The Ocean Enterprise in 2025

A study of US business activity in ocean observation, measurement, and forecasting in support of the Ocean Economy

FOREWORD

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The ocean is increasingly recognized as a major domain of economic activity. From shipping, ports, offshore energy, fisheries, aquaculture, and tourism to emerging sectors such as marine autonomy and seabed resources, the Ocean Economy is expanding rapidly in scale, complexity, and global significance.

Effective observation, measurement, mapping, modeling, and forecasting of the ocean is a critical enabler of this ocean economic activity. This essential ocean intelligence is delivered through partnerships across government, academia, and industry. At the heart of this Ocean Enterprise is the ecosystem of businesses that develop technologies, systems, and services enabling ocean observation and the transformation of ocean data into actionable ocean intelligence.

Ocean sensors, autonomous systems, mapping technologies, communications infrastructure, data platforms, analytics, artificial intelligence, and forecasting services provide the operational intelligence needed to support safe navigation, resilient coastal infrastructure, offshore operations, environmental stewardship, maritime security, and sustainable economic development. Since the previous Ocean Enterprise report in 2020, the sector has evolved rapidly. Advances in sensors, robotics, machine learning, cloud computing, satellite observation, modeling, and digital twins are transforming our ability to understand and manage ocean and coastal systems while expanding the availability and benefits that ocean intelligence provides across all sectors of the wider Ocean Economy.

The findings contained in this report showcase the increasing scale, diversity, and economic significance of the business component of the Ocean Enterprise. Continued growth in the number of businesses, expanding applications of ocean intelligence, and increasing integration of advanced technologies all point to the growing strategic importance of U.S. Ocean Enterprise business activity and a skilled workforce to support it.

For NOAA and the National Ocean Service, Ocean Enterprise businesses are essential partners. Through innovation and collaboration, they extend the nation's capacity to observe and understand the ocean while accelerating the delivery of new operational capabilities and services.

As the Ocean Economy continues to grow, so will the importance of trusted ocean intelligence. By issuing this report the National Ocean Service offers an important assessment of the current scale and trajectory of the U.S. Ocean Enterprise business sector and its expanding role in enabling a resilient, sustainable, and prosperous Ocean Economy.

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EXECUTIVE SUMMARY

ES1.1 Introduction

The Ocean Economy encompasses the full range of economic activities dependent on the ocean, together with the natural capital and ecosystem services that sustain them.

The ocean is fundamental to life on Earth, comprising approximately 98% of the planet's living space by volume and serving as a cornerstone of global environmental stability, human well-being, and economic prosperity (United Nations, 2025).

Ocean industries, including fisheries, aquaculture, offshore energy, shipping, ports, tourism, marine technology, national defense, and ocean information services, play an increasingly important role in the global economy. Coastal regions host nearly 40% of the world's population and a substantial share of global economic activity (United Nations, 2017). At the same time, the ocean provides essential ecosystem services (Costanza et al, 2014; Dasgupta, 2021), including climate regulation, carbon sequestration, oxygen production, biodiversity support, nutrient cycling, and coastal protection. The ocean absorbs roughly one-quarter of carbon dioxide emissions and more than 90% of excess atmospheric heat, making it central to global climate regulation and resilience.

International assessments by the Organisation for Economic Co-operation and Development (OECD) identify the Ocean Economy as one of the world's fastest-growing economic frontiers (OECD 2016). OECD projections estimate that ocean-based industries could contribute more than $3 trillion in global value added and support approximately 40 million jobs by 2030. The latest OECD assessment, *The Ocean Economy to 2050* (OECD, 2025), highlights accelerating growth across sectors including offshore renewable energy, marine aquaculture, maritime transport, ports, offshore infrastructure, ocean information services, and marine technology. However, the OECD also warns that long-term growth depends upon sustainable management of ocean resources and protection of marine ecosystem services in the face of changing environmental conditions, pollution, biodiversity loss, and overexploitation.

Delivering the ocean data and information needed to enable and support economic use of the ocean and ocean stewardship depends upon a complex ecosystem of organizations, technologies, infrastructure, and services collectively referred to as the Ocean Enterprise.

The Ocean Enterprise encompasses the knowledge, technology, and operational backbone that enables the observation, understanding, and sustainable management of ocean and coastal systems. The Ocean Enterprise is defined as *all entities in the public, private, non-profit, research, and academic sectors that provide infrastructure and capacity for ocean observation, measurement, and forecasting, or who deliver operational ocean information products* (LeBoeuf et al., 2023).

In 2015, the U.S. Integrated Ocean Observing System (IOOS) Program Office within the National Oceanic and Atmospheric Administration's (NOAA) National Ocean Service (NOS) commissioned the 2015 Ocean Enterprise Study (NOAA, 2017). This study sought to assess the size and

characteristics of the private sector component of the U.S. Ocean Enterprise. The subsequent 2020 Ocean Enterprise Study investigated how the sector had developed since 2015 (NOAA, 2021).

This 2025 report builds upon and extends the findings of the 2015 and 2020 studies providing updated insights into the scale, structure, technological evolution, market dynamics, and export performance of the U.S. Ocean Enterprise business sector.

ES1.2 Methodology

As with the 2015 and 2020 studies, the methodology used in the 2025 study comprised a combination of a web-survey of Ocean Enterprise businesses together with secondary analysis of the Ocean Enterprise sector based on public and proprietary business information sources.

The use of secondary analysis was expanded in the 2025 study to provide a more comprehensive assessment of the breadth and depth of the Ocean Enterprise and to take advantage of increasingly powerful sources and methods for identifying businesses belonging to the sector.

In total, the study screened over 4,000 U.S. businesses. Detailed secondary analysis allowed the survey results to be put into the context of the overall population of 1,830 identified Ocean Enterprise businesses.

ES1.3 Key findings

Figure ES.1 provides summary details of the number of Ocean Enterprise businesses, their geographical distribution, their total employment, and the revenue they derive from Ocean Enterprise activities as determined by the 2020 and 2025 studies.

Figure ES.1. U.S. Ocean Enterprise businesses: their geographical locations, employment, and Ocean Enterprise revenue.

2025 U.S. Ocean Enterprise

1,830 BUSINESSES

across

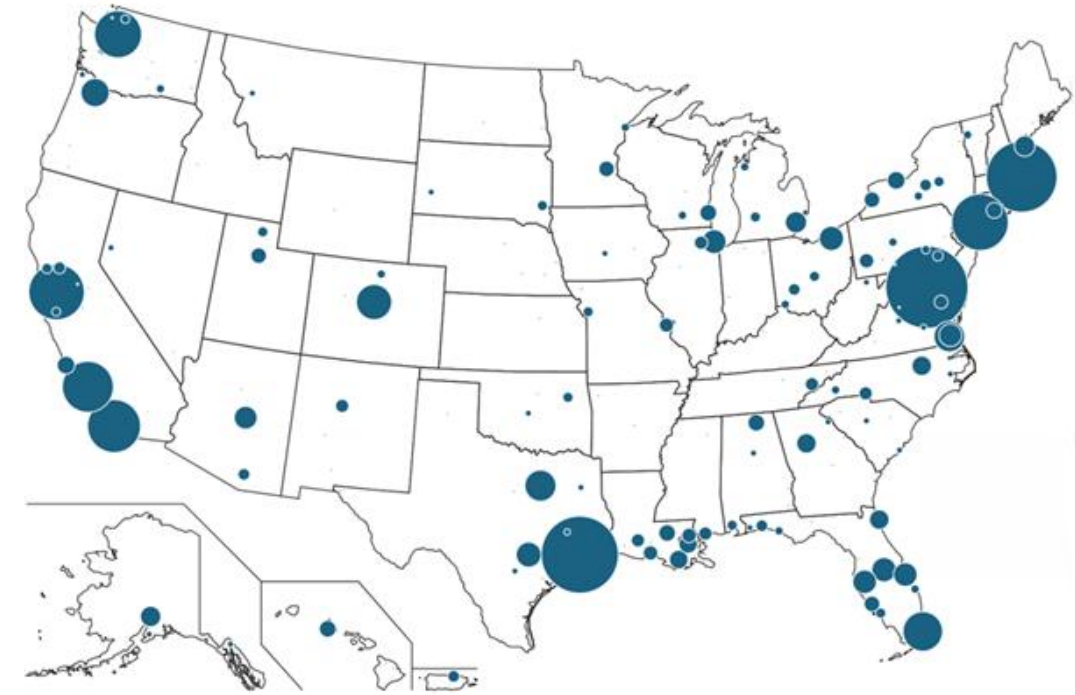
50 STATES

from companies employing

1.4 MILLION EMPLOYEES

generating

$16.4 BILLION OCEAN ENTERPRISE REVENUE



2020 U.S. Ocean Enterprise

1,049 BUSINESSES

across

45 STATES

from companies employing

325,000 EMPLOYEES

generating

$8.8 BILLION OCEAN ENTERPRISE REVENUE

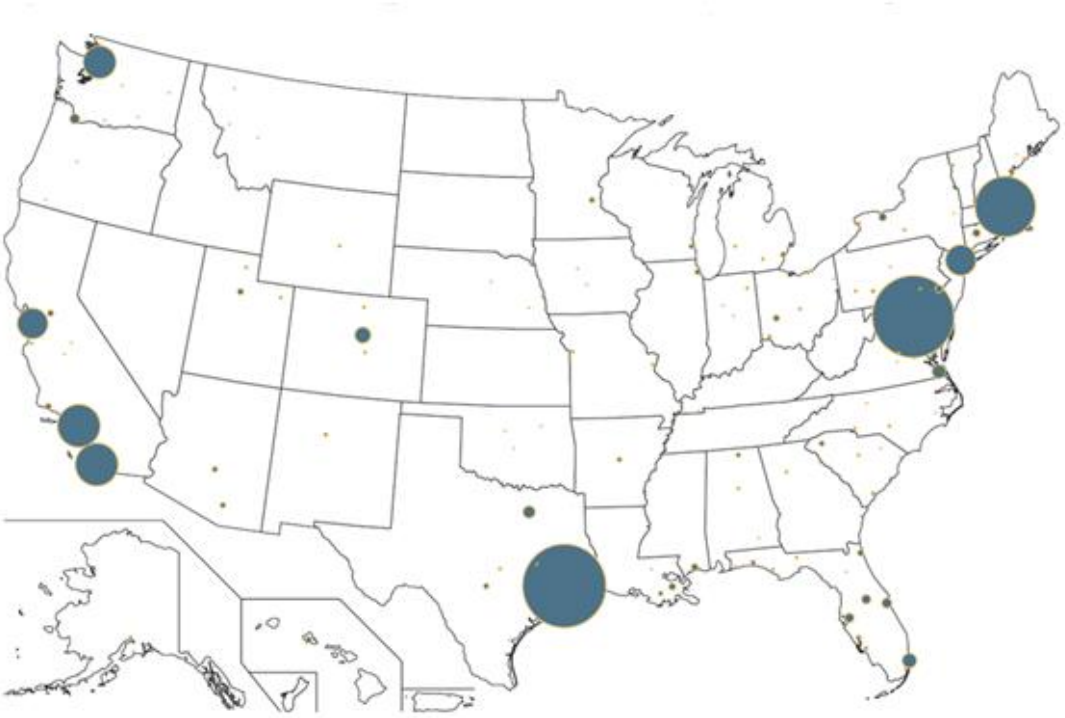


Table ES.1 summarizes key findings from the 2015, 2020, and 2025 Ocean Enterprise studies with 2015 and 2020 Ocean Enterprise revenue adjusted to 2025 values to permit direct comparison.

Table ES.1. U.S. Ocean Enterprise key metrics comparison for 2015, 2020, and 2025.

Ocean Enterprise Indicator	2015	2020	2025
Business Count	410	1,049 [1]	1,830
Revenue (unadjusted)	$7.1B	$8.8B [2]	$16.4B
Revenue (adjusted to 2025) [3]	$9.7B	$11.0B	$16.4B
Employment [4]	245 thousand [5]	325 thousand	2.4 million
Export Share	20%	21%	21%
Export Revenue (unadjusted)	$1.4B	$1.8B	$3.5B
AI Adoption	N/A	N/A	60%

[1] 2020 business count adjusted to account for additional Ocean Enterprise businesses identified during the 2025 study that were also in scope in 2020.

[2] 2020 unadjusted revenue has been corrected to account for the impact of additional Ocean Enterprise businesses identified during the 2025 study that were also in scope in 2020.

[3] 2015 and 2020 revenue estimates adjusted to 2025 value per Consumer Price Index.

[4] Employment reflects total employment of businesses participating in Ocean Enterprise activities, whereas Ocean Enterprise revenue reflects only the Ocean Enterprise share of those businesses' revenues.

[5] Employment in 2015 was originally calculated as a range between 223,000 and 268,000. For this table the average between those two numbers is used.

Key Messages

- The number of identified Ocean Enterprise businesses has almost doubled since 2020.
- Ocean Enterprise revenues grew 49% in real terms between 2020 and 2025.
- Autonomous systems and artificial intelligence (AI) are transforming how ocean intelligence is generated and delivered.
- Ocean Enterprise technologies increasingly serve both civilian and national security applications.
- Ocean observations and ocean intelligence are important elements of strategic national infrastructure.

The *2025 Ocean Enterprise Study* identified 1,830 U.S. businesses active in provision of Ocean Enterprise products and services in all 50 states, the District of Columbia, and two overseas U.S. territories. Total employment for these companies was some 2.4 million employees, and their Ocean Enterprise revenue was estimated at $16.4 billion. This employment figure represents a substantial increase over the 2020 study, and points to the increasing involvement of a number of the larger technology and defense corporations in the Ocean Enterprise sector.

Between 2020 and 2025, the U.S. Ocean Enterprise experienced real dollar growth of 49% with the number of businesses identified as being engaged in the Ocean Enterprise sector increasing by 74%, to a total of 1,830.

The U.S. Ocean Enterprise sector is highly export-driven with approximately 21% of businesses' Ocean Enterprise revenue being from export sales. This is almost double the export share of the overall U.S. economy, where exports of goods and services represented approximately 11.1% of GDP in 2024 (World Bank, 2024). Businesses in the sector export to all regions of the world, with Europe and Asia-Pacific being the most important markets, and with Europe increasing in significance since 2020.

Surveyed businesses were generally more optimistic than might be expected given the survey period's macroeconomic context. Over the coming year, 41% percent of businesses surveyed expected employment increases, compared to 17% expecting decreases. This represents an increase over the 36% reported in 2020. Revenue increases over the same period were expected by 39% of respondents, up from 36% in 2020, while decreases were expected by 16%.

Businesses reported substantially increased market diversification. In 2025, five market sectors were targets for at least 40% of respondents. For all survey periods, academic research was among the top endorsed activities. However, activity for the environmental monitoring market sector dropped sharply in the most recent survey year, from over 60% in both previous survey periods to 40% in 2025.

The five years since the last study have seen growth in the provision of autonomous systems as platforms for ocean observations and measurements. Between 2015 and 2020, the share of technology providers that delivered ocean data platforms, including autonomous underwater and surface vehicles, nearly doubled, and a further 8% increase was seen in this category from 2020 to 2025.

Businesses that provided ocean information services involving physical oceanographic information, already the most important sector in 2015 and 2020, further grew in importance with over 80% of survey respondents using physical oceanographic information in their service offerings. The next most cited categories were hydrographic and bathymetric surveys, shallow geophysical data, and satellite information.

Survey respondents provided information concerning their awareness of IOOS and its future plans, as well as perceived barriers to working with IOOS. The pattern of responses showed a decrease in awareness of IOOS, from 72% in 2020 to 57% in 2025. The most commonly cited barrier to working with IOOS was difficulties or limitations with adapting new technology into IOOS. Limited knowledge about future investments and developments were also commonly cited as barriers to working with IOOS.

The survey provided a unique opportunity to ask about the use of artificial intelligence and machine learning. Overall, 60% of surveyed businesses reported that they used these tools, with

the most common usage being for quantitative tasks such as data interpretation and analysis or predictive modeling.

ES1.4 Conclusions and next steps

The 2025 Ocean Enterprise study demonstrates the continued expansion and growing strategic importance of the U.S. Ocean Enterprise within the broader Ocean Economy. Building on the baseline established in the 2015 and 2020 studies, the findings reveal a sector that has significantly evolved in scale, technological sophistication, and market diversity.

The study highlights how the Ocean Enterprise is transitioning from a sector focused primarily on ocean observations and traditional marine industries toward a much broader operational ecosystem centered on ocean intelligence. Increasingly, value is being created through the integration of sensors, communications systems, cloud infrastructure, artificial intelligence, predictive analytics, and digital platforms that deliver operational information to end users across the Ocean Economy.

Demand for ocean intelligence has accelerated due to several major global drivers shaping the 2025 study period, including post-pandemic economic recovery, rapid digital transformation, heightened geopolitical tensions, climate-related impacts, offshore renewable energy development, and growing concerns regarding maritime security and supply chain resilience.

Growth within the Ocean Enterprise is increasingly being driven by sectors such as offshore renewable energy, maritime domain awareness, coastal resilience, aquaculture, digital ports, autonomous and robotic systems, subsea infrastructure, marine spatial planning, defense, and maritime security.

A particularly important trend identified in the study is the rapid adoption of autonomous and uncrewed technologies. These technologies are reshaping ocean observation by enabling more persistent, scalable, cost-effective, and higher-resolution monitoring of ocean and coastal environments.

The expansion of autonomous systems is also driving demand for enabling technologies such as advanced communications, low-power sensors, cloud computing, edge processing, and integrated digital infrastructure. Artificial intelligence and machine learning are becoming important components of this evolving capability. Of surveyed businesses, 60% reported utilizing AI or machine learning in areas such as predictive modeling, automation, anomaly detection, data interpretation, and operational decision support. Ocean Enterprise businesses are increasingly moving toward the delivery of integrated operational services capable of supporting diverse decision-making across commercial, environmental, and public-sector applications.

The study clearly identified that the boundaries between commercial, scientific, environmental, and defense applications are becoming increasingly blurred. Technologies initially developed for ocean science, fisheries management, hydrography, and offshore energy are now widely applied to maritime security, critical infrastructure protection, and defense operations. Autonomous systems, advanced sensors, satellite-enabled ocean surveillance, digital twins, and persistent

monitoring networks increasingly support both civilian and national security applications, contributing to rising public and private investment throughout the sector. These trends suggest that the Ocean Enterprise should be treated as strategic national infrastructure supporting economic competitiveness, environmental stewardship, and maritime security.

Another major development since 2020 has been the emergence of a more mature innovation ecosystem supporting ocean technology entrepreneurship and commercialization. Dedicated accelerators, incubators, venture networks, and public-private partnerships are helping early-stage companies overcome longstanding barriers associated with ocean technology development, including high hardware costs, limited testing infrastructure, long validation timelines, and complex regulatory environments.

International initiatives such as the "1000 Ocean Startups" coalition under the UN Decade of Ocean Science, along with programs such as NOAA's Ocean Enterprise Accelerators, reflect growing recognition of the importance of innovation and entrepreneurship in addressing ocean sustainability challenges while supporting Ocean Economy growth.

The continued growth of the Ocean Enterprise is also reshaping workforce needs, increasing demand for interdisciplinary expertise spanning ocean science, robotics, engineering, software development, artificial intelligence, cloud computing, and data analytics. At the same time, the sector is becoming increasingly internationalized, with U.S. businesses expanding exports to growing European and Indo-Pacific markets.

The study reinforces the critical role of public-sector investment in sustaining this ecosystem, particularly through NOAA, IOOS, and related programs that provide foundational observing infrastructure, open-access ocean data, forecasting systems, standards, and long-term monitoring capabilities that enable private-sector innovation.

Overall, the findings point toward the emergence of a far more digitally enabled, operationally integrated, and strategically significant Ocean Enterprise than existed five years ago. The sector is evolving from a specialized marine technology sector into a foundational component of the broader infrastructure supporting the wider Ocean Economy. As ocean use intensifies and pressures on marine systems continue to grow, the capabilities delivered by Ocean Enterprise businesses will become increasingly essential for sustainable ocean management, resilient coastal communities, economic competitiveness, and national security.

The study identifies several areas where continued investment and coordination will be especially important. These include sustaining public ocean observing infrastructure and open data systems, accelerating commercialization of emerging technologies, supporting small and medium-sized enterprises, expanding technology testbeds and validation programs, strengthening public-private partnerships, and enhancing workforce development in areas such as robotics, AI, data science, and operational oceanography. Additional priorities include improving standards and interoperability for trusted ocean data, supporting export growth, and strengthening understanding of Ocean Enterprise value chains and economic impacts.

The findings underscore the importance of continued measurement and analysis of the Ocean Enterprise sector as technologies, markets, and organizational structures continue to evolve.

Future research could provide deeper analysis of artificial intelligence applications, digital ocean technologies, defense and dual-use, venture financing trends, regional innovation clusters, international competitiveness, commercial satellite integration, and the contribution of Ocean Enterprise activities to climate resilience and adaptation.

Ultimately, the 2025 study reinforces a central conclusion emerging from all Ocean Enterprise studies since 2015: the ability to observe, measure, model, forecast, and understand the ocean is fundamental to enabling ocean economic activity, environmental stewardship, public safety, and national security.

The Ocean Enterprise is now a foundational component of the nation's ocean infrastructure, transforming ocean observations into actionable ocean intelligence that supports a growing and increasingly complex Ocean Economy.

Sustaining U.S. leadership in this capability will require continued investment, collaboration, and partnership across government, industry, academia, investors, and end users.

1. INTRODUCTION

Before the ocean is an economic domain, it is the foundation for the life support system of our planet and the physical setting for much of life on Earth, with the ocean comprising 98% of our planet's living space by volume (United Nations, 2025). The Ocean Economy extends beyond the measurable economic use of the ocean and its resources. It also encompasses protection and sustainable management of ocean natural capital and ecosystem services upon which human society and the wider Earth system depend.

The ocean is a critical and expanding source of food, energy, and mineral resources, while also serving as the foundation of international trade through maritime transportation. Approximately 40% of the global population resides in coastal regions, and nearly three-quarters of the world's largest cities are situated along coastlines (United Nations, 2017). Coastal zones host a substantial proportion of global economic activity and much of the world's tourism and recreation industries.

Beyond these direct economic contributions, the ocean provides an immense stock of natural capital and ecosystem services that underpin human well-being, climate stability, and economic prosperity (Costanza et al, 2014; Dasgupta, 2021). Marine ecosystems supply food, regulate climate through heat and carbon absorption, generate oxygen, cycle nutrients, protect coastlines from storms and erosion, support biodiversity, and provide cultural, recreational, and tourism benefits. The ocean absorbs approximately 25–30% of anthropogenic carbon dioxide emissions and more than 90% of the excess heat trapped by greenhouse gases (IPCC, 2019; NOAA, 2024), making it a critical regulator of the global climate system.

The first comprehensive global assessment of the Ocean Economy was undertaken by the Organisation for Economic Co-operation and Development (OECD) in 2016 (OECD, 2016). *The Ocean Economy in 2030* identified the ocean as the "new economic frontier" and projected that, under a business-as-usual scenario, ocean-based industries could outpace the growth of the global economy in both value added and employment. The report estimated that the Ocean Economy could more than double its contribution to global value added between 2010 and 2030, exceeding US$ 3 trillion and supporting approximately 40 million full-time equivalent jobs by 2030.

Subsequent OECD analyses have reinforced both the scale of this opportunity and the increasing strategic importance of the ocean within the global economy.

The latest OECD assessment, *The Ocean Economy to 2050* (OECD, 2025), confirms that growth trends have been consistent with the projections presented in 2016 and projects continued expansion through to mid-century. The OECD highlights further strong growth potential across sectors including offshore renewable energy, marine aquaculture, maritime transport, ports, offshore infrastructure, ocean information services, and marine technology. It emphasizes the

growing role of digitalization, artificial intelligence, autonomy, and advanced ocean observation systems in enabling sustainable ocean economic development.

The OECD stresses that realizing this potential depends upon the sustainable management of ocean natural capital and ecosystem services. Their assessments underscore the ocean's critical role in addressing global challenges including food security, climate regulation, the energy transition, resource management, biodiversity protection, and human health. They warn that overexploitation of marine resources, pollution, biodiversity loss, and changing environmental conditions pose significant risks to the long-term resilience and productivity of the Ocean Economy. Sustainable and science-informed approaches to ocean development are identified as essential to securing enduring economic, environmental, and societal benefits.

Reflecting the growing importance of ocean related economic activity, a number of countries have established dedicated "satellite accounts" within their national income accounting frameworks to measure ocean-related economic activity at national and regional levels (Fenichel et al., 2020; Jolliffe et al., 2021).

In the U.S., the Marine Economy Satellite Account (MESA), developed jointly by the U.S. Bureau of Economic Analysis (BEA) and the National Oceanic and Atmospheric Administration (NOAA), provides the nation's most comprehensive national accounting framework for measuring ocean, coastal, and Great Lakes-related economic activity. The first official MESA release, published in 2021, covered the period 2014–2019 (BEA, 2021). It estimated that in 2019 the U.S. marine economy contributed $397 billion, or 1.9%, of national gross domestic product (GDP) and supported 2.4 million jobs. Between 2018 and 2019, the sector expanded at a rate of 4.2%, nearly double the growth rate of the overall U.S. economy.

