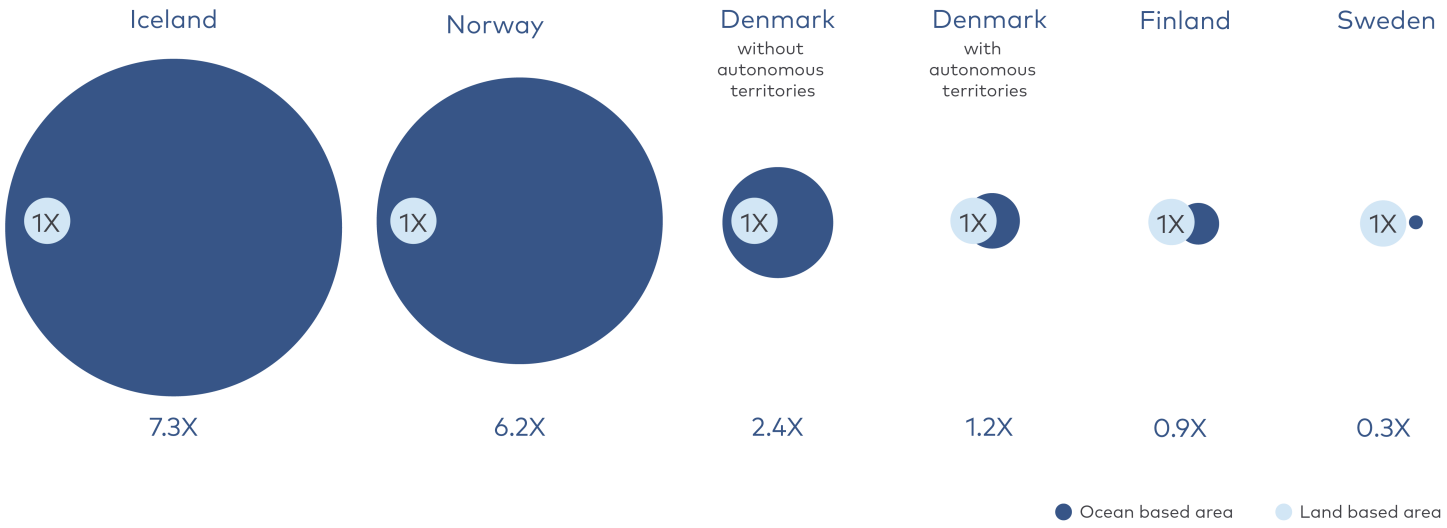
The Nordics are uniquely positioned to capture the Ocean Economy opportunity due to their vast and diverse marine territories, which provide a significant "unfair" advantage to the region's capacity to create value from ocean assets. This extensive access to ocean territory provides unparalleled opportunities for innovation and resource utilization.

Geographically, the region is deeply connected to the ocean. The Nordic region holds one of the largest ocean territories in the world, deeply shaping its economy and strategic position. Surrounded by eight major seas—including the Barents Sea, Norwegian Sea, North Sea, and the Arctic Ocean—the Nordic countries collectively control 6.6 million square kilometers of Exclusive Economic Zones (EEZs), an area larger than the entire European Union, and a coastline of circa 121,000 kilometers, equivalent to circling the Earth more than three times.

The largest contributor to this ocean territory is Norway, which controls 2.8 million square kilometers, including the strategically significant maritime area around Svalbard. Denmark follows closely, with 2.6 million square kilometers, when including the maritime zones of Greenland and the Faroe Islands. Of this, Greenland alone accounts for 2.2 million square kilometers, making it a dominant force in Denmark's maritime presence, while the Faroe Islands contribute an additional 274,000 square kilometers. Iceland also plays a major role, with an EEZ of 758,000 square kilometers. Finland, including the autonomous Åland Islands, holds 298,000 square kilometers of EEZ, while Sweden controls 160,000 square kilometers of EEZ.

In **relative terms**, the region's ocean territories are almost 2 times **larger than their combined land area**, with Iceland and Norway leading at 7 and 6 times their landmass, respectively.

## SIZE OF EACH NORDIC COUNTRY'S OCEAN AREA COMPARED TO ITS LAND AREA, MULTIPLIER




The wealth of resources within Nordic ocean territories underlines the region's competitive edge. Norway, for instance, boasts Europe's largest oil reserves, with 7.7 billion barrels of crude oil,[32] which have driven its energy leadership and helped establish the world's largest sovereign wealth fund, now valued at over $1 trillion. Another impressive example is Greenland, that is believed that holds 43 of the 50 critical minerals essential for green energy and advanced manufacturing, including rare earth elements, copper, and cobalt, alongside an estimated 52 billion barrels of offshore oil.[33]

If the Ocean Economy is defined as the system that creates value from ocean assets, then the Nordics, with their vast and resource-rich marine territories, are naturally positioned to take a leading role. Their abundance of ocean assets serves as the foundation for innovation, industry development, and economic value creation in the Ocean Economy.

32. https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/753941/EPRS_BRI(2023)753941_EN.pdf
33. https://www.economist.com/finance-and-economics/2024/10/31/greenland-faces-one-of-historys-great-resource-rushes-and-curses

## 4.2 A region with high expertise in creating value from ocean assets today

The Nordic region's rich ocean resources have enabled the development of strong capabilities and expertise in creating value from ocean assets. This is evident in the significant role the Ocean Economy plays in the region's overall economy and the Nordic leadership in key ocean industries, such as shipping, aquaculture, and renewable energy.

The Ocean Economy plays a much larger role in the Nordics compared to global averages. Nearly 75% of the Nordic population[34]—over 20 million people—live in coastal areas, almost double the global average of 40%. This proximity to the ocean has supported thriving industries such as shipping, fisheries, offshore energy, and marine biotechnology, which benefit from direct access to resources and markets.

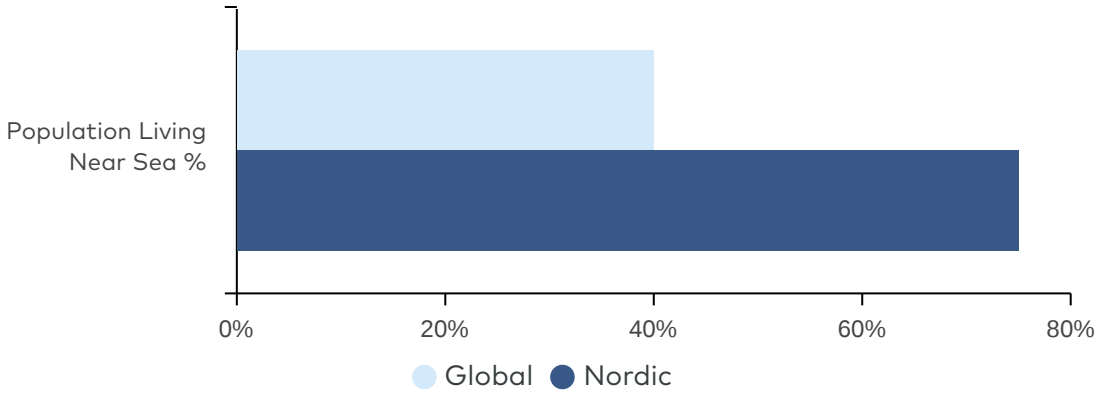
In 2022, the Nordic Ocean Economy contributed over EUR 250 billion to GDP, accounting for 15% of the region's total economic activity[35]—nearly four times higher than the global average of 3–5%. Norway, Iceland, Greenland, and Faroe Islands are clear examples of this. Norway's Ocean Economy generates 40% of the country's value creation and over 70% of its export value,[36] while in Iceland, Greenland, and Faroe Islands ocean industries account for roughly 25% of GDP[37] and in Greenland and Faroe Island fish and seafood products represent around 90% of total exports. These figures highlight how deeply connected the region's economy is to ocean-based activities.

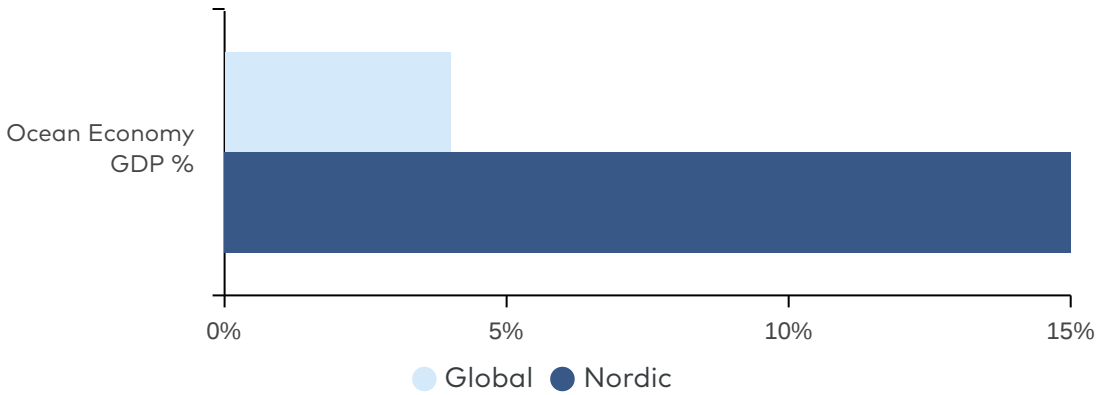
Employment in the Nordic Ocean Economy reflects its high levels of industrialization and resource-driven focus. In 2023, an estimate of 750,000 people [38]—around 5% of the active workforce—were employed in ocean industries, slightly below the global average of 7%.[39] This is because the Nordic Ocean Economy is highly industrialized and centered on resource-intensive sectors like fisheries, oil, and gas, rather than service-driven industries like tourism, which are more prominent in other regions' ocean economies.

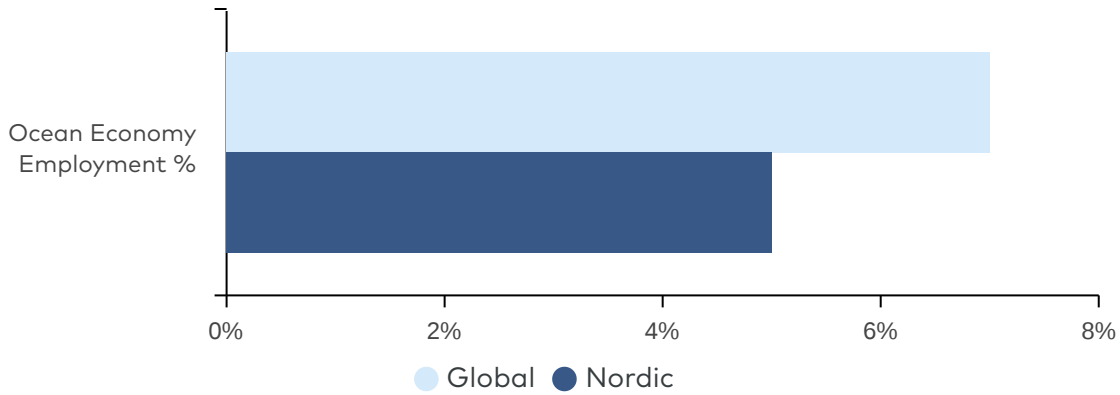
34. https://nordregio.org/maps/a-3d-population-map-for-the-holiday-season/
35. This figure is based on 2022 GDP data from the World Bank and ocean economy contributions from Norway.no, Sjávarklasinn, and estimated contributions for Sweden, Denmark, and Finland based on broader marine sector analyses.
36. https://www.norway.no/en/central-content/en/values-priorities/the-norwegian-economy-and-business-sector/
37. https://www.sjavarklasinn.is/wp-content/uploads/2012/03/Sjavarklasinn_Skyrsla-enska-low.pdf

    https://visitfaroeislands.com/en/about-vfi/history-governance-economy/economy/
38. This figure was calculated by aggregating the Ocean Economy GDP contributions of each Nordic country using national statistics databases.
39. Globally, ocean-based sectors employ around 350 million people, or nearly 7% of the global active workforce. https://dealroom.co/guides/blue-economy

# COMPARISON OF THE NORDIC OCEAN ECONOMY VS THE GLOBAL OCEAN ECONOMY



This expertise, combined with the abundance of ocean resources, has made the Nordics global leaders in several key Ocean Economy activities today, such as:

- OIL AND GAS: Norway is the third-largest exporter of natural gas and the fifth-largest exporter of oil in the world, contributing 3% and 2% of global production, respectively.[40] In 2023, Norway exported crude oil, natural gas, NGL, and condensate worth approximately NOK 1,200 billion, accounting for 62% of its total goods exports.[41] Norway's reserves of 7.7 billion barrels of crude oil are the largest in Western Europe.
- SHIPPING: Norway is the fourth-largest shipping nation globally, with a merchant fleet valued at USD 80 billion.[42] Denmark ranks as the 10th largest maritime nation, operating approximately 58 million tons of shipping tonnage.[43] In 2022, shipping accounted for 27% of Denmark's total exports, [44] led by companies like A.P. Moller-Maersk, the world's second-largest shipping line by fleet size and cargo capacity.
- SHIP CONSTRUCTION: Finland ranks among the top three countries globally for cruise ship construction, with exports valued at USD 2.26 billion in 2023, led by the Meyer Turku shipyard delivering vessels like the *Icon of the Seas*—the world's largest cruise ship—worth USD 1.3 billion in 2023.[45] Additionally, Finland has constructed over 60% of the world's icebreakers,[46] with exports worth €200 million in 2019, reinforcing its dominance in this critical Arctic and Baltic niche.
- FISH AND SEAFOOD: Norway is the second-largest seafood exporter by volume and the largest by export value, after China. In 2023, Norway exported 2.8 million tons of fish, valued at $15.48 billion—a 14% increase from the previous year[47]— and salmon alone accounted for 71% of this volume. Greenland is the largest producer of cold-water shrimp globally, with an annual catch of approximately 105,000 tons in 2022, contributing significantly to the international seafood supply.
- OFFSHORE WIND ENERGY: Denmark pioneered offshore wind energy with the world's first offshore wind farm in 1991. Today, Denmark continues to lead with an installed offshore wind capacity of 3 GW, representing 4% of the world's total and meeting 24% of the country's electricity demand. Offshore and onshore wind combined provide 55% of Denmark's electricity consumption.[48]

40. https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/753941/EPRS_BRI(2023)753941_EN.pdf
41. https://www.norskpetroleum.no/en/production-and-exports/exports-of-oil-and-gas/#:~:text=The%20total%20export%20value%20of,crude%2C%20NGL%20and%20condensate).
42. https://www.rederi.no/globalassets/dokumenter/alle/rapporter/maritime-outlook-2024.pdf
43. https://maritime-professionals.com/denmark-the-worlds-10th-largest-maritime-nation/
44. https://danishshipping.dk/en/
45. https://oec.world/en/profile/country/fin
46. https://www.wilsoncenter.org/article/icebreaking-explained-finland-europes-icebreaker-superpower
47. https://en.seafood.no/news-and-media/news-archive/2024-was-the-best-year-ever-for-norwegian-seafood-exports/
48. https://windeurope.org/newsroom/press-releases/no-offshore-bids-in-denmark-disappointing-but-sadly-not-surprising/

- TIDAL ENERGY: The Faroe Islands are first in the world to use tidal kites for big-scale power, built by Minesto, a Swedish company.[49] The Dragon 12 kite, cranking out 1.2 MW, started feeding the grid in 2024, pulling electricity straight from ocean tides, making the Faroes a top player in sea-powered energy.

## 4.3 A region with favorable factors supporting the development of new ocean solutions

For innovation to succeed, it requires three key elements: talent, infrastructure, and capital. And the Nordics excel in all three within the ocean domain, creating a favorable environment for ocean solutions and innovations to be developed, grow, and succeed.

The Nordics are uniquely positioned to develop and scale disruptive ocean solutions, thanks to a strong combination of talent, infrastructure, and capital that drives innovation across the Ocean Economy.

### TALENT: HIGH LEVELS OF ENTREPRENEURSHIP, INNOVATION, AND QUALITY OF NORDIC OCEAN COMPANIES

In a survey of 100 Nordic investors, respondents highlighted the region's exceptional talent as a key driver of the Ocean Economy. Investors indicated that the Nordics stand out globally for their high levels of entrepreneurship, innovation, and the quality of ocean companies. Specifically:

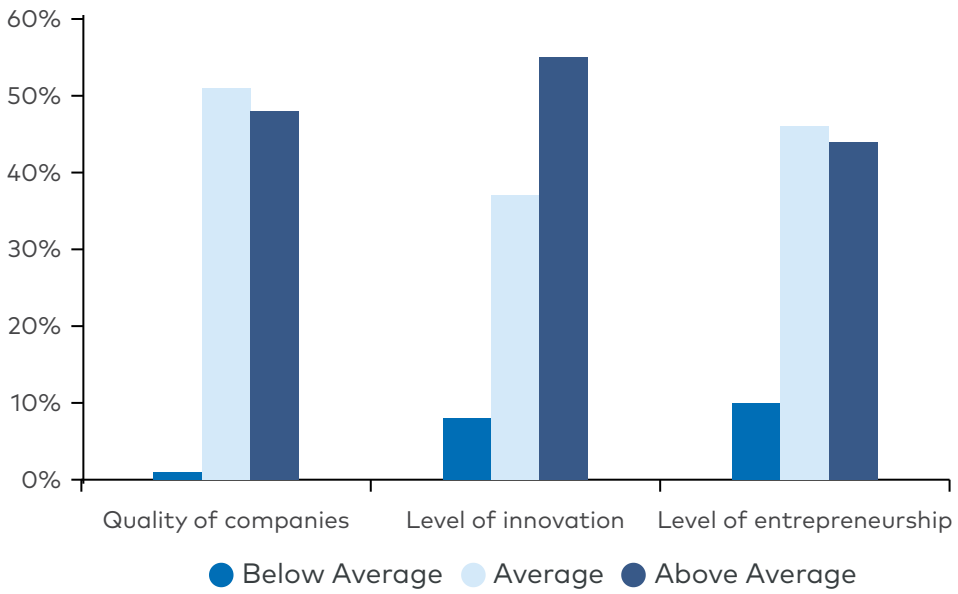
- 44% of the investors see higher entrepreneurship levels in Ocean Economy in the Nordics than in other regions
- 55% believe innovation levels in the Nordic Ocean Economy are higher than other regions
- 48% say Nordic ocean companies are higher quality than average than ocean companies in other regions.

