Ocean Alliance Canada

Unlocking Workforce Potential in Canada's Blue Economy

Canada's Voice for the Sustainable Blue Economy

August 27, 2025

About Ocean Alliance Canada

Ocean Alliance Canada is a national initiative dedicated to strengthening the foundations of Canada's sustainable Blue Economy. As an intermediary for ocean sector stakeholders with a strong workforce focus, we support people at every stage of their career journey while aligning partners across the country to drive systemic change. To learn more, please visit oceanalliancecanada.ca

Who We Are

Ocean Alliance Canada is a collaborative initiative that brings together partners from across the country to align efforts, share knowledge and strengthen the foundations of Canada's sustainable Blue Economy. OAC is built on a collaborative, people-first approach. We strengthen the systems that power innovation – aligning workforce development, inclusive leadership and policy coordination to support the continuously evolving ocean sector.

What We Do

Ocean Alliance Canada works to *convene national partners* to share insights, reduce duplication, and foster a more connected Blue Economy. The organization *bridges gaps* between training, policy, and practice to strengthen real-world impact across sectors. It *amplifies underrepresented voices*—including Indigenous Peoples, equity-deserving groups, and emerging leaders—ensuring they are at the forefront of ocean policy conversations. *By facilitating knowledge exchange and collaboration*, Ocean Alliance Canada supports inclusive innovation, capacity-building, and long-term planning.

Our Focus

While many initiatives prioritize innovation, Ocean Alliance Canada focuses on building the systems that enable it. We're laying the groundwork—through policy connections, inclusive practices, and long-term strategy: *to ensure the Blue Economy is not only sustainable, but also equitable and innovative.*

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Overview

Canada's Blue Economy holds significant promise for driving sustainable growth, innovation, and workforce development. However, it remains under-leveraged relative to its global potential. As international markets shift toward low-carbon solutions, ocean-based industries are rapidly evolving. In this context, two urgent questions emerge:

1. Where is growth happening across Canada's Blue Economy?
2. How can workforce systems adapt to meet that demand?

This research explores those questions across two key areas. The first examines where growth is occurring across Canada's marine sectors—what industries are gaining traction, how regional strengths are influencing development, and what types of jobs and skills are in demand as sectors modernize. Whether it's port infrastructure, ocean technology, marine renewables, or sustainable seafood, the aim is to understand how Canada's Blue Economy is taking shape—and what it will take to build a workforce that's ready for it.

The second area focuses on the workers themselves—particularly those navigating transitions from high-risk or declining industries into careers in the Blue Economy. It considers how skills developed in the Green Economy and other sectors align with the needs of the Blue Economy, and where targeted upskilling can open doors. While many transitions are promising and require minimal retraining, others expose critical gaps in areas like management, digital tools, and physical competencies. Wage comparisons help clarify which career shifts are economically viable, while analysis of training pathways highlights what supports are currently available—and what's still missing. By understanding the realities of these transitions, this work sheds light on how Canada can create more accessible, strategic routes into sustainable ocean work.

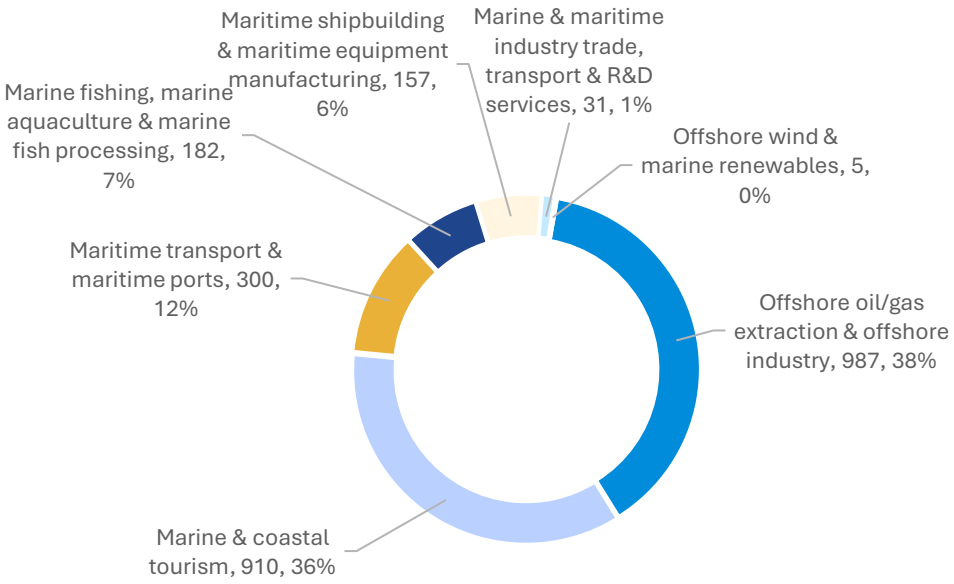
Together, these two lines of inquiry offer a window into how Canada's Blue Economy is growing—and how workforce systems, training providers, and employers can evolve with it.