The latest U.S. Marine Economy Satellite Account, published in 2025 (BEA, 2025) covering the period 2014–2023, estimated that the U.S. marine economy generated more than $800 billion in gross output and contributed over $511 billion to the U.S. GDP. It supported more than 2.6 million jobs across ocean-dependent sectors. The Ocean Economy has continued to outperform growth of the wider U.S. economy and is increasingly recognized as a strategic component of national economic competitiveness.

While the Marine Economy Satellite Account quantifies the economic activities that directly depend upon the ocean, the Ocean Enterprise represents a critical enabling layer within this broader economy. Ocean Enterprise businesses provide the technologies, observations, measurements, forecasts, and information services that enable Ocean Economy sectors to operate efficiently, safely, and sustainably.

Recognition of the need to balance use of the ocean and ocean resources with protection of the essential natural capital and ecosystem services upon which this economy depends has led to a broader definition of the Ocean Economy that incorporates both measurable economic activity and environmental externalities. NOAA and the OECD define the Ocean Economy as *the sum of*

the economic activities of ocean-based industries, together with the assets, goods, and services provided by marine ecosystems (LeBoeuf et al., 2023).

Achieving this balance is particularly challenging given the unique physical, technological, and logistical barriers to operating in the ocean environment. Ocean-based economic activity depends heavily on systematic observations, measurements, and forecasts, which deliver the ocean intelligence enabling effective economic use and environmental stewardship.

These same data and information systems are also critical inputs to weather prediction and climate projection, extending the benefits of ocean monitoring far beyond the ocean and coastal regions and into the wider economy.

Since publication of the *2020 Ocean Enterprise Study*, the strategic importance of ocean information has accelerated significantly. Further growth of the Ocean Economy and the increasing importance of maritime surveillance and security have increased demand for ocean data, mapping, forecasting, and decision-support services. At the same time, advances in sensors, robotics, artificial intelligence, cloud computing, and satellite observation are transforming the means of generation of ocean intelligence.

As the Ocean Economy expands, the ability to observe, understand, forecast, and manage the ocean is becoming ever more central to economic resilience, environmental stewardship, national security, and climate resilience. The Ocean Enterprise represents not only a rapidly growing business sector, but also a foundational enabling capability for the sustainable development of the wider Ocean Economy.

1.1 The Ocean Enterprise

Delivering the ocean intelligence required to support economic use of the ocean and ocean stewardship depends upon a complex ecosystem of organizations, technologies, infrastructure, and services collectively referred to as the Ocean Enterprise.

The Ocean Enterprise comprises the knowledge, technology, and operational backbone that enables the observation, understanding, and sustainable management of ocean and coastal systems. The Ocean Enterprise is defined as *all entities in the public, private, non-profit, research, and academic sectors that provide infrastructure and capacity for ocean observation, measurement, and forecasting, or who deliver operational ocean information products* (LeBoeuf et al., 2023).

The ocean intelligence generated by Ocean Enterprise activities enables operational decision making, enhances environmental stewardship, improves safety and security, and underpins all ocean related economic activity. It enables the wider Ocean Economy supporting safe navigation, offshore energy development, fisheries and aquaculture management, coastal resilience, maritime security, environmental monitoring, climate assessment, and disaster preparedness.

The evolution of the Ocean Enterprise parallels the development of the Weather Enterprise, a mature framework that transforms weather data into operational services supporting transportation, agriculture, energy, defense, public safety, and many other components of the

terrestrial economy. The Ocean Enterprise is evolving into a similar framework for the provision of operational services centered on ocean data, with increasing demand for ocean intelligence driving both technological innovation and the growth of specialized ocean information businesses.

Ocean Enterprise businesses not only design, manufacture, and deploy observation systems. They also add value by transforming ocean data and information into customized ocean intelligence meeting the needs of diverse end users across the wider Ocean Economy. In cases where insufficient publicly available data are available to meet specific end user requirements, Ocean Enterprise businesses frequently generate the new observations, measurements, and forecasts that are required.

Increasingly, the Ocean Enterprise can be viewed as the operational intelligence layer of the Ocean Economy. Through the integration of sensors, observing systems, communications infrastructure, cloud computing, advanced analytics, artificial intelligence, and forecasting systems, Ocean Enterprise organizations transform observations into actionable intelligence supporting decision-making across government, industry, and society.

1.2 The Private Sector Ocean Enterprise

This study focuses specifically on the private-sector components of the Ocean Enterprise.

For the purposes of this study, the U.S. private-sector Ocean Enterprise is defined as U.S.-based businesses that either provide the technological infrastructure required for ocean observations and measurements, or act as intermediaries adding value to ocean data, observations, and forecasts by developing customized products and services for public- and private-sector end users and uses. These private-sector activities form critical components of the value chains that link observational, measurement, and forecast capacity to the realization of socioeconomic benefits.

Although this study does not attempt to quantify the benefits derived from the end use of ocean information, it is important to recognize the broad range of user communities supported and enabled by the Ocean Enterprise. End users include the scientific community, marine and maritime industries, as well as federal, state, and local government agencies that rely on ocean information for regulatory functions, public safety, and environmental protection. In addition, ocean intelligence is increasingly recognized as essential for national security, protection of critical infrastructure, and maritime domain awareness. Citizens are also an important category of end users, particularly in the context of leisure and recreation.

Given the central role of ocean data and information in improving weather forecasting and climate outlooks, Ocean Enterprise benefits extend inland to sectors such as agriculture, transportation, and retail.

The foundation of the Ocean Enterprise rests on three interdependent elements:

1. **Providers** of ocean observing tools, platforms, and data infrastructure.

2. **Producers** of publicly available ocean observations, measurements, and forecasts.
3. **Intermediaries** who transform ocean information into actionable ocean intelligence serving the needs of specific end users and uses.

Providers are predominantly private businesses, including manufacturers of sensors, instruments, and platforms; companies developing data infrastructures for managing and transmitting ocean data; and organizations responsible for the software, models, and analytical tools that transform raw data into usable information. While satellite-based providers technically fall within this definition, consistent with prior studies in 2015 and 2020, this 2025 study only included commercial satellite-based observing technology in cases where ocean-related activities can be disaggregated from broader remote-sensing markets.

Producers of ocean observations are predominantly public-sector entities that deliver ocean data, information, and forecasts as a public good, either free of charge or at cost of distribution. Producers comprise national, regional, and international institutions operating across differing spatial scales. Many countries have established dedicated marine research infrastructure and observatories, while regional collaborations pool resources to enhance coverage and share data.

At the global level, coordination of ocean observation is provided through the Global Ocean Observing System (GOOS), which operates under the auspices of UNESCO's Intergovernmental Oceanographic Commission (IOC) in partnership with the World Meteorological Organization (WMO). GOOS integrates national and regional systems, aligning them within the broader Global Earth Observing System of Systems (GEOSS) framework. Governance is provided by a Steering Committee, three discipline-based Expert Panels (physics and climate, biogeochemistry, and biology/ecosystems), and thirteen GOOS Regional Alliances (GRAs).

Examples of mature national or regional systems contributing to GOOS include Australia's Integrated Marine Observing System (IMOS), Ocean Networks Canada and the Canadian Integrated Ocean Observing System (CIOOS), the Japan Oceanographic Data Center (JODC), EuroGOOS, the European Union's Copernicus Marine Environment Monitoring Service (CMEMS), the European Marine Observation and Data Network (EMODnet), NOAA's Global Ocean Monitoring and Observing Program (GOMO), and the U.S. Integrated Ocean Observing System (IOOS).

U.S. IOOS comprises a national–regional partnership of 17 federal agencies and 11 Regional Associations established under the 2009 Integrated Coastal and Ocean Observation System (ICOOS) Act (Public Law 111-11). The ICOOS Act was subsequently reauthorized and updated through the Coordinated Ocean Observations and Research Act of 2020 (Public Law 116-271). Together, these statutes mandate the establishment and maintenance of a nationally integrated system of ocean, coastal, and Great Lakes observing systems coordinated at the federal level, with the mission "to produce, integrate, and communicate high quality ocean, coastal, and Great Lakes information that meets the safety, economic, and stewardship needs of the Nation."

Alongside public-sector producers, some end users commission their own ocean observations, measurements and forecasts when operational requirements cannot be met using publicly available data and information. In these cases, contracts are often awarded to commercial intermediaries, who undertake observations, measurements, analysis, and modeling on behalf of their end user customers. In some cases, such privately collected data and information is subsequently incorporated into public repositories, either because of regulatory obligations or through voluntary contributions.

Intermediary roles may be fulfilled by a single organization managing the entire data-to-information service chain or may be divided among multiple actors specializing in components of the overall value chain.

A more recent development has been the emergence of public–private partnerships, within which Ocean Enterprise businesses undertake observation, measurement or forecasting and then license the resulting data and information for public or private use.

In this study, business intermediary activity is defined as including all commercially contracted services encompassing the collection of ocean observations, the processing and analysis of data, and the generation of customized information services for specific end users or uses. Illustrative examples include site characterization and design criteria for offshore energy infrastructure, ocean forecasts for shipping or recreational activities, and coastal flood risk assessments for insurance companies or municipalities.

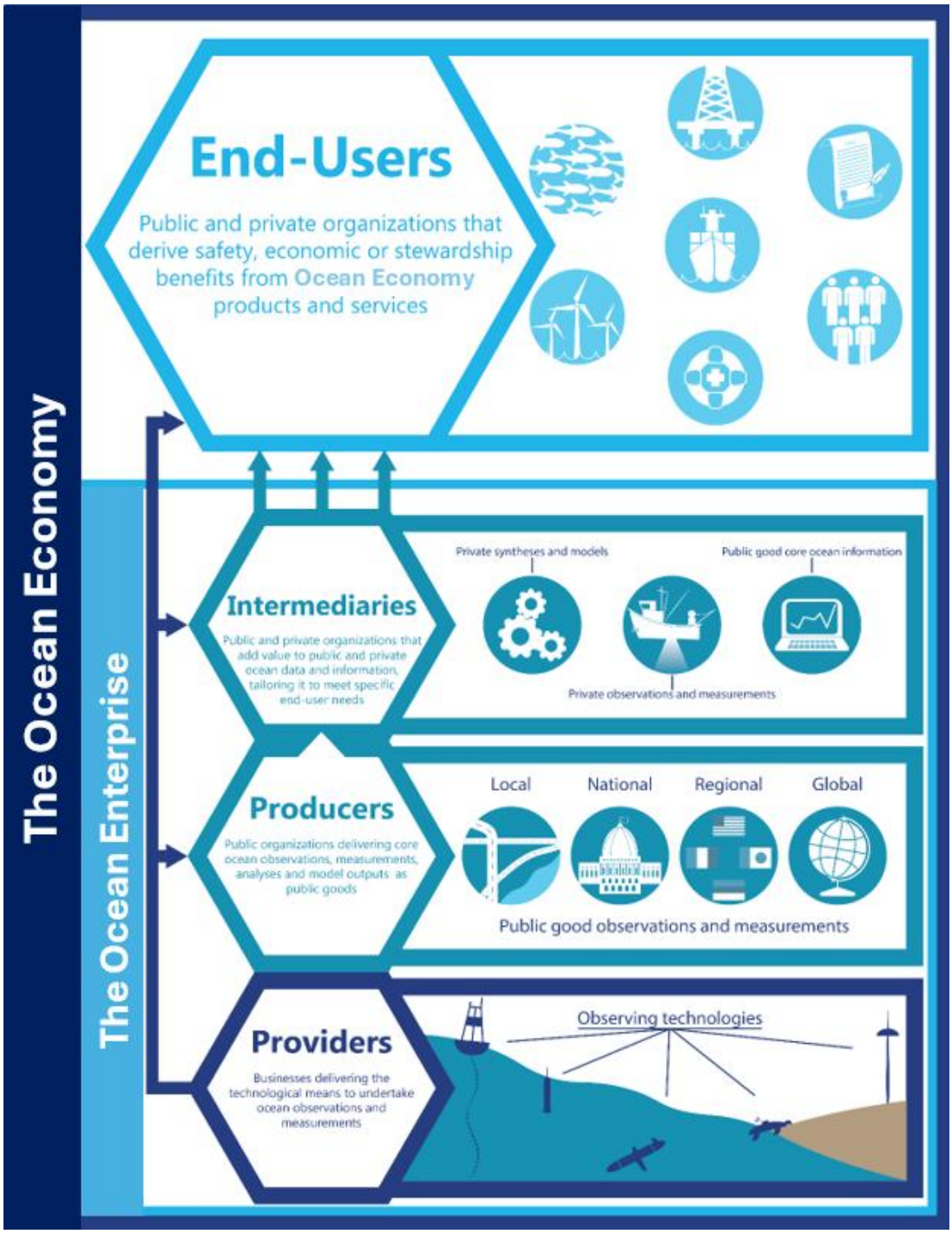


Figure 1.1. The principal components of the Ocean Enterprise.

1.3 The Ocean Enterprise in 2025

As part of its mission, NOAA[1] and IOOS seek to engage with U.S. businesses that are providers of the technological means to gather ocean data; act as intermediaries in generating value-added services based on ocean data and information; or are end-users deriving safety, economic, or stewardship benefits from use of the resulting ocean intelligence.

In 2015, IOOS and NOAA's National Ocean Service (NOS) commissioned the *2015 Ocean Enterprise Study* (NOAA, 2016; Rayner et al., 2019), a first of its kind evaluation of the scale and scope of the U.S. Ocean Enterprise provider and intermediary business activity.

A key objective of the 2015 study was to raise visibility and awareness of the Ocean Enterprise business sector's importance and to improve the understanding of its engagement with NOAA and the IOOS Program.

In the period since the publication of the *2015 Ocean Enterprise Study*, there has been increasing recognition of the growth potential of the Ocean Economy and, in turn, the Ocean Enterprise business activities that are essential to support delivery of this potential.

To better understand how U.S. Ocean Enterprise businesses are responding to the opportunities afforded by a growing Ocean Economy, and to help guide how NOAA might best support U.S. Ocean Enterprise activity, NOAA commissioned a repeat Ocean Enterprise study in early 2020.

This Ocean Enterprise 2025 study report builds upon and extends the findings of the 2015 and 2020 studies, providing updated insights into the scale, structure, technological evolution, market dynamics, and export performance of the U.S. Ocean Enterprise business sector.

The period between 2020 and 2025 has been one of significant growth and transformation for both the wider Ocean Economy and the Ocean Enterprise that supports it. While the 2020 Ocean Enterprise Study documented a sector that had successfully navigated major changes in energy markets and demonstrated resilience during the onset of the COVID-19 pandemic, the years that followed have seen accelerating technological innovation, expanding applications of ocean intelligence, and growing recognition of the strategic importance of ocean information.

At the global level, the ocean is increasingly viewed as a critical domain for economic development, environmental stewardship, climate resilience, energy transition, food security, and national security.

In the United States, growth in sectors such as offshore energy, coastal resilience, marine technology, maritime transportation, aquaculture, and ocean data services has increased demand for ocean observations, measurements, forecasts, and decision-support products. At the

[1] As an Agency of the Department of Commerce, engagement with industry is an important part of NOAA's mission. All NOAA Line Offices interact with Ocean Enterprise businesses to a lesser or greater degree. NOAA programs such as the Office of Coastal Management (OCM), the Center for Operational Oceanographic Products and Services (CO-OPS), the National Data Buoy Center (NDBC), the Global Ocean Monitoring and Observing program (GOMO), the NOAA Office of Coast Survey (OCS), and the NOAA IOOS Program are closely engaged with Ocean Enterprise Provider businesses and with Intermediary businesses that make use of NOAA data and information in developing products and services with a wide range of end-uses and end-users.

same time, increasing awareness of sea-level rise, coastal flooding, marine heatwaves, and extreme weather events, has expanded the range of public and private-sector users dependent upon timely and reliable ocean information.

The period since the 2020 study has also seen rapid technological change. Advances in sensors, autonomous and robotic systems, satellite observations, communications technologies, cloud computing, high-performance computing, and advanced modeling have significantly expanded the ability to observe and understand ocean and coastal environments. These developments have reduced the cost of data collection, increased the spatial and temporal coverage of observations, and accelerated the delivery of operational ocean information.

Perhaps most significantly, the emergence of artificial intelligence and machine learning technologies is beginning to transform how ocean data are collected, processed, analyzed, and applied. These technologies are increasingly being used for sensor output processing, automated quality control, feature detection, forecasting, digital twins, decision support systems, and the management of autonomous observing platforms.

The growing adoption of autonomous and uncrewed systems since 2020 has been particularly notable. Autonomous surface vehicles, underwater vehicles, remotely operated systems, and distributed sensor networks are changing the economics of ocean observation and enabling persistent monitoring at scales that were previously impractical or prohibitively expensive. These developments are creating new markets for sensors, communications systems, software, analytics, and operational services throughout the Ocean Enterprise.

At the same time, the distinction between commercial, scientific, environmental, and national security applications of ocean technology has become increasingly blurred. Many of the technologies that support environmental monitoring, offshore infrastructure development, and maritime operations also have applications in maritime domain awareness, critical infrastructure protection, seabed monitoring, and defense. This growing convergence has increased interest in Ocean Enterprise technologies as strategic national capabilities and has created new opportunities for businesses operating within the sector.

These developments are occurring alongside a broader transition toward a digitally enabled Ocean Economy in which ocean observations, environmental intelligence, predictive analytics, and decision-support services are essential components of economic activity.

Increasingly, ocean information has become a form of strategic infrastructure underpinning activities such as navigation, offshore operations, fisheries management, coastal planning, insurance, finance, energy development, and national security.

Against this backdrop, this 2025 study provides an updated assessment of the scale, structure, and economic significance of U.S. Ocean Enterprise business activity. Building upon the baseline established by the 2015 and 2020 studies, it examines how the sector has evolved over the past five years, quantifies its current contribution to the U.S. economy, and identifies key technological, market, and organizational trends shaping its future development.

The findings presented in this report suggest that the period from 2020 to 2025 can be characterized not simply as one of growth, but as a period in which the Ocean Enterprise has evolved from a sector primarily focused on ocean observation toward one increasingly focused on the delivery of operational ocean intelligence. This evolution is reshaping both the structure of the sector and its importance within the wider Ocean Economy.

Taken together, these developments suggest that the Ocean Enterprise is entering a new phase of maturity. No longer viewed solely as a supporting component of ocean science, the Ocean Enterprise is increasingly becoming a strategic sector, providing the operational ocean intelligence, digital infrastructure, and technological innovation required to support a growing, sustainable, and secure Ocean Economy.

2. METHODOLOGY

2.1 Background

While the primary goal of this 2025 study is to provide an update on the 2015 and 2020 work, it also provided an opportunity to improve methods and apply lessons that were learned during both previous studies. Applying this experience resulted in a comprehensive multi-method design that generated a uniquely detailed profile of U.S. Ocean Enterprise business activity.

The overall approach was to create a database of all known U.S. businesses that are Ocean Enterprise providers and/or intermediaries, and to survey a representative sample of these utilizing a web-survey. Results of the web-survey were combined with a detailed secondary analysis on all businesses contained in the database. The analysis presented in this report draws on data from these two main sources:

- **A database of web-survey responses:** Survey respondent data supported a sample-based analysis, which could then be generalized to an overall Ocean Enterprise population level.
- **Secondary Ocean Enterprise information:** Secondary data sources do not rely on direct reporting from individuals in target businesses, such as through surveys or interviews. Public and proprietary sources were analyzed to build a database of U.S. Ocean Enterprise businesses and their economic characteristics. Sources included annual reports, Dun & Bradstreet listings, Securities and Exchange Commission (SEC) filings, company websites, and other publicly available information. These sources provided details on corporate structure, locations, employment, revenue, industry focus, and other indicators. Appendix 1 provides a more detailed description of the secondary analysis methodology.

2.2 Creation of a Database of Ocean Enterprise Businesses

An initial database of businesses was compiled from multiple sources. First, lists of businesses that might provide Ocean Enterprise activities were obtained from professional and industry associations, industry-specific email and contact lists, and lists provided by federal agencies and an array of IOOS stakeholders. As it was initially unknown if any individual business on these lists conducted activities that would classify them as belonging to the Ocean Enterprise sector, this represented a "wide net" approach that required further screening. Initially, the aggregated list was screened to eliminate any businesses obviously uninvolved in Ocean Enterprise Provider and/or Intermediary activities, as well as those with no operating locations in the United States.

The final database of included businesses for the web-survey comprised contacts at 2,768 companies.[2] Given this large and purposely overly inclusive list, the survey design relied upon screening questions to ensure only businesses who conducted Ocean Enterprise activities were asked to respond to the full survey instrument.

[2] Multiple contacts were often obtained for individual companies.

2.3 Outreach and Survey Administration

Initial outreach efforts designed to inform businesses of the upcoming survey were conducted through announcements in industry publications, information posted on the NOAA website, social media, and through announcements at relevant industry meetings and conferences. Due to the large database of potential Ocean Enterprise businesses, survey invitations were sent in waves of 100 to 300. Prior to each wave of survey invitations, an informational email was sent from NOAA IOOS informing the recipient of the upcoming survey, providing links to further information, and offering the option to go directly to the survey. The first survey invitations were sent out in June 2025, with survey activities continuing through October 2025. Successive waves of invitations were sent out weekly. Reminder emails were sent out after two weeks with no response, and weekly for up to 10 weeks. In total, 12 waves of invitations were sent out with accompanying reminders following. In total, approximately 18,000 emails were sent including informational outreach, invitations, and reminders.

The web-survey obtained responses from 218 individual businesses engaged in the Ocean Economy, 192 of which engaged in Ocean Enterprise activities. This compared with 159 responses to the 2015 survey and 128 responses to the 2020 survey.

The full survey instrument can be found in Appendix 3.

2.5 Secondary Data Analysis and Representativeness of the Survey Sample

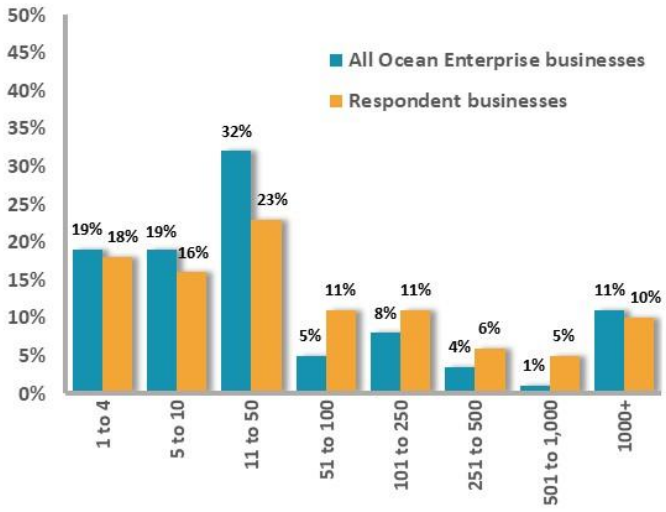
Secondary analysis of the initial database of potential businesses that might be engaged in Ocean Enterprise activities proceeded in parallel with the web-based survey.

Screening of all businesses in the full database identified 1,830 as having Ocean Enterprise activities. Based on this total, the web-survey response rate comprised just over 12% of the total population of Ocean Enterprise businesses.

A key goal of the web-survey was to obtain responses that were representative of the overall population of Ocean Enterprise businesses, especially with respect to company size.

As shown in Figure 2.1, the employment size categories for the survey sample and the overall Ocean Enterprise population, determined from secondary analysis, closely correspond. The biggest differences lie within some of the mid-sized employment categories, with the "11 to 50" category slightly under-represented in the sample and the "51 to 100" category slightly over-represented. It is notable that the proportion of businesses with 1,000 or more employees is very similar.

Figure 2.1. Size of survey respondent and total Ocean Enterprise businesses.



2.6 Function of Survey Respondents

For any survey, collected information is only as good as its source. An indicator of the reliability and validity of the collected information is the appropriateness and knowledge of the individuals who responded to the web-survey. Figure 2.2 profiles the job categories of the individuals who provided full survey responses. As individuals were allowed free-text entry of their job titles, responses were coded into the three categories shown. Of particular interest was the high share of respondents, 91%, who were executives or managers of their respective businesses; this gives the responses particular merit as representative of the overall, strategic view that corporate executives tend to reflect. This is not to say that technical specialists' views would not have been of interest, only that the survey should be understood as reflecting an executive/managerial perspective rather than a technical one.