With these figures, it is evident that general investors hold a strong positive view of the Nordic Ocean Economy, with nearly half recognizing the region's companies as exceeding average quality standards. However, ocean investors—defined as those who have made at least one investment in an ocean-related company within the past three years—demonstrate even greater enthusiasm. A notable 53% of these investors commended the quality of Nordic ocean companies as above average, while 58% highlighted their exceptional innovation.

49. https://www.offshore-mag.com/production/article/55019870/north-sea-hanz-produces-first-oil-with-reused-subsea-trees

This heightened optimism, particularly among local investors and specialized ocean investors, represents a positive indicator. It suggests that the confidence of those with regional and sector-specific expertise could resonate with the broader investment community, reinforcing the Nordics' position as a hub for high-quality, innovative ocean solutions.

## INVESTOR PERCEPTION OF THE NORDIC REGION COMPARED TO OTHER REGIONS




### INFRASTRUCTURE: WELL ESTABLISHED AND INTEGRATED MARITIME INFRASTRUCTURE THAT SUPPORT NEW SOLUTIONS TO BE DEVELOPED

The Nordics have a well-established and integrated maritime infrastructure, built on a long history of ocean activities and Nordic cooperation. Cross-border institutions, such as the Nordic Investment Bank, support infrastructure development, while large Nordic maritime companies actively collaborate through joint ventures to drive new projects. Together, these efforts enable the region to develop, scale, and implement innovative ocean solutions.

This comprehensive maritime infrastructure spans key areas:

- MARINE UNIVERSITIES AND RESEARCH INSTITUTES. The Nordics host leading marine universities and research institutes with specialized maritime departments that advance ocean innovation. Institutions such as the Technical University of Denmark (DTU), Norway's University of Bergen, Chalmers University of Technology in Sweden, and Aalto University in Finland drive cutting-edge research and collaborate with industries on practical applications. For example, Aalto University partners with Wärtsilä to integrate smart technologies into maritime operations. Another example is the OFFWOFF project (Offshore Floating Wind and Offshore Fish Farms) is a collaborative effort between Freja Offshore AB, Nordic research institutions, and local marine operators to optimize offshore wind and aquaculture co-use infrastructure.
- TRANSPORT INFRASTRUCTURE. Existing transport infrastructure in the Nordics is highly advanced, with major ports like the Port of Gothenburg in Sweden handling 115 million tons of cargo annually and the Port of Hirtshals in Denmark serving as a key hub for fish, general cargo, and passenger transport. New infrastructure projects are also being developed to modernize and decarbonize transport. Greenland's Nuuk port, the region's largest with over 100,000 tons of cargo capacity yearly, was recently upgraded for bigger ships and cruise vessels, boosting Arctic maritime capacity.[50] The Nordic ferry decarbonization project, a joint venture between NatWest, Fjord Line, and other stakeholders, is one of several examples of how the region is transitioning to cleaner propulsion systems and upgraded facilities to support sustainable transport.
- ENERGY INFRASTRUCTURE. The energy sector is anchored by Norway's extensive oil and gas infrastructure, including offshore platforms, pipelines, and onshore facilities that have long supported energy generation and transportation.[51] However, the Nordics are actively developing new green energy infrastructure, like the Faroe Islands' Vestmannasund project—the region's largest tidal energy site with a 1.2 MW kite system powering over 1,000 homes since 2024.[52] Another example is Equinor, a leader in the sector, has committed up to $6.7 billion annually through 2035 for offshore wind and renewable energy projects.[53] For example, joint ventures like the Norlights project, a collaboration between Equinor and Kongsberg Gruppen, focus on building and managing renewable energy systems, using advanced technology to monitor and optimize offshore wind farms and other green energy infrastructure.

50. https://www.highnorthnews.com/en/new-nuuk-port-facility-open-business
51. https://www.norskpetroleum.no/en/production-and-exports/the-oil-and-gas-pipeline-system/
52. https://www.offshore-energy.biz/minestos-megawatt-scale-tidal-energy-kite-is-up-and-running/
53. https://www.offshore-mag.com/renewable-energy/news/55137832/report-equinor-withdraws-from-three-offshore-wind-markets

- COMMUNICATIONS INFRASTRUCTURE. The Nordics' communications infrastructure ensures reliable connectivity for maritime operations. Telenor's Maritime Connectivity Center provides critical voice and data services for ships, offshore rigs, and coastal communities. Additionally, projects like GlobalConnect's recently completed Nordic digital infrastructure initiative—the largest in a decade—installed over 125,000 kilometers of new fiber-optic cable, significantly enhancing data capacity and connectivity across the region.[54] Collaborations between telecom providers and maritime stakeholders are enabling advancements like IoT integration and real-time data platforms, improving efficiency and safety for maritime industries.

## CAPITAL: HIGH LEVELS OF RISK CAPITAL AVAILABLE FOR NORDIC OCEAN COMPANIES ACROSS THE DIFFERENT COMPANY STAGES

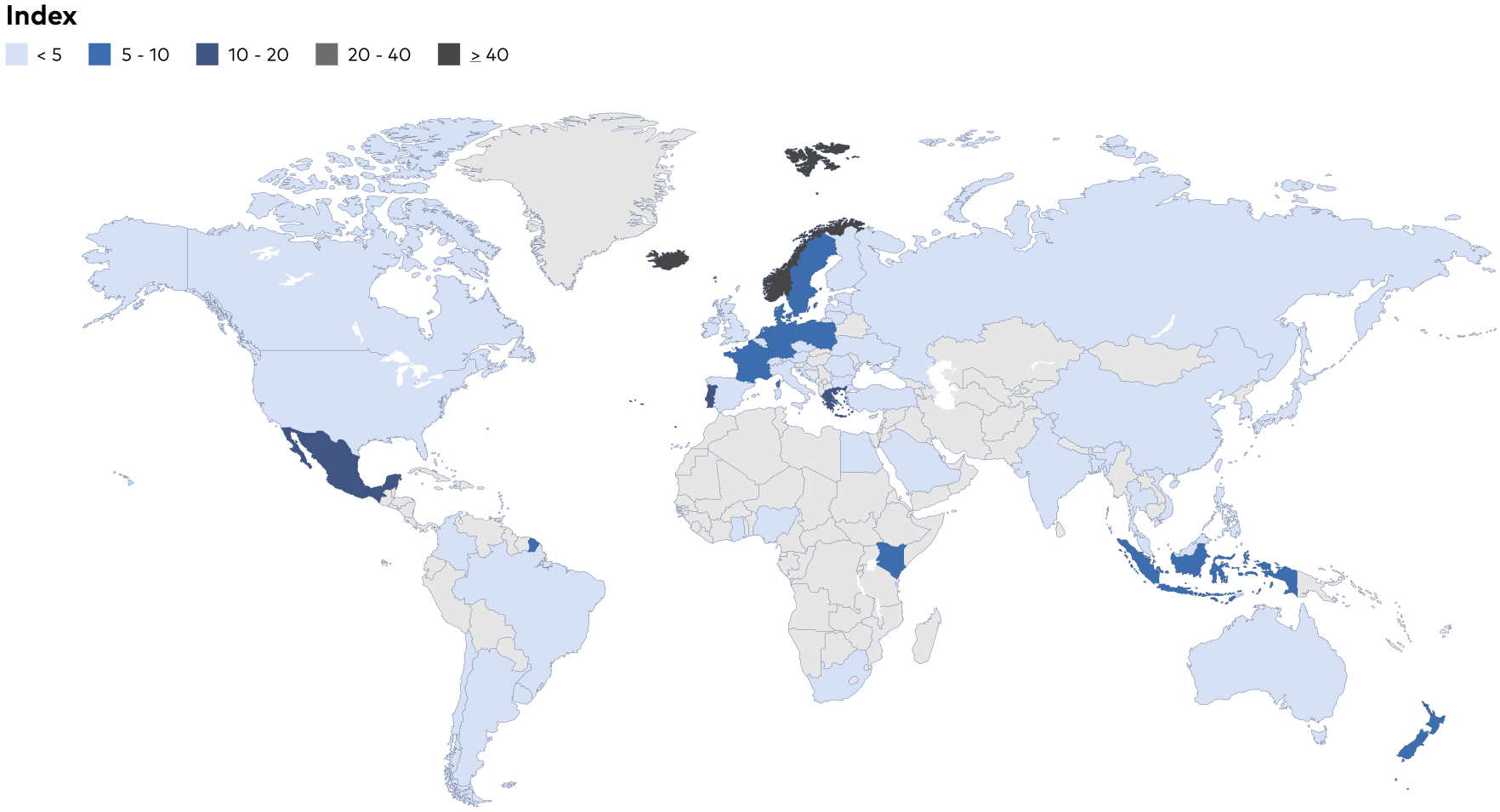
A final key factor supporting innovation and the development of ocean companies in the Nordic Ocean Economy is the availability of sufficient risk capital across all company stages. This ensures that early-stage startups can secure funding to innovate and grow, while later-stage companies have access to the capital needed to scale and expand into global markets.

The Nordics benefit from a unique "capital flywheel," where wealth generated from traditional ocean industries—such as shipping, fishing, and offshore energy—is reinvested into emerging sectors like marine biotechnology, aquaculture, and renewable energy. This self-sustaining cycle drives continuous growth, ensuring that profits from established businesses support the next wave of disruptive innovations.

This capital ecosystem includes family offices reinvesting wealth from maritime industries, corporate venture arms of major companies like Maersk and Equinor funding innovation, and specialized early-stage venture funds supporting ocean startups. Private equity firms and state-backed investors also play critical roles in scaling mature companies, while public markets offer opportunities for raising growth capital and providing liquidity to investors. Together, these investors create a robust support system, ensuring both capital and ocean expertise are available for ocean-based companies across all stages of growth.

54. https://www.mynewsdesk.com/globalconnect/pressreleases/globalconnect-completes-largest-nordic-digital-infrastructure-project-in-a-decade-3310786

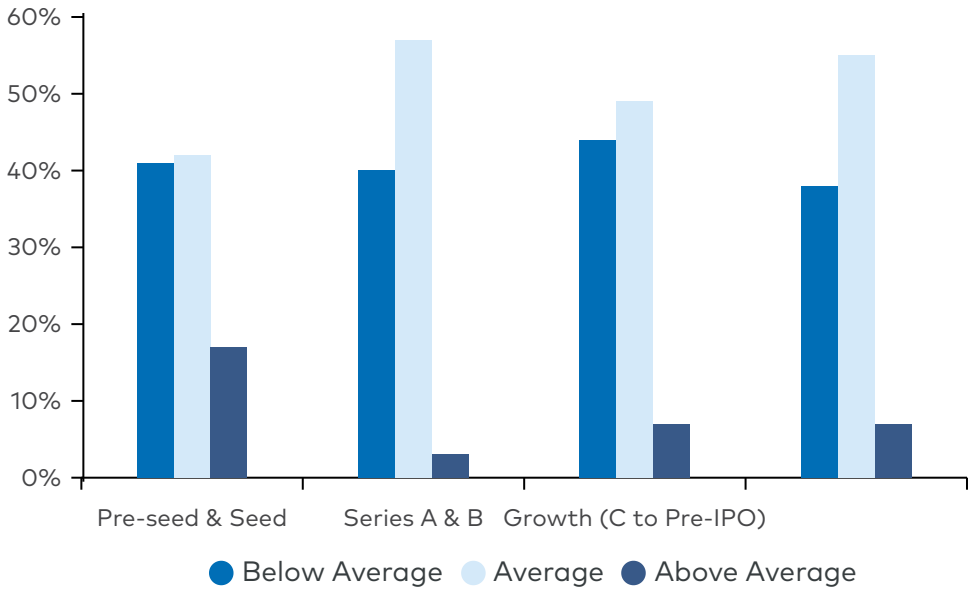
# BLUE ECONOMY VC INVESTMENT AS % OF TOTAL VC (2017–2024)



Recent data from Dealroom.co highlights the exceptional nature of this capital ecosystem. Between 2017 and 2024, over 40% of all venture capital (VC) funding in Norway and Iceland went to Blue Economy ventures—a figure that far exceeds the global average. This high concentration of capital directed toward ocean innovation reflects the Nordics' prioritization of the sector, and high levels of ocean focused investors.

A survey of Nordic investors further supports this view, with a total of 55–70% of respondents indicating that funding levels for ocean-related companies were average or above average across every stage of growth.

## INVESTOR PERCEPTION OF FUNDING LEVELS FOR NORDIC OCEAN COMPANIES ACROSS STAGES



## 4.4 A region with proven capacity to generate returns for investors

The final reason why the Nordic region is best positioned to capture the Ocean Economy investment opportunity is simple: they've done it before. The Nordics have consistently demonstrated their ability to build successful ocean-related companies that scale globally, generate significant returns for investors, and become global category leaders. This track record of success reinforces the region's position as a global hub for innovation and investment in the Ocean Economy.

In public markets, Nordic ocean-related companies are among the region's most valuable. Across the top 10 companies by market capitalization from each of the five Nordic countries—50 firms in total—32%, or roughly one out of every three, are ocean-focused, contributing 21% of the region's total market cap. Global giants like Equinor (USD 67 billion), a leader in energy; DSV (USD 49 billion), a logistics giant; and Maersk (USD 27 billion), a global leader in shipping, dominate critical ocean-related industries. Beyond their size, these companies deliver exceptional returns: Aker BP, operating in the oil and gas industry, has achieved 25.2x MOIC since its 2009 listing, while Mowi, a global leader in aquaculture, has delivered an extraordinary 63x MOIC since 2004. These examples are some of the indicators of how large and profitable companies in the Nordic Ocean Economy can become.

# OCEAN ECONOMY COMPANIES AMONG NORDIC TOP 15 BY MARKET CAP, IN USD BILLION (JAN 2025)

| | 40% | 33% | 33% | 20% | 13% |
|---|---|---|---|---|---|
| **Rank** | **Norway** | **Denmark** | **Iceland** | **Finland** | **Sweden** |
| 1 | Equinor | Novo Nordisk | Alvotech | Nordea Bank | Spotify |
| 2 | DNB | DSV | Marel | Nokia | Investor AB |
| 3 | Kongsberg Gruppen | Novozymes | Embla Medical | KONE | Atlas Copco |
| 4 | Telenor | Coloplast | Arion Banki | Sampo | Volvo Group |
| 5 | Aker BP | Danske Bank | Islandsbanki | Amer Sports | EQT |
| 6 | Norsk Hydro | Maersk | Sildarvinnslan | UPM-Kymmene | Assa Abloy |
| 7 | Mowi | Ørsted | Brim | Fortum | Swedbank |
| 8 | Gjensidige Forsikring | Pandora | Hagar | Wärtsilä | Ericsson |
| 9 | Orkla | Genmab | Kvika Banki | Neste | Hexagon AB |
| 10 | Vår Energi | Vestas Wind Systems | Festi | Stora Enso | Sandvik |
| 11–15 | 12 SalMar | | 14 Eimskipafelag Islands | 11 Metso, 15 Konecranes | 11 Sandvik, 14 Epiroc |

Ocean Economy companies

In private markets, the Nordics boast a dynamic and fast-growing ecosystem. Companies like Cognite (Norway), valued at USD 1.6 billion in 2021, and Kerecis (Iceland), acquired for USD 1.3 billion in 2023, demonstrate the region's ability to scale startups into billion-dollar businesses. Other notable examples include Marlink (USD 1.4 billion valuation) in satellite communications, Iceye (USD 900 million in 2024) in space-based monitoring, PharmaQ (sold to Zoetis for USD 765 million) in aquaculture health, Salmon Evolution (USD 580 million post-listing in 2021) in aquaculture innovation, and Kongsberg Digital (USD 540 million after raising USD 90 million in 2023) in digital maritime solutions. Companies like CorPower Ocean, which raised USD 100 million in 2021 for wave energy technology, and Again, which secured USD 43 million in 2024 to develop technology that turns $CO_2$ into sustainable chemicals, showcase how disruptive Nordic solutions can be. These funding rounds and success stories highlight the region's capacity to create highly innovative companies that attract significant capital to develop, grow and scale.

The Nordic Ocean Economy also has an active exit landscape, with active IPOs and strategic M&A activity. Nordic ocean companies consistently attract acquisitions from both regional and global corporations, reflecting their competitiveness on the world stage. Recent examples include Novo Nordisk's acquisition of Stingray Marine Solutions for USD 300 million and BMK Genetics, expanding its aquaculture portfolio. Zoetis, an US animal health company, has made significant investments in the region, acquiring multiple Nordic companies such as PharmaQ, Scan Aqua and Vaki, to strengthen its aquaculture presence. Other notable exits include Eniram, acquired by Wärtsilä in 2024, and Valka, acquired by Marel in 2021, both leading companies in Finland and Iceland respectively that rank among the largest by market capitalization in their home countries.

This extensive track record of scaling businesses, attracting significant capital, and reaching high valuations clearly shows the potential of this sector to create global category leaders and proves the Nordic Ocean Economy's capacity to generate significant returns to investors that take the risk to back them.

# 5. THE LANDSCAPE: How does the Nordic Ocean Economy landscape look like today?

Now that we have defined the Ocean Opportunity, explained why the timing is right, and shown why the Nordics have a strong position, the next step is to map out the current landscape of the Nordic Ocean Economy. This means identifying where innovation is happening, which sectors are most active, and how companies cluster together.