1. Emerging Growth Areas

The ocean is vital to the global economy, supporting food security for over three billion people through fisheries and marine harvesting. With more than 80% of goods transported by sea and over 98% of international Internet traffic carried by undersea cables, maritime activities underpin global trade and digital connectivity. Developing a resilient and productive Blue Economy depends on controlling climate change, conserving biodiversity, and leveraging the global energy transition.

Growth Has Been Steady, but Still Anchored in Legacy Sectors

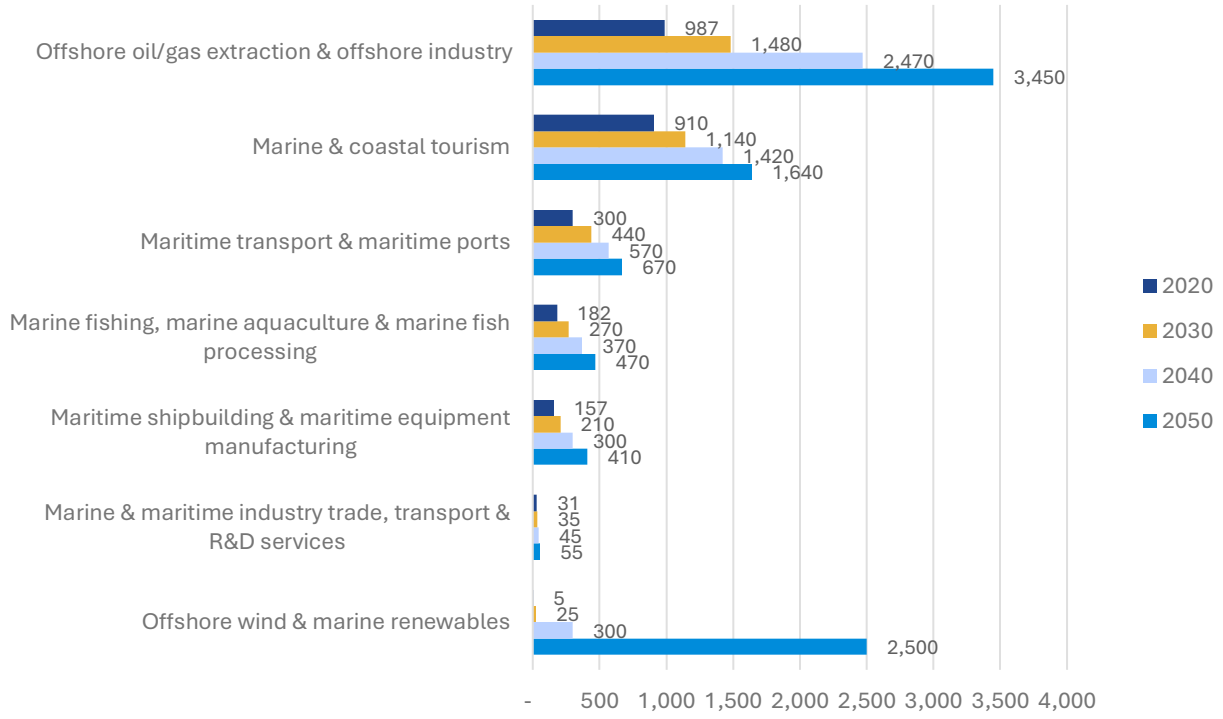
The global Blue Economy's gross value added doubled from US$1.3 trillion in 1995 to US$2.6 trillion in 2020, achieving a 2.8% annual growth rate that matched or exceeded the overall economic growth rate. Oil and gas extraction (38%) and tourism (36%) currently account for the majority of Blue Economy output. Although it is very small, offshore wind and marine renewables have grown fourfold since the mid-2000s, reflecting significant investments in renewable energy infrastructure aimed at reducing fossil fuel dependency (OECD, 2025).