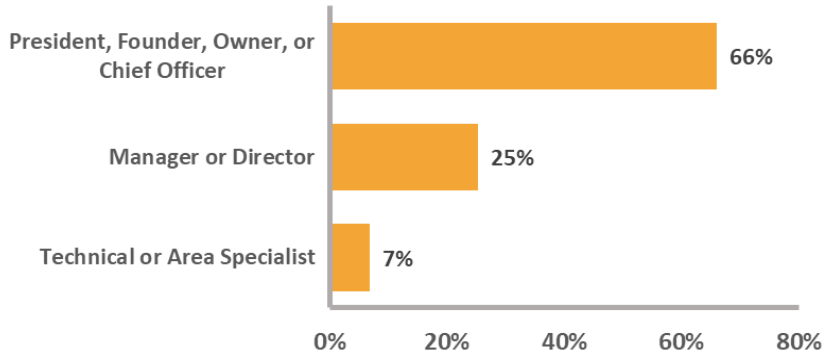


Figure 2.2. Function of survey respondents.

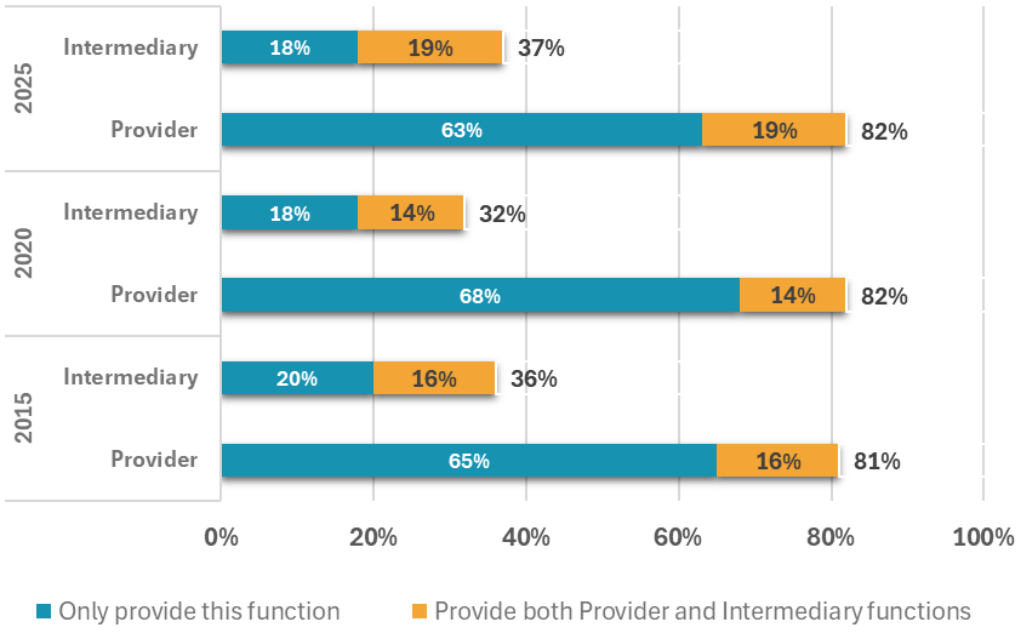
2.7 Organization Function

The survey's screening question categorized Ocean Enterprise respondents' activities between:

- Providers of sensors, instruments, platforms, and associated infrastructure for ocean observation and measurement.
- Intermediaries that make use of ocean, coastal and Great Lakes observations, measurements, and models as an input to the creation of value-added information services in support of specific end-uses.

In 2025, most respondent businesses (63%) identified themselves as Providers, 18% of respondents identified themselves as performing activities as an Intermediary, and 19% indicated they performed both functions. This yielded a combined 82% of respondents that were Providers and a combined 37% that were Intermediaries (Figure 2.3).

Figure 2.3. Business function of respondents.



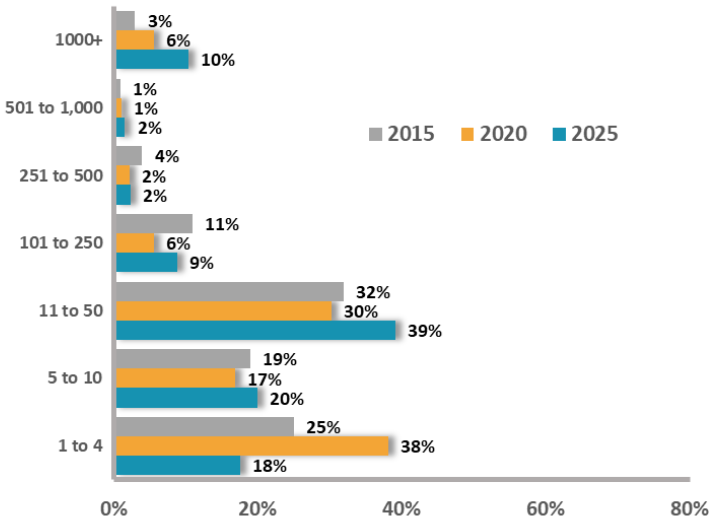
3. STUDY FINDINGS

3.1 Company Size

3.1.1 Business size of survey respondents

Figure 3.1 shows the total employment of respondent businesses for all three study periods. In 2025, 18% of respondent businesses reported fewer than five employees; a decrease from both the previous time-points. For all survey periods, there was a large proportion of respondent businesses with between 11 and 50 employees, reflecting a tendency for many Ocean Enterprise businesses to be small to medium-sized businesses.

Figure 3.1. Business size of survey respondents.



3.1.2 Comparative size of all Ocean Enterprise businesses, survey respondents, and all U.S. businesses

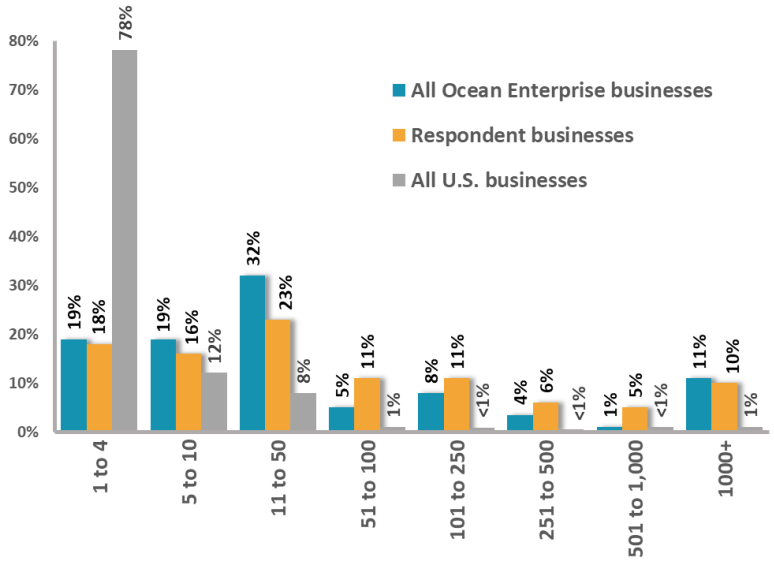
Figure 3.2 shows the distributions of business count by employment size for three groups:

- The 2025 survey respondents.
- The larger universe of businesses identified as conducting Ocean Enterprise activities.
- Businesses in the overall U.S. economy.

As shown, when compared with the U.S. distribution, small businesses (those with more than 10 and fewer than 500 employees) are more prevalent in the Ocean Enterprise sector compared to the overall economy, while micro businesses (those with fewer than 5 employees) are less common.

An examination of employment size by Ocean Enterprise function (Figure 3.3) shows that Providers were somewhat more concentrated in the smaller

Figure 3.2. Total employment of Ocean Enterprise businesses compared to all U.S. businesses



employment categories, while Intermediaries were more represented in the largest category. For example, 19% of Providers had between one and four employees, compared with 15% of Intermediaries, and 22% of Providers had five to ten employees, compared with 17% of Intermediaries. At the upper end, 15% of Intermediaries had 1,000 or more employees, compared with 12% of Providers.

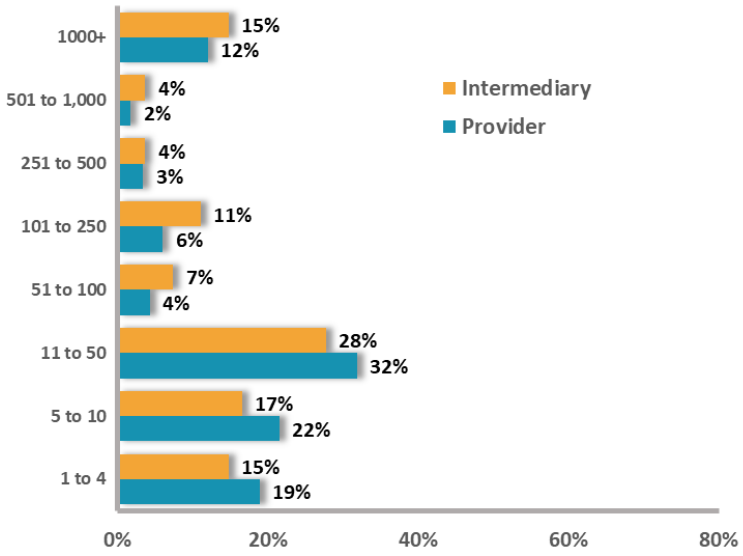


Figure 3.3. Total employment of respondent businesses by function.

3.2 Corporate Structure

The 2025 survey asked, in very precise terms, about the structure of respondent businesses. As shown in Figure 3.4, the most common structural type by a wide margin was "one location, multiple employees" (42%). This is not surprising given the large number of small businesses that are contained in the Ocean Enterprise population.

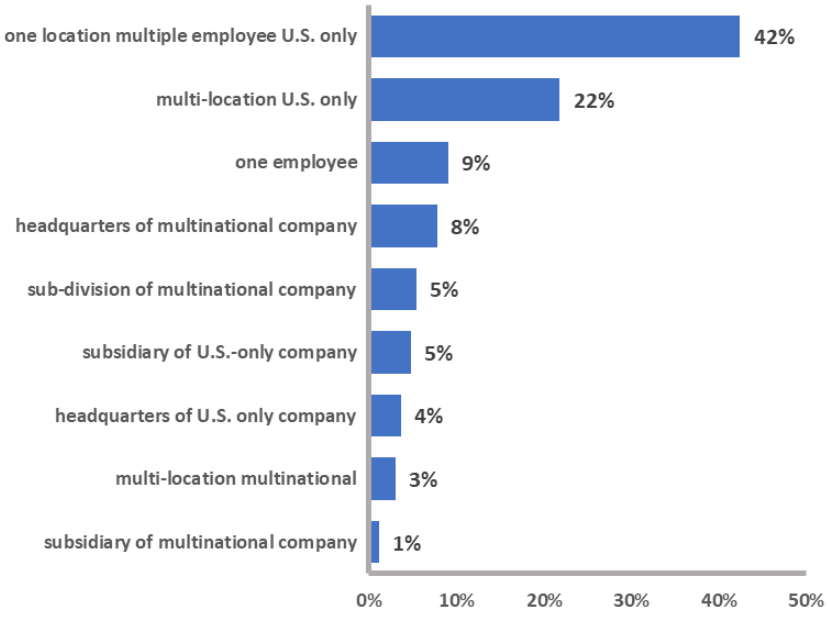


Figure 3.4. Structure of respondent businesses.

3.3 Location Dynamics

3.3.1 Number of locations

The number of respondent discrete locations is displayed in Figure 3.5. Relative to 2015, both subsequent survey years show a far larger proportion of businesses that operate from a single location. The sharp increase in businesses with 10 or more locations since 2020 may reflect difficulty contacting those companies during the pandemic period.

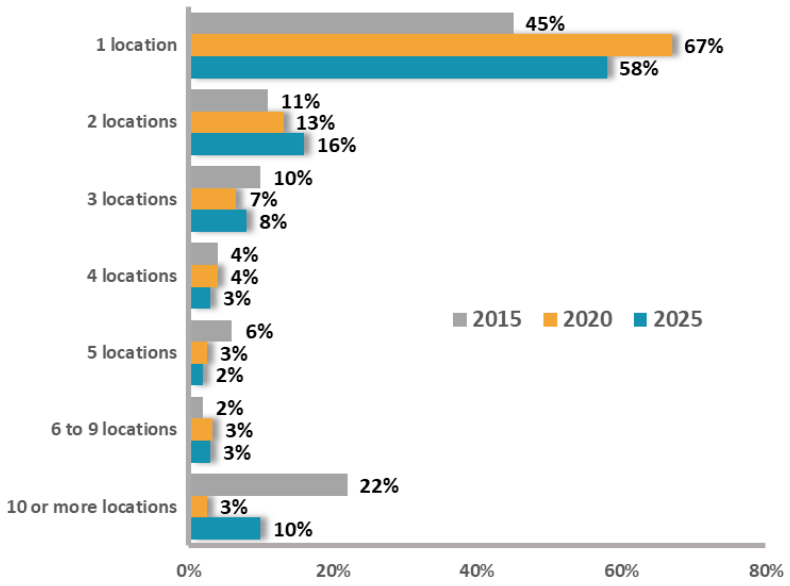


Figure 3.5. Number of discrete locations operated by respondent businesses.

3.3.2 Number of foreign locations

Figure 3.6 shows the number of non-U.S. locations operated by respondents' businesses for all survey periods. With 58% of respondents indicating they are one-establishment businesses (see Figure 3.5), it is not surprising that, similar to the 2020 survey period, the great majority (84%) of respondents report their business as operating solely within the U.S. This reflects an increase in U.S.-only businesses compared with 2015. There was a small increase in the proportion of businesses who reportedly had 10 or more foreign locations in 2025 as compared with 2020.

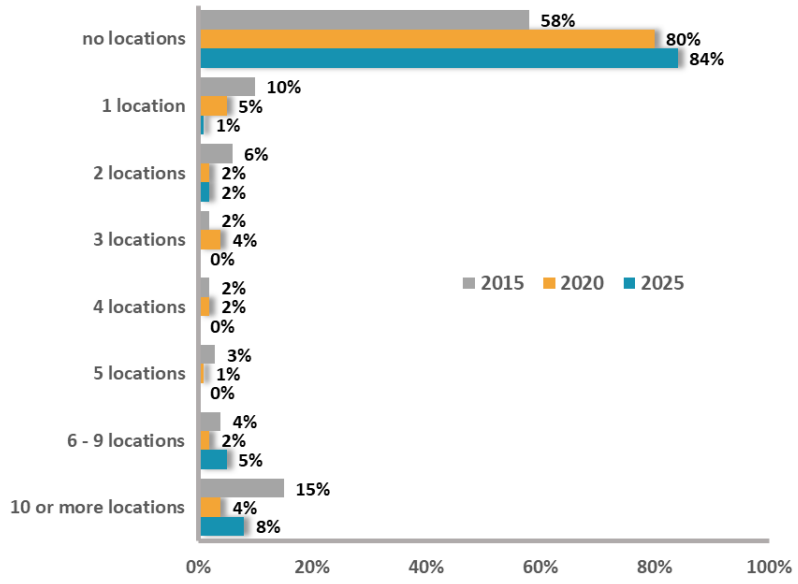
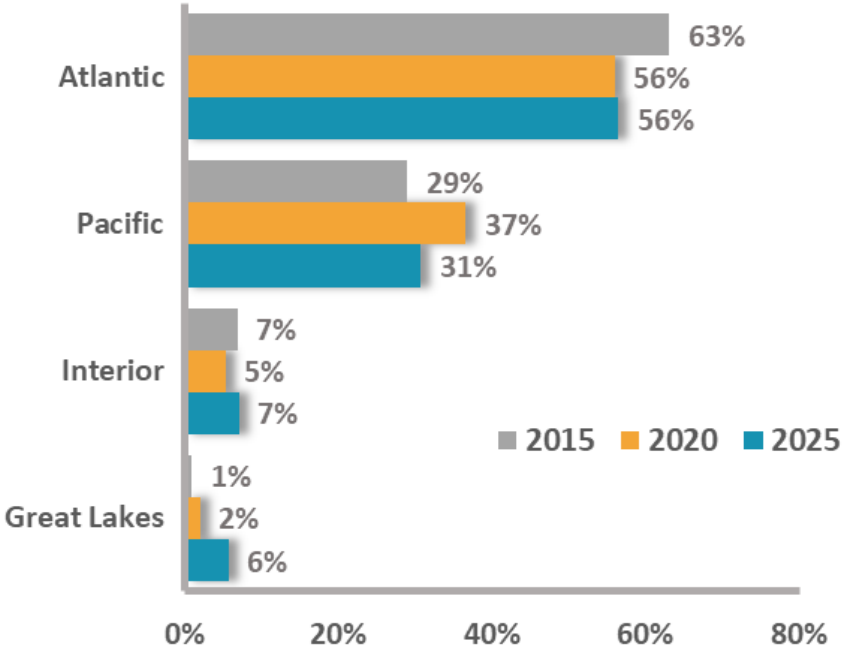


Figure 3.6. Number of foreign locations operated by respondent businesses.

3.3.3 Proximity to the ocean

Figure 3.7 examines the location of respondents slightly differently, by proximity to an ocean basin (or the lack thereof). This was determined by the respondent's state (see Appendix 4 for further details of respondent locations by state) as opposed to their metropolitan area. The Ocean Enterprise community is most concentrated in states that border the Atlantic Ocean,[3] with over half of respondents in such locations. Similar to previous study years, respondent businesses were predominantly bordered by the Atlantic, followed by the Pacific. The 2025 study year saw an increase in the proportion of respondent businesses who bordered the Great Lakes as compared to previous study years. Respondents from the interior of the nation in states that did not border the ocean[4] reached 7%

Figure 3.7. Ocean of access of respondent businesses.



[3] Businesses located in any state along the Mississippi river or its tributaries were classified as belonging to the Atlantic region.
[4] Being classified as belonging to the "interior" category does not necessarily indicate that a respondent's state had no waterborne access to the ocean, as many included river systems that support ocean-related shipping. However, for the purposes of this report, these states were considered interior.

3.3.4 Ocean Enterprise business locations

In total, the survey and secondary analyses identified 1,830 U.S. businesses conducting Ocean Enterprise activities located in all 50 states, the District of Columbia, and two overseas territories. This compares with 1,049 businesses in 49 states in 2020, and 410 businesses located in 36 states in 2015.

Figure 3.8 shows two dimensions of company location dynamics. The overall size of the circles represents the number of operations per U.S. Office of Management and Budget Statistical Area, using an entity's Combined Statistical Area, Metropolitan Statistical Area, Micropolitan Statistical Area, or non-metropolitan U.S. city, as appropriate. The smallest dots represent one operation. The largest circle represents a metropolis with 201 Ocean Enterprise businesses. The second dimension, color density of the circles, depicts non-branch locations (e.g., headquarters operations or legal subsidiaries). A colorless circle includes no headquarters or subsidiaries, while the darkest blue circles are regions with non-branch company operations in the triple digits.

Figure 3.8. Locations of Ocean Enterprise businesses.

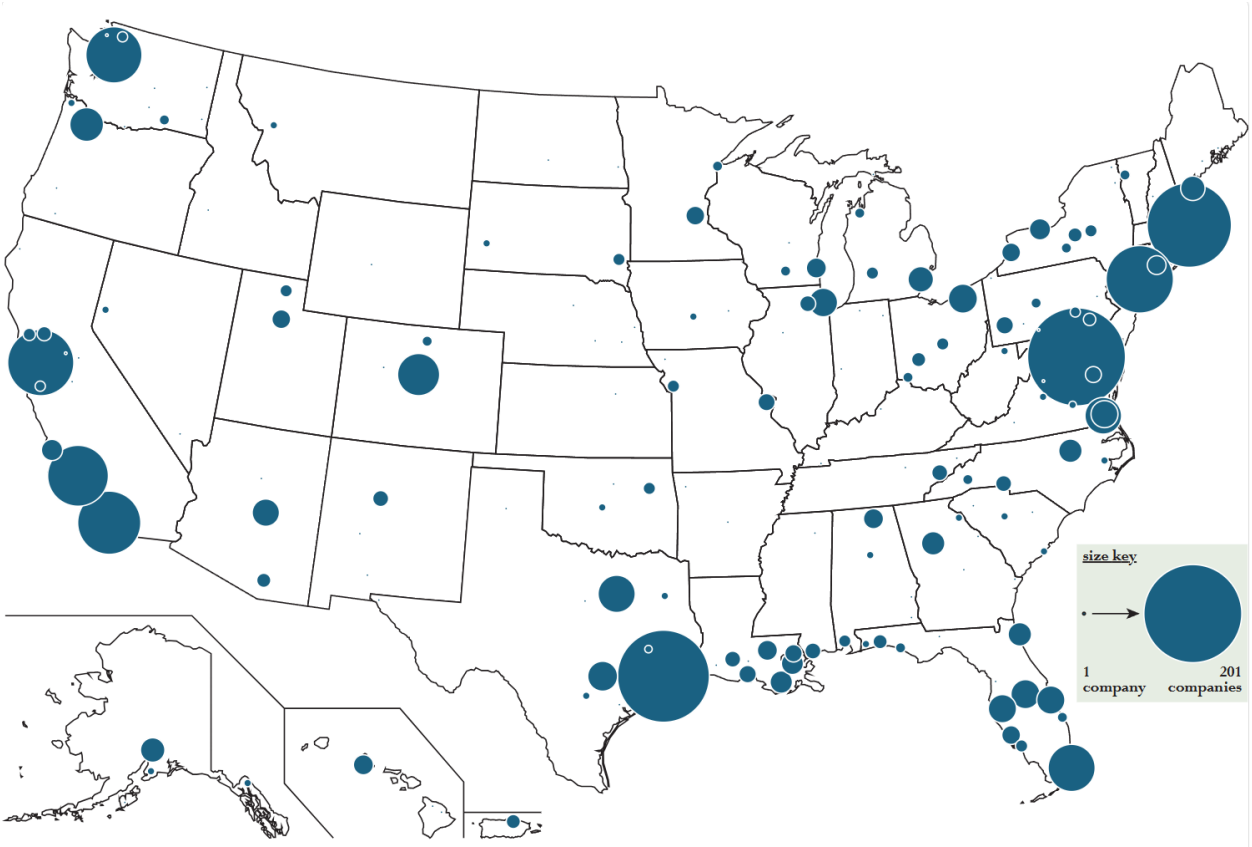
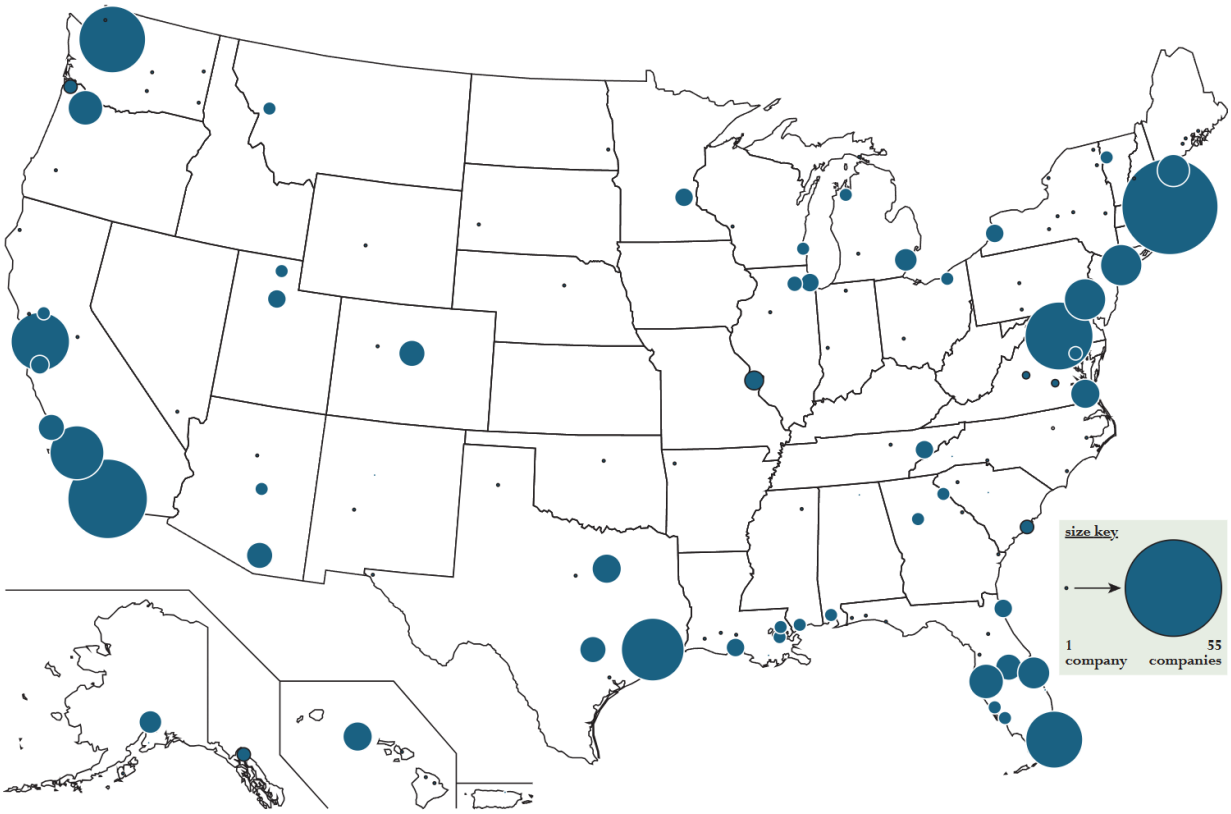


Figure 3.9 examines the spatial distribution of independent businesses[5] within the U.S. Ocean Enterprise. Although the nation's major Ocean Enterprise hubs remain important centers of independent business activity, their relative importance shifts when large corporate families are excluded from the analysis. The prominence of the Mid-Atlantic region declines substantially after removing corporate family operations concentrated along the New York–Hampton Roads/Virginia Beach corridor. Conversely, Southern and Central California and the Pacific Northwest become the dominant concentrations of independent Ocean Enterprise businesses, reflecting the geographic distribution of entrepreneurial and stand-alone firms within the sector.