Step four in the investment thesis framework involves answering the key question:

WHERE ARE INNOVATIONS AND SOLUTIONS BEING CREATED TODAY IN THE NORDIC OCEAN ECONOMY?

The goal of this step is to provide a structured and factual overview of the Nordic Ocean Economy ecosystem today. However, this is not yet about identifying the best investment opportunities—that will be covered in the final step, where we will analyze which areas offer the strongest potential for long-term growth and returns. Before assessing where capital should be allocated, we first need to understand what solutions exist today and how different sectors are evolving.

To build this landscape, we analyzed over 500 ocean-based companies founded in the Nordics between 2000 and 2024. From this pool, we filtered down to around 200 startups that demonstrated strong innovation, novelty, and market traction. We then categorized these companies by sector, based on the core problems they aim to solve, and by country, to capture regional differences in activity.

This mapping exercise helps us visualize where deal flow is strongest and the main areas of innovation in the Nordic Ocean Economy and this understanding sets the stage for the next chapter, where we will analyze which of these areas present the best investment opportunities.

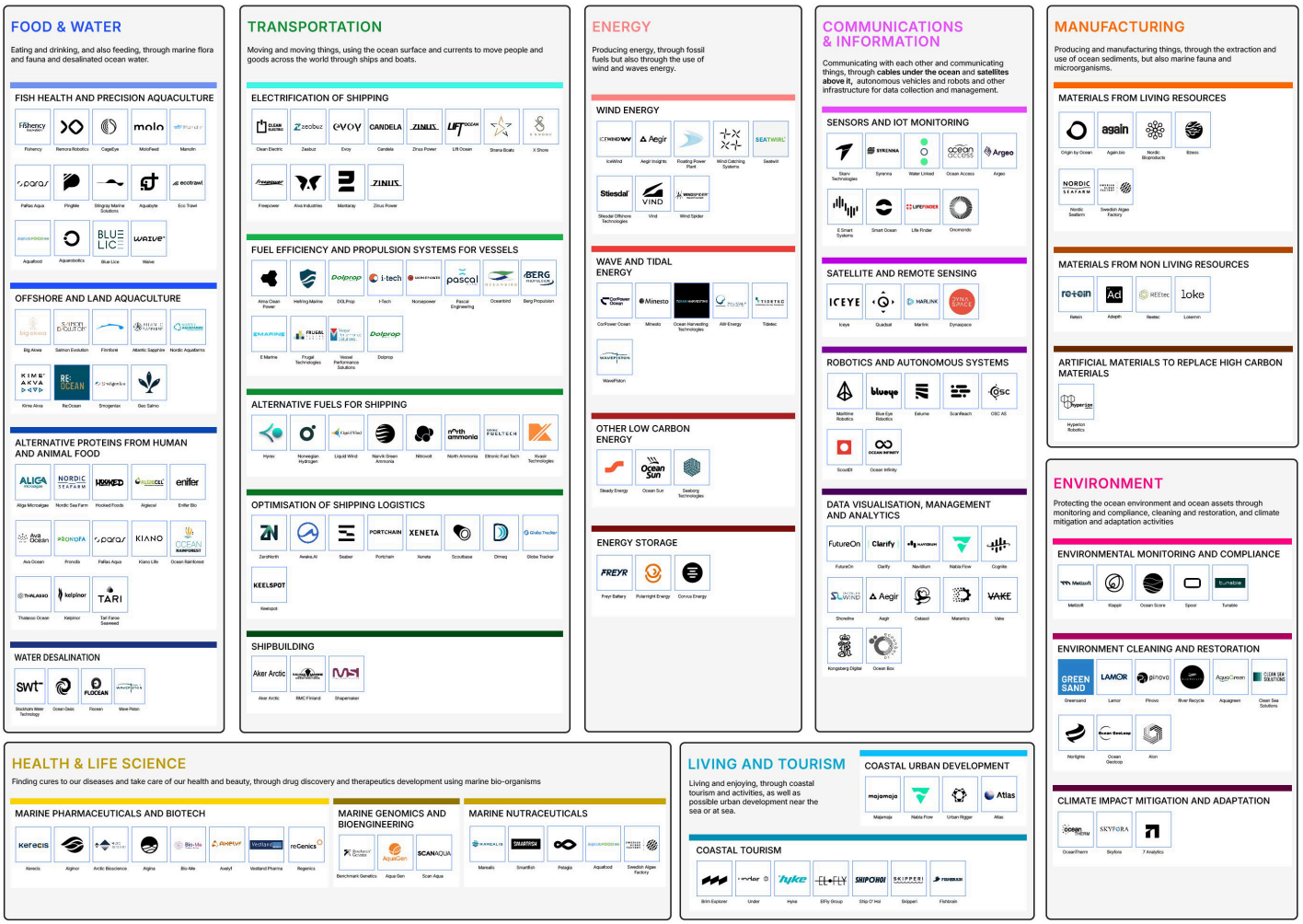
## 5.1 Nordic Ocean Economy Landscape by sector

To understand where innovation is happening in the Nordic Ocean Economy, we mapped companies based on the solutions they are creating rather than traditional industry classifications. This solutions-first approach aligns with our definition of the Ocean Economy as a system that creates value from ocean assets to address human needs.

By focusing on how ocean assets are transformed into valuable solutions, we can better identify clusters of innovation, emerging technologies, and the areas driving the most advancement.

The Nordic Ocean Economy Landscape infographic illustrates this ecosystem by grouping 200 of the most promising ocean startups into eight key solution areas, each further divided into subcategories based on specific types of innovation. This method helps us see not just which sectors are active, but also how different innovations are interconnected.

## NORDIC OCEAN ECONOMY LANDSCAPE



## KEY SOLUTIONS AREAS FROM OCEAN ASSETS EMERGING IN THE NORDIC OCEAN ECONOMY:

- **FOOD & WATER** FOR EATING AND DRINKING, AND ALSO FEEDING, THROUGH MARINE FLORA AND FAUNA AND DESALINATED OCEAN WATER.

  Companies in the Nordic seafood sector are focused on improving the efficiency and sustainability of food production. Fish health and precision aquaculture is a major area of activity, with companies developing data-driven farming solutions to optimize feed, monitor fish populations, and reduce resource waste. Offshore and land-based aquaculture is expanding, with businesses creating controlled farming environments that minimize environmental impact while increasing production capacity.

  Beyond traditional seafood production, alternative proteins from marine flora are emerging as a high-growth sector, with companies developing algae and seaweed-based proteins as substitutes for fish feed and human consumption. In the water sector, desalination and water recycling technologies are attracting company activity, with solutions designed to improve water security in coastal regions and industrial applications.

- **TRANSPORTATION** FOR MOVING AND MOVING THINGS, USING THE OCEAN SURFACE AND CURRENTS TO MOVE PEOPLE AND GOODS ACROSS THE WORLD THROUGH SHIPS AND BOATS.

  The Nordic shipping sector is undergoing a significant shift, with companies focusing on reducing emissions and improving operational efficiency. A growing number of businesses are working on electrification of shipping, developing battery-powered and hybrid vessels for short-haul transport. Fuel efficiency and propulsion system innovations are also a major focus, with companies improving vessel performance through AI-driven optimization and new engine designs.

  The development of alternative fuels for shipping, including hydrogen and ammonia, is another area where companies are clustering, working to create scalable fuel solutions for long-haul maritime transport. Meanwhile, companies in the digitalization of shipping logistics are emerging, using real-time tracking and AI-driven platforms to optimize fleet management and port operations.

- **ENERGY** FOR PRODUCING ENERGY, THROUGH OFFSHORE FOSSIL FUELS BUT ALSO THROUGH THE USE OF WIND AND WAVES ENERGY.

  The Nordic region has a long history of offshore oil and gas extraction, but in recent years, innovation has shifted toward cleaner energy solutions. Offshore wind is a major area of activity, with companies developing floating

and fixed wind farms to expand renewable energy capacity. Wave and tidal energy are also gaining traction, with businesses working on technologies to harness ocean currents for power generation.

Beyond direct energy production, companies are advancing low-carbon marine technologies, including floating solar installations and hybrid energy systems designed for offshore environments. The energy storage sector is also growing, with businesses developing battery and grid integration solutions to stabilize and optimize offshore renewable power supply.

- **COMMUNICATIONS & INFORMATION** FOR COMMUNICATING WITH EACH OTHER AND COMMUNICATING THINGS, THROUGH **CABLES UNDER THE OCEAN** AND **SATELLITES ABOVE IT**, AUTONOMOUS VEHICLES AND ROBOTS AND OTHER INFRASTRUCTURE FOR DATA COLLECTION AND MANAGEMENT.

  As the demand for real-time ocean intelligence and automation grows, Nordic companies are clustering around solutions that improve monitoring, security, and operational efficiency. Businesses specializing in sensors and IoT monitoring are developing new ways to track ocean conditions, vessel movements, and environmental changes.

  The satellite and remote sensing sector is also expanding, with companies working on ocean surveillance, maritime logistics tracking, and environmental monitoring. Autonomous systems and underwater robotics are another area of high company activity, with businesses developing AI-driven drones and remotely operated vehicles for industrial inspections, research, and infrastructure monitoring. Data analytics companies are also emerging, providing insights that help optimize fisheries, shipping, and offshore energy operations.

- **HEALTH & BEAUTY** FOR FINDING CURES TO OUR DISEASES AND TAKING CARE OF OUR HEALTH AND BEAUTY, THROUGH DRUG DISCOVERY AND THERAPEUTICS DEVELOPMENT USING MARINE BIO-ORGANISMS.

  Nordic companies are developing new health and beauty applications by utilizing marine bio-organisms. In pharmaceuticals, researchers are extracting bioactive compounds from marine life to develop new drugs, particularly in areas where existing treatments are limited. The nutraceutical industry is commercializing algae-based supplements and functional foods, responding to growing demand for natural health products.

  Beyond medicine and nutrition, marine genomics and bioengineering are advancing aquaculture, genetic research, and biomaterials. Companies are exploring marine-derived ingredients for skincare and medical applications, using nature's own chemistry to improve treatments, enhance nutrition, and develop new industrial solutions.

- **MANUFACTURING** FOR PRODUCING AND MANUFACTURING THINGS, THROUGH THE EXTRACTION AND USE OF OCEAN SEDIMENTS, BUT ALSO MARINE FAUNA AND MICROORGANISMS.

  The Nordic manufacturing sector is seeing growing interest in ocean-derived materials as companies seek alternatives to fossil-based inputs. One major area of innovation is bioplastics made from algae and seaweed, which offer a renewable and biodegradable alternative to petroleum-based plastics. These materials are being developed for packaging, textiles, and industrial applications.

  Beyond marine flora, companies are also researching non-living ocean resources, such as ocean sediments and deep-sea minerals, to explore their potential in construction, electronics, and energy storage. At the same time, advances in synthetic marine materials are helping replace high-carbon industrial inputs, providing more sustainable solutions for manufacturing processes across industries.

- **ENVIRONMENT** FOR PROTECTING THE OCEAN ENVIRONMENT AND OCEAN ASSETS THROUGH MONITORING AND COMPLIANCE, CLEANING AND RESTORATION, AND CLIMATE MITIGATION AND ADAPTATION ACTIVITIES.

  Nordic companies are expanding efforts to protect ocean environments by focusing on monitoring, restoration, and pollution control. Businesses in environmental compliance are developing tools to track emissions, pollution levels, and industry impact, ensuring adherence to regulations.

  Marine habitat restoration projects are targeting seagrass replanting, coral reef recovery, and contamination removal to maintain healthy ecosystems. The waste management sector is advancing plastic removal technologies and large-scale industrial cleanup solutions. Meanwhile, companies working on carbon storage and coastal protection are developing offshore $CO_2$ sequestration methods and strengthening coastal defenses against environmental changes.

- **LIVING & TOURISM** FOR LIVING AND ENJOYING, THROUGH COASTAL TOURISM AND ACTIVITIES, AS WELL AS POSSIBLE URBAN DEVELOPMENT NEAR THE SEA OR AT SEA.

  Nordic businesses are advancing coastal infrastructure, tourism, and marine-based living. Sustainable urban development near the sea includes modular cabins, airflow-optimized designs, floating residences, and tailored planning tools, meeting population and industrial needs while addressing climate challenges. Coastal tourism and travel feature silent boat tours, underwater dining, ferries, electric aviation, yacht rentals, boat-sharing, and fishing communities, merging commerce with eco-conscious exploration. Ferry

networks and water-based transit enhance connectivity between coastal hubs and tourist spots. As maritime lifestyles gain traction, these efforts improve sea access and enrich coastal living while preserving nature.

## 5.2 Nordic Ocean Economy Landscape by country

Innovation in the Nordic Ocean Economy is not evenly distributed, with certain countries developing strong industry clusters that drive regional growth, shaping together a diverse and complementary ecosystem. By mapping the 200 most promising ocean startups by their country of origin, we identified clear patterns in company distribution. Norway leads with around half of these companies, while the rest are spread across the other 6 countries.

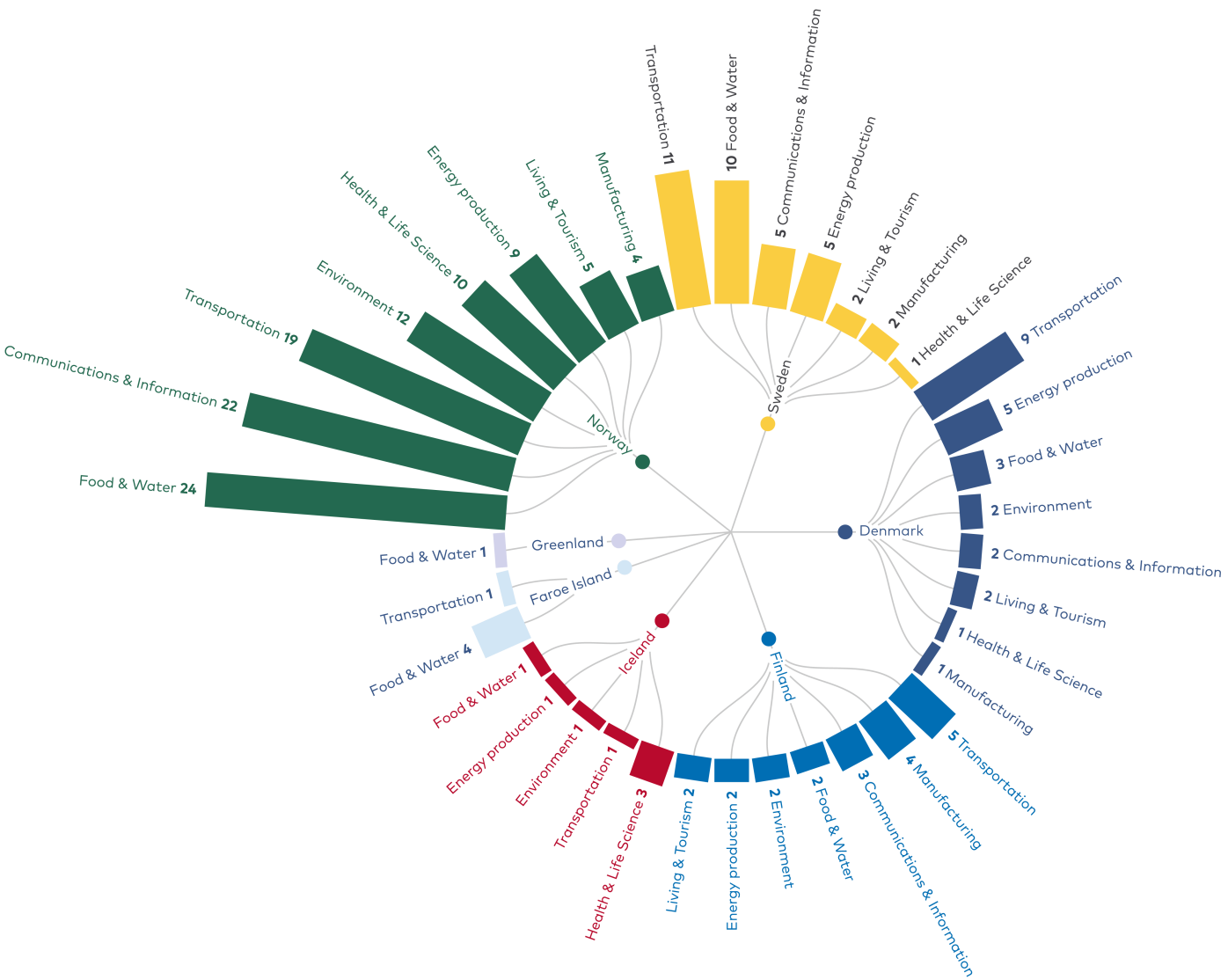
This analysis highlights where startups are emerging, which industries dominate in each country, and how each nation contributes to innovation in the ocean space. While all Nordic countries engage across multiple sectors, each has distinct strengths that reinforce the region's leadership in ocean-based industries. Instead of competing, these strengths complement each other, reinforcing the Nordics as a global leader in ocean innovation.

### OVERVIEW THE NORDIC OCEAN ECONOMY BY COUNTRY:

- **Norway** leads in the Ocean Food industry, driven by its expertise in aquaculture and precision fisheries, particularly salmon farming. Companies are developing advanced farming techniques, optimized feed solutions, and technology-based systems to improve efficiency and reduce resource waste. Norway is also at the forefront of shipping innovation, developing battery-powered vessels, alternative fuels like hydrogen and ammonia, and advanced propulsion technologies to cut emissions. The country has made notable progress in Communications & Information, with marine IoT systems and satellite monitoring improving operational safety and logistics. Additionally, Norway is leveraging its offshore expertise to expand beyond oil and gas, making significant advancements in offshore wind and other emerging energy solutions.
- **Sweden** plays a key role in Maritime Transportation and the Ocean Food & Water industry, focusing on logistics, propulsion technologies, and improved shipping efficiency. The country is also developing alternative protein sources from algae, seaweed, and other marine ingredients to diversify food and feed options. In the Energy sector, Sweden is advancing wave and tidal energy solutions, harnessing ocean currents for power generation. Additionally, Sweden is active in manufacturing, particularly in developing bio-based materials from ocean resources to support industrial applications and reduce reliance on traditional materials.