Note: USD billions, 2020
Source: OECD, The Ocean Economy to 2050.

The Future Blue Economy Will Be Led by Energy Sectors

Looking to the future, under the baseline scenario, which assumes a continuation of past trends, the global Blue Economy's gross value added (GVA) is projected to rise from approximately US$2.6 trillion in 2020 to US$3.4 trillion by 2030, reaching US$4.1 trillion in 2040 and US$5.1 trillion by 2050. The sharp increase in offshore wind and marine renewables after 2040 is anticipated to reflect technological advances and increased investment.



Note: USD billions, 2020

Source: OECD, The Ocean Economy to 2050.

However, the path of the energy transition will significantly influence both the pace and composition of Blue Economy growth. In an accelerated transition scenario, where offshore oil and gas production is scaled back to align with Net Zero targets, the Blue Economy is expected to expand to approximately 40% above its 2020 level by 2050. This shift would also alter the sectoral composition of the economy, with offshore oil and gas declining from one-third of total GVA in 2020 to just one-fifth by 2050.

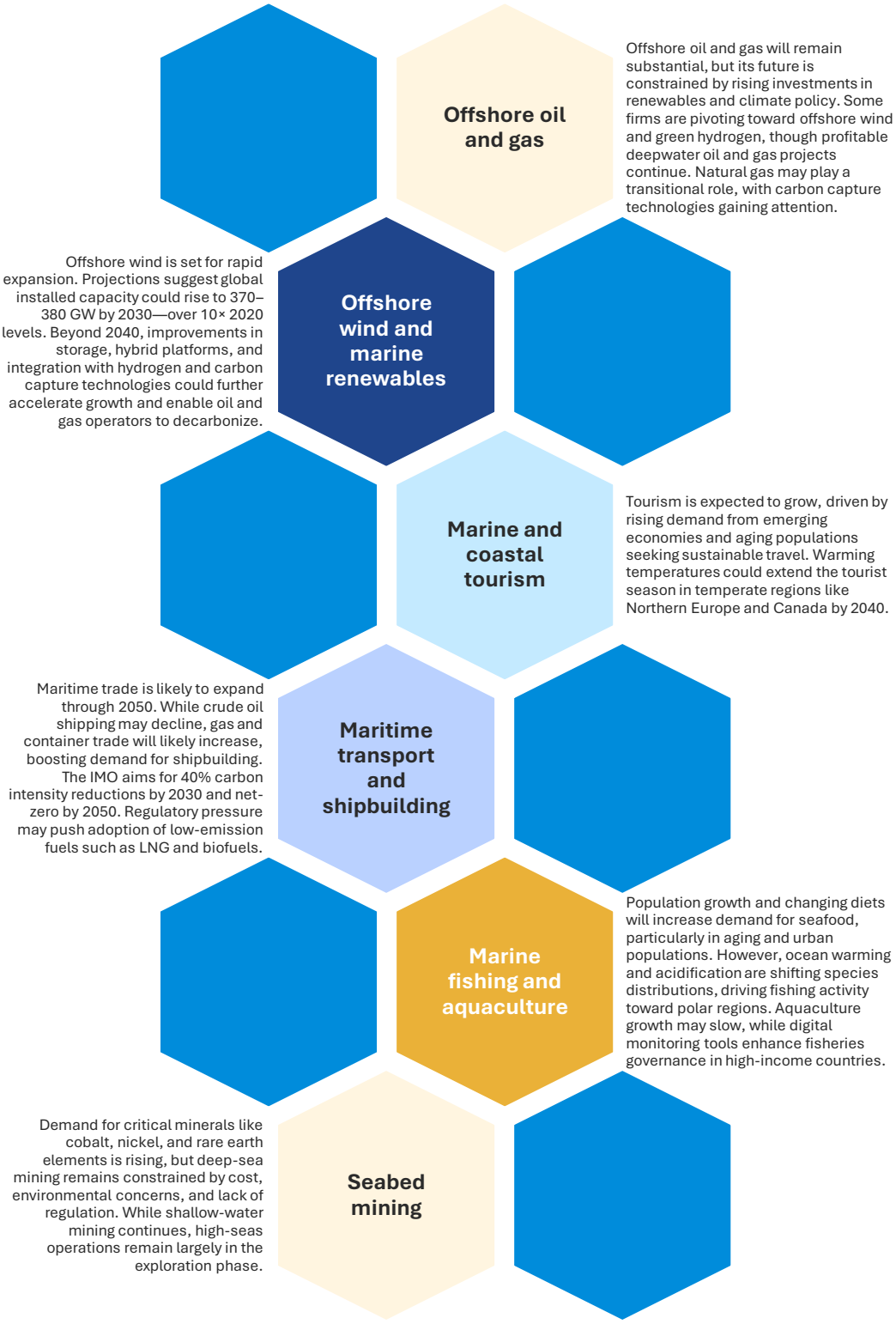
Technology Is Redefining What's Possible (and Needed) in Ocean Science