Figure 3.9. Locations of independent Ocean Enterprise businesses.



[5] An independent business is a business that is free from outside control. It usually means a privately owned establishment, as opposed to a public limited company, the latter of which is owned by investment shares traded in the stock market. In many cases, independent businesses are sole proprietorship companies.

3.4 Organizational Experience in Ocean Enterprise Activities

3.4.1 Survey findings

On average, businesses reported relatively extensive experience in Ocean Enterprise activities. More than eight in ten respondents reported at least five years' experience in the market (Figure 3.10). Nine percent were new to the market. Intermediaries tended to have been in Ocean Enterprise-related business longer than Providers. It should be noted that organizations that had conducted Ocean Enterprise activities for a very short time would be less likely to have been identified and may not have participated in the survey. This particular dynamic would of course be equally true for the 2015 and 2020 surveys.

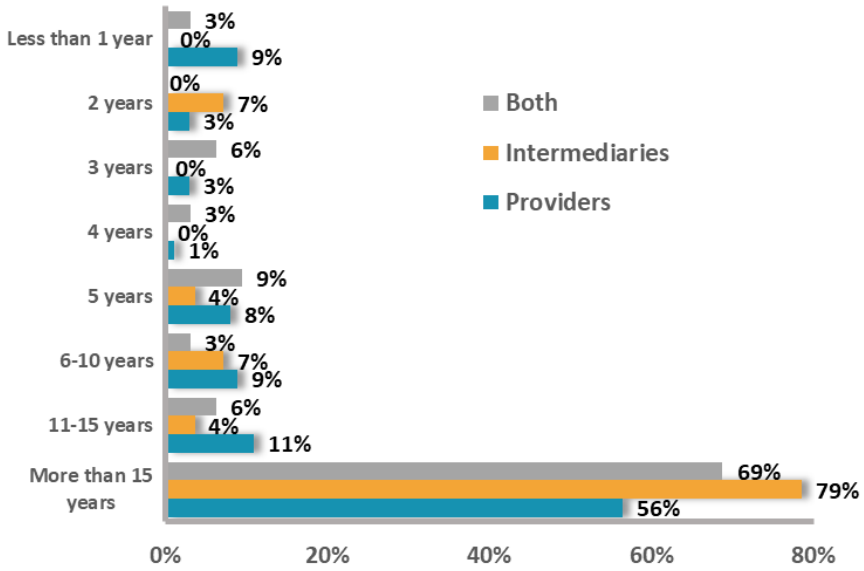


Figure 3.10. Organizational experience in the Ocean Enterprise.

3.4.2 Growth in number of Ocean Enterprise businesses since the 2020 study

A primary objective of the 2025 study was to develop a more comprehensive and accurate inventory of Ocean Enterprise participants. Building on previous studies, the 2025 effort expanded further along the Ocean Enterprise value chain and examined industry sectors that have only recently emerged as significant contributors to ocean observation and related activities. These enhancements provide a more complete and refined characterization of the Ocean Enterprise population. Despite these improvements, the sector is still likely to be underestimated. Moreover, the rapid evolution of technologies, markets, and corporate structures since 2015 has made the identification and classification of Ocean Enterprise activities increasingly challenging.

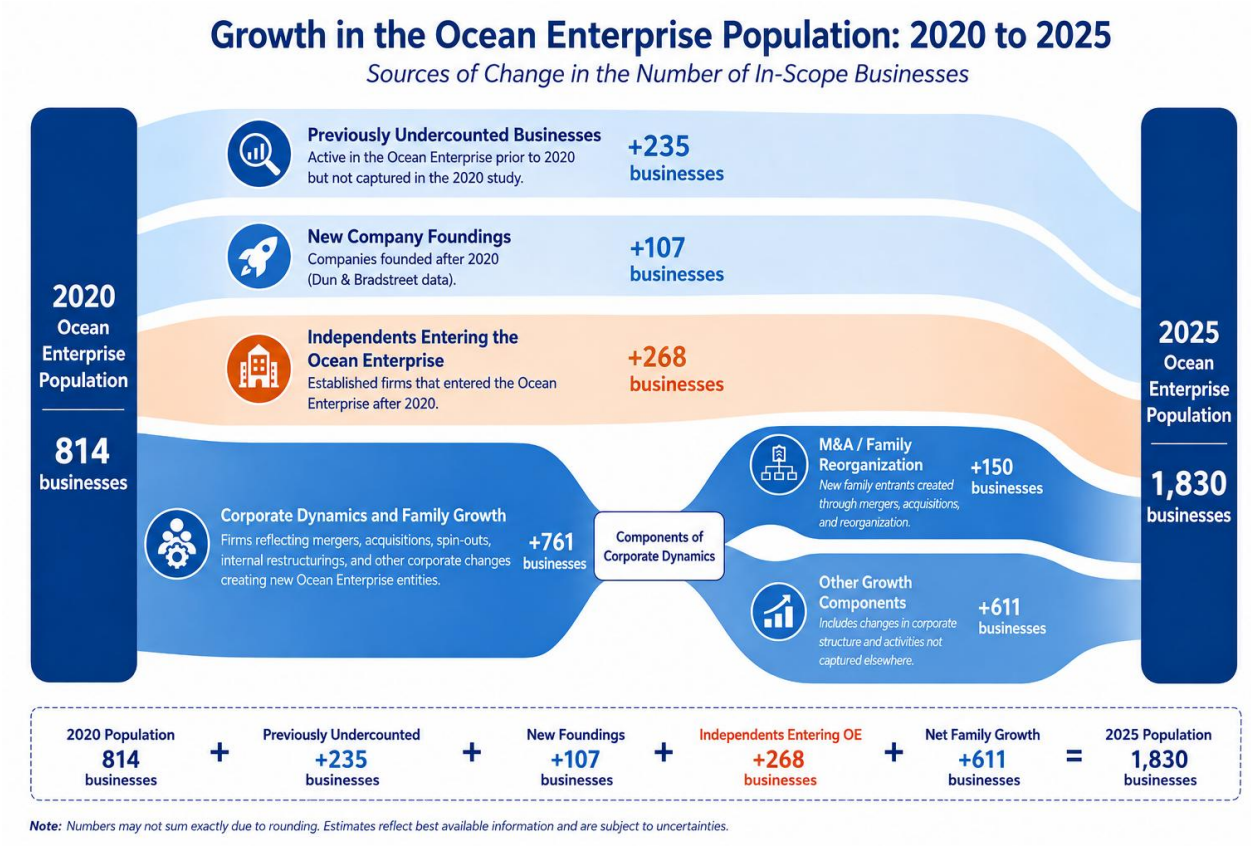
Given this challenge, a detailed analysis was conducted in order to examine the nature of the growth of the sector since the last survey period. As shown in Figure 3.11, of the 1,830 businesses identified as in-scope in 2025, 494 companies could be directly matched to firms included in the 2020 study through their Data Universal Numbering System (DUNS) numbers. The remaining growth reflects several distinct dynamics. An estimated 235 businesses were already engaged in Ocean Enterprise activities prior to 2020 but were not captured in the earlier study, while 107 businesses were formed after 2020. Another 268 established independent businesses entered

the Ocean Enterprise sector after 2020 as they expanded into Ocean Enterprise-related products and services.

The remaining 761 businesses reflect more complex changes within the corporate landscape, including mergers, acquisitions, spin-offs, and internal reorganizations. Within this group, approximately 150 businesses are estimated to represent new corporate family entrants created through merger and acquisition activity, while the remaining 611 businesses represent broader net growth within Ocean Enterprise corporate families. Together, these factors illustrate both the continuing expansion of the sector and the increasingly dynamic and interconnected structure of the Ocean Enterprise ecosystem. In all, the number of identified Ocean Enterprise businesses has increased substantially in the last half-decade. The 1,830 identified businesses represent an approximate doubling of the 2020 estimate, and a tripling of the 2015 estimate.

A full description of the methodology utilized to determine the growth in Ocean Enterprise business count is provided in Appendix 2.

Figure 3.11. Analysis of growth in Ocean Enterprise sector since 2020.



Based on this analysis the size of the 2020 U.S. Ocean Enterprise business population has been amended to include the 235 businesses that were active in the Ocean Enterprise prior to 2020, but which were not captured in the 2020 study.

3.5 Revenue and Employment Estimates

The information presented in this section is based primarily on secondary research on the population of businesses that engage in Ocean Enterprise activities. The critical conceptual framework for these estimates is that they are for businesses engaged in Ocean Enterprise activities only and are not for these businesses' larger corporate families where they are subsidiaries. Location counts, employment, and revenue of the full corporations involved in the Ocean Enterprise would be much larger than the estimates that follow.

In similar fashion, all estimates are only for U.S. Ocean Enterprise businesses' U.S. operations. Any foreign locations, overseas employment, and overseas revenue not consolidated into the accounts of a U.S. parent organization are excluded from the estimates.

As described in the detailed methodology provided in Appendix 1, total revenue and employment data for Ocean Enterprise businesses was derived primarily through secondary research conducted using sources such as Dun & Bradstreet, and publicly available records found through web-searches, review of Annual Reports and Securities and Exchange Commission filings. In some cases, these data were augmented by AI estimates for companies' total revenue and employment.

This provided population-based revenue and employment figures, which have the advantage of not suffering from survey and sample related limitations.

It is undoubtedly the case that, like the prior studies, the work conducted for 2025 will not have identified the entire population of U.S. businesses conducting Ocean Enterprise activities (see Appendix 1 for further discussion of the estimated extent of undercounts). The more robust 2025 analytical approach and use of AI tools to identify target businesses can be expected to have significantly reduced the likelihood of missing all but the very smallest recently formed businesses. As a result, no correctives or inflators have been used in the 2025 study.

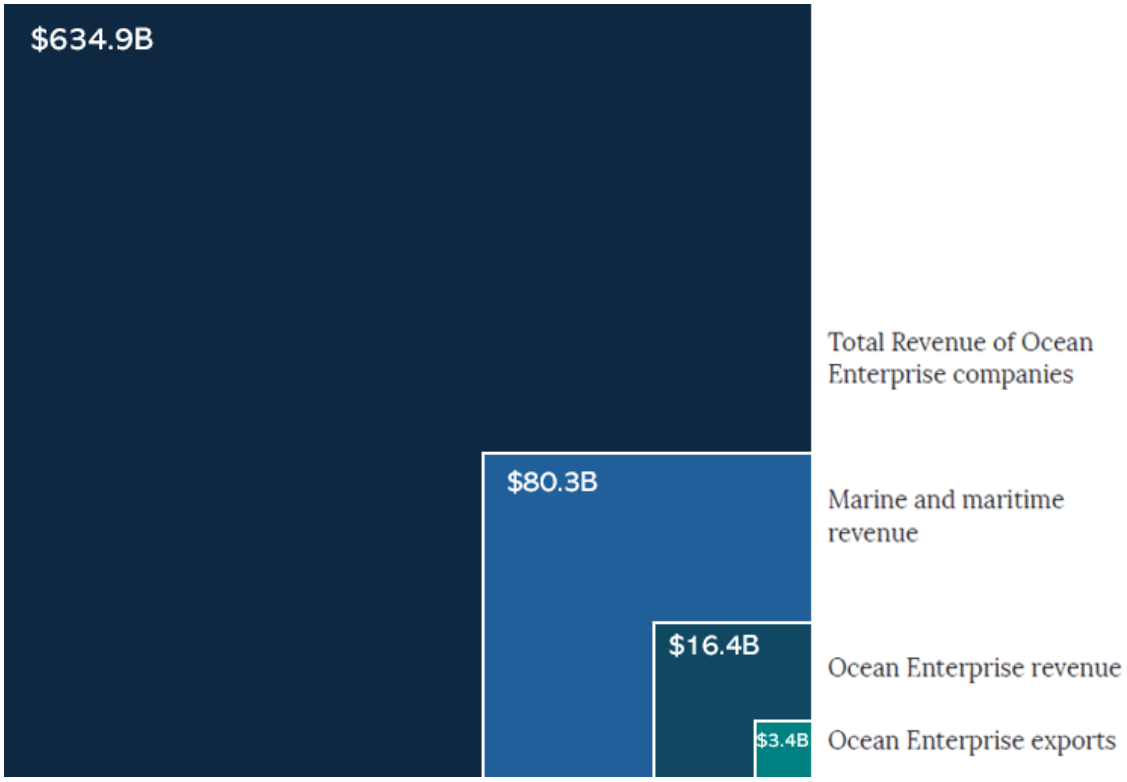
3.5.1 2025 Ocean Enterprise revenue estimates

Figure 3.12 shows the total 2025 revenue of U.S. businesses in the Ocean Enterprise sector at an estimated $634.9 billion. Total Ocean Economy revenue of these businesses was 13% of total revenue and is estimated at $80.3 billion.

Total Ocean Enterprise revenue is estimated to be $16.4 billion. This represented 20% of overall Ocean Economy revenue, and just under 3% of total revenue of businesses operating in the Ocean Enterprise sector.

The final revenue measure calculated for the U.S. Ocean Enterprise sector was the value of Ocean Enterprise product and service exports. This was estimated at $3.4 billion, with just over one-fifth, or 21%, of Ocean Enterprise revenue resulting from export activity.

Figure 3.12. Revenue types of Ocean Enterprise businesses.



3.5.2 Ocean Enterprise business count, total employment, and revenue comparison for 2015 - 2020 – 2025

Table 3.1 below summarizes Ocean Enterprise business count, total revenue, and export revenues for the 2015, 2020 and 2025 studies.

For the purposes of compiling this table, estimated 2020 revenues for the 235 businesses that were active in the Ocean Enterprise prior to 2020, but which were not captured in the 2020 study, have been added to the 2020 revenue total.

Aggregate Dun & Bradstreet data revealed that the Ocean Enterprise sector growth between 2020 and 2025 continued a trend identified in the 2020 study with much higher growth in numbers of businesses than in Ocean Enterprise revenues. This reflects the smaller revenues of the many new entrants to the sector.

In order to compare estimated revenues for the 2015, 2020, and 2025 study periods, the estimates must first be converted to a common time period.

The 2025 Ocean Enterprise revenue of $16.4 billion represents a 2020-25 increase of approximately 49% in real terms.

In 2025, the U.S. Ocean Enterprise sector continued to be highly export-driven with approximately 21% of businesses' Ocean Enterprise revenue being from export sales, a proportion consistent with that identified in 2015 and 2020. This is almost double the export share of the overall U.S. economy, where exports of goods and services represented approximately 11.1% of GDP in 2024 (World Bank, 2024).

Table 3.1. Ocean Enterprise Revenue, Employment and Export Activity in 2015, 2020, 2025

Ocean Enterprise Indicator	2015	2020	2025
Business Count	410	1,049 [1]	1,830
Revenue (unadjusted)	$7.1B	$8.8B [2]	$16.4B
Revenue (adjusted to 2025) [3]	$9.7B	$11.0B	$16.4B
Employment [4]	245 thousand [5]	325 thousand	2.4 million
Export Share	20%	21%	21%
Export Revenue (unadjusted)	$1.4B	$1.8B	$3.5B

[1] 2020 business count adjusted to account for additional Ocean Enterprise businesses identified during the 2025 study that were also in scope in 2020.

[2] 2020 unadjusted revenue has been corrected to account for the impact of additional Ocean Enterprise businesses identified during the 2025 study that were also in scope in 2020.

[3] 2015 and 2020 revenue estimates adjusted to 2025 value per Consumer Price Index.

[4] Employment reflects total employment of businesses participating in Ocean Enterprise activities, whereas Ocean Enterprise revenue reflects only the Ocean Enterprise share of those businesses' revenues.

[5] Employment in 2015 was originally calculated as a range between 223,000 and 268,000. For this table the average between those two numbers is used.

3.5.3 Ocean Enterprise business revenue by location

Figure 3.13 explores the geographic distribution of businesses' Ocean Economy and Ocean Enterprise revenue. The darkest blue represents nearly $13 billion in Ocean Economy revenue from the region's Ocean Enterprise businesses, and the two darkest blue circles, for Houston (predominantly offshore oil and gas) and Virginia Beach-Newport News (predominantly shipbuilding and defense), show how the size of a region's marine/maritime activity is a general but imperfect predictor of the size of its Ocean Enterprise cluster. The Ocean Enterprise revenue is depicted by the size of the circles, with the highest-earning region being the location of businesses earning almost $3 billion from Ocean Enterprise activities.

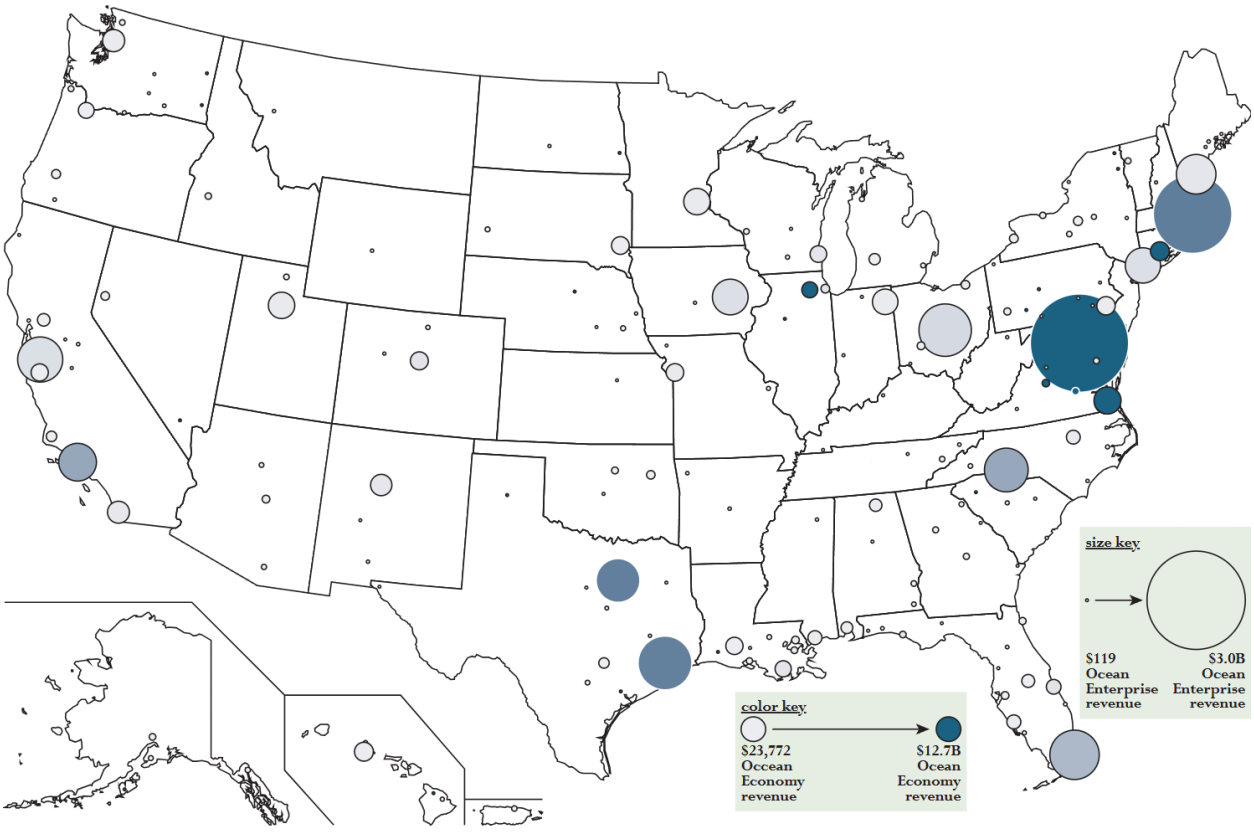


Figure 3.13. Geographic distribution of Ocean Economy and Ocean Enterprise revenue of Ocean Enterprise businesses.

3.6 Ocean Enterprise Industry Code Description and Analysis

In any analysis of industry sectors, it is normal to find a discussion of economic activity by North American Industry Classification System (NAICS) codes. Neither the NAICS code schema nor the former Standard Industrial Classification (SIC) schema fit the complex and rapidly evolving Ocean Enterprise sector. Standard industry definitions do not capture Ocean Enterprise activity with any accuracy or granularity, as the Ocean Enterprise has a focus and function that cuts across standard industry code structures.

Appendix 5 provides a summary of the allocation of identifiable Ocean Enterprise activity across NAICS and SIC industry classifications.

3.6.1 Economic impact analysis

Economic Impact analysis (often referred to as "multiplier analysis") is a process used to estimate the total economic effects of a selected economic change within a defined region. It is an effort to capture how a dollar of spending in a focused industry or business ripples through a local, regional, or national economy. This study included such an analysis of the impact of the Ocean Enterprise cluster on the U.S. economy.

Traditional Economic Impact Analysis has multiple components[6]:

- **Direct effects** refer to U.S. Ocean Enterprise revenue of all businesses in the Ocean Enterprise cluster.
- **Indirect effects** measure the value of additional economic demands that businesses in the Ocean Enterprise cluster place on supplying industries in the U.S.
- **Induced effects** accrue when workers in the Ocean Enterprise cluster and their indirect supplying industries spend their earnings on goods and services in the U.S. (often called "Type II multiplier" effects).
- **Total economic effects** are the sum of these three direct, indirect, and induced effects. They are all the transactions attributable, either directly or indirectly, to the activities being measured.

Using the U.S. Bureau of Economic Analysis Industry-by-Industry product accounts, an aggregate economic impact analysis was calculated for the Ocean Enterprise sector with respect to Ocean Enterprise revenue.

Since the Ocean Enterprise sector is composed of businesses across the supply chain that may purchase from one another, an economic impact assessment faces risks of double counting.

Available data does not permit easy sorting of indirect spending along the supply chain. Three especially conservative estimation modifications were used to avoid double-counting.

- Rather than use an existing Economic Impact model, very conservative multipliers using U.S. Bureau of Economic Analysis Industry-by-Industry product accounts were generated. These industry-specific coefficients for indirect impacts were applied for only one round of spending.

- This analysis estimated only direct and indirect effects; it did not include the impacts from the compensation of employees within the supply chains of Ocean Enterprise businesses (i.e., the "Induced" or "Type II" multiplier effects).

- As a further effort to be conservative, a downward adjustment was applied to reduce indirect spending based on consideration of industry mix in the cluster.[7]

  Using these highly conservative assumptions, the direct and indirect economic impact of Ocean Enterprise-specific business activities is estimated to be $20.7 billion. The implicit sector-wide multiplier for the Ocean Enterprise is thus 1.8 (i.e., $1.00 of Ocean Enterprise sales generates an additional $0.80 of sales among suppliers).

[6] A vast literature, as well as multiple government and private modeling systems, are focused on economic impact analysis. The U.S. Bureau of Economic Analysis provides one that is in wide use, RIMS II. More detailed information on economic impact and the use of the RIMS II system can be found at this website. (https://apps.bea.gov/regional/rims/brfdesc.cfm).

[7] While a detailed discussion of the effort is available in the methodology, the basis of the technique extended from the total share of an industry's U.S. Gross Industry Product associated with Ocean Enterprise businesses. The smaller that share, the more "specialized" the Ocean Enterprise aspect of an industry was assumed to be, and thus the more likely to be associated with spending *from* other Ocean Enterprise businesses. To reflect this assumption and increase the conservatism of the estimates, a sliding adjustment was applied to the calculated share of total industry Gross Industry Product, and the resulting ratio was subtracted from each businesses' sales as representative of spending by other Ocean Enterprise businesses.

3.7 Employment Estimates

Survey respondents were asked to report the employment numbers for their organization. A similar methodology as used for revenues was utilized, whereby the employment data from the survey respondents and secondary sources was used to project employment for all businesses determined to be involved in the Ocean Enterprise. The total U.S. employment of businesses engaged in the Ocean Enterprise businesses in 2025 was an estimated 2.4 million employees[8]. This is a substantial increase over the 2020 study (see Table 3.1), and points, in combination with the consistency of other measures, to the increasing involvement of a number of the world's largest technology and defense corporations in the Ocean Enterprise sector.