- **Denmark** leads in offshore wind energy, driving advancements in turbine technology and offshore infrastructure, strengthening its position in global energy markets. In Transportation, Denmark is improving shipping efficiency by developing cleaner fuels and more effective propulsion systems. The country is also advancing the Food & Water sector, working on alternative proteins and precision aquaculture to enhance seafood production. Additionally, Denmark is active in the Environment and Living & Tourism sectors, focusing on coastal development, urban expansion, and tourism projects that integrate economic growth with long-term resource management.
- **Finland** stands out in Maritime Transportation and ocean-based Manufacturing, with a strong focus on shipbuilding, advanced vessels, and propulsion systems that improve efficiency and lower emissions. In Energy, Finland contributes to ocean-based power solutions, including wave energy converters and thermal storage systems. The country is also involved in Food & Water, innovating in aquaculture, resource management, and new protein sources from marine environments. Additionally, Finland is making strides in ocean data capture, defense, and surveillance technologies, integrating monitoring, satellite systems, and maritime security advancements to address operational and geopolitical challenges.
- **Iceland** is a leader in Marine Health & Life Sciences, where marine biotechnology is driving breakthroughs in therapies, nutraceuticals, and protein extraction from ocean resources. The country also contributes to Energy by combining marine and geothermal resources to develop tailored energy solutions. Additionally, Iceland plays a role in the Environment sector, focusing on ecosystem protection, resource efficiency, and responsible ocean management.
- **Faroe Islands'** ocean economy centers on established marine industries with emerging innovation. In the Food & Water sector, seaweed cultivation is gaining momentum, with startups exploring new uses for food, biofuels, and industrial products. Fisheries and aquaculture, key economic drivers, are seeing incremental advancements in sustainable practices and efficiency, building on the islands' expertise. In the Energy sector, tidal energy is an area of interest, leveraging the region's strong currents, though development remains in early stages.
- **Greenland's** ocean-related activities are modest but deeply tied to its core industries. Living & Tourism and Transportation are intertwined, relying on sea-based travel due to limited inland infrastructure. The region offers unique Arctic wildlife tours and cultural experiences rooted in its ocean heritage. In the Food & Water sector, aquaculture and fisheries remain economic drivers, with increasing efforts to enhance sustainability and resource management.

# NORDIC OCEAN ECONOMY LANDSCAPE BY COUNTRY



# 6. THE SEGMENTS: What are the main opportunities emerging in the Nordic Ocean Economy?

Now that we have examined the Ocean Economy opportunity, the global trends reshaping the market, the Nordic region's competitive strengths, and the current landscape of innovation, the final step is to determine where the strongest opportunities for growth and investment are emerging—what we define as the **Nordic Ocean Opportunity**.

At its core, this step answers the key question:

### WHAT ARE THE MAIN OPPORTUNITIES EMERGING IN THE NORDIC OCEAN ECONOMY?

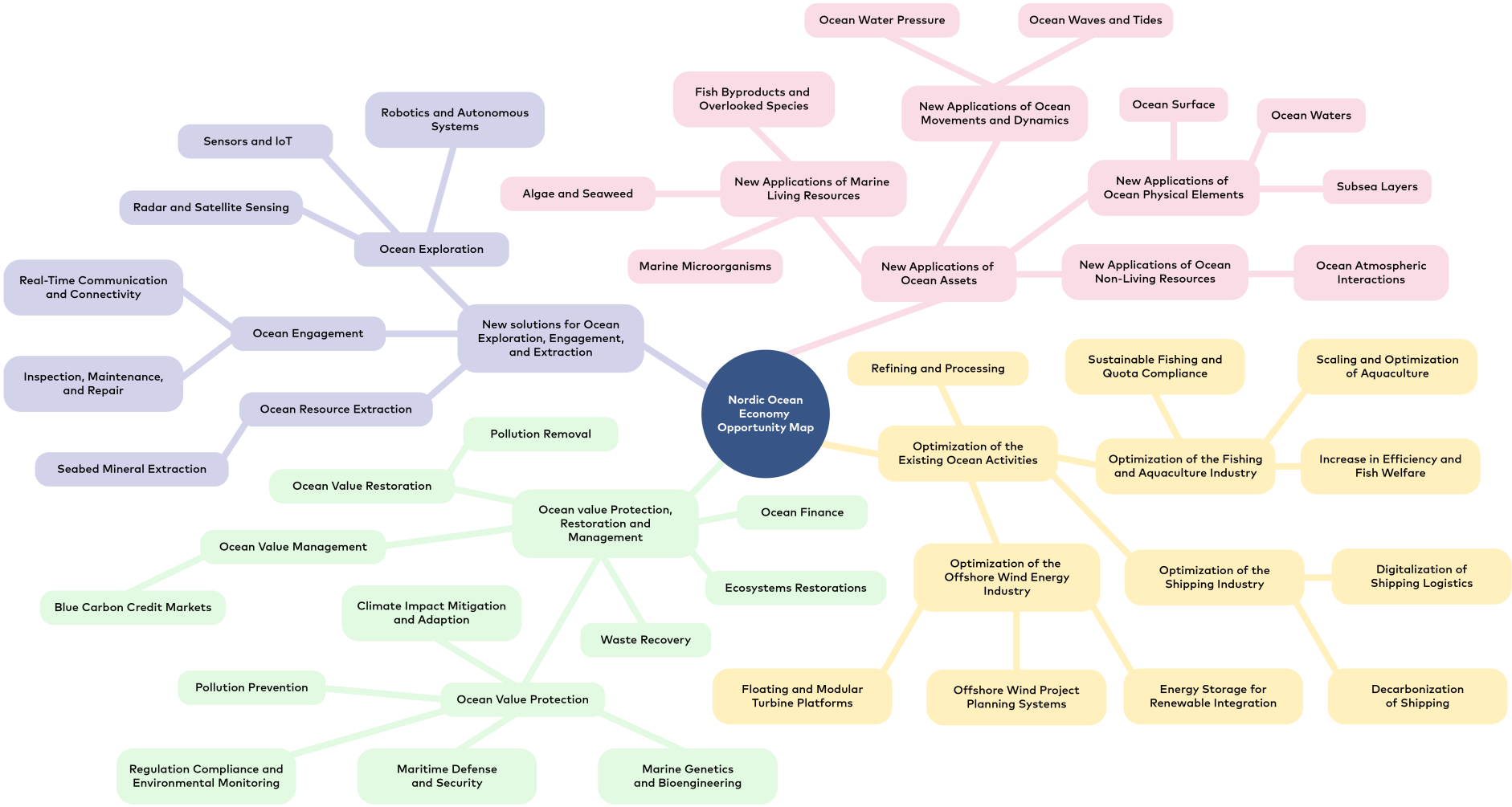
Step five of the investment thesis framework brings together insights from the previous steps to identify the most strategic areas for investment. It focuses on where innovation, market demand, and Nordic strengths converge. To do this, we use an **opportunity mapping analysis**—a structured method to highlight the most scalable and high-impact segments. The goal is to segment the Nordic Ocean Economy in a way that highlights where the best solutions can emerge—solutions that serve large and growing markets, improve on existing approaches, scale efficiently, offer a distinct advantage, and generate long-term value.

Through this process, we have identified **13 key opportunities** within **four main segments**. Each **segment** represents a long-term structural area of the Nordic Ocean Economy, expected to remain relevant over time. In contrast, each **opportunity** is a specific business or investment potential within a segment, influenced by market conditions, technological advancements, and regulatory changes—making it more dynamic and subject to change over time.

The four key segments are:

1. OPTIMIZATION OF EXISTING OCEAN ACTIVITIES: Improving the efficiency and value of key Nordic Ocean industries like shipping, aquaculture, and offshore wind through advanced technologies such as AI, automation, and precision tools.
2. NEW APPLICATIONS OF OCEAN ASSETS: Finding new ways to use Nordic ocean resources to solve problems and create new products, such as marine-based medicines, algae proteins, and renewable energy solutions like floating solar and wave power.
3. NEW SOLUTIONS FOR OCEAN EXPLORATION, ENGAGEMENT, AND EXTRACTION: Building advanced tools to better explore the ocean, collect data, and extract resources in a responsible way.
4. NEW SOLUTIONS FOR OCEAN VALUE PROTECTION, RESTORATION, AND MANAGEMENT: Creating systems to protect and restore Nordic ocean assets, including pollution tracking, habitat restoration, and better resource management frameworks.

# NORDIC OCEAN ECONOMY OPPORTUNITY MAP



## 6.1 Segment 1: Optimization of the existing ocean activities

The optimization of existing ocean activities is the largest, most obvious, and most immediate investment opportunity in the Nordic Ocean Economy, representing more than half of the total dealflow today. This segment encompasses solutions, technologies, and innovations that support the efficiency, sustainability, and profitability of established ocean industries where the Nordics hold global leadership today—such as shipping, fishing and aquaculture, and energy production.

These industries form a cornerstone of the Nordic economy, contributing 13% of regional GDP and an extraordinary 40% in Norway. However, as they face mounting pressures from stricter regulations, resource scarcity, and rising operational costs, the need for innovative solutions is greater than ever. The demand for change is driven not only by internal industry challenges but also by global trends. The world's increasing appetite for fish proteins, clean energy, and maritime trade creates an unprecedented opportunity for growth in these sectors. At the same time, unsustainable practices in ocean industries are leading to tighter regulations, compelling players to adopt greener, more efficient approaches.

Across these industries, Nordic businesses face a strong push to increase efficiency and reduce their negative climate impact. And these dynamics are spurring the emergence of new companies across the Nordics that are addressing these challenges head-on. Many of the solutions developed locally for shipping, seafood production, and offshore wind, if proven successful, can also be applied globally, creating a significant potential for long-term growth. We expect many promising opportunities to emerge from this segment in the coming decades, addressing the key challenges faced by established ocean industries.

Within this segment, the most significant specific opportunities that dominate are those where Nordics are leaders today and that face the main optimization challenges:

1. Optimization of the shipping industry
2. Optimization of the fishing and aquaculture industry
3. Optimization of the offshore wind energy industry

## OPTIMIZATION OF EXISTING OCEAN ACTIVITIES

Improving the efficiency and value of key Nordic Ocean industries like shipping, aquaculture, and offshore wind through advanced technologies such as AI, automation, and precision tools.

| Optimisation of shipping industry | Optimisation of fishing and aquaculture industry | Optimisation of offshore wind energy industry |
|---|---|---|
| Decarbonisation of shipping | Scaling and optimisation of aquaculture | Floating and modular turbine platforms |
| Digitalisation of shipping logistics | Sustainable fishing and quota compliance | Energy storage for renewable integration |
| | Increase in efficiency and fish welfare | Offshore wind project planning systems |

The potential of this segment is exemplified by Cognite, a Norwegian company founded in 2016. In just a few years, the company has grown into a global leader valued at $1.6 billion (as of January 2025) by providing an industrial data platform that optimizes operations in sectors like oil and gas. Cognite shows how large companies in this sector can become and highlights the value potential of solutions dedicated to improving established ocean activities.

Moving forward, the most successful solutions in this space will be those that are able to combine increased productivity and efficiency for these leading ocean industries with sustainable practices that protect the environment and avoid harm. In the new era, winners will be the companies that can deliver both economic value and environmental responsibility.

### 6.1.1 Optimization of the shipping industry

Nordic countries are global leaders in shipping, with strong infrastructure, large fleets, and a focus on digitalization and decarbonization. This leadership puts them in a prime position to tackle the challenges and opportunities shaping the future of maritime transport.

The shipping industry is under growing pressure as global seaborne trade is expected to increase 35% by 2050, requiring greater cargo capacity and operational efficiency. At the same time, disruptions like the Suez Canal blockage and geopolitical shifts expose vulnerabilities in global trade routes, making resilient and adaptable logistics systems a priority. Environmental regulations are also

tightening. The industry emits about one billion metric tons of $CO_2$ annually, pushing regulators to enforce stricter emissions targets. Meanwhile, new technologies—including AI, IoT, and advanced propulsion systems—are transforming operations, enabling smarter, cleaner, and safer shipping.

These converging factors create a pressing need to transform the shipping industry by increasing efficiency, reducing emissions, and enhancing safety. Nordic countries, as global leaders in shipping—ranking 4th globally in fleet size (Norway) and 10th (Denmark), and home to major shipping companies like Maersk—are under increasing pressure to digitalize operations.

At the heart of this opportunity lies the potential to decarbonize shipping, digitize logistics, and improve crew safety, ensuring that the sector evolves to meet the demands of the future. MAIN AREAS WHERE NEW NORDIC SOLUTIONS ARE EMERGING:

- DECARBONIZATION OF SHIPPING: Maritime transport is responsible for 3–4% of global $CO_2$ emissions and at the current growth rates it could jump to 10% by 2050.[55] New regulations are driving operators to cut emissions, creating a major opportunity to provide solutions that help the industry decarbonize in a cost-effective way. The range of emerging solutions spans from fuel optimization technologies to complete fuel replacement. The Nordic region is at the forefront of **three main approaches** to decarbonization:
    - FUEL OPTIMIZATION: Rather than replacing fuel entirely, these solutions maximize fuel efficiency to cut waste and emissions. Companies in this space develop software and hardware solutions that allow vessels to consume less fuel while maintaining performance. Examples of this are companies like: **ZeroNorth (Denmark)** providing platforms to optimize fuel consumption and fleet operations. **Cetasol (Sweden)**, **Frugal Technologies (Denmark)**, and **Hefring Marine (Iceland)** creating tools to enhance vessel performance, cut fuel use, and lower emissions.
    - ALTERNATIVE PROPULSION SYSTEMS: Some companies are developing new ways to power ships, including wind-assisted propulsion and hybrid technologies to reduce reliance on fossil fuels by replacing or complementing traditional propulsion systems. Examples are: **Oceanbird (Sweden)** designing wind-powered systems for large vessels, while **Pascal Technologies (Norway)** working on innovative propulsion systems to improve energy efficiency.

55. https://www.transportenvironment.org/topics/ships/climate-impact-shipping

- ALTERNATIVE FUELS AND ELECTRIFICATION: A growing number of Nordic startups are developing alternatives to fossil fuels, such as methanol, hydrogen, and battery-powered electric systems. Examples of companies in the space are: **Liquid Wind (Sweden)**, **Hyrex (Norway)**, and **Kvasir Technologies (Denmark)** are producing low-carbon fuels like methanol and hydrogen. In ELECTRIFICATION, **Evoy (Norway)** and **Candela (Sweden)** lead with advanced electric propulsion systems, while **Alma Clean Power (Norway)** is innovating in fuel cell technology to further cut emissions.

- DIGITALIZATION OF SHIPPING LOGISTICS: The global shipping industry, historically slow to adopt new technology, is now undergoing rapid digital transformation. Rising trade volumes, increased vessel traffic, and complex cargo operations are driving the need for smarter, more efficient logistics. This shift presents a major opportunity to enhance operational efficiency, lower costs, and improve safety across the shipping value chain. The most promising areas of digitalization in Nordic shipping logistics include:
  - FLEET COORDINATION: Optimizing vessel scheduling and fleet utilization is essential for reducing fuel consumption, minimizing delays, and improving operational efficiency. AI-driven planning tools and real-time data systems are enabling shipping operators to streamline logistics, maximize cargo loads, and improve route optimization. Examples of companies in the space include: **Seaber (Finland)** specialized in vessel scheduling, ensuring maximum shipping capacity, and minimizing delays. **Navidium (Sweden)** that offers advanced solutions for logistics management and operational planning, enabling better fleet coordination and resource use.
  - CARGO MANAGEMENT: New digital platforms are transforming how cargo is tracked, handled, and delivered, making supply chains more efficient and responsive. These solutions enhance visibility, automate processes, and leverage predictive analytics to prevent disruptions and improve overall cargo flow. Examples of companies include: **Awake.AI (Finland)** that integrates digital tools for ports, streamlining cargo flows and reducing bottlenecks, **Xeneta (Norway)** that provides data-driven platforms to benchmark shipping rates, helping stakeholders optimize cargo management, and **Globe Tracker (Faroe Islands/ Denmark)** that tracks and controls refrigerated containers' conditions in real-time.
  - PORT OPERATIONS AND CREW SAFETY: Automation and data-driven systems are revolutionizing port logistics and onboard safety. Advanced scheduling tools are helping ports coordinate arrivals and

departures more efficiently, while real-time monitoring technologies are improving crew working conditions and reducing risks at sea. Examples of companies include: **Portchain (Denmark)** that uses real-time data and advanced scheduling solutions to improve coordination between ships and ports. **Scoutbase (Denmark)** that develops real-time monitoring tools to enhance crew safety and prevent accidents. **Dimeq (Norway)** and **Maranics (Iceland)** that focus on improving onboard safety and creating safer, more efficient working environments.

### 6.1.2 Optimization of fishing and fish farming industry

Global seafood demand is rising rapidly, with consumption expected to grow from 158 million tons in 2020 to nearly 190 million tons by 2030.[56] This increasing demand puts pressure on fisheries and aquaculture to scale production efficiently while meeting market needs. At the same time, stricter regulations on wild fishing quotas and sustainability standards are limiting traditional fisheries, reinforcing the need for more efficient and environmentally compliant aquaculture systems. Technology is playing a key role in addressing these challenges. AI-powered precision farming, IoT-enabled sensors for real-time monitoring, and autonomous robotics for cage cleaning and stock assessments are improving efficiency, ensuring regulatory compliance, and reducing environmental impact. These advancements are transforming fish farming into a more scalable and sustainable industry.