Ocean science is set to transform over the next two decades, driven by technologies that enhance both stewardship and industry productivity.

Advancement	Description	Source
New ocean observation tools	Drones, vehicles, and other technologies will make data collection cheaper, continuous, and more precise.	OECD, 2025
Seabed mapping	Efforts like GEBCO's Seabed 2030 project aim to map the entire ocean floor. Improved imaging and processing will allow deeper exploration and better biodiversity assessments.	OECD, 2025
Genomic research	Initiatives like the Ocean Genome Atlas Project are unlocking insights into marine biodiversity by sequencing plankton DNA—organisms vital to ocean ecosystems and global cycles.	OECD, 2025
Blue biotechnology	These technologies harness marine organisms like shellfish, bacteria, and algae for healthcare and pharmaceutical development.	European Union, 2024 Canada's Ocean Supercluster, 2024
Ocean-powered desalination	These technologies are creating new business opportunities by combining renewable marine energy with water treatment systems.	European Union, 2024
Wave and tidal energy	Small arrays of tidal turbines already reliably deliver power to the grid, and there is potential for significant capacity expansion.	Ren21, 2024
AI-based modelling systems	Technologies like digital twins (e.g., AI-GOMS and Mercator's models) are improving forecasts and scenario testing.	OECD, 2025
Ocean-based carbon dioxide removal (CDR)	Methods like alkalinity enhancement and ocean fertilization may be critical to climate mitigation.	OECD, 2025

Sector by Sector, the Ocean Economy Is Being Reshaped by Global Forces

Over the coming decades, the ocean economy will be shaped by five major global forces—emerging technologies, demographic shifts, climate change, geopolitical tensions, and the energy transition—bringing both opportunities and disruptions.



Norway's Lead Is No Accident—And Canada Has Lessons to Learn

Norway has the highest share of ocean economy relative to GDP among OECD countries, with ocean sectors accounting for approximately 20% of GDP in 2020. This specialization has fostered deep expertise in Blue Economy governance and workforce development. Norway also has more ocean-related policy initiatives than Canada (27 vs. 23), and they appear more targeted and strategic. For example, *Blue Ocean, Green Future* outlines a comprehensive national vision for ocean industries. The OECD highlights Norway's ocean workforce programs as best practices for other countries

A comparison of the scope and precision of ocean policies between Norway and Canada could help inform the design of more effective and integrated policies in Canada (OECD STIP Compass).