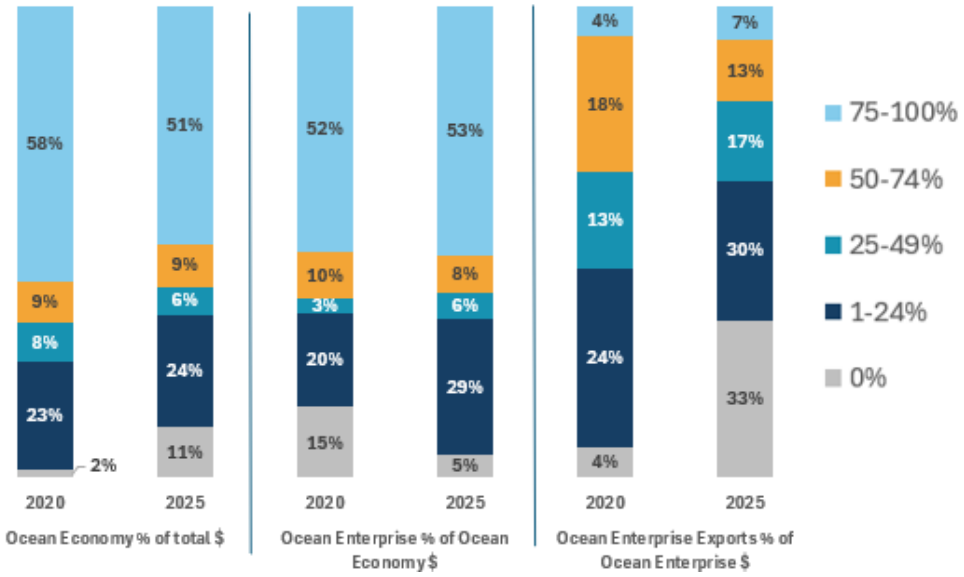
3.8 Proportion of Respondent Businesses' Revenue Associated with Marine/Maritime, Ocean Enterprise Activities, and Ocean Enterprise Exports

Surveyed businesses were asked a series of questions to determine how much of their total business was attributable to marine/maritime and Ocean Enterprise activities, and what proportion of their Ocean Enterprise revenues were attributable to export sales. A summary of survey responses to these questions is shown in Figure 3.14.

In 2025, over half of survey respondents reported that the majority of their revenues were from marine/maritime business. This was similar but slightly less than the 58% reported in the 2020 survey. When asked what proportion of their marine/maritime revenue was due to Ocean Enterprise activities, just over half reported that Ocean Enterprise revenues accounted for the majority of their overall marine/maritime activity, again similar to that seen in the 2020 survey period.

Respondents were asked to report what proportion of their Ocean Enterprise-related revenue was from export sales with 20% reporting that exports accounted for at least half of their Ocean Enterprise-related revenues. A combined 63% reported that exports contributed to less than one-quarter of their total Ocean Enterprise-

Figure 3.14. Marine/maritime, Ocean Enterprise, and Ocean Enterprise exports shares of total revenue.



[8] Employment estimates represent total employment within businesses participating in Ocean Enterprise activities, whereas Ocean Enterprise revenue estimates represent only the Ocean Enterprise share of those businesses' revenues

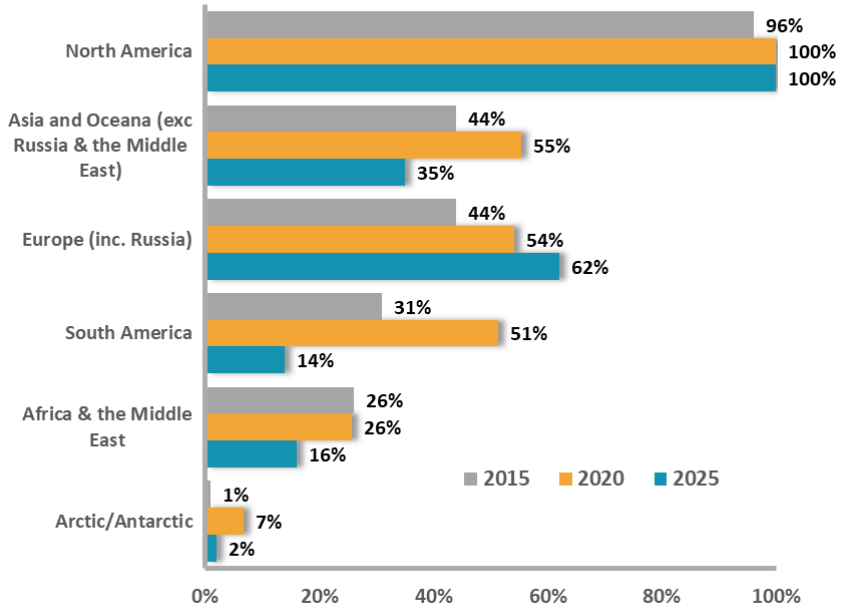
related business with 33% reporting that export sales accounted for none of their Ocean Enterprise-related revenue. This contrasts markedly with the 2020 survey, where only 4% of respondents reported no Ocean Enterprise export revenue. However, the proportion of those with exports that accounted for more than half of their Ocean Enterprise revenue was comparable (22% and 20% respectively).

3.9 Export Markets

Given the inherently international nature of a product and service suite focused on the ocean and therefore extending beyond U.S. borders, the nature of the U.S. Ocean Enterprise sector's export markets is an obvious interest. Respondents were asked to identify various national or regional markets (including the U.S.) that were a source of at least 5% of revenues. Respondents were allowed to select as many markets as applied. Unsurprisingly, given the inclusion of the U.S., the most cited market was North America. In 2020 and 2025, every surveyed business reported customers in North America, with 99% of these reporting customers in the U.S. (Figure 3.15). This was similar to the 2015 survey findings, when a comparably high proportion (96%) reported customers in North America. Of note for the 2025 study period is the sharp drop in the proportion of businesses that reported South America as an export market relative to the previous study periods.

Of particular interest in the responses about export markets is the importance of the European region with a growing proportion of export activity compared to the 2020 survey period. The Asian and Pacific Rim regions showed a slight decline but remains another important export market region.

Figure 3.15. Foreign markets that represent at least 5% of respondents' sales.



3.10 Business Dynamics

The survey asked a series of questions that related to Ocean Enterprise businesses' expectations about the future trajectory of their Ocean Enterprise business activity.

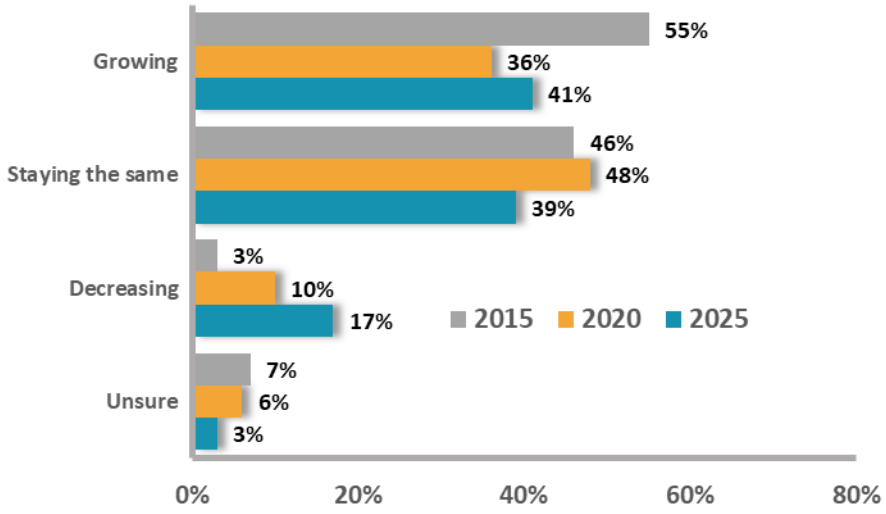
3.10.1 Business outlook: 2015-2025 employment projection comparison

Respondents were generally optimistic about employment growth over the next 12 months. As shown in Figure 3.16, 41% expect their businesses' employment to increase during this time period, while 39% reported their employment would remain the same. However, relative to the 2020 survey period, a larger proportion of employers projected a decrease in employment. These expectations were markedly different to those seen in 2015. Specifically, a smaller proportion of

employers reported plans to grow, while relatively more businesses plan to downsize. The proportion expecting to stay at current employment levels was similar in both years.

These more conservative growth projections for 2020 and rebound for 2025 are not surprising given the macroeconomic context over the 2020 survey period. The start of data collection for the 2020 period coincided almost exactly with the COVID-19 pandemic lockdown and spanned the period through fall of 2020 when the impact of the pandemic remained unknown to many employers. Moreover, for many businesses, the pandemic inevitably interacted with additional market challenges.

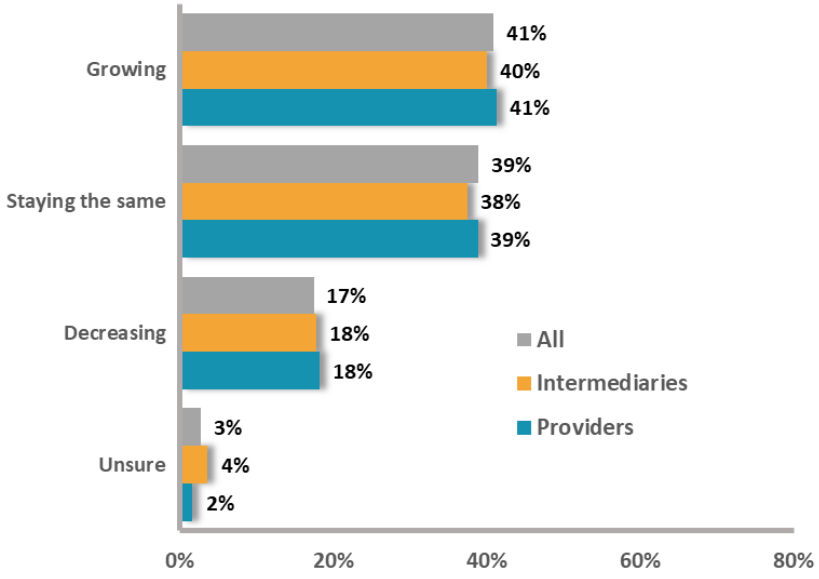
Figure 3.16. Employment projections for the next 12 months comparison.



3.10.2 Business outlook: Employment projection by company function

The outlook was very uniform when examined by company function. As shown in Figure 3.17, Providers and Intermediaries were very similar with regard to their future employment expectations.

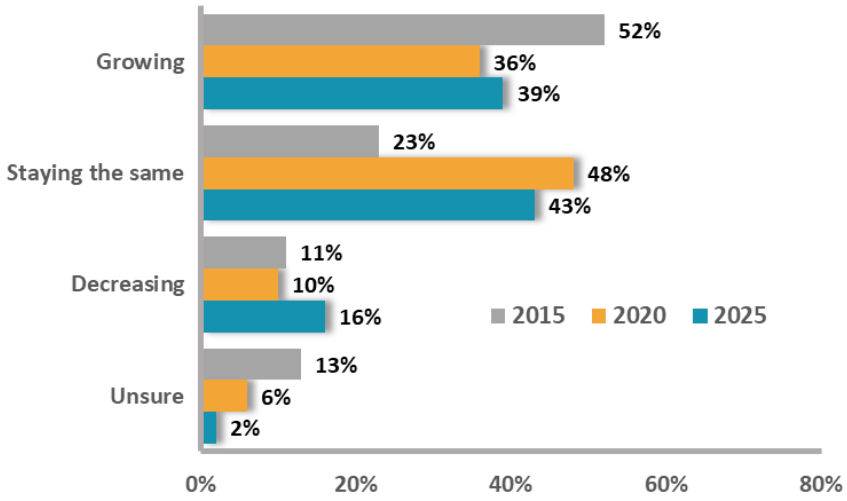
Figure 3.17. Employment projections for the next 12 months by function.



3.10.3 Business outlook: 2015-2025 revenue projection comparison

As with employment, respondents were generally optimistic about revenue growth in the next 12 months. As shown in Figure 3.18, 39% expected their business revenue to grow during this time period. However, compared to employment expectations, businesses were significantly more likely to anticipate decreased revenue levels, with 16% expecting business revenues to decrease in the next 12 months. These projections highlight a more conservative revenue outlook as compared to that seen in 2015, when over half of respondents predicted revenue growth in the next 12 months, and only 11% expected revenue decline. As with employment, these revenue projections undoubtedly reflect the impact and recovery from the effects of the pandemic and other external challenges discussed earlier.

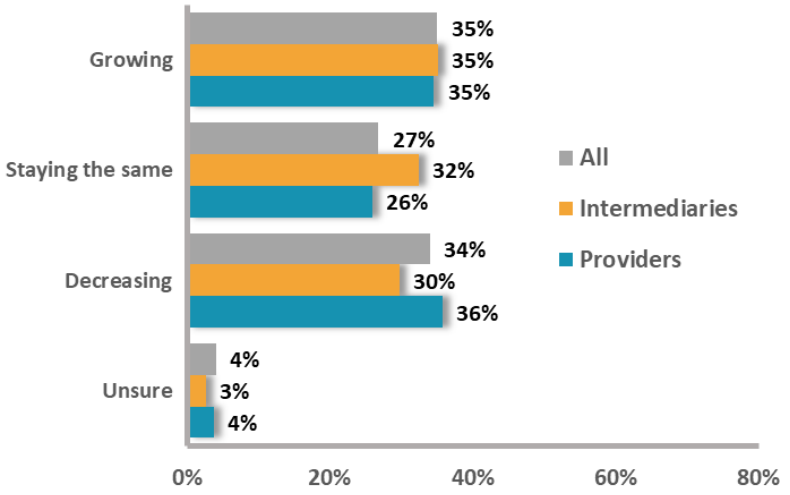
Figure 3.18. Revenue projections for the next 12 months timepoint comparison.



3.10.4 Business outlook: Revenue projections by business function

As with employment projections, the outlook differed slightly when examined by business function. Figure 3.19 shows that Providers and intermediaries reported roughly equal expectations of revenue growth in the next 12 months. Intermediaries were more likely to predict static revenue than were Providers.

Figure 3.19. Revenue projections for the next 12 months by business function.

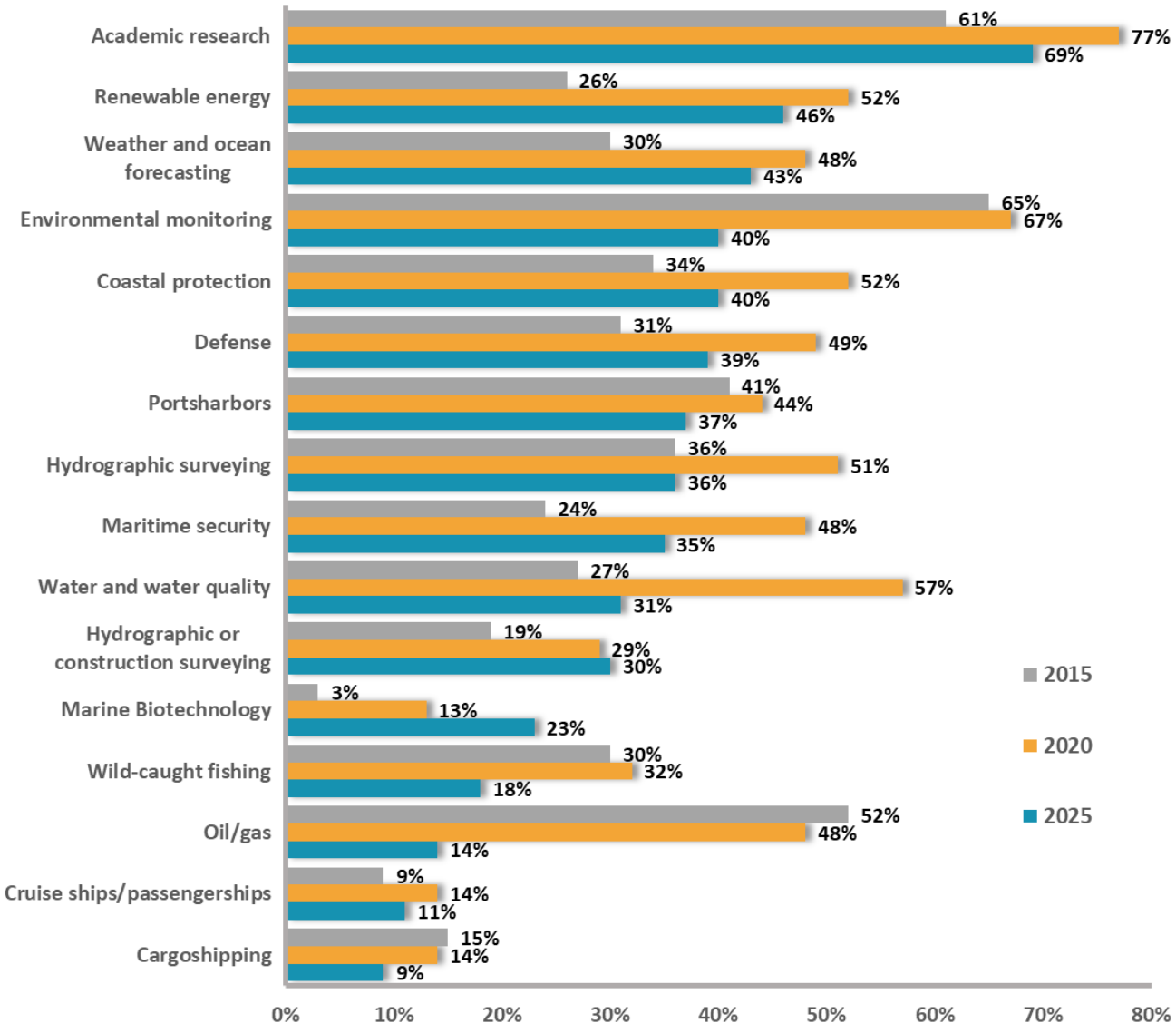


3.11 Market Sectors

3.11.1 Chief market sectors: Multi-year comparison

Figure 3.20 indicates respondents' main market sectors for all three survey periods. For all survey periods, academic research was among the top endorsed activities. However, activity for the environmental monitoring market sector dropped sharply in the most recent survey year, from over 60% in both previous survey periods to 40% in 2025.

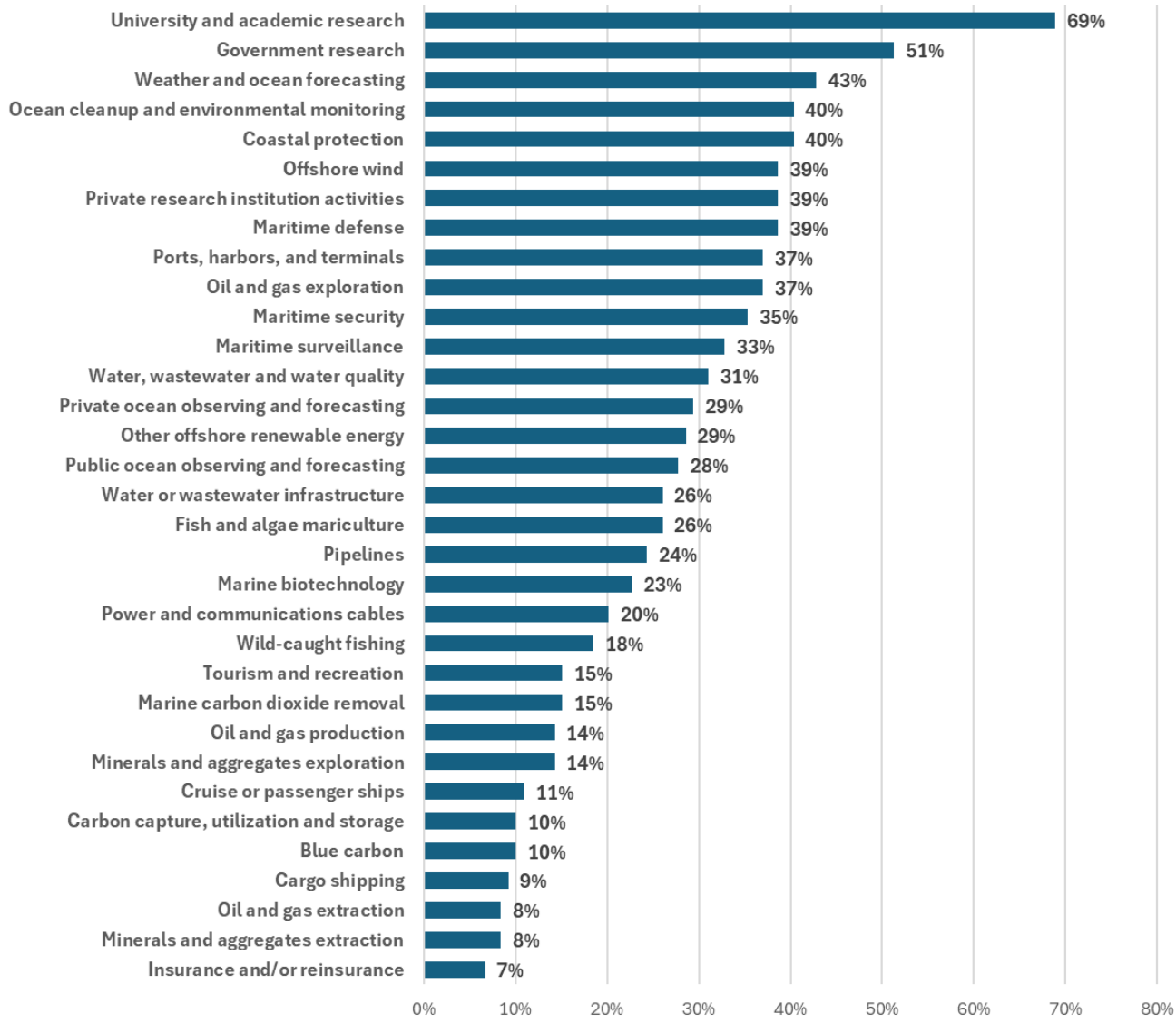
Figure 3.20. Respondents' chief market sectors 2015-2025.



3.11.2 Chief market sectors: All categories

The 2025 survey allowed for a more granular analysis of market sectors, with some sectors broken down into subsidiary components. Responses inclusive of these are shown in **Error! Reference source not found.** In 2025, eight separate end-uses were a target for at least half of the respondents, and a further ten were targets for at least one-third of respondents.

Figure 3. 21. Chief market sectors of survey respondents.



3.11.3 Number of market sectors served

The number of market sectors chosen by respondents provides an indicator of diversity of function. Figures 3.22 and 3.23 show the number of market sectors endorsed by survey respondents. A combined 32% of respondents reported their business was engaged in at least ten of the listed market sectors. Only 4% reported that their business was engaged in only a single listed sector[9].

Of the respondents 39% focus on 5 or less market sectors, while almost 50% of respondents sell to between 6 to 15 market sectors. Just 12% of respondents focus on more than 16 sectors.

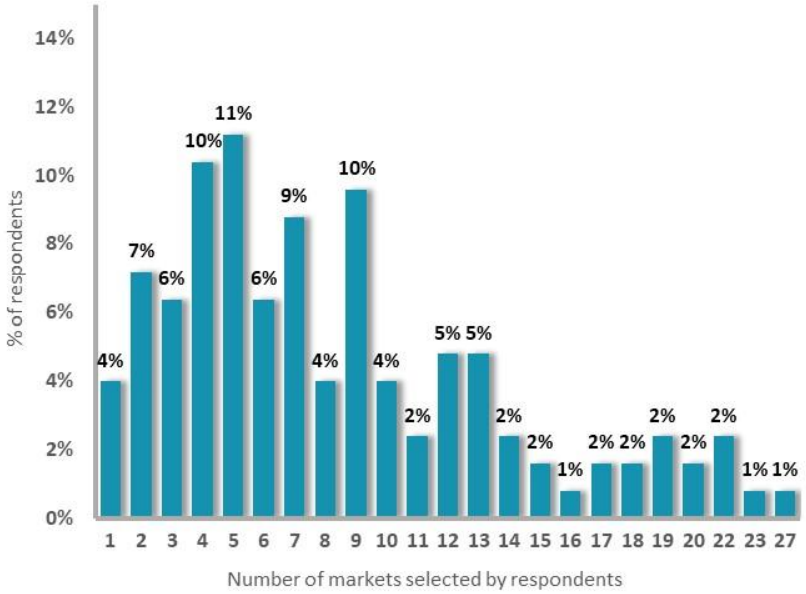
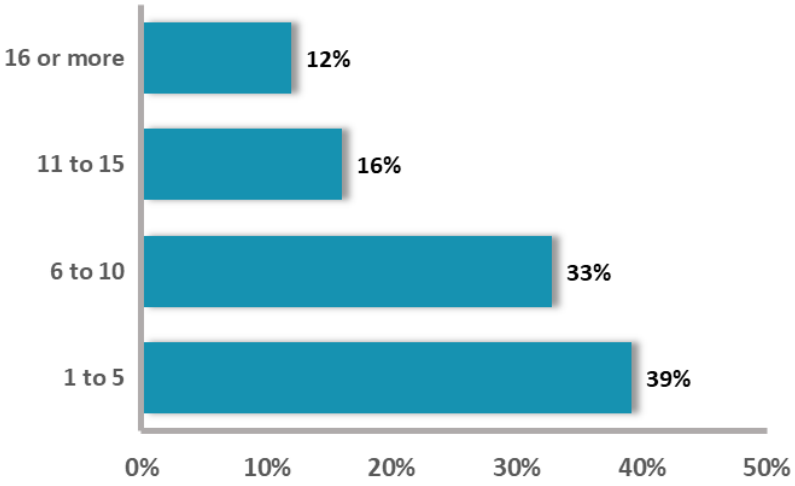


Figure 3.22. Proportion of market sectors endorsed by respondents.