These converging factors create a pressing need to transform the fishing and aquaculture industry by increasing efficiency, optimizing production, ensuring compliance with new regulations, and minimizing environmental impact. Nordic countries, as global leaders in fish exports and aquaculture—particularly with Norway farming 90% of its salmon—are under increasing pressure to adapt and enhance their practices.

At the heart of this opportunity lies in solutions that support the increase of seafood production while ensuring regulation compliance and environmental considerations. MAIN AREAS WHERE NEW NORDIC SOLUTIONS ARE EMERGING:

- SCALING AND OPTIMIZATION OF AQUACULTURE. Rising global seafood demand, coupled with stricter regulations on wild fishing quotas, is driving the need to scale and optimize aquaculture systems. As traditional fisheries face limitations, the opportunity lies in developing innovative solutions to expand production while ensuring compliance with environmental standards. The Nordic region is at the forefront of three main approaches to scaling and optimizing aquaculture:

56. https://www.fao.org/4/i3640e/i3640e.pdf

- SCALING AQUACULTURE SYSTEMS: To meet growing demand, aquaculture is shifting beyond traditional nearshore farms to offshore and land-based systems that offer greater control, higher production, and reduced environmental risks. Companies in the Nordics are pioneering new ways to increase capacity while maintaining efficiency. Examples of companies include: **Salmon Evolution (Norway)** or **Geo-Salmo (Iceland)** that focuses on sustainable land-based aquaculture systems to meet increasing demand. **KIME Akva (Norway)** that develops advanced offshore aquaculture systems that balance efficiency with environmental considerations.
- INCREASE IN EFFICIENCY AND FISH WELFARE: Advancements in AI, robotics, and data-driven monitoring are making aquaculture more efficient by optimizing feeding, improving fish welfare, and reducing resource waste. These technologies help farmers improve operations while ensuring fish are healthy and growing efficiently. Examples of companies include: **Aquabyte (Norway/US)** that uses AI cameras for fish growth monitoring, disease detection, and feeding optimization. **Stingray Marine Solutions (Norway)** that uses laser technology to remove sea lice, reducing the need for chemicals. Remora Robotics (Norway) that develops autonomous cage-cleaning systems to enhance water quality and reduce maintenance. **Sea Farm Innovations (Faroe Islands)** that employs mechanical delousing technologies to gently remove sea lice, boosting fish welfare.
- ADVANCED FEED AND NUTRITION SOLUTIONS: Feed is the largest cost in aquaculture and improving its efficiency can significantly impact production economics. Nordic companies are innovating with new feed formulations and marine-based alternatives to reduce dependence on traditional fishmeal while enhancing fish growth and health. Examples of companies include: **Molofeed (Norway)** that produces advanced feed solutions to enhance fish growth and minimize waste. **Calanus AS (Norway)** that develops marine-based feed products that improve fish nutrition.

- SUSTAINABLE FISHING AND QUOTA COMPLIANCE: As fishing quotas become stricter and environmental regulations tighten, the fishing industry faces growing pressure to improve how it operates. The challenge is to ensure long-term fish stock sustainability while maintaining the economic viability of fishing businesses. The opportunity lies in tools that help monitor and manage fishing activities, support sustainable harvesting, reducing bycatch, and aligning with evolving environmental requirements. In the Nordics, companies are developing solutions in two key areas to make fishing more efficient, compliant, and resource-smart:

- REDUCING BYCATCH AND IMPROVING HARVESTING METHODS: Traditional fishing methods often result in high levels of bycatch—unintended species caught alongside the target fish—which can lead to wasted resources and ecosystem damage. New technologies are emerging to make fishing more selective, reducing environmental impact while maintaining catch efficiency. Examples of companies include: **EcoTrawl (Norway)** that designs trawling systems that reduce bycatch and protect marine ecosystems.
- COMPLIANCE AND MONITORING TOOLS: With strict quotas and sustainability targets in place, monitoring and reporting fishing activities has become essential. New digital tools are helping fleets track their operations in real time, ensuring compliance with regulations and improving transparency across the industry. Examples of companies include: **PingMe (Norway)** that provides digital compliance tools for tracking fishing activities and meeting regulatory standards. **Aqua Robotics (Norway)** that develops systems to monitor fishing practices and ensure compliance with environmental regulations.

### 6.1.3 Optimization of the offshore wind energy industry

Global energy demand is set to increase by 50% by 2050, driven by industrial growth, urbanization, and energy-intensive technologies like electric vehicles and hydrogen production. Meeting this demand requires a major shift toward low-carbon energy sources, expected to provide up to 80% of global power generation by mid-century. Offshore wind is emerging as a key pillar of this transition, offering scalable energy production without competing for land. Capacity is projected to grow from 40 GW in 2020 to 2,465 GW by 2050, creating an urgent need to expand infrastructure and develop new technologies. However, scaling offshore wind presents significant challenges. High installation costs in deep waters, complex grid connections, and harsh marine conditions make deployment expensive and technically demanding. Another major bottleneck is grid stability and energy storage, as wind production fluctuates and must be balanced with demand.

These converging factors create a pressing need to optimize the offshore wind energy industry by reducing installation costs, improving grid integration, enhancing maintenance efficiency, and addressing the challenges of deep-water deployment and variable energy production. Nordic countries, as global leaders in offshore wind, are under increasing pressure to expand their capacity and meet ambitious renewable energy targets.

At the heart of this opportunity lies the potential to scale offshore wind energy, optimize turbine technology, and develop the necessary infrastructure to meet the

growing demand for clean energy, ensuring that the sector evolves to support the global transition to low-carbon energy. MAIN AREAS WHERE NEW NORDIC SOLUTIONS ARE EMERGING:

- FLOATING AND MODULAR TURBINE PLATFORMS: Offshore wind energy is expanding beyond shallow coastal waters but installing turbines in deep-sea locations remains expensive and complex. Floating and modular turbine platforms are emerging as a solution, allowing wind farms to operate in deeper waters where wind conditions are stronger and more consistent. These technologies reduce installation costs, increase energy output, and make large-scale offshore wind deployment more feasible**.** Main emerging Nordic solutions and companies in the space are:
    - FLOATING AND MODULAR DESIGNS FOR DEEP WATERS: Deploying offshore wind farms in deep-sea locations requires adaptable and scalable solutions, with modular turbine designs and floating platforms enhancing flexibility, reducing construction complexity, and enabling expansion into deeper waters. Examples of companies are: **Windeed (Sweden)** – floating offshore wind platforms for cost-effective deep-sea deployment; **Seatwirl (Sweden)** and **Stiesdal (Denmark)** – modular turbine designs for scalable, flexible deep-water deployment.
    - MULTI-TURBINE PLATFORMS: Traditional offshore wind farms rely on single large turbines, but multi-turbine platforms are changing the approach by capturing more wind energy within a smaller footprint. These systems optimize space and reduce material costs, improving overall efficiency. Examples of companies are: **Windcatching Systems (Norway)** – Multi-turbine floating platforms that use less space to capture more wind, lowering costs and increasing energy production.
    - HYBRID PLATFORMS: Some floating platforms are integrating multiple renewable energy sources, combining wind and wave power to maximize efficiency and energy production. Examples of companies are: **Floating Power Plant (Denmark)** – Hybrid platforms that combine wind and wave energy, enhancing efficiency and overall energy output.
- ENERGY STORAGE FOR RENEWABLE INTEGRATION: Renewable energy sources like offshore wind produce power intermittently, creating challenges for grid stability and continuous energy supply. Energy storage systems play a crucial role in addressing these challenges by capturing excess energy during peak production and releasing it when demand is high or production is low. This makes offshore wind and other renewables more reliable and scalable for large-scale energy grids. Main emerging Nordic solutions and companies in the space are:

- HIGH DENSITY BATTERY STORAGE: One of the key solutions for stabilizing renewable energy supply is high-density battery storage. These systems store large amounts of energy efficiently, making it possible to balance fluctuations in wind power production and ensure a steady flow of electricity to the grid. Examples include: **Freyr Batteries (Norway)** that develops high-density batteries for large-scale storage, improving the reliability of renewable energy supply.
- MARITIME AND OFFSHORE ENERGY STORAGE: Energy storage is also critical for offshore applications, where wind farms and maritime industries require stable power supply. Offshore storage systems help optimize energy use, reduce dependency on fossil fuels, and enhance the overall efficiency of renewable energy operations. Examples include: **Corvus Energy (Norway)** that specializes in energy storage systems for offshore and maritime applications.

- OFFSHORE WIND PROJECT PLANNING SYSTEMS: Scaling offshore wind energy requires efficient planning and management to overcome engineering challenges and streamline complex processes such as permitting and grid connection. Digital tools and data-driven analytics are playing a crucial role in optimizing project design, improving decision-making, and accelerating deployment. These technologies help reduce risks, cut costs, and enhance the overall efficiency of offshore wind development. Main emerging Nordic solutions and companies in the space:
  - ANALYTICS AND OPTIMIZATION: Advanced analytics platforms provide real-time data and forecasting models to optimize wind farm site selection, performance predictions, and operational planning. Examples include: **Aegir Insights (Denmark)** that provides advanced analytics for optimizing offshore wind project planning, including site selection and performance forecasts. **FutureOn (Norway)** that offers digital platforms to visualize and manage subsea infrastructure.
  - OPERATIONAL SIMULATIONS: Offshore wind farms rely on simulations to anticipate challenges, plan maintenance, and optimize energy output. Cloud-based modeling helps operators test scenarios, mitigate risks, and refine project strategies. Examples include: **Shoreline (Norway)** – Cloud-based solutions for optimizing offshore wind operations; **Vind AI (Norway)** –AI-driven platform for wind project planning and optimization.

## 6.2 Segment 2: New applications of ocean assets

New applications of ocean assets represent roughly a third of the dealflow in the Nordic Ocean Economy, making this segment an exciting and transformative opportunity. Building on the Nordics' established leadership in traditional ocean industries like fishing, shipping, and offshore wind, this segment is about exploring new ways to create value from the ocean. The success of offshore wind in Denmark exemplifies this mindset. By leveraging its offshore oil and gas expertise and abundant wind resources, Denmark became a global leader in offshore wind energy —a sector shaping the future of energy production. This success has inspired a wave of innovators across the Nordics to ask: *What else can we do with these resources? How can we use them differently to meet global needs and create disruptive new applications of ocean assets?*

The Nordics are particularly well-suited to lead in this area because of their access to vast ocean territories—spanning over seven million square kilometers. These waters not only provide abundant resources but also serve as a real-world laboratory for developing and testing innovative solutions. This unique combination of access, resources, and expertise allows the Nordics to pioneer new applications of ocean assets and scale them effectively. Several factors are driving this opportunity. The region is home to world-class marine research institutions, active industries in ocean sectors, and a strong entrepreneurial culture in the ocean space. These elements create a supportive environment for developing disruptive innovations.

Additionally, global demand for ocean solutions—such as green energy, alternative proteins, clean water, and eco-friendly materials—is pushing for new discoveries and applications. As land becomes increasingly constrained, industries are turning to the ocean to meet the demands of growing populations. The ocean offers critical materials, energy sources, and opportunities for sustainable innovation, such as through marine living resources like algae, seaweed, and fish by-products, as well as ocean physical elements for energy production, urban development, and climate change mitigation. At the same time, new regulations limiting the use of plastics and rising self-sufficiency policies, along with geopolitical tensions, are making the ocean an essential resource for securing new sources of materials, critical materials, and energy. Furthermore, advances in tech, science, and engineering open up new possibilities for utilizing ocean assets in diverse ways.

This segment invites an open-minded approach, encouraging the exploration of all possible new applications of ocean assets, such as:

1. Marine living resources
2. Physical elements
3. Ocean movements, dynamics, and atmospheric interactions
4. Geological and chemical components (non-living resources).

## NEW APPLICATIONS OF OCEAN ASSETS

Finding new ways to use Nordic ocean resources to solve problems and create new products, such as marine-based medicines, algae proteins, and renewable energy solutions like floating solar and wave power.

| Marine living resources | Ocean physical elements | Ocean movements | Non living resources |
|---|---|---|---|
| New uses of algae and seaweed | New uses of ocean surface | New uses of ocean waves and tides | Using of ocean plastics |
| New uses of fish byproduct and overlooked species | New uses of subsea layers | New uses of ocean atmospheric interactions | |
| New uses of marine microorganisms | New uses of ocean water | New uses of ocean water pressure | |

A great example of the potential in this segment is **Kerecis**, acquired by Coloplast for $1.3 billion in 2023. Founded in 2009 in Iceland, the company transformed fish skin—traditionally seen as a low-value byproduct—into a high-value medical product. By using the natural collagen and omega-3 fatty acids in fish skin, Kerecis created a globally recognized wound care solution to treat burns and chronic wounds. This success story demonstrates how underutilized marine resources can be transformed into breakthrough products, showcasing the significant potential of ocean-based innovations.

Moving forward, the most promising solutions in this segment will be those able to provide disruptive value of ocean assets, more than those providing an incremental value, and those solutions capable of transforming low-value ocean assets into high-value applications with significant global impact. We expect incredible breakthroughs in this space, many of which are yet to be discovered, as the ability to harness and repurpose ocean assets continues to evolve.

### 6.2.1 New applications of marine living resources

Advancements in science and technology are unlocking new ways to utilize marine living resources—such as algae, seaweed, fish by-products, and microorganisms—to create sustainable solutions in food, energy, and materials. Once considered underutilized, these resources are now being developed into high-value applications ranging from alternative proteins and bioplastics to health products and biofuels.

Nordic companies are at the forefront of these innovations, transforming marine biomass into commercially viable and environmentally friendly solutions. MAIN AREAS WHERE NEW NORDIC SOLUTIONS ARE EMERGING:

**USE OF ALGAE AND SEAWEED FOR:**

- BIOPLASTICS AND MATERIALS FOR MANUFACTURING AND PRODUCTION: Algae and seaweed are emerging as eco-friendly alternatives for industrial applications, particularly in bioplastics and renewable materials. These resources provide biodegradable and bio-based options that can replace fossil fuel-derived plastics and other synthetic materials. Examples are: **Origin by Ocean (Finland)** that converts invasive algae into bio-based ingredients for packaging, cosmetics, and food production. **Swedish Algae Factory (Sweden)** that utilizes diatom shells from algae to enhance solar panel efficiency, supporting renewable energy applications. **Nordic SeaFarm (Sweden)** that cultivates seaweed for use in biodegradable packaging, sustainable furniture, and food products.
- ALTERNATIVE PROTEINS FOR HUMAN AND ANIMAL FEED: Algae and seaweed are nutrient-rich, making them a valuable ingredient for sustainable protein production. They are being developed into food alternatives for humans and high-protein feed for aquaculture and livestock. Examples are **Nordic SeaFarm (Sweden)**, **Ocean Rainforest (Faroe Islands)** and **Tari (Faroe Islands)** that cultivate seaweed for human food and animal feed: **Algiecel (Denmark)** and **Aliga Microalgae (Denmark)** that develop algae/microalgae protein for food and feed.
- HEALTH COMPOUNDS: Seaweed contains bioactive compounds with potential health benefits, including anti-inflammatory and immune-boosting properties. These compounds are being extracted and developed into natural health supplements and pharmaceutical alternatives. Examples are: **Alginor (Norway)** that extracts compounds from seaweed for anti-inflammatory and immune-support applications, offering sustainable alternatives to synthetic products.
- BIOFUELS: Algae can also serve as a renewable energy source, providing an alternative to fossil fuels through biofuel production. Research and development efforts are focused on refining algae-based biofuels for commercial energy applications. Examples are: **Biofuel Region (Sweden)** that develops biofuels from algae as a renewable energy source.

**USE OF FISH BYPRODUCTS AND OVERLOOKED SPECIES FOR:**

- ALTERNATIVE PROTEINS: Fish processing by-products, such as trimmings and small fish species, can be converted into high-quality protein sources for animal feed and aquaculture. By using these materials, companies are reducing waste while providing sustainable protein alternatives. Examples

are: **Pronofa (Norway)** that utilizes small fish and byproducts from seafood processing to create sustainable protein options for animal feed. **Ava Ocean (Norway)** that innovates with marine bioproducts derived from fish processing waste to improve resource efficiency. **Musselfeed (Sweden)** that processes blue mussels into powder and flour from marine by-products

- PHARMACEUTICAL AND NUTRACEUTICAL APPLICATIONS: Bioactive compounds extracted from fish by-products are increasingly being used in health, nutrition, and pharmaceutical applications. These compounds offer natural alternatives to synthetic treatments, supporting medical and wellness innovations. Examples are: **Pelagia (Norway)** that processes marine byproducts into pharmaceutical-grade ingredients. **Vestland Pharma (Norway)** that produces cod liver oil and other marine ingredients for supplements and medicines. **Smartfish (Norway)** that develops omega-3 formulations for improving metabolic health.
- THERAPEUTIC APPLICATIONS: Fish-derived materials are being harnessed for advanced medical treatments, focusing on tissue regeneration and disease management through innovative applications. Examples are: **Kerecis (Iceland)** that turns fish skin into wound dressings for tissue regeneration. **Regenics (Norway)** that uses salmon roe extracts to develop wound dressings and hydrogels for tissue regeneration. **Marealis (Norway)** that extracts peptides from shrimp shells for blood pressure management.

**USE OF MARINE MICROORGANISMS:**

- CHEMICAL ALTERNATIVES FOR INDUSTRIAL MANUFACTURING: Marine microorganisms offer new solutions for industrial manufacturing by enabling bioprocessing methods that reduce environmental impact. These microorganisms can be used to produce sustainable chemicals and materials, replacing traditional industrial processes that rely on fossil-based inputs. Examples are: **Again.bio (Denmark)** that uses ancient bacteria combined with modern technology to transform $CO_2$ into carbon-negative chemicals, providing sustainable alternatives for industrial manufacturing.