2. Regional Opportunities

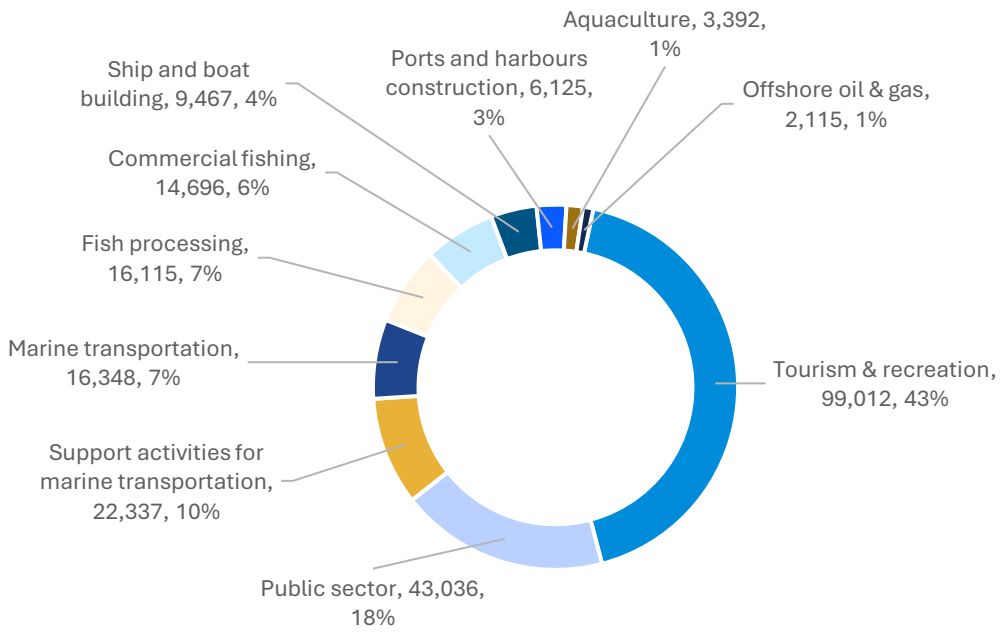
The Blue Economy presents a critical and timely opportunity for Canada to position itself as a global leader in sustainable ocean development. With the OECD projecting that the global Blue Economy will double to US$5.1 trillion by 2050, Canada, bordered by three oceans and rich in marine resources, is uniquely positioned to benefit. The ocean underpins global food security, trade, and the transition to renewable energy. Emerging ocean technologies, such as low-emission ships, undersea vehicles, AI-driven modelling, advanced seabed mapping, and genomic research, are reshaping the future of marine industries. By investing in ocean innovation and developing solutions that are needed globally, Canada can unlock substantial economic potential, create high-quality jobs, and make significant contributions to global climate and biodiversity goals.

Canada's Blue Economy remains underdeveloped relative to its global potential. The Blue Economy accounts for 1.2% of employment (232,644) and 1.2% GDP ($28 billion) in the Canadian economy in 2023 (Fisheries and Oceans Canada). These figures are much lower than those of the global economy, where the ocean economy consistently generated 3.0% to 4.0% of global economic output and 3.5% to 4.7% of global employment (OECD, 2025).

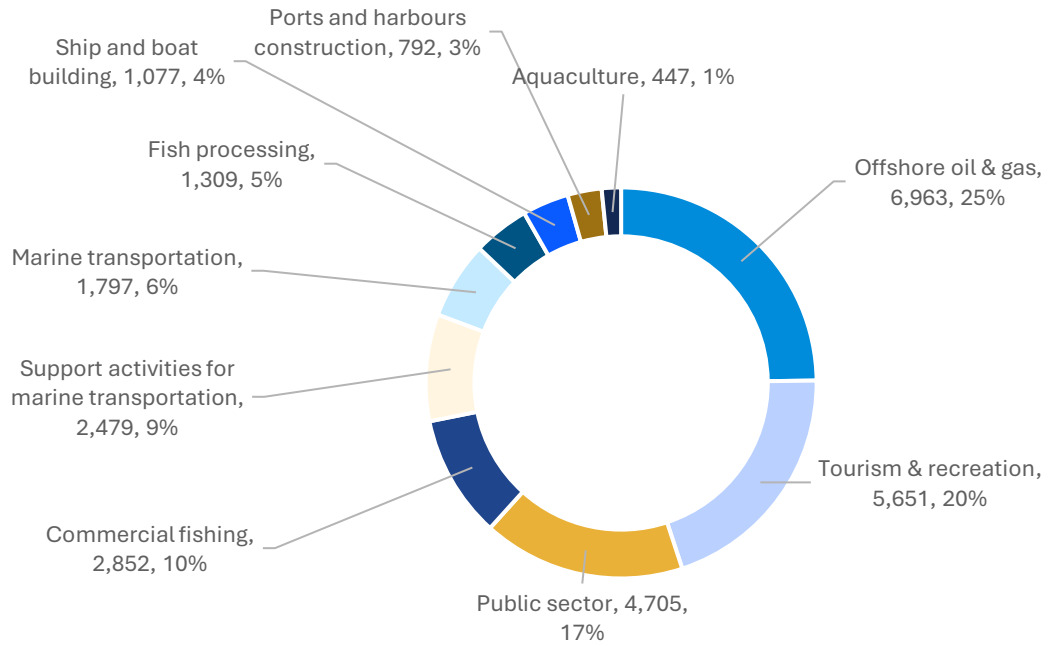
Not All Jobs Are Created Equal: Value and Volume Vary Widely Across Sectors