Analysis of the gross number of businesses engaged in certain market activities does not necessarily reflect employment or Ocean Enterprise revenue. For example, a hypothetical business engaged in the defense market sector could potentially represent more gross employment than all businesses engaged in environmental monitoring combined.

Figure 3.23. Number of market sectors endorsed by respondents.



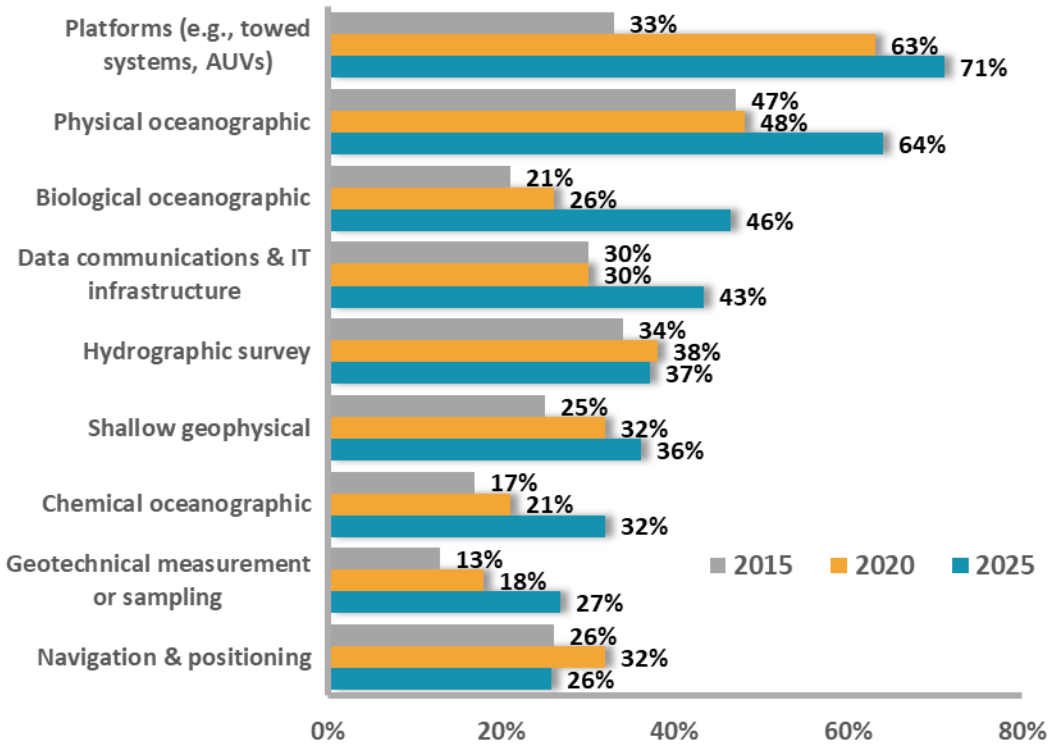
[9] Respondents were permitted to choose as many categories as applied; therefore, percentages can sum to more than 100%.

3.12 Types of Ocean Enterprise Product Sales

3.12.1 Types of Product Sales: 2015-2025 comparison

Respondents who indicated that they were a Provider of ocean observation and measurement products were asked a question regarding the types of products they sold. **Error! Reference source not found.**24 shows a comparison of types of products sold for all three survey periods. The greatest change was an increase in the proportion of businesses reporting their sales were from Biological Oceanographic products.

Figure 3. 24. Types of Ocean Enterprise product sales.

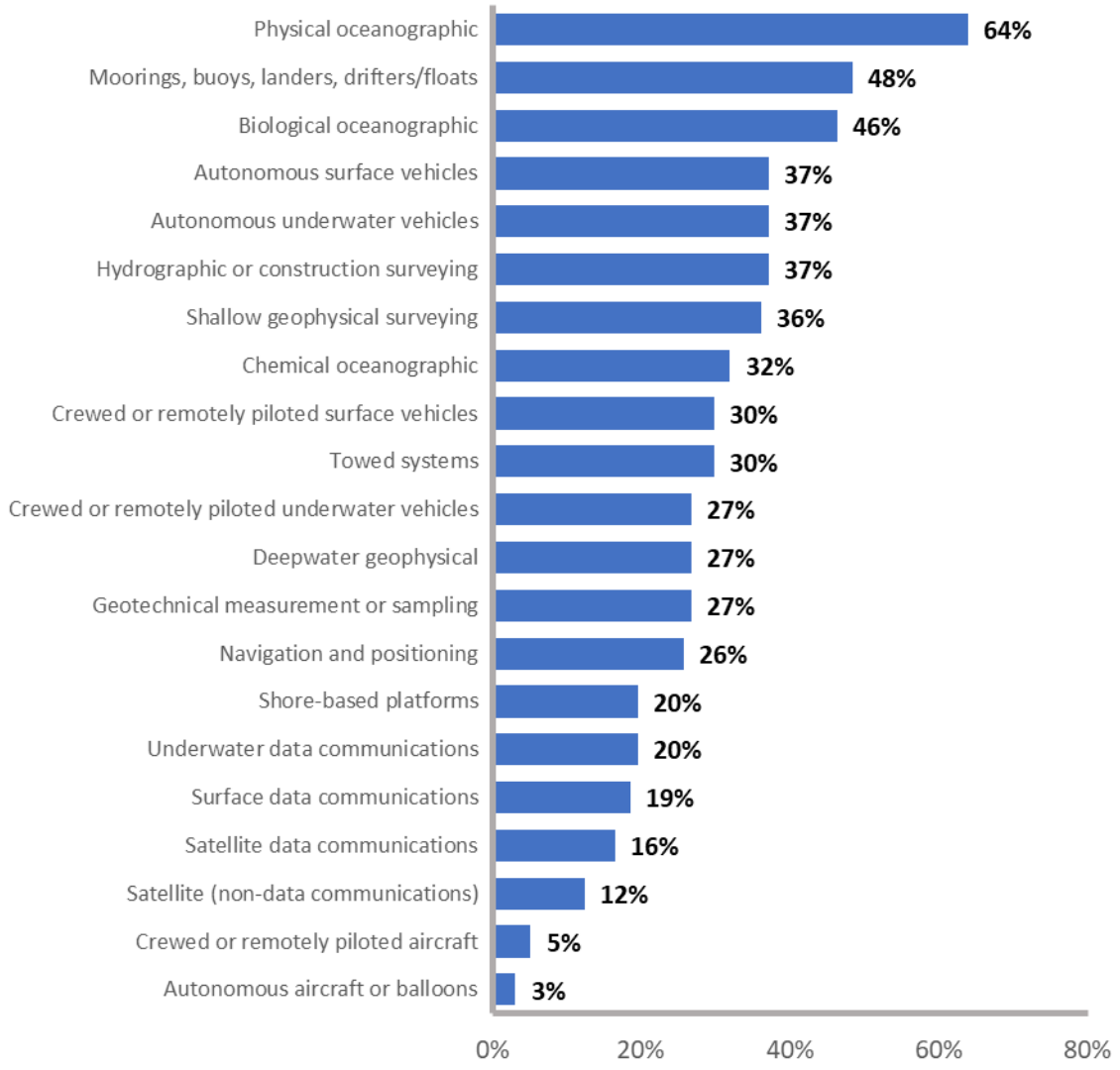


3.12.2 Types of product sales: All categories

The multi-year comparisons presented above represent categories common to all survey years. Where necessary, these comparative categories were compiled based on combining the responses to the more detailed list of product types used in the 2025 survey. These more detailed categories are shown in Figure 3.25.

When considering the percentages shown in Figures, 3.24 and 3.25, it is important to remember that they relate to the number of businesses active in each product type, rather than the employment or revenue generation related to each. This cannot be determined from the survey or secondary analysis data.

Figure 3.25. Types of Ocean Enterprise products sold.



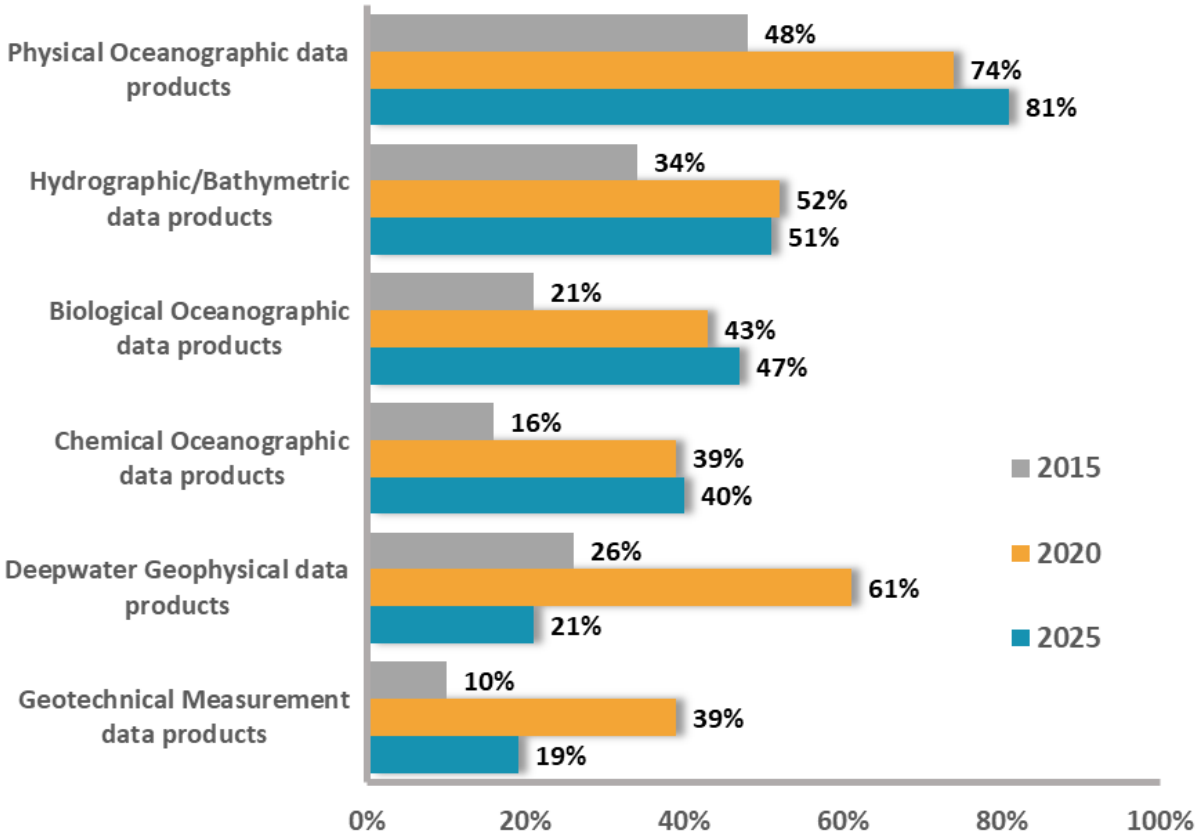
3.13 Use of Ocean Observation Information

Businesses that indicated they were Intermediaries were asked a series of questions regarding their use of different types of ocean observation, measurement, and forecast information in the generation of the information services that they sell to end-users.

3.13.1 Use of in situ information

Figure 3.26 shows a comparison of reported types of information used for all three survey periods.[10] Similar to 2020, in 2025 Intermediaries were most likely to report that they use and sell physical oceanographic data products.

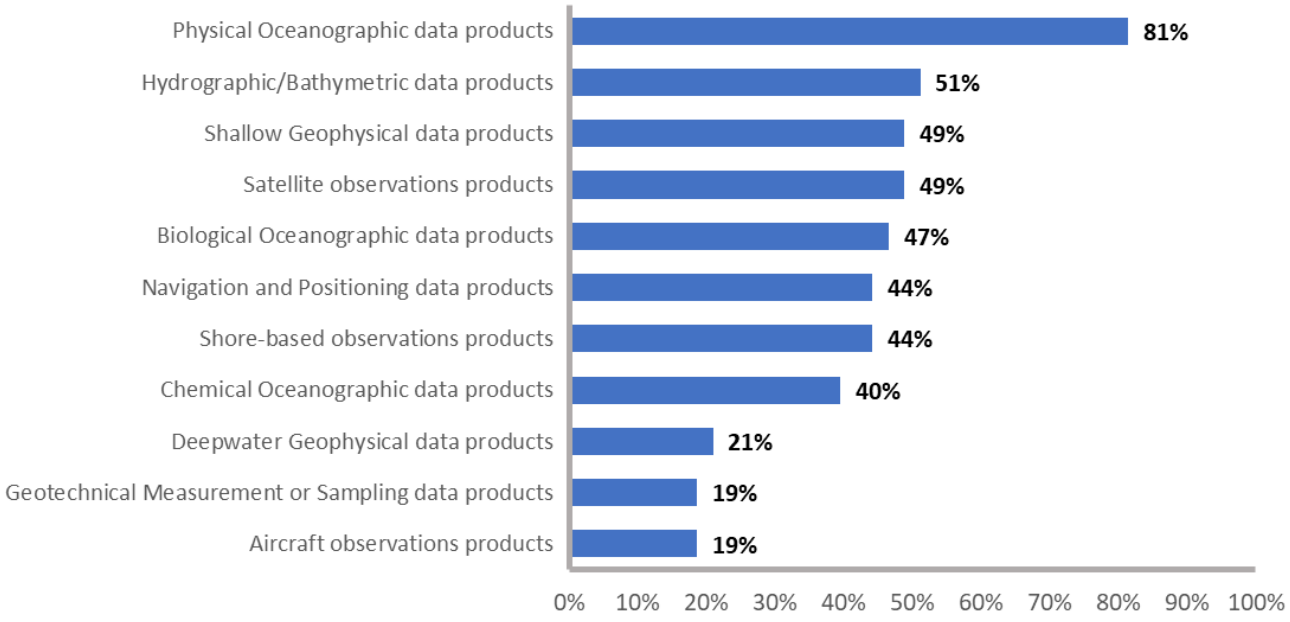
Figure 3.26. Use of *in situ* information by use type.



[10] Respondents were permitted to choose as many categories as applied; therefore, percentages can sum to more than 100%.

Figure 3.27 shows the detailed categories offered as possible information types in the 2025 survey. As shown, the great majority of users (81%) use physical oceanographic information, with about half using hydrographic/bathymetric information and navigation/positioning information.

Figure 3.27. 2020 use of information by *in situ* type.



3.13.2 Intermediary use of remotely sensed information

Intermediary use of remotely sensed data and information is shown in Figure 3.28.[11] In general, remotely sensed observations are used less frequently than *in situ* data products. However, it must be recognized that remotely sensed data, and especially satellite observations, are a key enabler of public good ocean predictive models. The resulting public good ocean forecasts are widely utilized by Intermediaries as an input to their customized information services. These indirect uses of remotely sensed data would generally not be recognized in the survey responses.

Shore and satellite observations are the most commonly used type of remotely sensed information for all three survey periods. For the 2025 survey period, satellite observations were the most commonly reported remotely sensed data, representing a sharp increase from both previous periods. Almost half of respondents reported use of shore observations in both the 2020 and 2025 survey periods, representing a substantial change from the 2015 study (33%). As in previous survey periods, in 2025 observations taken from aircraft were the least commonly used.[12]

[11] Satellites, airplane observations, high frequency radar

[12] Respondents were permitted to choose as many categories as applied; therefore, percentages can sum to more than 100%.

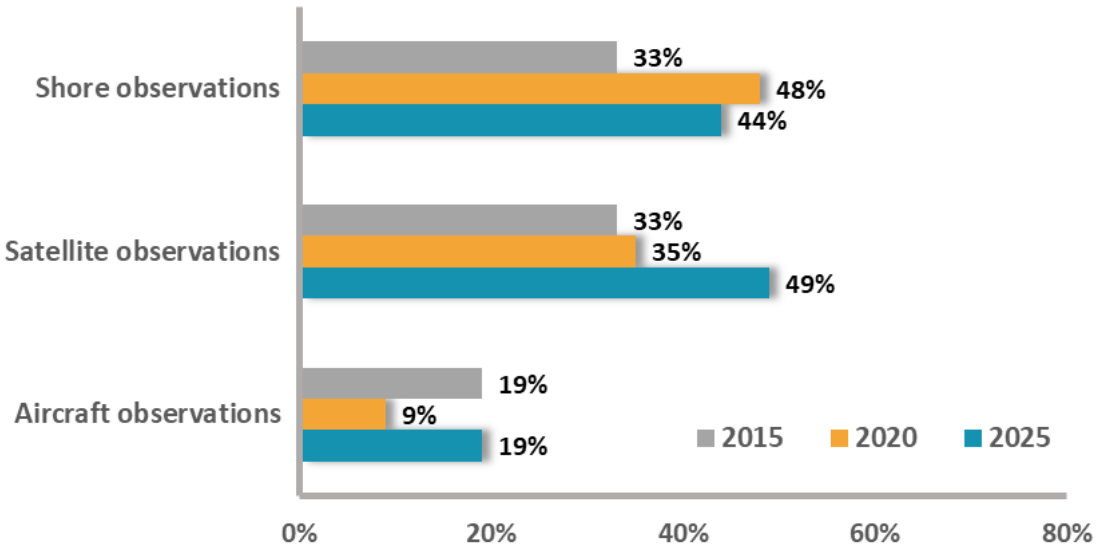


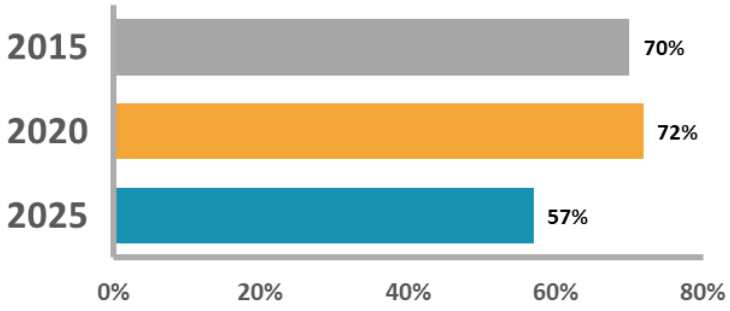
Figure 3.28. Use of remotely sensed information by use type.

3.14 IOOS Business Dynamics

3.14.1 Awareness of IOOS and future plans

One purpose of this study was to assess respondents' awareness of IOOS. Respondents to the 2025 survey indicated less familiarity with IOOS as compared to the previous survey years. (Figure 3.29). This is probably partly the result of the entry of significant numbers of defense businesses into the Ocean Enterprise sector.

Figure 3.29. Awareness of IOOS (% Yes).



3.14.2 Barriers and suggested improvements for working with IOOS

Reported barriers to working with IOOS are shown in Figure 3.30. The pattern of responses from the 2025 survey were markedly different than previous survey years, with 2025 respondents more likely to list almost all choices as difficult as compared to previous survey years. Most notably, there was a sharp increase in the proportion of respondents who indicated that difficulties or limitations adapting new technology into IOOS was a barrier. Figure 3.31 shows the proportion of respondents that endorsed each of the entire list of available options.

Figure 3.30. Barriers to working with IOOS comparison by year.

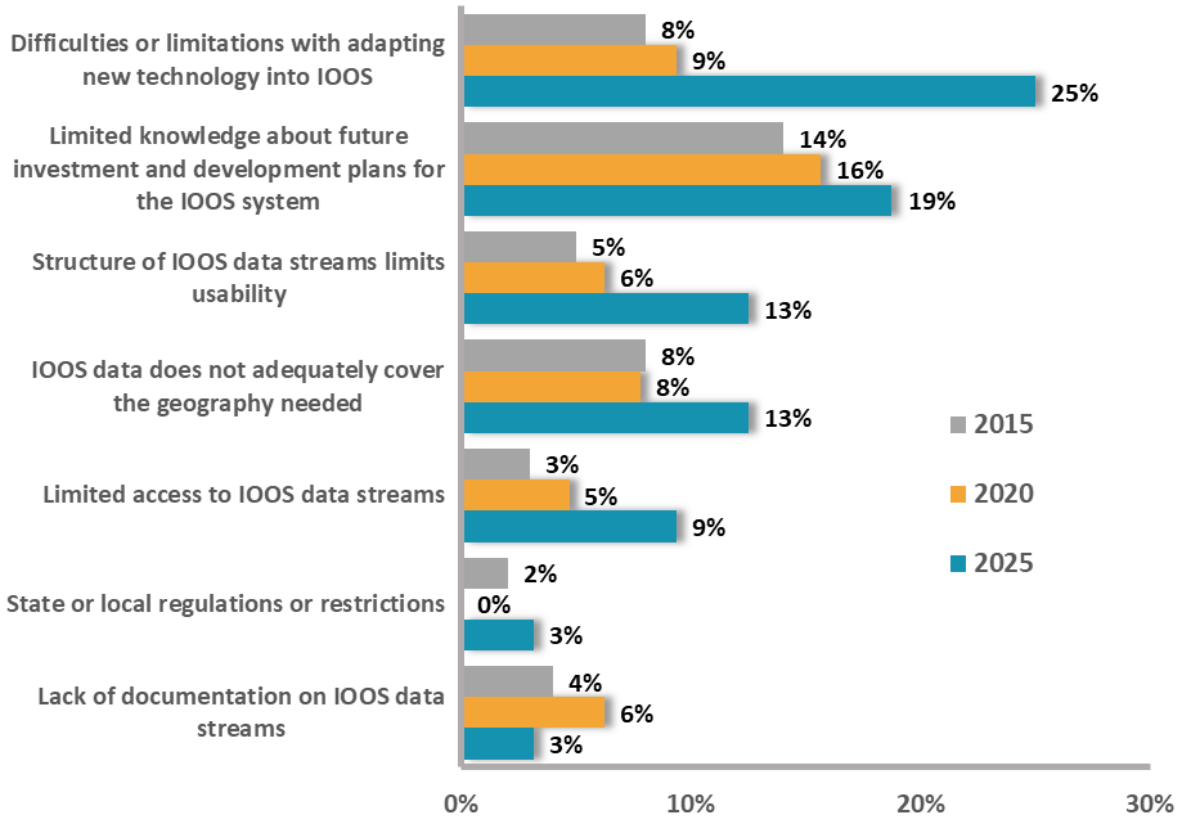
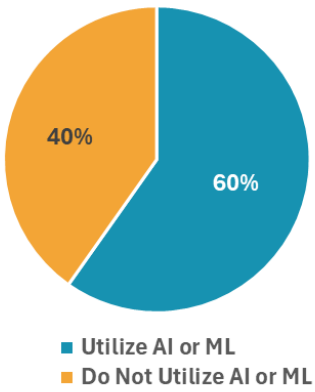


Figure 3.31. Barriers to working with IOOS all items.