### 6.2.2 New applications of ocean physical elements.

Innovations in using the physical aspects of the ocean—such as its surface, subsea structures, and cold deep waters—are unlocking new opportunities in renewable energy, urban expansion, carbon storage, and industrial efficiency. These advancements leverage the ocean in ways that were previously unfeasible, offering scalable solutions for energy production, climate mitigation, and infrastructure development. Nordic companies are at the forefront of these emerging applications. MAIN AREAS WHERE NORDIC SOLUTIONS ARE EMERGING:

**USE OF OCEAN SURFACE FOR:**

- RENEWABLE ENERGY PRODUCTION: Floating solar technology is making it possible to generate solar power at sea, reducing the need for land-based installations. These systems integrate with offshore infrastructure to optimize energy production. Examples include: **Ocean Sun (Norway)** that develops floating solar arrays in coastal waters for renewable energy. **Alotta (Norway)** that combines solar energy with offshore infrastructure for optimized energy production.
- URBAN DEVELOPMENT: Floating infrastructure is emerging as a solution for coastal cities facing land shortages and rising sea levels. By utilizing ocean space, these structures provide new areas for housing and commercial use. Examples include: **Urban Rigger (Denmark)** that creates floating housing to expand urban areas in coastal regions.
- AVIATION LANDING: The ocean surface is being utilized for seaplane operations, enabling efficient transport and connectivity in coastal and remote areas. Examples include: **Elfly (Norway)** that has developed the first fully electric seaplanes for coastal mobility.

**USE OF SUBSEA LAYERS FOR:**

- CARBON STORAGE: Subsea geological formations, particularly those previously used for oil and gas extraction, are now being repurposed to store $CO_2$ from industrial emissions, reducing greenhouse gases in the atmosphere. Examples include: **GreenSand (Denmark)** and **Norlights (Norway)** that use undersea geological formations, previously used for oil and gas extraction, to store $CO_2$ captured from industrial emissions, reducing greenhouse gases in the atmosphere.

**USE OF OCEAN COLD WATERS FOR:**

- DATA CENTER COOLING: Data centers consume significant amounts of energy to maintain optimal operating temperatures. Using ocean water as a cooling mechanism significantly reduces energy consumption and environmental impact. Examples include: **Orcaconnect (Norway)** that uses submersible, ocean-cooled data centers to leverage the ocean's thermal properties for efficient, sustainable cooling, reducing energy use and the environmental impact.

### 6.2.3 New applications of ocean movements, dynamics, and atmospheric interactions.

Advancements in technology and engineering are opening new ways to harness ocean forces for energy production, climate mitigation, and freshwater generation. By leveraging ocean waves, tides, atmospheric interactions, and water pressure,

Nordic innovators are unlocking new ocean solutions that were previously unfeasible. These technologies present significant opportunities for renewable energy, environmental protection, and resource efficiency. MAIN AREAS WHERE NORDIC SOLUTIONS ARE EMERGING:

**USE OF OCEAN WAVES AND TIDES FOR:**

- NEW SOURCES OF GREEN ENERGY: Ocean waves and tidal currents are powerful and predictable energy sources that can be converted into electricity through specialized technologies. Nordic companies are developing solutions to capture this energy efficiently and integrate it into the renewable energy mix. Examples include: **Minesto (Sweden)** that designs underwater kite-like devices that harness tidal currents to generate electricity. **CorPower Ocean (Sweden)** that produces wave-energy buoys that convert wave motion into electricity. **Tidetec (Norway)** that develops compact tidal turbines for efficient energy capture and deployment.
- PRODUCTION OF FRESH WATER: With freshwater scarcity becoming a growing global challenge, some technologies are now using wave energy to power desalination, offering a sustainable alternative to traditional energy-intensive methods. Examples include: **Ocean Oasis (Norway)** that uses wave energy to convert seawater into drinkable water, providing an innovative solution to freshwater scarcity. **Wavepiston (Denmark)** Deploys a modular wave energy system to generate electricity and desalinated water.

**USE OF OCEAN ATMOSPHERIC INTERACTIONS FOR:**

- MITIGATION OF WEATHER IMPACTS: Ocean-based technologies are being developed to reduce the strength of extreme weather events, such as hurricanes, by altering ocean surface conditions. Examples include: **OceanTherm (Norway)** that is exploring underwater bubble barriers to reduce hurricane intensity by cooling surface waters, helping mitigate storm impact.
- CARBON CAPTURE: Marine photosynthesis is being used to capture $CO_2$ and improve water quality by reducing excess nutrients. Examples include: **AlgaePro (Norway)** that cultivates algae for carbon capture and nutrient removal, enhancing water quality and reducing ocean eutrophication.

**USE OF OCEAN WATER PRESSURE FOR:**

- ENERGY EFFICIENCY DESALINATION TECHNOLOGIES: Seawater desalination is a crucial technology for freshwater production, but it is often energy-intensive. Innovative desalination technologies use the natural pressure of ocean depths to reduce energy consumption and produce sustainable freshwater. Examples include: **Waterise (Norway)** and **Flocean (Norway)** – Develop subsea desalination systems that harness ocean depth pressure to create freshwater with reduced energy.

### 6.2.4 New applications of ocean non-living resources.

While non-living ocean resources—such as minerals and plastics—have long been explored, new innovations are emerging that expand their potential applications across multiple industries. These developments are transforming ocean-derived resources into high-value materials, unlocking new opportunities to be utilized across industries. MAIN AREAS WHERE NORDIC SOLUTIONS ARE EMERGING:

**USING OCEAN PLASTICS FOR:**

- MATERIALS MANUFACTURING AND PRODUCTION: Plastic pollution has become an ocean asset, with an estimated 11 million metric tons entering the ocean each year and is projected to rise to 29 million by 2040.[57] This growing issue presents a significant opportunity to transform ocean plastic into valuable materials for manufacturing and production. Examples of companies in the space include: **AION (Norway)** that converts ocean plastic waste into valuable materials, promoting reuse and reducing environmental harm. **Ogoori (Norway)** that upcycles ocean plastic waste into high-quality regranulate, creating a sustainable circular value chain for manufacturing.

## 6.3 Segment 3: New solutions for ocean exploration, engagement, and extraction

Ocean exploration, discovery, and engagement currently account for less than 15% of the dealflow in the Nordic Ocean Economy. However, its importance is growing rapidly as we enter the "Ocean Rush" era. This era is marked by a global race to explore ocean assets, uncover their potential, and engage with marine environments, alongside increasing competition for critical resources. With more than 80% of the ocean still unexplored, the development of new solutions to fully engage with the ocean represents one of the most significant and transformative opportunities for the future. This vast potential is amplified by advancements in technology and engineering, which are enabling new capabilities for ocean exploration, resource extraction, and environmental management.

The Nordic region, rich in ocean assets and backed by decades of expertise in oil and gas operations, is uniquely positioned to lead in the development of these solutions. Nordic extensive ocean territories hold abundant, yet largely untapped, resources, creating both a pressing need and a unique opportunity for innovation. The region also has a long history of ocean and Arctic exploration, with a legacy spanning early maritime trade routes, Arctic expeditions, and decades of leadership in oil and gas exploration. This combined expertise in exploration and innovation, as well as the

57. https://www.nationalgeographic.com/science/article/plastic-trash-in-seas-will-nearly-triple-by-2040-if-nothing-done

region's strong energy infrastructure, including offshore platforms, pipelines, and maritime facilities, provides a strong foundation for creating the next generation of tools to map, monitor, and access areas of the ocean that were previously out of reach.

Global factors are accelerating the need for innovation in ocean exploration. Emerging trends, like the global race for critical materials and shifting geopolitical dynamics, are intensifying the focus on oceans as a key resource frontier. As demand for minerals, energy, and marine data grows, especially in the Arctic and Greenland regions, competition for marine assets has intensified. Climate change is making these areas more accessible, increasing global interest in technologies that map, monitor, and secure critical resources. This includes accessing untapped resources, establishing trade routes, addressing defense needs, and supporting environmental monitoring. This places the Nordics, with their Arctic expertise and strategic positioning, at the center of a rising global demand for ocean exploration and engagement solutions.

The segment encompasses three key areas:

1. Solutions for ocean exploration
2. Solutions for ocean engagement
3. Solutions for ocean resource extraction

## NEW SOLUTIONS FOR OCEAN EXPLORATION, ENGAGEMENT AND EXTRACTION

Building advanced tools to better explore the ocean, collect data, engage with the ocean and extract resources from it in a responsible way.

| Ocean exploration | Ocean engagement | Ocean resource extraction |
|---|---|---|
| Rada and satelite sensing | Real time communication and connectivity | Seabed mineral extraction |
| Sensors and IoT | Inspection manteinance and repair | Refining and processing |
| Robotics and autonomous systems | Ocean mobility | |

A great example of the potential in this segment is ICEYE, a radar satellite company valued at over $900 million (as of January 2025). Founded in 2014 in Finland, ICEYE revolutionized ocean exploration with its high-resolution satellite imaging technology, capable of capturing detailed images in any weather condition. This capability is crucial for Arctic navigation, resource mapping, and disaster response. ICEYE demonstrates how advanced technologies can transform how we explore, understand, and engage with the ocean, setting a precedent for further innovation in this space.

Moving forward, the most promising solutions in this segment will be those that provide the infrastructure to enable the development of new tools for ocean exploration, discovery, and engagement, or solutions that can support multiple ocean sectors in their exploration and engagement activities.

### 6.3.1 New solutions for ocean exploration.

New technologies are revolutionizing how we explore and understand the ocean. Innovations in data collection, satellite imaging, and autonomous robotics are making ocean mapping, environmental monitoring, and resource exploration more precise and accessible—even in remote or extreme conditions. These advancements are improving our ability to track climate change, assess marine ecosystems, and identify potential resources. The focus here is on gathering data and expanding knowledge of the ocean environment. MAIN AREAS WHERE NORDIC SOLUTIONS ARE EMERGING:

- RADAR AND SATELLITE SENSING: Satellite and radar-based sensing technologies provide real-time insights into ocean conditions, supporting weather forecasting, resource management, and safe navigation. These solutions are particularly valuable for remote areas, such as the Arctic, where traditional monitoring is challenging. Examples include: **ICEYE (Finland)** that provides radar satellite imagery in all weather conditions, supporting Arctic surveillance, ice monitoring, and disaster response. **Quadsat (Denmark)** that develops satellite antenna testing systems to ensure reliable communication for remote ocean applications. **Dynaspace (Norway)** that uses satellite imagery to deliver insights for aquaculture, improving transparency in seafood production.
- SENSORS AND IOT: New sensor and IoT technologies are improving real-time monitoring of marine environments, helping industries optimize operations, increase efficiency, and reduce risks. These systems provide accurate data for decision-making in maritime operations, offshore infrastructure, and resource management. Examples include **Kongsberg Digital (Norway)** that develops advanced IoT-based data platforms and analytics tools to enable smarter maritime operations and real-time decision-making. **SmartOcean (Norway)** that develops IoT-based systems for

maritime data collection and infrastructure monitoring. **Scanreach (Norway)** that combines wireless sensors with IoT technologies to improve communication and operational efficiency on vessels and offshore platforms. **Water Linked (Norway)** that develops underwater communication systems and sensor technology for enhanced exploration and data capture.

- ROBOTICS & AUTONOMOUS SYSTEMS: Systems allow for precise ocean mapping, resource exploration, and monitoring without human intervention. These technologies make it possible to survey deep-sea environments, inspect infrastructure, and track environmental changes in ways that were previously too costly or dangerous. Examples include: **Argeo (Norway)** that provides advanced robotics and geophysical imaging systems for precise underwater mapping, resource exploration, and infrastructure management. **Maritime Robotics (Norway)** that produces USVs and surface drones for infrastructure monitoring and environmental assessments, streamlining routine maintenance.

### 6.3.2 New solutions for ocean engagement.

Unlike exploration and engagement, this category focuses on physically accessing and utilizing ocean resources. Advancements in robotics, imaging technology, and extraction processes are making it possible to retrieve valuable materials from the seabed—such as minerals, metals, and other critical resources—while minimizing environmental impact. These technologies enhance industries like energy production, electronics, and advanced manufacturing, allowing for more efficient and controlled resource utilization. The defining element here is the focus on extracting and processing ocean-based materials for industrial use. MAIN AREAS WHERE NORDIC SOLUTIONS ARE EMERGING:

- REAL TIME COMMUNICATION AND CONNECTIVITY: Seamless data flow and communication are critical for offshore industries, allowing operators to monitor and manage operations remotely. New communication technologies are improving real-time monitoring, vessel coordination, and IoT integration in maritime environments. Examples are: **Ocean Access (Norway)** that focuses on enabling real-time communication and IoT connectivity for offshore operations. **Onomondo (Denmark)** that provides IoT connectivity solutions for seamless data collection and transmission in maritime environments. **Ocean Space Communication (Norway)** that develops control systems for autonomous and remotely operated vessels, enabling seamless communication and operation.
- INSPECTION, MAINTENANCE, AND REPAIR: The ability to inspect, maintain, and repair underwater structures without human divers or downtime is revolutionizing maritime operations. Autonomous and robotic systems are reducing risks, improving efficiency, and minimizing operational disruptions.

Examples are: **Eelume (Norway)** that designs snake-like robots that maneuver through tight spaces to inspect and repair underwater assets, reducing downtime and risk. **ScoutDI (Norway)** that develops drone-based systems for fully digitalized inspections in confined industrial spaces. **Skarv Technologies (Norway)** that offers autonomous systems for inspection, monitoring, and transport, improving efficiency and reducing environmental impact.

- OCEAN MOBILITY: Technologies enabling movement across and within ocean environments are enhancing transport efficiency and operational performance in maritime activities. These solutions support passenger transport, cargo logistics, and overall urban connectivity. Examples are: **Hyke (Norway)** that designs electric, autonomous ferries for urban water transport. **Zeabuz (Norway)** that provides autonomy-as-a-service for electric ferries, enabling urban water transport.

### 6.3.3 New solutions for ocean resource extraction.

Advancements in robotics, imaging technology, and refining processes are enabling more precise and efficient extraction of ocean resources. These new solutions allow industries to access valuable materials from the seabed while reducing unnecessary environmental disruption. They also improve the ability to operate in extreme marine conditions, such as deep-sea environments and remote offshore areas. Nordic innovators are developing technologies that enhance exploration, extraction, and processing of critical materials, supporting key industries like energy, electronics, and manufacturing. MAIN AREAS WHERE NORDIC SOLUTIONS ARE EMERGING:

- SEABED MINERAL EXTRACTION: Seabed minerals, including rare earth elements and critical metals, are increasingly important for industries such as energy storage, electronics, and advanced manufacturing. New methods use robotics and geophysical imaging to locate and extract these resources with precision, avoiding inefficient or excessive material removal. Examples of companies include: **Loke Marine Minerals (Norway)** that focuses on extracting seabed minerals using methods designed to minimize ecological disruption. **Adepth Minerals (Norway)** that utilizes advanced robotics and geophysical tools to explore and assess resources with precision and minimal environmental impact.
- REFINING AND PROCESSING: Once extracted, raw materials need to be refined and processed efficiently to meet industry demands. New refining technologies are improving extraction from both newly mined materials and recycled sources, reducing reliance on raw material mining, and enhancing the availability of rare earth elements. Examples of companies include:

**Reetec (Norway)** – Specializes in refining rare earth elements to support the growing demand for clean energy technologies. **Retein Tech (Sweden)** – Develops advanced chemical processes for recycling and extracting rare earth elements from end-of-life products, helping reduce reliance on raw material mining and supporting a circular economy.

## 6.4 Segment 4: New solutions for value protection, restoration, and management

Ocean value restoration, protection, and management represent an early but critical segment of the Nordic Ocean Economy. While opportunities in this space are few today, this segment holds the potential to redefine how we perceive and interact with the ocean in the coming decades. The core opportunity lies in recognizing the increasing value of ocean assets and building an industry focused on their protection, restoration, and management—what can be called the "ocean asset management" industry.

Unlike other segments that focus on creating value from the ocean, extracting resources, or expanding existing activities, this segment is about safeguarding and managing the value of the ocean itself. Although this may sound futuristic, the need for such solutions will become inevitable as we better explore, measure, and understand the true value of the ocean and as the pressure to protect it grows.

This opportunity is driven by mounting global challenges, such as pollution, climate change, and unsustainable practices that degrade marine environments. The push for ocean protection and restoration comes from multiple sources: environmental movements advocating for healthier ecosystems, coastal populations facing threats from pollution and rising seas, governments recognizing the strategic importance of ocean assets, and supranational organizations like the UN and NATO pushing for better ocean governance and protection.

The Nordic region's reliance on the ocean makes this a pressing priority. With 75% of the population in coastal areas and the Ocean Economy contributing 13% to GDP—well above global averages—the health of ocean resources is essential for industries like shipping, fisheries, and offshore energy, and therefore the Nordics have a vested interest in maintaining the health and value of their ocean assets. Furthermore, the Nordics' deep commitment to sustainability, demonstrated by initiatives like Norway's Sustainable Ocean Plan, sets them apart as global leaders in preserving and managing ocean resources. Moreover, as Arctic nations, they face firsthand the challenges of climate change and environmental degradation, giving them practical experience and a clear incentive to invest in solutions for ocean restoration and management.

The segment encompasses three areas, but due to the limited dealflow in the space as of today we have grouped them into two:

1. Ocean value protection
2. Ocean value restoration
3. Ocean value management

## NEW SOLUTIONS FOR VALUE PROTECTION, RESTORATION AND MANAGEMENT

Creating systems to protect and restore Nordic ocean assets, including pollution tracking, habitat restoration, and better resource management frameworks.

| Ocean value protection | Ocean value restoration | Ocean value management |
|---|---|---|
| Regulation compliance and environmental monitoring | Ecosystem restorations | Marine genetics and bioengineering |
| Climate impact mitigation and adaptation | Pollution removal | Ocean finance |
| Pollution prevention | Waste recovery | Blue carbon credit markets |
| Maritime defence and security | | |

Although this is a new and evolving space, with no established success stories yet, the most promising solutions in this segment will be those that protect or restore the ocean's most valuable assets and introduce disruptive innovations capable of increasing the intrinsic value of these assets.