Tourism & Recreation	•Dominates employment with 99,012 workers (43% of total blue economy jobs), making it the largest employer by far. •Contribution of $5.6 billion represents only 20% of blue economy GDP.
Oil & Gas	•Shows the highest productivity, despite employing only 2,115 people (less than 1% of blue economy employment). •Generates nearly $7 billion in GDP (25% of total), demonstrating extremely high value per employee compared to other sectors. This is due to its capital-intensive nature.
Marine Transportation	•Core marine transportation employees 16,348 people and produces $1.8 billion in GDP. •The larger support services cluster employs 22,337 people and generates $2.5 billion GDP.
Fishing Industries	•Commercial fishing employs relatively fewer people (14,696) but generates more GDP ($2.8 billion). •Fish processing employs slightly more workers (16,115) but only produces considerably less GDP ($1.3 billion).
Smaller Sectors	•Aquaculture employs 3,392 people and generates $447 million GDP. •Ship and boat building has 9,467 employees and produces $1 billion in economic output.

Employment by Sector, 2023



GDP by Sector, 2023 ($ Billion)

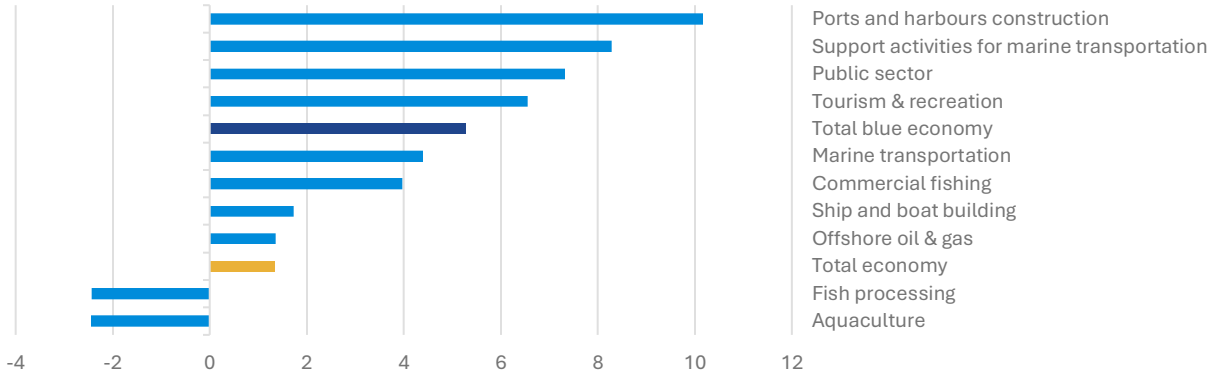


Source: Fisheries and Oceans Canada.

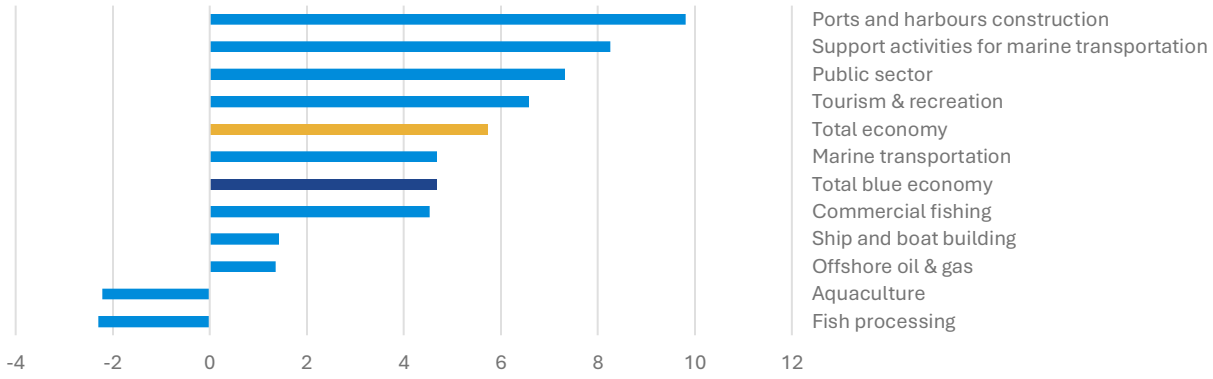
Strong Job Growth Masks Deeper Productivity Challenges