3.15 Utilization of Artificial Intelligence and Machine Learning

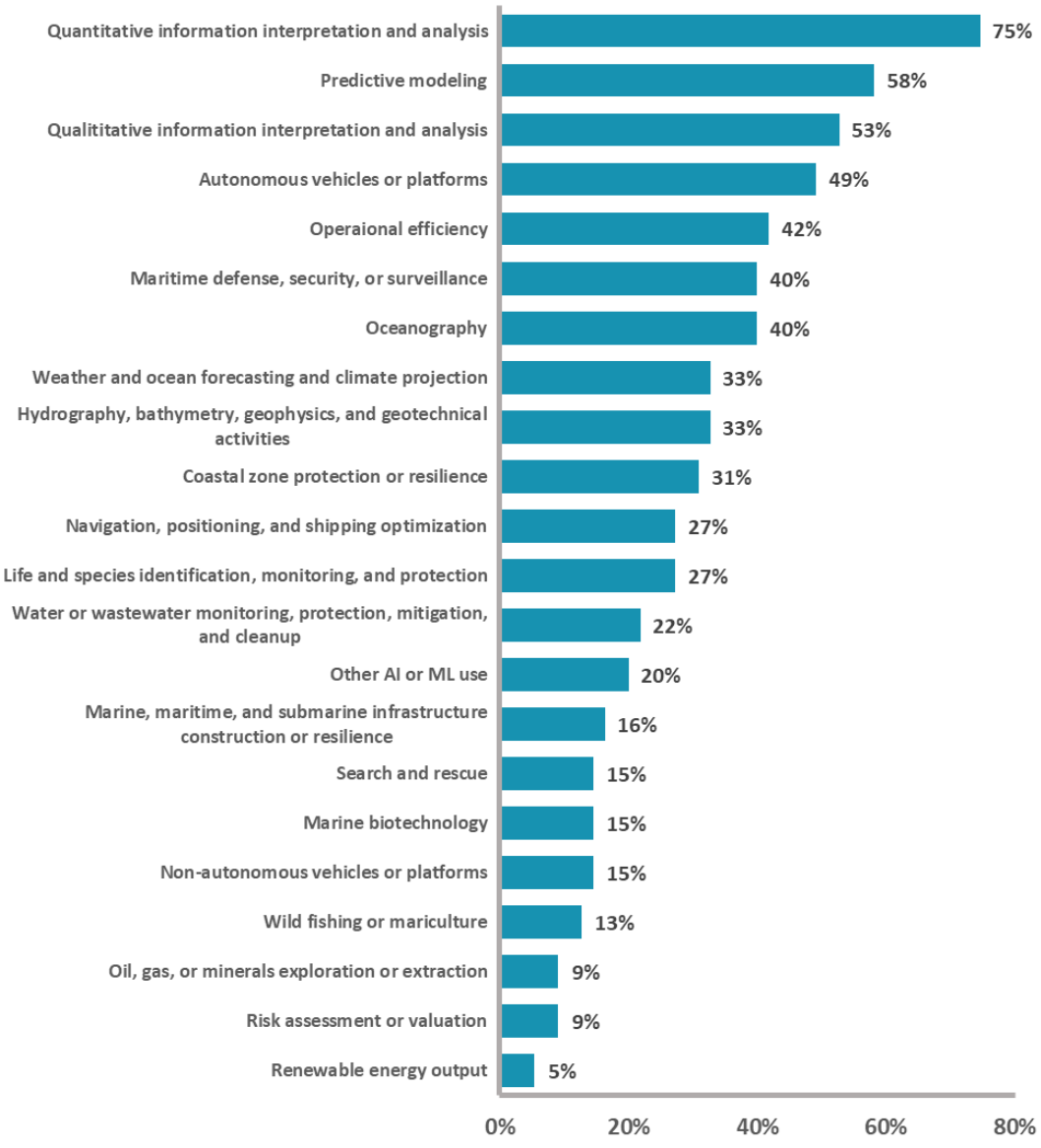
Surveyed businesses were asked to report if they used AI or ML in their business activities. As shown in Figure 3.32, 60% of respondents reported using these tools for their business.

Figure 3.32. Utilization of Artificial Intelligence or Machine Learning



As shown in Figure 3.33, respondents were most likely to report using AI/ML for quantitative tasks such as data interpretation and analysis or predictive modeling, although over half of respondents also indicated they used these tools for qualitative purposes.

Figure 3.33. Areas of Artificial Intelligence and Machine Learning Utilization.



4. Qualitative Interview Findings

In addition to the survey and quantitative data analysis, qualitative information was collected through telephone interviews with selected executives from businesses in the Ocean Enterprise sector. During these interviews, respondents were asked to share their expert perspectives on data-as-a-service business models, autonomous platforms, AI-enabled analytics, scaling ocean data collection, evolving market demand, and the role of NOAA/IOOS in the ocean observation sector.

Major Themes

1. Ocean data is valuable, but scalable business models are still maturing

A central theme was that many businesses now aim to sell data or mission outcomes rather than hardware, but few have fully resolved the challenge of building a repeatable, scalable "collect once, sell many times" model.

A recurring concern was that scalable ocean data businesses must offer lower cost than bespoke collection, better integration across the value chain, and greater analytical value.

2. Autonomy is central to lowering costs

Autonomous systems, including surface and underwater platforms, along with expanding networks of sensor technologies and satellite remote sensing, were widely viewed as essential for making ocean observation cheaper, more persistent, and more scalable. Interviewees described meaningful progress in autonomous vehicle endurance, reliability, and deployment capability, although further improvements are still needed in both sensor and platform performance.

Sensors were identified as a major opportunity area, especially in bio-chemical sensing, where respondents emphasized the need for technologies that are both better and less expensive.

3. AI and analytics are promising but still developing

The large volume of data generated by modern sensors is increasing the need for advanced processing tools. Interviewees consistently viewed artificial intelligence and machine learning as important growth areas, particularly for extracting value from large ocean datasets, improving forecasts, and supporting applications.

At the same time, some respondents cautioned that the industry may become overly reliant on AI without maintaining sufficient investment in physical observation and validation.

4. Market growth is strongest where data clearly improves decisions

Interviewees identified strong market opportunities in several areas where better ocean data directly supports decision-making, including:

- Offshore energy, especially offshore wind.
- Shipping, fuel optimization, and weather routing.
- Defense and maritime security, particularly autonomous systems, surveillance, and infrastructure monitoring.
- Seafloor mapping and subsea infrastructure, including underwater cables, protected areas, and early-stage survey work.
- Fisheries and seafood management, with a focus on sustainability and compliance.

- Coastal and hyperlocal weather forecasting, especially continuous observation and early warning for coastal hazards.
- Inspection, repair, and maintenance of a growing array of marine assets.

5. Funding, geopolitics, and procurement remain major constraints

Respondents commonly cited several challenges that constrain growth, including uncertain or inconsistent funding, slow government procurement cycles, capital access constraints, geopolitical instability, regulatory fragmentation, and the difficulty of aligning long-term technology development with short-term budget structures.

6. NOAA/IOOS is valued, but coordination and resourcing are concerns

NOAA/IOOS relationships were generally viewed positively, but interviewees noted several concerns. Internal complexity and fragmentation can make the system difficult for outsiders to navigate, and budget and contracting processes may limit participation.

Respondents also suggested that there is room for stronger dataset integration and more flexible use of mobile sensing platforms. IOOS was often perceived as being more focused on fixed infrastructure than on newer mobile systems.

Key Takeaways from Interviews

Overall, interviewees described an Ocean Enterprise that is moving toward a future in which persistent autonomous platforms, cloud-based data systems, and AI-driven analytics make marine data more useful and scalable. However, the sector continues to face important challenges related to business model repeatability, funding, procurement, sensor economics, and coordination.

Despite substantial progress in ocean observation over the past decade, interviewees also emphasized ongoing barriers tied to the extreme physical conditions of the deep ocean, the high costs of deep-sea technology, and the logistical and data-related challenges involved in operating in these environments.

5. Conclusions and Next Steps

The findings of the 2025 Ocean Enterprise study demonstrate that the Ocean Enterprise has become an increasingly important enabling component of the evolving Ocean Economy.

This section of the report draws together the most important changes in the U.S. Ocean Enterprise business sector that have occurred since publication of the 2020 report. It concludes with some recommendations regarding use of the study to promote the further development of the sector and some suggestions for additional work that would add to our understanding of how the Ocean Enterprise is delivering economic, societal and environmental benefits.

5.1 Growth and Change

The 2025 Ocean Enterprise study demonstrates the continuing expansion and increasing strategic importance of the U.S. Ocean Enterprise business sector within the wider Ocean Economy. Building on the baseline established by the 2015 and 2020 studies, the results show a sector that has continued to evolve in scale, structure, technological capability, and market orientation.

The findings indicate that the Ocean Enterprise has grown substantially since the 2020 study.

Total Ocean Economy revenue has grown from $8.8 billion to $16.4 billion over the period since the 2020 study. Corrected for inflation over this period, this represents a growth from approximately $11.0 billion to $16.4 billion; a growth of 49%.

The U.S. Ocean Enterprise sector is highly export-driven with approximately 21% of businesses' Ocean Enterprise revenue being from export sales. This is almost double the export share of the overall U.S. economy, where exports of goods and services represented approximately 11.1% of GDP in 2024 (World Bank, 2025). Businesses in the sector export to all regions of the world, with Europe and Asia-Pacific being the most important markets, and with Europe especially increasing in significance since 2020.

The number of identified U.S. businesses engaged in Ocean Enterprise activities increased from 1,049 in 2020 to 1,830 in 2025. Part of this increase is the result of improved identification methodologies and greater visibility into Ocean Enterprise activities embedded within larger corporate structures and adjacent technology sectors. However, most of this increase reflects the emergence of new businesses and the expansion of established businesses into Ocean Enterprise related markets. This growth highlights both the increasing demand for ocean intelligence and the widening range of end users relying upon ocean observations, measurements, modeling, and forecasting.

At the same time, the structure of the sector continues to evolve. The Ocean Enterprise remains characterized by a large population of small and medium-sized businesses, while also increasingly attracting participation from larger multinational corporations, especially in areas linked to defense, maritime security, autonomous systems, digital infrastructure, and advanced analytics.

The Ocean Enterprise is also evolving from a sector focused primarily on the collection of ocean observations toward one increasingly centered on integrated operational services. The combination of sensors, communications, cloud infrastructure, AI-enabled analytics, and predictive modeling is enabling the delivery of real-time ocean intelligence products that directly support operational decision-making across a wide range of industries.

The 2025 study period has been shaped by several major external drivers. These include recovery from the COVID-19 pandemic, accelerating digital transformation, heightened geopolitical tensions, increasing climate-related impacts (IPCC, 2023), rapid expansion of offshore renewable energy (GWEC, 2025; IEA, 2024), subsea energy infrastructure, and associated marine operations, and growing recognition of the strategic importance of resilient maritime infrastructure and supply chains. Together, these drivers have significantly increased demand for trusted ocean intelligence across both civilian and defense applications.

The study findings suggest that the Ocean Enterprise is continuing to transition from a sector associated primarily with ocean research, offshore oil and gas, transportation, and fisheries toward a far broader and more diversified portfolio of markets. While these sectors remain important, growth is now being driven by other sectors and especially the demands for ocean intelligence associated with offshore renewable energy, maritime domain awareness, coastal resilience, digital ports, aquaculture, environmental monitoring, autonomous and robotic systems, subsea infrastructure, marine spatial planning, and defense.

A clear trend in the 2025 study is the further adoption of autonomous and robotic technologies across the Ocean Enterprise. Uncrewed surface vessels, autonomous underwater vehicles, remote sensing systems, distributed sensor networks, and persistent monitoring platforms are reshaping the economics and operations of ocean observation. Together, these technologies enable more persistent, cost-effective, scalable, and higher-resolution monitoring of ocean and coastal environments over larger geographic areas.

This rapid expansion of autonomous systems is simultaneously driving demand for enabling technologies including low-power sensors, advanced communications, cloud-based data systems, edge computing, and integrated digital infrastructure. Increasingly, the value of Ocean Enterprise activity lies not only in the collection of ocean observations, but also in the ability to integrate, process, analyze, and operationalize large volumes of ocean data.

Artificial intelligence and machine learning are becoming important enabling technologies within the Ocean Enterprise. Of businesses surveyed, 60% reported utilizing AI or ML in their operations, primarily in support of data interpretation, predictive modeling, automation, anomaly detection, and decision support. The combination of autonomous sensing systems with AI-enabled analytics is accelerating the transition toward the delivery of operational decision support services capable of aiding decision-making across a wide range of ocean industries and public-sector applications.

In many respects, the Ocean Enterprise is undergoing a transition like earlier transformations in the weather, geospatial, and telecommunications sectors, where public observing infrastructure, digital platforms, and private-sector innovation combined to create entirely new layers of economic activity and operational capability.

As noted in the introduction, the boundaries between commercial, scientific, environmental, and defense applications of ocean technology are becoming increasingly blurred. Many technologies originally developed for scientific research, offshore energy, hydrography, fisheries management, or environmental monitoring are now also being deployed for maritime security, defense, and the protection of critical infrastructure. Autonomous systems, advanced sensors, subsea communications, satellite-enabled ocean surveillance, digital twins, and persistent monitoring networks are all technologies with significant dual-use applications spanning the civilian and defense domains.

The rapid growth of autonomous and uncrewed systems is particularly illustrative of this convergence. Autonomous underwater vehicles, uncrewed surface vessels, distributed sensing systems, and AI-enabled data fusion platforms are increasingly valued because they provide persistent, lower-risk, and lower-cost maritime awareness capabilities. These same characteristics make them attractive for both commercial operations and national security applications, contributing to increased investment and acquisition activity across the Ocean Enterprise sector.

The findings suggest that the Ocean Enterprise should increasingly be understood as strategic national infrastructure; underpinning economic competitiveness, maritime security, and environmental stewardship.

An additional and important dimension of Ocean Enterprise growth since 2020 has been the emergence of a more structured innovation ecosystem supporting ocean technology entrepreneurship and commercialization. The study findings indicate a continuing influx of new businesses into the sector, reflecting both expanding market opportunities and growing investor interest in ocean-related technologies and services.

This trend is increasingly supported by dedicated ocean-focused innovation initiatives including accelerators, incubators, venture networks, and public-private partnerships. Such initiatives are helping early-stage companies navigate the technical, operational, and financial barriers associated with developing ocean technologies and novel applications of ocean intelligence.

Historically, Ocean Enterprise start-ups have faced significant challenges relative to many terrestrial technology sectors, including high hardware development costs, limited access to test infrastructure, long operational validation cycles, and complex regulatory and procurement environments. The emergence of targeted support mechanisms therefore represents an important maturation of the wider Ocean Enterprise ecosystem.

Internationally, initiatives such as the “1000 Ocean Startups” coalition associated with the UN Decade of Ocean Science for Sustainable Development reflect growing recognition of the importance of entrepreneurship and innovation in addressing ocean sustainability challenges while simultaneously supporting economic growth. These efforts seek to accelerate the development of scalable ocean solutions spanning areas such as autonomous systems, ocean data services, aquaculture, offshore renewable energy, marine carbon monitoring, coastal resilience, biodiversity monitoring, and digital ocean technologies.

NOAA and its partners also support innovation and pathways to commercialization through programs such as the NOAA Ocean Enterprise Accelerators program. Through this program NOAA is supporting the development and commercialization of ocean, coastal, and Great Lakes technologies and information services through coordinated accelerator initiatives helping to connect emerging companies with operational users, public datasets, test environments, domain expertise, and potential commercialization pathways.

The growing importance of these innovation support mechanisms reflects the technology-driven nature of the Ocean Enterprise itself. Many of the most dynamic areas of growth identified in the study, including AI-enabled analytics, autonomous systems, distributed sensing, digital twins, advanced communications, and integrated ocean information platforms, are areas where start-ups and rapidly scaling small businesses are playing a particularly important role.

This innovation ecosystem is likely to become increasingly important as the Ocean Enterprise continues to develop. Emerging ocean markets and societal needs will require new generations of technologies, business models, and service capabilities that often originate from smaller, highly innovative businesses. Ensuring that these businesses can access capital, testing infrastructure, demonstration opportunities, and early customers will therefore be an important component of strengthening U.S. leadership in ocean technology and ocean information services.

The continued evolution of the Ocean Enterprise is also reshaping workforce requirements. Future growth will increasingly depend upon interdisciplinary capabilities spanning ocean science, engineering, robotics, software development, artificial intelligence, cloud computing, data science, and operational analytics. Building and sustaining this workforce will be essential to maintaining U.S. leadership in Ocean Enterprise technologies and services (Hotaling & Spinrad, 2021).

The study also highlights the further internationalization of the Ocean Enterprise sector. Export activity remains an important source of revenue for many U.S. businesses, with European and Indo-Pacific markets representing particularly significant opportunities. As many Ocean Economy sectors continue to expand globally, U.S. Ocean Enterprise businesses are well positioned to supply technologies, services, and expertise into growing international markets.

The findings reinforce the critical role of public-sector investment and coordination in sustaining the Ocean Enterprise ecosystem. Public observing infrastructure, open access data, forecasting systems, standards, and long-term observing programs remain foundational enablers of private-sector innovation and commercial activity. NOAA, IOOS, and related federal programs continue to play a central role not only as providers of public good observations and forecasts, but also as conveners, partners, and early adopters of emerging technologies.

The study further demonstrates that the Ocean Enterprise is becoming central to national resilience and security. Ocean intelligence capabilities now underpin a growing range of applications including maritime domain awareness, critical infrastructure protection (NATO, 2023), climate adaptation, disaster preparedness, and supply chain resilience.

More broadly, the results reinforce the emergence of a knowledge-based Ocean Economy in which the ability to observe, understand, model, and predict ocean conditions becomes an increasingly important source of economic value. In many respects, the Ocean Enterprise is becoming to the Ocean Economy what the Weather Enterprise (National Research Council (2003) became to the broader terrestrial economy; an enabling ecosystem that converts environmental observations into operational ocean information supporting economic activity, public safety, environmental stewardship, and national resilience.

The continued growth of the Ocean Enterprise reflects a broader structural transition in our relationship with the ocean. As ocean use intensifies, pressures on marine systems will also increase. The ability to sustainably develop ocean resources, protect marine ecosystems, support resilient coastal communities, and manage increasing competition for ocean space will depend fundamentally on the capabilities delivered by the Ocean Enterprise.

Taken together, these developments point toward the emergence of a far more digitally enabled, operationally integrated, and strategically significant Ocean Enterprise than existed even five years ago. The sector is evolving from a specialized marine technology cluster into a critical component of the broader infrastructure supporting the future Ocean Economy.

As the Ocean Economy continues to expand, the strategic importance of this capability will continue to grow. Ocean observations, forecasting systems, digital ocean infrastructure, and the businesses that deliver operational ocean intelligence should increasingly be viewed as elements of national strategic infrastructure, analogous to weather services, telecommunications, geospatial systems, and positioning, navigation, and timing services.

5.2 Next Steps

The 2025 Ocean Enterprise study provides an updated baseline for understanding the scale, structure, and trajectory of the U.S. Ocean Enterprise sector. The results of this study will support NOAA, IOOS, the Department of Commerce, and other federal and state agencies in developing policies and programs that strengthen U.S. leadership in ocean technology, ocean observation, and ocean intelligence services.

Communication of the study findings through this report, associated workshops, industry engagement, and broader outreach activities will continue to raise awareness of the Ocean Enterprise as a critical enabling component of the wider Ocean Economy. The results also provide an important evidence base for discussions concerning workforce development, innovation policy, industrial strategy, public-private partnerships, and future investment priorities.

The study highlights several areas where continued support and engagement may be particularly important:

- Sustaining and modernizing public ocean observing infrastructure and open data systems.
- Accelerating the transition of emerging technologies into operational use.
- Supporting innovation and commercialization among small- and medium-sized enterprises.
- Expanding testbeds, demonstration programs, and technology validation capabilities.
- Strengthening public-private partnerships for ocean data collection and service delivery.
- Supporting development of technology and data standards, interoperability, and trusted ocean data frameworks.
- Enhancing workforce development in ocean technology, data science, robotics, AI, and operational oceanography.
- Supporting export growth and international market access for U.S. Ocean Enterprise businesses.
- Improving understanding of Ocean Enterprise supply chains, value chains, and economic impacts.

The rapid evolution of the Ocean Enterprise also reinforces the importance of continued measurement and analysis of the sector itself. As technologies, markets, and organizational structures continue to evolve, future studies will be important in tracking changes in the scale, composition, and strategic role of the Ocean Enterprise within the broader Ocean Economy.

Future work could also expand analysis in several areas not fully addressed in the present study, including:

- More detailed assessment of the role of artificial intelligence and digital ocean technologies.
- Improved characterization of defense and dual-use Ocean Enterprise activities.
- Better understanding of venture capital, private equity, and innovation financing trends.
- Expanded analysis of regional innovation clusters and workforce dynamics.
- Improved international comparisons and benchmarking of Ocean Enterprise activity.
- Assessment of the role of commercial satellite systems and emerging space-ocean data integration.
- Evaluation of the contribution of Ocean Enterprise activities to climate resilience and adaptation.

Ultimately, the findings of the 2025 study reinforce a central conclusion emerging from the series of Ocean Enterprise studies which have demonstrated how the ability to observe, measure, model, forecast, and understand the ocean is becoming increasingly fundamental to enabling ocean economic activity, environmental stewardship, national security, and societal resilience.

The central message of the 2025 study is clear: the future Ocean Economy will depend increasingly on the capacity to turn ocean observations into trusted, actionable intelligence.

Sustaining U.S. leadership in the Ocean Enterprise sector will require continued investment, coordination, and partnership across government, academia, industry, investors, and end users.

References

BEA (2021). U.S. Bureau of Economic Analysis, Marine Economy Satellite Account, 2014 -2019. at https://www.bea.gov/news/2021/marine-economy-satellite-account-2014-2019.

BEA (2025). U.S. Bureau of Economic Analysis, Marine Economy Satellite Account, 2023 at mesa0625.pdf

Costanza R. et al. (2014). *Changes in the global value of ecosystem services*. Global Environmental Change, 26, 152–158.

Dasgupta P. (2021). The Economics of Biodiversity: The Dasgupta Review. London: HM Treasury.

Fenichel EP, Milligan B, Porras I, et al. (2020). *National Accounting for the Ocean and Ocean Economy.* Washington, DC: World Resources Institute. Available online at https://www.oceanpanel.org/blue-papers/national-accounting-ocean-and-ocean-economy.

GWEC (2025). *Global Offshore Wind Report 2025*. Global Wind Energy Council. GWEC's Global Offshore Wind Report

Hotaling L and Spinrad RW. (2021). *Preparing a Workforce for the New Blue Economy: People, Products and Policies*. Elsevier Science Publishing Co Inc ISBN: 9780128214312.

IEA (2021). *Net zero by 2050 – A roadmap for the global energy sector*. International Energy Agency. Net Zero by 2050 – Analysis - IEA.

IPCC (2023) Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 184 pp., doi: 10.59327/IPCC/AR6-9789291691647.

LeBoeuf, Nicole; Rayner, Ralph F.; Gouldman, Carl; Baize, Zack; Grasso, Monica; Croll, Brittany; and Quigley, Kate (2023) "Terminology Related to Ocean and Coastal Economic Activity," Journal of Ocean and Coastal Economics: Vol. 11: Iss. 1, Article 1. DOI: https://doi.org/10.15351/2373-8456.1189

National Research Council (2003). *Fair Weather: Effective Partnership in Weather and Climate Services.* Washington, DC: The National Academies Press. https://doi.org/10.17226/10610.

NOAA (2017). *The Ocean Enterprise: A study of U.S. Business Activity in Ocean Measurement, Observation and Forecasting*. oceanenterprise_feb2017_secure.pdf (noaa.gov).

NOAA (2019). *NOAA report on the U.S. Ocean and Great Lakes Economy*. National Oceanic and Atmospheric Administration (NOAA), Office for Coastal Management. Charleston, SC: NOAA Office for Coastal Management. http://coast.noaa.gov/digitalcoast/training/econreport.html.

NOAA (2021). *The Ocean Enterprise 2015 – 2020: A study of U.S. New Blue Economy business activity.* https://doi.org/10.4031/MTSJ.56.1.13

https://cdn.ioos.noaa.gov/media/2021/12/OE-REPORT-2015_2020-FINAL_120721_web.pdf

NOAA (2024). NOAA Climate.gov – Ocean and Climate Change overview

OECD (2016). *The Ocean Economy in 2030*. OECD Publishing, Paris.

OECD (2025), *The Ocean Economy to 2050*, OECD Publishing, Paris, https://doi.org/10.1787/a9096fb1-en.

PLN 111-11 (2009) *Public Law No. 111-11*, Omnibus Public Land Management Act of 2009 (Engrossed Amendment as Agreed to by Senate; H.R. 146) Subtitle C--Integrated Coastal and Ocean Observation System Act of 2009 (33 U.S.C. §3601-3610).

PLN 116-271 (2020) *Public Law No 116-271*, Coordinated Ocean Observations and Research Act of 2020.

Rayner RF, Gouldman C, and Willis Z. (2019). *The Ocean Enterprise -understanding and quantifying business activity in support of observing, measuring and forecasting the ocean*, Journal of Operational Oceanography.

World Bank (2024) Exports of goods and services (% of GDP) | Data

United Nations (2025) UN Sustainable Development Fact Sheet – Goal 12.

Appendices

Appendix 1. Non-Survey Methodology

The 2015 and 2020 studies relied on two key components of the Ocean Enterprise universe: 1) an identifiable population of businesses that emerged from research and review, and 2) research that informed assumptions about the number of Ocean Enterprise businesses that were not captured in this way, as well as these businesses' employment, total revenue, Ocean Economy revenue, and Ocean Enterprise revenue. With some exceptions, it was assumed that the undercounted entities were distributed in a similar way to the survey sample responses. This approach had been informed by and followed other efforts that had been made to understand the Ocean Enterprise universe.

The current study utilized an updated process informed by the lessons learned since the 2020 study and the availability of new Artificial Intelligence tools.

Population Identification:

1. First, the entire Ocean Enterprise-related population identified for the 2015 and 2020 studies was reviewed, including some businesses previously deemed out-of-scope. Websites and other materials were scanned to determine if they were still in business and, if so, if they appeared to be in the Ocean Enterprise sector. Where the listed businesses were part of a larger corporate family, other related businesses were also screened to determine whether they might be engaged in Ocean Enterprise activities.
2. The next effort (run concurrently) was to expand upon the efforts of 2015 and 2020 and collect information on as many entities as possible from:
    - Memberships of Ocean Enterprise related organizations.
    - Participants in and exhibitors at Ocean Enterprise related conferences.
    - Referrals from IOOS staff and other knowledgeable experts.
    - Knowledge of the ERISS research team.
    - Businesses identified as selling Ocean Enterprise related products and services to the U.S. Government, based on a detailed search of federal contracts data (collected and reported in the Federal Procurement Data System).
    - A detailed search of Thomas Network listings at Thomasnet.com (formerly *Thomas Register)* using maritime and Ocean Enterprise related search criteria.
    - A detailed search of the Dun & Bradstreet Hoovers database using their web search tools, also using maritime and Ocean Enterprise related search criteria.
    - Searches of Ocean Enterprise relevant market and analyst reports.
    - Generalized web research.
3. As with the 2015 and 2020 populations, websites were scanned to determine if businesses were active in areas relevant to the Ocean Enterprise and, when appropriate, the Ocean Enterprise relevance of the companies' larger corporate families.