### 6.4.1 New solutions for ocean assets value protection

As pressures on marine environments grow, new technologies are emerging to protect ocean assets, enforce regulations, and mitigate risks from illegal activities, pollution, and climate-related impacts. These solutions are improving maritime security, enabling real-time environmental monitoring, and strengthening long-term ocean management. Nordic companies are at the forefront of these developments, offering advanced tools that support ocean protection while ensuring compliance with evolving regulations. MAIN AREAS WHERE NORDIC SOLUTIONS ARE EMERGING:

- REGULATION COMPLIANCE AND ENVIRONMENTAL MONITORING: Monitoring marine environments and ensuring compliance with regulations are critical for maintaining the health and value of ocean resources. AI-driven tools, remote sensing, and advanced data analytics are making it possible to detect illegal activities, track biodiversity, and manage marine ecosystems with greater accuracy. Examples are: **Oceanscore (Norway)** that develops AI-driven tools to detect illegal fishing and monitor marine environments in real time. **Klappir (Iceland)** that develops software solutions to monitor and manage environmental impacts in marine and industrial activities, ensuring compliance with sustainability targets. **Spoor AI (Norway)** that uses AI-powered systems to track marine life near shipping lanes and detect environmental violations. **Syrenna (Norway)** advanced sensors for pollution tracking and biodiversity monitoring, supporting resource management and ecosystem restoration.
- CLIMATE IMPACT MITIGATION AND ADAPTATION: Oceans and coastal areas are increasingly affected by climate-related challenges such as rising sea levels, extreme weather, and ecosystem changes. Nordic companies are developing predictive tools and mitigation technologies to address these risks and help maritime industries adapt. Examples are: **Skyfora (Norway)** that offers weather prediction systems to enhance climate adaptation strategies for maritime operations and coastal regions. **7Analytics (Norway)** that utilizes AI to model coastal flood risks, helping safeguard critical infrastructure and vulnerable communities from rising sea levels and extreme weather. **Ocean GeoLoop (Norway)** – $CO_2$ capture and utilization technologies to reduce emissions and mitigate climate change impacts on oceans.
- POLLUTION PREVENTION: Preventing pollutants from entering marine ecosystems is essential for protecting ocean resources. Nordic innovators are addressing pollution at its source, with technologies that intercept waste before it reaches the ocean and reduce industrial pollution. Examples are: **Pinovo (Norway)** that offers solutions for eco-friendly surface preparation and paint removal that prevent microplastics from entering the ocean. **RiverRecycle (Finland)** that focuses on removing plastic waste from rivers before it reaches the ocean, addressing the root cause of marine plastic pollution.
- MARITIME DEFENSE AND SECURITY: Ensuring maritime security and protecting ocean assets from illegal activities requires advanced monitoring technologies. Satellite surveillance, aerial monitoring, and autonomous systems are improving the detection of unauthorized activities and supporting large-scale ocean oversight. Examples are: **Vake (Norway)** – Satellite-based maritime monitoring to detect illegal activities and enhance ocean security. **Kelluu (Finland)** that provides autonomous airships for

continuous aerial monitoring, supporting maritime security and large-scale environmental observation. **Nordic Air Defence (Sweden)** that develops a drone interceptor platform with AI-driven aerial threat detection for maritime protection.

### 6.4.2 New solutions for ocean assets value restoration

The field of ocean restoration is still emerging but is gaining momentum with new technologies that aim to reverse environmental damage and enhance the economic value of marine ecosystems. Advances in pollution removal, waste recovery and ecosystem restoration are helping recover the value of the ocean assets. MAIN AREAS WHERE NORDIC SOLUTIONS ARE EMERGING:

- POLLUTION REMOVAL AND WASTE RECOVERY: New technologies are addressing pollution by removing harmful materials from marine environments and recovering valuable resources from waste. These solutions are helping to clean up oil spills, collect plastic debris, and restore areas affected by industrial activities. Examples include: **Lamor (Finland)** that specializes in oil spill response and environmental cleanup to restore polluted marine environments. **Clean Sea Solutions (Norway)** – Automated systems to collect and remove floating plastic waste from oceans and harbors. **Norwegian Technology (Norway)** that provides waste treatment solutions for offshore and onshore industries.

### 6.4.3 New solutions for ocean assets value management

New technologies are changing how ocean assets such as fish, seaweed, and water are valued, managed, and enhanced. These innovations are not just about improving operations—they focus on recognizing both the intrinsic and economic value of marine resources and actively increasing their worth. This is still a new field in the Nordics, but interest is growing as industries and investors see opportunities to better define, protect, and expand the worth of ocean-based assets. While early, this space has strong growth potential, with new solutions emerging to optimize and scale value creation. MAIN AREAS WHERE NORDIC SOLUTIONS ARE EMERGING:

- BIOENGINEERING OF OCEAN ASSETS: Technologies that modify marine species to enhance their resilience, quality, and suitability for aquaculture and food cultivation through genetic and bioengineering techniques. Examples include: **BMK Genetics** and **AquaGen (Norway)** – Develop genetically optimized fish breeds to improve aquaculture productivity and quality. **Seaweed Solutions (Norway)** – Enhances seaweed varieties for better cultivation through breeding and molecular techniques.

- MONITORING AND ANALYTICS OF OCEAN ASSETS: Tools that manage water quality, ocean conditions, and ecosystem health to ensure operational efficiency and environmental safety. Examples include: **Thalasso (Norway)** and **Thetis (Faroe Islands)** – Provide water quality analytics and safety testing for marine farming and industries. **Microwise (Denmark)** – Offers ballast water testing to prevent invasive species spread.

# 7. THE SUMMARY: the Nordic Ocean Opportunity

Congratulations—you've made it to the end! As we said at the beginning, this report was a journey. Step by step, we've explored the key elements that define the Nordic Ocean Economy opportunity. Along the way, we've uncovered insights, answered important questions, and mapped out a market full of potential. Now, it's time to bring it all together.

Using the FRONTTIER Investment Thesis framework, we've answered five essential questions that help turn a complex market into a clear and compelling investment case:

1. WHAT IS THE OCEAN OPPORTUNITY?
2. WHY INVEST NOW?
3. WHY THE NORDICS?
4. WHAT DOES THE NORDIC OCEAN ECONOMY LANDSCAPE LOOK LIKE?
5. WHERE ARE THE KEY OPPORTUNITY SEGMENTS?

Each section of the report tackled one of these questions in depth. Now that all the answers are in place, this final summary walks through them again—this time all in one place—so you can see the full picture clearly and confidently. Let's go through each question one last time—with the whole opportunity now in view.

### WHAT IS THE OCEAN OPPORTUNITY? THE OCEAN ECONOMY OPPORTUNITY IS THE GAP BETWEEN WHAT THE OCEAN CONTRIBUTES TODAY AND WHAT IT COULD PROVIDE IN THE FUTURE. IT IS ABOUT DISCOVERING, DEVELOPING, AND MANAGING THE OCEAN'S ASSETS FOR GREATER VALUE CREATION.

The ocean is Earth's largest resource, covering about 70% of our planet's surface, holding over 90% of its water, and hosting 80% of its life. Far more than open water, it provides marine life, minerals, and powerful forces—such as waves, currents, and tides—that can be transformed into valuable products and services. Yet its current contribution to the global economy sits at only 3%–5% of GDP (about USD 3–6 trillion each year), leaving much of its true potential untapped.

At the same time, more than 80% of the ocean remains unexplored, meaning most of its species, minerals, and processes are still unknown. In 2015, the United Nations placed a careful value of USD 24 trillion on known ocean assets, a figure that would be around USD 32 trillion today. Given that this estimate is based on only a fraction of the ocean, fully exploring and understanding the ocean of it would likely reveal a

value at least three times higher—above USD 128 trillion—which is similar to the total value of all publicly listed companies in the world. This huge gap between what the ocean contributes today and what it could provide in the future is the essence of the Ocean Economy Opportunity.

The Ocean Economy is the system that creates value from ocean assets—whether by harvesting fish and minerals, generating energy from waves and wind, or providing tourism and transportation services. Because so much of the ocean remains unknown and its resources underused, the Ocean Economy Opportunity lies in finding better ways to tap into these resources and uncovering entirely new ones. Therefore, the Ocean Economy Opportunity consists in the discovering, developing, and managing the ocean's assets for greater value creation. These assets include marine life, water, seabed minerals, and natural processes like waves, tides, and carbon absorption. The opportunity has several dimensions:

1. EXPLORING THE REMAINING 80% OF THE OCEAN. The more we explore the ocean, the more value we can uncover—whether that's new marine organisms for medicines, rare minerals for high-tech industries, or better data for climate forecasting. Advancements in mapping, deep-sea research, and AI-driven sensors are driving a new "Ocean Rush," revealing hidden resources and processes that can transform existing industries and spark entirely new ones.
2. FINDING NEW AND BETTER USES FOR OCEAN ASSETS. The more we understand the ocean, the more we can find new ways to use its resources. Discovering new species, minerals, and natural processes can help solve global challenges. This might mean creating new medicines from marine organisms, using ocean minerals in high-tech industries, or placing solar panels on open waters to produce clean energy.
3. IMPROVING HOW WE CREATE VALUE TODAY. Existing ocean industries—like fishing, shipping, and aquaculture—can innovate with technology to reduce costs, increase efficiency, and minimize environmental damage. For example, autonomous ships can lower fuel use and accidents, AI-driven aquaculture can grow more fish with less waste, and advanced desalination can deliver clean water where it is most needed.
4. SHIFTING HOW WE SEE AND MANAGE THE OCEAN AND ITS ASSETS. As we recognize the ocean's vast potential, a paradigm shift is under way. Rather than viewing it as a free, limitless resource, more stakeholders now see the ocean as a valuable asset that must be actively managed and protected to sustain—and grow—its worth. This "Ocean Asset Management" approach includes restoring ecosystems, preventing overuse of resources, and even creating new market opportunities such as blue carbon credits or habitat restoration services.

In essence, the Ocean Economy Opportunity is about narrowing the gap between the ocean's modest current economic output and its much larger potential value. It is a call to explore uncharted possibilities, reimagine how we can engage and utilize the ocean's vast potential, and position ourselves to effectively seize this emerging multi-trillion-dollar market. For businesses, investors, and governments, it offers a chance to create new markets and expand existing ones, while also solving critical global challenges—like food security, clean energy, and climate change.

This opportunity will shape industries and economies in the decades to come and those able to identify early on these growing emerging opportunities and able to best position themselves to capture this new wave of value creation will be the ones that will win.

### WHY NOW? THE OCEAN ECONOMY IS APPROACHING A TIPPING POINT, DRIVEN BY MULTIPLE FACTORS THAT ARE SETTING THE STAGE FOR THE DEVELOPMENT OF GROUNDBREAKING SOLUTIONS, INNOVATIONS, AND NEW MARKETS IN THIS SPACE IN THE COMING DECADES.

The Ocean Economy is at a pivotal moment. Rapid global changes—ranging from growing populations to new technologies—are creating fresh demand for ocean-based solutions and reshaping how we view and use the ocean. These shifts present significant opportunities for businesses, investors, and governments looking to address new challenges, form new markets, and develop new products or services. Below are four key forces driving these changes and opening doors for innovation in the Ocean Economy:

1. RISING GLOBAL DEMAND IS PUSHING OCEAN INDUSTRIES TO EXPAND.
   As the global population approaches 10 billion, rising incomes and consumption patterns are increasing demand for food, energy, and trade. Seafood consumption is growing rapidly, with fish farming and alternative proteins expanding to meet the need. Offshore energy production—wind, wave, and tidal—is scaling up to support the clean energy transition. Meanwhile, global trade, 90% of which moves by sea, is set to grow 35% by 2050, pushing the shipping industry to expand capacity and adopt efficiency-driven innovations. Companies that enhance food production, energy output, or transport efficiency will have a strong advantage in this evolving market.
2. ENVIRONMENTAL LIMITS ARE CHANGING INDUSTRY PRACTICES.
   Industries reliant on ocean resources—fishing, shipping, and offshore energy—are facing hard limits. Over 90% of fish stocks are at or beyond capacity, and stricter regulations are forcing industries to rethink how they operate. Oil and gas extraction faces rising costs and environmental constraints, while marine pollution, including 11 million metric tons of plastic annually, is drawing scrutiny. This is driving industries to adopt new efficiencies, invest in better resource management, and find more productive ways to extract value. The shift is opening the market for high-efficiency fishing, alternative fuels, and resource optimization.

3. GEOPOLITICAL TENSIONS ARE INCREASING THE STRATEGIC IMPORTANCE OF THE OCEAN. The ocean is becoming a key battleground for resources, trade security, and national interests. Countries are racing to secure critical minerals, such as cobalt and rare earth elements, which are vital for battery production, defense, and electronics. Trade disruptions in key chokepoints like the Strait of Hormuz and the Suez Canal are highlighting the need for maritime security, alternative routes, and supply chain resilience. Meanwhile, new Arctic trade routes are intensifying territorial disputes and driving investments in infrastructure and defense. These and other multiple factors are accelerating the demand for ocean surveillance, deep-sea mining technologies, and strategic resource exploration.
4. TECHNOLOGICAL, SCIENTIFIC, AND ENGINEERING BREAKTHROUGHS. New technologies are making previously unreachable ocean resources accessible. AI, robotics, and satellite monitoring are transforming how industries explore and manage the ocean. Autonomous underwater vehicles (AUVs) and remote sensors are mapping the seabed and finding new resources. Floating wind farms, modular nuclear reactors at sea, and wave energy systems are enabling offshore energy to expand far beyond coastal areas. Engineering advances in materials, desalination, and marine construction are also driving new opportunities. These innovations are reducing costs, improving efficiency, and making previously unfeasible ocean solutions commercially viable.

### WHY FOCUS ON THE NORDICS? THE NORDICS ARE UNIQUELY POSITIONED TO CAPTURE THE OCEAN ECONOMY OPPORTUNITY DUE TO AN UNPARALLELED BLEND OF NATURAL RESOURCES, EXPERT KNOW-HOW, SUPPORTIVE INNOVATION ECOSYSTEMS, AND A CONSISTENT HISTORY OF CREATING WORLD-CLASS OCEAN ENTERPRISES.

The Nordics stand out as global leaders in the Ocean Economy due to their unique combination of abundant ocean resources, deep expertise in ocean industries, favorable innovation conditions specific to ocean-based solutions, and a proven track record of building category winners in the sector and delivering strong investor returns. Below, we break down why these factors give the Nordics an unmatched edge.

1. ABUNDANT OCEAN ASSETS. Nordics benefit from a vast abundance of **ocean assets**. The region's marine territories are often several times larger than their land areas, and its coastline stretches tens of thousands of kilometers. This gives Nordic countries an unfair "natural advantage" in tapping resources like fish stocks, critical minerals, and offshore energy potential. For example:

    - The Nordic region controls over 6.6 million square kilometers of Exclusive Economic Zones (EEZs), alongside a coastline that spans

**98,000 kilometers**. In **relative terms**, the region's ocean territories are almost 2 times **larger than their combined land area**, with Iceland and Norway leading at 7 and 6 times their landmass, respectively.

- This scale translates into enormous access to fish stocks, offshore wind and wave energy, seabed minerals, and other critical resources. Norway alone holds **7.7 billion barrels** of crude oil reserves, Europe's largest. Meanwhile, Greenland is believed to contain **43 of the 50** minerals considered essential for green technologies.

2. DEEP INDUSTRY EXPERTISE AND A STRONG OCEAN ECONOMY TODAY. Nordics already have deep **expertise in ocean industries**. Norway, for instance, leads in global seafood exports, shipping, and offshore energy production. Denmark pioneered offshore wind technology and is home to some of the world's biggest shipping companies. Other Nordic nations excel in advanced aquaculture, oil and gas, or maritime logistics, showing a long-established capacity to harness the ocean for economic gain.

   - Thanks to this wealth of resources, the Ocean Economy already drives a higher share of GDP in the Nordics than in most regions—**15%** on average, compared to **3–5%** globally. In Norway, ocean-based industries account for 40% of total value creation, while in Iceland, Greenland, and Faroe Island, they represent an estimated 25% of GDP.
   - The region leads in key sectors: Norway ranks among the top **seafood exporters** in both volume and value; Denmark has pioneered **offshore wind** since 1991; Finland is a global leader in icebreaker and cruise ship construction; and Nordic shipping companies like Maersk dominate global maritime trade. This established leadership provides the know-how, infrastructure, and global networks needed to scale new ocean solutions.

3. INNOVATION-FRIENDLY ENVIRONMENT. The region has an innovation-friendly environment, driven by high quality talent in the ocean space, leading maritime research institutions, well-integrated maritime infrastructure, and a steady flow of capital into ocean solutions. Nordic investors and government programs actively back startups in marine technology, fisheries, renewable energy, and more, creating the conditions for promising ideas to grow and scale globally.

   - HIGH-QUALITY TALENT: The Nordic region stands out globally for its excellence in entrepreneurship, innovation, and company-building within ocean-based solutions. Investors highlight the region's superior performance, with over 40% recognizing higher entrepreneurship levels, 55% identifying stronger innovation, and almost 50% affirming that Nordic ocean companies demonstrate higher overall quality compared to other regions. This combination positions the Nordics as a leader in delivering top-tier dealflow for ocean-based industries.