- The Blue Economy substantially outperformed the broader economy with a 5.3% compound annual growth rate (CAGR) in employment versus 1.3% for the total economy during 2019–2023. However, its GDP growth of 4.7% lagged the economy-wide rate of 5.7%.
- Ports and harbours construction leads growth with 10.2% employment CAGR and 9.8% GDP CAGR during the 2019–2023 period. This sector demonstrates robust development, likely driven by infrastructure investments and increased maritime trade activity.
- Support activities for marine transportation show growth with an 8.3% CAGR in both employment and GDP from 2019 to 2023. This sector's strong performance suggests increasing demand for logistics and maintenance.
- Tourism & recreation maintains solid growth at 6.6% CAGR for both employment and GDP from 2019 to 2023.
- Fishing sectors declined with aquaculture showing -2.4% employment CAGR and -2.2% GDP CAGR, while fish processing exhibits -2.4% employment and -2.3% GDP CAGR during the 2019-2023 period. The contraction of these sectors suggests production challenges.

Compound Annual Growth Rate of Employment, 2019–2023



Compound Annual Growth Rate of GDP, 2019–2023



Source: Fisheries and Oceans Canada.

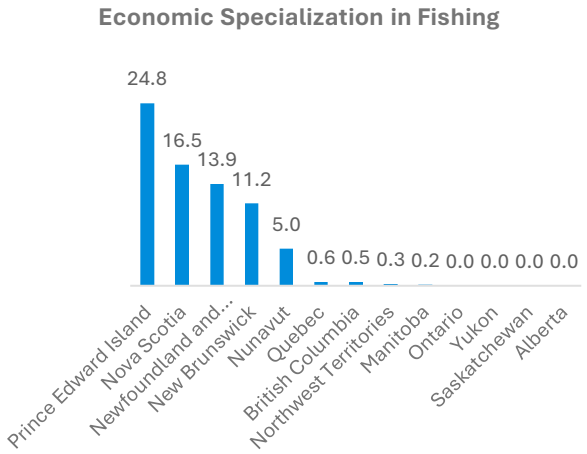
British Columbia Dominates Jobs, But Newfoundland Delivers More Value

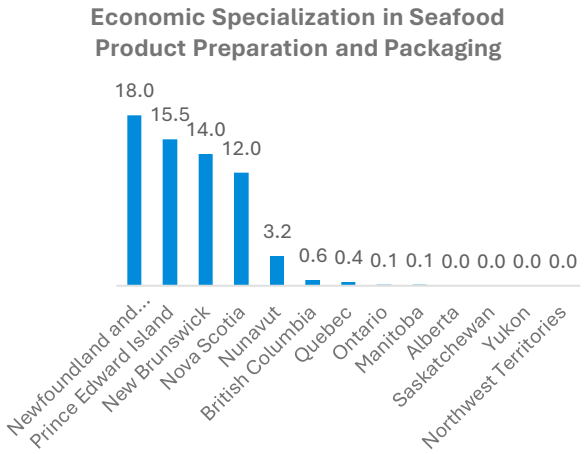
- British Columbia leads Blue Economy employment, accounting for nearly half (45.8%) of total jobs and 30% of GDP.
- Newfoundland and Labrador contributes the largest share of GDP (32%) despite representing only 8.2% of employment, indicating high value-added activity in the province.
- Nova Scotia has the second-largest share of employment (25.2%) and contributes over one-fifth (20.5%) of GDP.
- Quebec and New Brunswick contribute moderately to both employment and GDP, while Prince Edward Island has a small share of both.
- Northern territories (Yukon, NWT, Nunavut) together account for less than 1% of employment and around 1% GDP, reflecting limited Blue Economy activity in the territories.