4. The third identification effort was continual throughout the project: referrals, press reports and generalized research generated a small but useful list of potential candidates.
5. The fourth identification effort resulted from email blasts, newsletter, and website mentions by Ocean Enterprise relevant organizations, social media placements on NOAA and IOOS sites, and presentations by IOOS at relevant events.
6. The new modification in 2025 was the use of artificial intelligence to review the total population identified from these various sources. After some experimentation with strategies, the results were compared to the manual assessments. Results were very good. Any disagreements between AI and manual assessment were adjudicated through further research on the target businesses.

Secondary Research

The 2025 study expanded on the assessment of the identified Ocean Enterprise sector used in 2020 using additional secondary sources of information. These secondary sources do not have the level of context at the individual business level that was captured in the survey, but do provide information, especially economic data, that permitted the development of a more refined picture of the scope and scale of U.S. Ocean Enterprise activity.

For the 2025 analysis, a targeted effort was initiated to collect Ocean Enterprise-relevant data for every business in the identification database focused on verification of in or out of scope, total revenue, total employment, marine and maritime revenue, and Ocean Enterprise revenue. In most cases, AI results closely matched manual assessments.

During the identification process above, businesses were tentatively identified as in-scope, out-of-scope, or indeterminant. These assessments were validated using Artificial Intelligence. Conflicts were adjugated. Out of scope entities were dropped. Indeterminant entities, if located in the U.S. and if Dun & Bradstreet or other data were available, were assigned to the relevant but still unknown population for a deeper dive into their operations. For the final list of in-scope entities, an effort was made to assign conservative estimates of marine and maritime and Ocean Enterprise shares of total revenue, based on artificial intelligence, web research, annual reports, and other materials. Shares were assigned to each entity:

- Point or range estimates for the share of Ocean Economy revenue in total U.S. (including territories) revenue.
- Point or range estimates for the share of Ocean Enterprise revenue in Ocean economy revenue.
- If reasonable estimates of shares could not be determined, the firms were dropped from the in-scope population. Some efforts were made to estimate the potential undercount from this assumption.

Corporate families had many subsidiaries and branches that did not have a unique web identity that could be researched. However, each entry did have unique (North America Industry Classification System (NAICS) and Standard Industry Classification (SIC) codes reported in the Dun & Bradstreet Hoovers data set. With limited exceptions, branch activity was rolled into their respective reporting subsidiary or headquarters for analysis purposes. The primary exception

was a U.S. based branch of a foreign company with no U.S. subsidiary or headquarters. Such a branch was included as an U.S. based Ocean Enterprise company. A detailed AI analysis of all identified entities generated a range of potential shares of total revenue attributable to the Ocean Economy and Ocean Enterprise.

With these estimates in hand, a further process reviewed the estimates generated by this process for Ocean Enterprise-relevant entities that were previously identified. The general bias was to assign the range minimum, or to exclude the entity from the analysis.

Follow-up manual scans were pursued to flag entities that might deserve some additional attention.

The resulting database, including survey and interview participants, represented the study's identified U.S. Ocean Enterprise population for further analysis.

Estimation Biases

Throughout the non-survey analysis, conservative assumptions were used when determining "in-scope/out of scope" assignments, estimates of maritime and Ocean Enterprise revenue shares and statistical estimates of maritime and Ocean Enterprise revenue shares.

Many aerospace and most satellite observation-related Providers were excluded in 2020. Both the manual and the artificial intelligence processes were able to identify many additional businesses offering specific Ocean Enterprise-relevant activities. Where identifiable, or an aerospace business responded to the survey and provided its own data, such businesses were included. Businesses were still excluded because of the difficulty of separating specific Ocean Enterprise activities from their terrestrial business, but a significant number were clearly identified with good estimates of shares.

Advanced electronics supply chain companies were included only if detailed research identified specific Ocean Enterprise products, services, and markets as critical and estimable.

As noted, an analytical process was used to identify branches of large corporate families as potentially in the Ocean Enterprise sector, based on AI analysis and common NAICS/SIC codes with entities in the Ocean Enterprise cluster. Many of these were excluded, with some being assigned minimum marine/maritime and Ocean Enterprise shares.

Despite our wide net approach to identifying entities potentially in the Ocean Enterprise cluster, it is probable we will have missed some Ocean Enterprise businesses. Most likely to be omitted are branches of large corporations, which are not separate legal entities, and very young start-ups that are not yet visible in the sources used to identify target businesses.

In general, the non-survey analysis was designed to yield conservative estimates, understating total Ocean Enterprise revenue.

Appendix 2: Ocean Enterprise Business Count

An important objective of the 2025 study was to develop a more comprehensive inventory of Ocean Enterprise participants. Compared with previous studies, the 2025 effort expanded further into the Ocean Enterprise value chain and examined industrial sectors that have only recently become visibly active in ocean observation and related activities. As a result, the study provides a substantially more complete and precise picture of the Ocean Enterprise population. Nevertheless, the sector likely remains underestimated and the challenges associated with identifying Ocean Enterprise activities have become more pronounced over the decade since 2015 because of the sector's rapid evolution.

Multiple factors have contributed to growth in the Ocean Enterprise since 2020, although the relative contribution of each factor can only be estimated. Of the 1,830 companies identified as in-scope in 2025, 494 could be directly matched to companies included in the 2020 study using DUNS numbers.

Previously Existing Ocean Enterprise Companies

Analysis identified 235 companies that were already providing Ocean Enterprise products or services prior to 2020 but were not captured in the 2020 population. Many companies occupy a category that may be described as "estimably Ocean Enterprise" (the point at which the share of revenue attributable to Ocean Enterprise activities becomes large enough to be identified confidently using secondary research). Approximately 45% of these previously undercounted companies operated in sectors that were particularly difficult to classify at the time of the 2020 study.

New Entrants to the Ocean Enterprise

A company may be decades old and still represent a new entrant to the Ocean Enterprise. For example, an established electronics manufacturer that recently introduced a hydrographic sensor or adapted an existing technology for marine applications would be new to the Ocean Enterprise despite its long corporate history.

Several sources of new entrants were identified. Dun & Bradstreet records indicate that 107 Ocean Enterprise companies were founded after the 2020 study (excluding companies formed in 2025, which were not yet available in the database). In addition, NOAA and other public and private organizations substantially expanded accelerator and innovation programs after 2020. Many recipients of these programs were likely underrepresented in previous analyses.

Another important source of growth consisted of 268 independent companies that had existed prior to 2020 but only entered the Ocean Enterprise after that date.

Corporate Restructuring and Family Growth

The remaining 761 in-scope businesses identified in 2025 reflect a more complicated set of dynamics. The use of AI-assisted analysis in the 2025 study enabled a much more detailed

examination of subsidiary structures and corporate families than was possible in 2020 (see Appendix 1).

Since 2020, the Ocean Enterprise has experienced substantial restructuring through mergers, acquisitions, foreign investment, spin-offs, and internal reorganizations. These changes have redistributed Ocean Enterprise activities across increasingly complex corporate structures and a broader range of large firms.

Additional dynamics that could not be fully quantified include:

1. Companies present in 2020 that have since ceased operations;
2. Companies that remain in business but have exited the Ocean Enterprise sector;
3. Independent firms that have been absorbed into larger corporate families through mergers or acquisitions; and
4. Businesses whose status changed because of internal corporate restructuring.

Many firms included in the 2020 study continue to operate, but they now report through different corporate structures, making direct comparisons difficult.

Estimating Growth in Corporate Families

Removing the 494 companies with direct DUNS matches leaves 320 companies from the 2020 population requiring further examination. A preliminary AI-assisted search indicated that five companies had gone out of business and ten had been acquired and fully absorbed into other organizations.

The remaining 305 entities appeared to continue operating under their existing names despite lacking matching DUNS numbers. Two broad explanations account for this pattern:

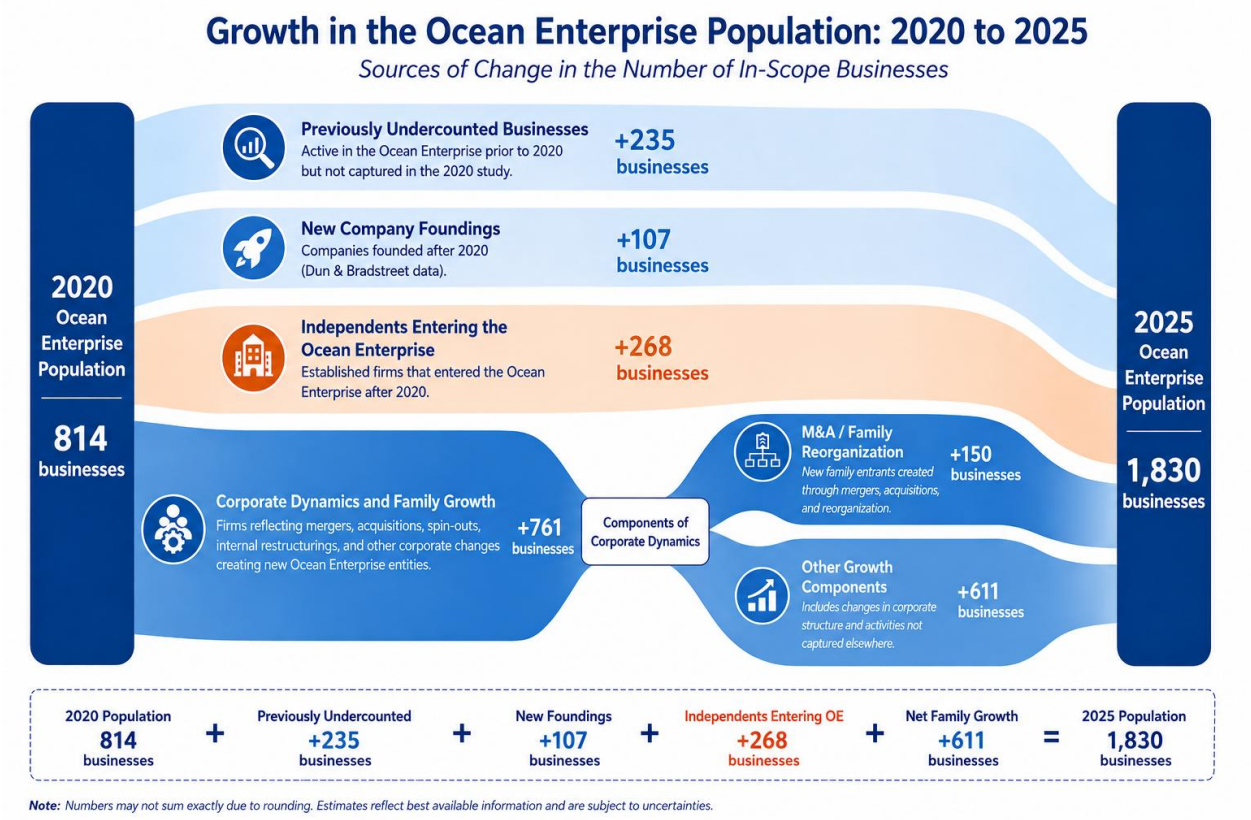
- Existing Ocean Enterprise firms merged or acquired other companies, expanding corporate families not directly linked to 2020 DUNS identifiers; or
- Previously out-of-scope firms entered the Ocean Enterprise by acquiring existing Ocean Enterprise businesses, a common market-entry strategy.

Although the relative importance of these two mechanisms cannot be determined precisely, an equal split between them represents a reasonable approximation. Under this assumption, approximately 152 new corporate families emerged through merger and acquisition activity, yielding an estimated net increase of identifiable new entrants of 527 Ocean Enterprise companies between 2020 and 2025. An additional 574 companies entered the Ocean Enterprise after 2020 reflecting the incredible dynamism of the sector combined with the significant improved tools that permit identification of ”estimably” Ocean Enterprise” companies.

In summary, of the 1,830 businesses identified as in-scope in 2025, 494 companies could be directly matched to firms included in the 2020 study through their DUNS numbers. The remaining

growth reflects several distinct dynamics. An estimated 235 companies were already engaged in Ocean Enterprise activities prior to 2020 but were not captured in the earlier study, while 107 companies represent newly formed businesses established since 2020. Another 268 established independent firms entered the Ocean Enterprise after 2020 as they expanded into ocean-related products and services.

The remaining 761 businesses reflect more complex changes within the corporate landscape, including mergers, acquisitions, spin-offs, and internal reorganizations. Within this group, approximately 150 businesses are estimated to represent new corporate family entrants created through merger and acquisition activity, while the remaining 611 businesses represent broader net growth within Ocean Enterprise corporate families. Together, these factors illustrate both the continuing expansion of the sector and the increasingly dynamic and interconnected structure of the Ocean Enterprise ecosystem.



Appendix 3: The Survey Instrument

The *Ocean Enterprise Study 2015-2020-2025* electronic survey instrument built upon the 2015 and 2020 survey efforts to both update and improve NOAA's and IOOS's understanding of the Ocean Enterprise business community.

As detailed in this report, the survey's questions promoted a direct comparison to the 2015 and 2020 project's findings. However, the 2025 survey was by no means a carbon copy of the original instrument. More attention was paid to the possible differences among organizational types. The list of choices in many questions were expanded to reflect the changed context faced by the Ocean Enterprise in terms of technologies, markets, and activities. Finally, while this report focuses on the Ocean Enterprise and IOOS business communities and their survey answers, parallel data was often collected on respondents that identified themselves as outside those core audiences. All changes were approved in accordance with U.S. Government human subject protocols and paperwork reduction priorities.

The new survey also relied significantly on advanced survey skip, piping, and branching functionality to minimize the time investment required of respondents.

The logic flow determinants were as follows:

- National location
- U.S. only or multinational structure
- Business or corporate structure type
- Ocean Economy contribution
- Export activity
- IOOS familiarity
- IOOS or other Ocean Enterprise data system contribution

The survey began with an introductory expression of gratitude for the respondent's time and attention. The introductory page also featured an explanation of the survey's purpose and structure, its relationship to the 2020 Ocean Enterprise Study project, and key concepts and terms. In addition, the survey questions and options regularly included detailed explanations of concepts and terms, such as definitions for Ocean Enterprise provider, intermediary, and end-user, and also included a number of clickable, in-survey, hyperlinked definitions of various terms.

With a few exceptions at the beginning of the survey, each survey question was optional; any required questions were indicated as such. The survey instrument clearly expressed that all responses would be kept confidential.

Note: The survey employed complex conditional skip logic to tailor questions to each respondent's organizational characteristics and activities. The condensed instrument presented below summarizes the substantive content and major respondent pathways while omitting programming details used in the web-based implementation. The instrument preserves the substantive content and major respondent pathways while condensing extensive survey programming and skip logic into a reader-friendly format.

Section 1. Organization Information

- Organization name, city, state/territory (or country), and respondent job title.
- Organization structure: sole proprietorship, single-location company, multi-location company, subsidiary/division/regional office, or corporate headquarters.
- If subsidiary/division/regional office: parent corporation name and location.

Section 2. Ocean Economy and Ocean Enterprise Participation

- Classification as Ocean Enterprise Provider, Ocean Enterprise Intermediary, Ocean Enterprise End User, Ocean Economy business, or none of the above.
- Skip Logic: respondents selecting 'None of the Above' exited the survey.
- Length of participation in each applicable activity category (<1 year, 1–5 years, 6–10 years, 11–15 years, >15 years, unknown).

Section 3. Business Locations

- Number of organizational locations.
- Number of U.S. locations.
- Plans to open additional U.S. locations.
- Skip Logic: additional geographic questions were asked of multi-location organizations.

Section 4. Employment

- Total employment as of January 1, 2025.
- U.S.-based employment as of January 1, 2025.
- Skip Logic: multinational and multi-location organizations received U.S. employment follow-up questions.

Section 5. Employment Outlook

- Expected employment change during the upcoming year.
- Open-ended explanation of employment expectations.

Section 6. Revenue and Business Activity

- Total gross revenue for the most recent completed fiscal year.
- Share of revenue generated in the United States.
- Share of revenue attributable to Ocean Enterprise and/or Ocean Economy activities.
- Expected revenue change during the current fiscal year.
- Open-ended explanation of revenue expectations.

Section 7. Customers and Markets

- Distribution of revenue across customer groups (households, businesses, universities, federal government, state/local government, and international customers).
- Major geographic markets served, including domestic and international regions.
- Skip Logic: market questions were tailored according to organizational classification.

Section 8. Technology, Products, and Services

- Ocean-related product and service areas served.
- Use of artificial intelligence and machine learning.
- Importance of AI/ML for research, production, and product functionality.

Section 9. Integrated Ocean Observing System (IOOS)

- Awareness of IOOS.
- Relationship to IOOS and Regional Associations.
- Skip logic: respondents without IOOS familiarity skipped subsequent IOOS-specific questions.

Section 10. Future Growth and Strategic Direction

- Future plans regarding Ocean Economy and Ocean Enterprise activities.
- Expected future participation as a provider, intermediary, or end user.
- Potential entry into new Ocean Enterprise market segments.

Major Skip Logic Summary

- Respondents selecting 'None of the Above' for Ocean Enterprise/Ocean Economy participation exited the survey.
- Subsidiaries, divisions, and regional offices received parent-organization questions.
- Multi-location organizations received additional location-distribution questions.
- Organizations with U.S. and international operations received U.S.-specific employment and revenue questions.
- Revenue attribution questions varied according to Ocean Enterprise classification.
- IOOS questions were shown only to respondents indicating familiarity with or participation in IOOS-related activities.

Survey Flow Diagram

Organization Information

↓

Organization Structure

↓

Parent Company Information (if applicable)

↓

Ocean Enterprise Classification

↓

(None of the Above → End Survey)

↓
Years of Participation
↓
Locations & Expansion Plans
↓
Employment & Employment Outlook
↓
Revenue & Revenue Outlook
↓
Customer Composition & Markets
↓
Products, Services & Technologies
↓
Artificial Intelligence / Machine Learning
↓
IOOS Awareness & Relationship
↓
Future Growth & Strategic Plans
↓
End of Survey

Appendix 4: Location of Targeted Businesses by State

State or territory	Businesses and branch operations count	Business count
Total	***10,874***	***1,788***
California	1318	274
Texas	1007	230
Virginia	963	159
Florida	837	139
Massachusetts	545	117
Maryland	475	74
New York	368	82
Colorado	349	46
Washington	349	78
Pennsylvania	321	42
Georgia	313	15
Illinois	286	17
New Jersey	284	61
Oregon	254	25
North Carolina	245	24
Ohio	245	31
Louisiana	208	54
Arizona	197	22
Alabama	192	17
Connecticut	150	28
South Carolina	124	7
Michigan	123	23
Wisconsin	106	21
Missouri	98	10
District of Columbia	95	10
Minnesota	92	8
Utah	88	12
Indiana	87	3
Oklahoma	85	7
Tennessee	85	9
New Mexico	77	8
New Hampshire	75	18
Hawaii	69	11
Rhode Island	67	16
Alaska	64	18
Kansas	62	2

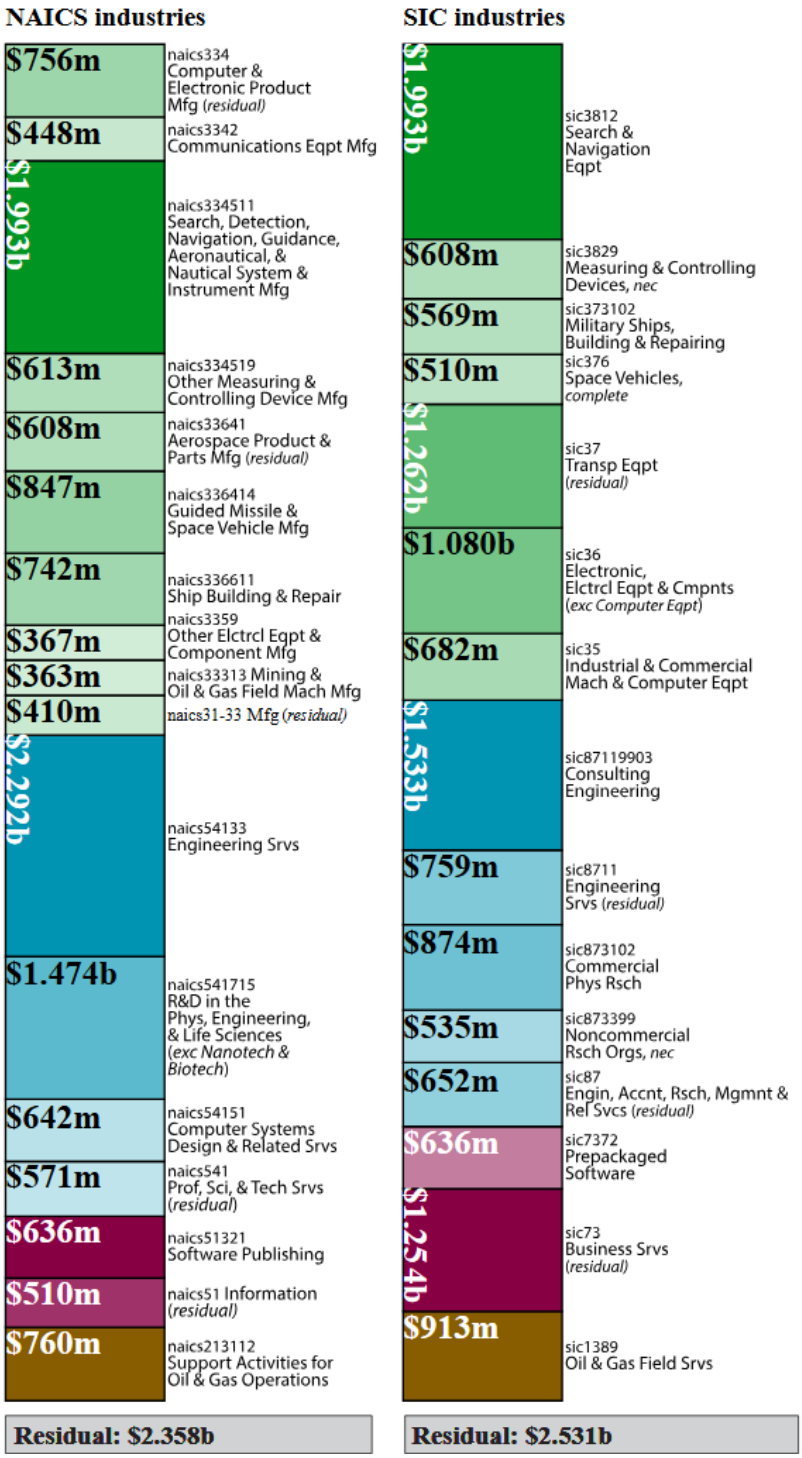
State or territory	Businesses and branch operations count	Business count
Mississippi	61	7
Kentucky	56	1
Nebraska	55	4
Iowa	48	3
Maine	48	18
Nevada	48	3
Arkansas	36	2
Idaho	32	2
South Dakota	31	6
Delaware	30	8
West Virginia	29	2
North Dakota	24	2
Montana	22	2
Vermont	19	3
Wyoming	19	1
Puerto Rico	12	5
Unreported	1	1

Appendix 5. Industry Code Classification Comparison.

The Ocean Enterprise cluster is a complex and rapidly evolving array of economic activity. Standard national data collection systems do not offer the level of detail required to analyze and monitor this cluster. In the process of identifying and estimating Ocean Enterprise revenue at the individual legal entity level for this project, we used the Dun & Bradstreet/Hoovers database to capture detailed North America Industry Classification System (NAICS) and Standard Industry Classification (SIC) codes for each business with a D-U-N-S (a unique number allocated to each legal entity reported by Dun & Bradstreet). The more detailed eight-digit Dun & Bradstreet SIC schema is based on the U.S. SIC methodology.

Ocean Enterprise revenue was allocated to the most detailed NAICS and SIC codes available for each specific entity. The results of this analysis are shown in the industry composition chart opposite. This describes the share of the Ocean Enterprise revenue driven by critical primary Dun & Bradstreet SIC and NAICS industries and industry aggregations. So, for example, in the NAICS column, the largest single detailed primary industry was NAICS 334511, which was associated with approximately 12% of Ocean Enterprise revenue.

In total, this stepwise technique accounts for about 84% of the total Ocean Enterprise in the case of the more detailed Dun & Bradstreet SIC schema, and approximately 85% of the total in the case of each entity's primary NAICS assignment.



IOOS
Integrated Ocean Observing System

NOAA
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Department of Commerce
United States of America

ERISS