- ROBUST INFRASTRUCTURE: The Nordics are home to world-class research institutes like the Technical University of Denmark and the University of Bergen, along with major maritime hubs such as the Port of Gothenburg, which drive R&D and large-scale testing. Collaborative initiatives, such as the Norlights offshore wind project, unite industry and academia to tackle complex ocean challenges. Notably, GlobalConnect's recently completed Nordic digital infrastructure project—the largest in a decade—has installed over 125,000 kilometers of fiber-optic cable, greatly enhancing connectivity and data capacity across the region. This strong foundation positions the Nordics as a leader in innovation and ocean solutions.
- AMPLE CAPITAL: A robust "capital flywheel" anchored in the Nordics' established shipping, fishing, and energy industries drives reinvestment into emerging ocean ventures. Specialized VC funds, corporate venture arms (e.g., Maersk, Equinor), and state-backed investors provide a consistent flow of risk capital across all stages, from seed to IPO. Dealroom.co highlights this unique ecosystem, noting that between 2017 and 2024, over 40% of all VC funding in Norway and Iceland was directed toward Blue Economy ventures—a figure far surpassing the global average. This is further reinforced by a survey of Nordic investors, where 60–70% indicated that funding levels for ocean-related companies are average or above average across all stages of growth.

4. PROVEN TRACK RECORD OF INVESTOR RETURNS. The Nordics have a proven ability to create category winners and build large, valuable companies in ocean-based industries. From shipping giants to disruptive energy and aquaculture ventures, Nordic companies consistently grow into global champions, delivering significant outcomes for early investors willing to take the risk.

    - In public markets, Nordic ocean-related companies are among the region's most valuable. One-third of the top 10 leading Nordic companies by market capitalization are ocean-focused, contributing 21% of the region's total market cap. Major players include Equinor, DSV, Maersk, Aker BP, and Mowi, demonstrating the strength and impact of the region's ocean economy.
    - In private markets, Nordic ocean startups have achieved remarkable success, with companies like Kerecis (valued at USD 1.3 billion), Cognite (valued at USD 1.6 billion in 2021), and ICEYE (valued at USD 900 million in 2024) showcasing the high potential of the region to scale ocean-focused ventures into global leaders.

Taken together, these factors make the Nordics exceptionally well-positioned to capture the Ocean Economy Opportunity.

## HOW DOES THE NORDIC OCEAN ECONOMY LOOK LIKE TODAY? THE NORDIC OCEAN ECONOMY IS A DYNAMIC ECOSYSTEM WITH MANY RISING STARS ACROSS DIFFERENT SECTORS, WHERE THE COMBINED STRENGTHS OF NORDIC COUNTRIES CREATE A STRONG AND COMPETITIVE LANDSCAPE.

The Nordic Ocean Economy is broad and diverse, covering a wide range of sectors and sub-sectors that leverage ocean resources to address major global challenges. These companies operate in every Nordic country, spanning industries such as maritime transport, aquaculture, energy production, health and life sciences, manufacturing, environment, and more. Collectively, they form a thriving ecosystem that positions the Nordics as a global hub for ocean innovation.

Nordic Ocean Economy Landscape by sector:

- TRANSPORTATION: Faced with the need to modernize and meet stricter environmental rules, Nordic companies are introducing battery-powered vessels, alternative fuels like hydrogen and ammonia, and advanced propulsion technologies that reduce emissions. They also develop data-driven logistics tools that optimize routes and improve supply chain efficiency, making maritime transport cleaner and more cost-effective.
- FOOD & WATER: With growing demands on seafood production and increasingly strict regulations, startups in the Nordics focus on precision aquaculture—using AI, sensors, and sustainable feed to boost yields and reduce waste. Other companies explore algae- and seaweed-based proteins for food and animal feed, while advanced desalination and water recycling technologies address global freshwater scarcity.
- COMMUNICATION AND INFORMATION: Technologies like IoT sensors, satellite systems, and autonomous drones are transforming how data is gathered and used at sea. Nordic companies in this area develop real-time monitoring solutions that track ocean conditions, improve safety, and help manage operations—from fishing fleets to offshore energy platforms.
- ENERGY: Building on a history of offshore engineering, the Nordics are ramping up offshore wind capacity—both fixed and floating turbines—and exploring wave and tidal energy solutions. Some firms are even trialing floating solar setups, taking advantage of open-water spaces to produce renewable power.
- HEALTH & LIFE SCIENCES: Marine biotechnology is opening new frontiers for **drug** discovery, nutraceuticals, and medical devices derived from ocean organisms. Nordic research in areas like tissue engineering, anti-bacterial compounds, and functional foods is fueled by the region's rich marine biodiversity and robust R&D infrastructure.

- MANUFACTURING: Companies are leveraging ocean resources to create sustainable materials for industrial use—such as bio-based plastics made from algae or marine sediments repurposed for construction. Some are advancing seabed mining and rare mineral extraction technologies to tap into critical resources hidden in deep-sea environments.
- ENVIRONMENT: Nordic startups are addressing marine pollution, habitat loss, and climate change by pioneering solutions like seagrass restoration, plastic waste collection, and carbon sequestration in decommissioned oil fields. These efforts not only safeguard marine ecosystems but also create new business models, from carbon credits to recycled plastic products.
- LIVING & TOURISM: With coastal populations growing and sea levels rising, innovations like floating infrastructure support housing, commercial developments, and climate adaptation in waterfront areas. Meanwhile, eco-tourism initiatives strike a balance between economic activity and preserving fragile coastal ecosystems, reflecting the region's focus on sustainable development.

Nordic Ocean Economy Landscape by country:

- NORWAY: Strong in aquaculture (especially salmon farming) and green shipping, developing battery-powered vessels, hydrogen fuels, and advanced propulsion. Also a leader in communications & information (e.g., maritime IoT) and transitioning offshore energy expertise from oil to renewables.
- SWEDEN: Focuses on maritime transportation—particularly logistics and propulsion technologies—and wave energy solutions. Additionally, it invests in alternative proteins and sustainable materials, expanding circular economy initiatives and biotech applications.
- DENMARK: A global pioneer of offshore wind, it continues to push turbine tech and related infrastructure. Also excels in transportation (cleaner fuels, emission-reducing propulsion) and food & water solutions, including alternative proteins and precision aquaculture.
- FINLAND: Known for maritime engineering (shipbuilding, advanced propulsion systems) and manufacturing from ocean resources, along with emerging interests in wave energy, thermal storage, and ocean defense/surveillance technologies.
- ICELAND: Leads in marine biotechnology, developing therapies, nutraceuticals, and protein products from ocean organisms. It also leverages renewable energy sources—both geothermal and marine—to innovate in power generation and contributes to environmental solutions around resource management and ecosystem protection.

- FAROE ISLANDS: Fisheries and aquaculture drive the economy, with ongoing efforts to improve sustainability and efficiency. Seaweed cultivation is expanding, with startups developing food, biofuel, and biomaterial applications. The islands also pioneer **tidal energy**, deploying kite technology to harness ocean currents for renewable power
- GREENLAND: Fisheries remain a key economic pillar, with a growing focus on sustainable resource management. Ocean-based transportation is critical for trade and tourism, supporting Arctic wildlife tours and cultural experiences. Meanwhile, the region's seabed holds valuable critical minerals, sparking interest in deep-sea exploration and extraction

Viewing the Nordics as a unified region reveals the full potential of their Ocean Economy. By combining their strengths, the Nordic countries create a stronger, more competitive opportunity, solidifying their position as a global leader in ocean-based industries. This collective approach makes the region far more attractive for investment and innovation than evaluating each country individually.

## WHAT ARE THE MAIN OPPORTUNITIES IN THE SPACE? THE NORDIC OCEAN OPPORTUNITY IS AS VAST AS THEIR SEAS, COVERING THE TRANSFORMATION OF KEY INDUSTRIES, THE DISCOVERY OF NEW USES FOR OCEAN RESOURCES, THE CREATION OF ADVANCED TOOLS FOR EXPLORATION, AND THE DEVELOPMENT OF SYSTEMS TO PROTECT AND RESTORE VITAL OCEAN ASSETS.

The Nordic Ocean Economy presents  four major segments where new technologies, innovative business models, and favorable market conditions are converging to create high-value investment opportunities. These segments and key opportunities identified in this report build on the Nordics' established leadership in maritime industries while also exploring entirely new ways to harness ocean resources. The four key segments are:

1. OPTIMIZATION OF EXISTING OCEAN ACTIVITIES: This is the largest and most immediate investment segment, covering established industries such as shipping, aquaculture, and offshore wind, which together contribute a significant share of Nordic GDP and export revenues. As these sectors face mounting pressures—including stricter regulations, higher resource costs, and growing global demand—there is a pressing need for solutions that boost efficiency, sustainability, and profitability. Key opportunities include:

- THE OPTIMIZATION OF THE SHIPPING INDUSTRY: As global trade expands and environmental rules become stricter, the shipping sector must reduce emissions, increase efficiency, and improve safety. Key opportunities include switching to alternative fuels like hydrogen and methanol, using new

propulsion systems such as wind-assisted and hybrid engines, and digitalizing logistics with IoT and AI for smarter route planning. Additionally, advanced safety technologies are improving crew conditions and making operations more reliable.

- THE OPTIMIZATION OF AQUACULTURE & FISHERIES: Rising seafood demand and stricter regulations are driving the need for more efficient and responsible practices. Key opportunities include expanding offshore and land-based aquaculture to increase production, using AI and automation for real-time monitoring and precision feeding, and improving sustainability with alternative feed sources and technologies that minimize bycatch.
- THE OPTIMIZATION OF OFFSHORE WIND ENERGY PRODUCTION: As offshore wind power continues to grow, there is increasing demand for technologies that lower costs, improve efficiency, and strengthen grid connections. Key opportunities include floating and modular turbines for deep-water deployment, multi-turbine platforms that maximize energy output in a smaller area, and energy storage systems that stabilize power supply. Advanced planning software and predictive analytics are also playing a crucial role in making wind farm development faster and more scalable.

The success story of Cognite—building a **USD 1.6 billion** industrial data analytics platform—underscores the significant upside for **solutions** that help key maritime industries become more efficient and productive. Moving forward, the most successful solutions in this space will be those that are able to combine increased productivity and efficiency for these leading ocean industries with sustainable practices that protect the environment and avoid harm. In the new era, winners will be the companies that can deliver both economic value and environmental responsibility.

2. NEW APPLICATIONS OF OCEAN ASSETS: Roughly a third of the emerging deal flow involves creating **entirely new uses** for ocean resources—turning overlooked or underutilized assets into high-value products and services. With almost **7 million square kilometers** of marine territory, the Nordics can test and deploy these novel solutions on a significant scale. Key opportunities include in:

- NEW APPLICATIONS OF MARINE LIVING RESOURCES: Algae, seaweed, fish by-products, and marine microorganisms are being developed into valuable products across multiple industries. These resources are now used for alternative proteins in food and animal feed, biodegradable bioplastics, and pharmaceutical and health applications. Bioactive compounds from fish and seaweed are being turned into nutraceuticals, wound care treatments, and medical products. Additionally, algae-based biofuels and marine microorganisms are providing new alternatives to fossil-based chemicals in industrial manufacturing.

- NEW APPLICATIONS OF PHYSICAL OCEAN ELEMENTS: The ocean's surface, subsea structures, and deep cold waters are being utilized in new ways for energy production, infrastructure, and industrial efficiency. Floating solar farms are increasing offshore power generation, while floating housing projects expand urban space in coastal areas. Subsea carbon storage repurposes former oil and gas sites to capture emissions. Ocean-cooled data centers are lowering energy use by using deep-sea cold water for cooling.
- NEW APPLICATIONS OF OCEAN DYNAMICS: Companies are harnessing ocean waves, tides, and atmospheric interactions to generate energy, produce freshwater, and reduce climate-related risks. Wave and tidal power technologies are converting ocean movements into electricity, while wave-powered desalination is providing a low-energy method to produce drinking water. Some technologies aim to weaken hurricanes by cooling surface waters, and subsea desalination systems use natural water pressure to generate fresh water with lower energy consumption.
- NEW APPLICATIONS OF MARINE NON-LIVING RESOURCES: Ocean plastics and seabed minerals are being repurposed into new materials for industry, lowering waste and improving resource efficiency. Ocean plastic waste is being recycled and processed into materials for manufacturing, reducing pollution while creating new supply chains. Meanwhile, advancements in seabed mineral extraction focus on reducing environmental impact while accessing critical materials for industrial and energy applications.

The success story of **Kerecis**—transforming fish skin into a billion-dollar wound care product—illustrates the immense upside for ventures that discover, refine, and commercialize **new applications** of ocean assets. Moving forward, the most promising solutions in this segment will be those able to provide disruptive value of ocean assets, more than those providing an incremental value, and those solutions capable of transforming low-value ocean assets into high-value applications with significant global impact.

3. NEW SOLUTIONS FOR OCEAN EXPLORATION, ENGAGEMENT, AND EXTRACTION: Currently less than 15% of deal flow but rapidly expanding, this segment emerges as we enter a global "Ocean Rush" era, driven by demand for critical minerals, climate change pressures, and geopolitical interests. Over 80% of the ocean remains unexplored, representing one of the largest untapped frontiers for discovery and innovation. Furthermore as Arctic melting opens new routes and global competition for marine resources intensifies, ocean exploration solutions could become some of the fastest-growing opportunities in the next decade. Key opportunities include in:

- NEW SOLUTIONS FOR OCEAN EXPLORATION: Technologies are advancing how we map, monitor, and understand the ocean. Satellite imaging, autonomous underwater vehicles, and IoT sensors are enabling more precise data collection, allowing industries to explore remote and uncharted waters with greater accuracy. These innovations support resource discovery, environmental monitoring, and climate research by providing real-time insights into ocean conditions, ecosystems, and underwater structures.
- NEW SOLUTIONS FOR OCEAN ENGAGEMENT: Technologies that enhance real-time communication, robotic inspection, and maritime mobility are transforming offshore operations. New communication systems improve data flow and vessel coordination, while autonomous inspection and maintenance tools reduce downtime and safety risks. Additionally, advancements in electric and autonomous maritime vehicles are improving transport efficiency and connectivity across ocean environments. These innovations optimize resource use, improve safety, and enable more efficient management of ocean-based activities.
- NEW SOLUTIONS FOR OCEAN RESOURCE EXTRACTION: New technologies are enabling the extraction of deep-sea minerals and rare-earth elements with greater precision and reduced ecological impact. Robotics and geophysical imaging are improving seabed exploration, allowing industries to access critical materials needed for energy storage, electronics, and manufacturing. Additionally, advancements in refining and processing are optimizing material recovery from both newly mined and recycled sources, reducing dependence on traditional raw material extraction.

The success story of ICEYE—turning advanced radar satellite imaging into a USD 900 million data platform—demonstrates the immense potential for solutions that transform how we explore and monitor the ocean. Moving forward, the most promising solutions in this segment will be those that provide the infrastructure to enable the development of new tools for ocean exploration, discovery, and engagement, or solutions that can support multiple ocean sectors in their exploration and engagement activities.

4. NEW SOLUTIONS FOR OCEAN VALUE PROTECTION, RESTORATION, AND MANAGEMENT: Though still in its early stages, this segment aims to safeguard, restore, and actively manage ocean assets—recognizing the ocean's growing economic and environmental value. Over time, it could evolve into a large-scale "ocean asset management" industry as businesses, governments, and global institutions act to protect critical marine ecosystems. Key opportunities include in:

- NEW SOLUTIONS FOR OCEAN VALUE PROTECTION: Innovative tools are safeguarding ocean assets by preventing damage and ensuring long-term sustainability. AI-driven monitoring, satellite surveillance, and compliance systems enhance oversight, detecting illegal activities and environmental threats in real time. Climate adaptation and pollution prevention technologies help protect marine ecosystems, while maritime security solutions secure key infrastructure and coastal areas.
- NEW SOLUTIONS FOR OCEAN VALUE RESTORATION: Much of the ocean's valuable assets have already been damaged, and restoration technologies are working to recover what has been lost. Solutions in waste cleanup, oil spill response, and plastic removal are actively rehabilitating marine environments, restoring ecosystems, and reclaiming lost value. These innovations focus on undoing past harm, ensuring that critical ocean resources can regain their economic and environmental significance.
- NEW SOLUTIONS FOR OCEAN VALUE MANAGEMENT: As we better understand the ocean and unlock new ways to generate value from its resources, the overall worth of ocean assets continues to grow. New solutions in this space focus on managing and maximizing this increasing value. Bioengineering innovations improve aquaculture and seaweed cultivation, while advanced monitoring tools optimize water quality and ecosystem health. These solutions not only sustain ocean assets but also create new pathways to enhance their long-term economic and environmental impact.

Although this is a new and evolving space, with no established success stories yet, the most promising solutions in this segment will be those that protect or restore the ocean's most valuable assets and introduce disruptive innovations capable of increasing the intrinsic value of these assets.

IN SUM, THE NORDIC OCEAN OPPORTUNITY IS IN ESSENCE THE UNIQUE CHANCE FOR THE NORDIC REGION TO LEVERAGE ITS STRENGTHS—VAST OCEAN RESOURCES, DEEP INDUSTRY EXPERTISE, AND AN INNOVATION-DRIVEN ECOSYSTEM—TO LEAD IN ONE OF THE LARGEST GLOBAL OPPORTUNITIES OF THE NEXT DECADE. AND MORE THAN JUST A REGIONAL ADVANTAGE, IT IS AN OPEN INVITATION FOR MORE INVESTORS AND OTHER ACTORS TO EXPLORE THIS OPPORTUNITY AND TO BE PART OF THIS VALUE CREATION AND VALUE CAPTURING PROCESS ARISING FROM THE OCEAN POTENTIAL AND ITS ASSETS.

REMEMBER, "*THE SHIP IS SAFE IN HARBOR, BUT THAT'S NOT WHAT SHIPS ARE BUILT FOR.*"—ROALD AMUNDSEN, POLAR EXPLORER.

# About this publication

## The Nordic Ocean Opportunity

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### Nordic co-operation

*Nordic co-operation* is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland and Åland.

*Nordic co-operation* has firm traditions in politics, economics and culture and plays an important role in European and international forums. The Nordic community strives for a strong Nordic Region in a strong Europe.

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