Province/territory	Employment	Share (%)	GDP	Share (%)
Newfoundland and Labrador	19,086	8.2	8,970	32.0
Prince Edward Island	6,710	2.9	578	2.1
Nova Scotia	58,738	25.2	5,761	20.5
New Brunswick	13,944	6.0	1,202	4.3
Quebec	26,038	11.2	2,836	10.1
British Columbia	106,534	45.8	8,435	30.0
Yukon	562	0.2	59	0.2
Northwest Territories	609	0.3	93	0.3
Nunavut	422	0.2	137	0.5
Total Blue Economy	**232,644**	**100.0**	**28,072**	**100.0**

Source: Fisheries and Oceans Canada.

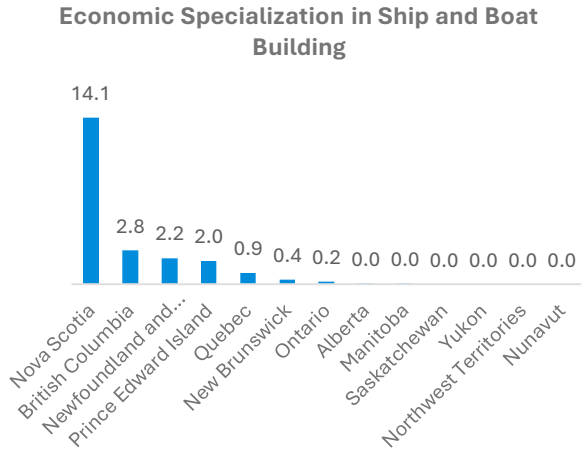
Atlantic Canada Leads in Specialization, But Strengths Vary Coast to Coast

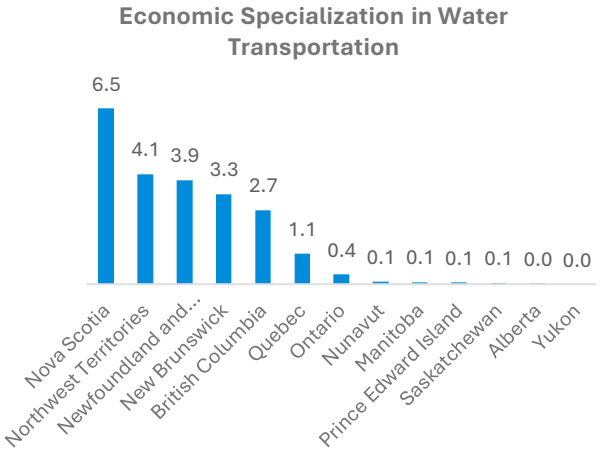




Note: Relative specialization index (RSI), 0 = no activity, 1 = neutral position, 2 = twice as specialized, etc.
Source: Statistics Canada.

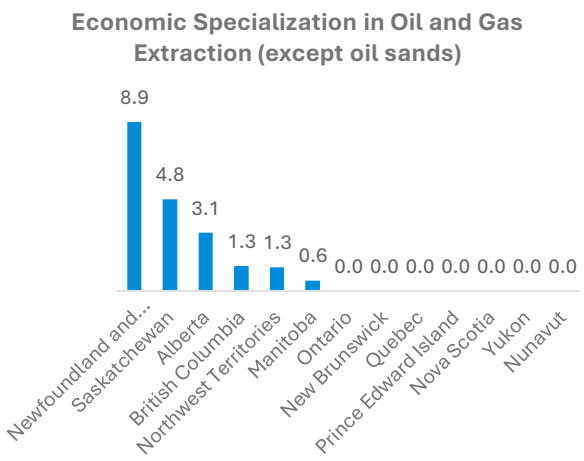
- Atlantic Canada leads in fisheries and seafood: Prince Edward Island (24.8), Nova Scotia (16.5), and Newfoundland & Labrador (13.9) show the highest specialization in Fishing, hunting, and trapping, while all four Atlantic provinces also strongly specialize in Seafood product preparation and packaging (e.g., Newfoundland at 18.0, New Brunswick at 14.0).





Note: Relative specialization index (RSI), 0 = no activity, 1 = neutral position, 2 = twice as specialized, etc.
Source: Statistics Canada.

- Nova Scotia stands out in shipbuilding and transport: It has a very high specialization index in Ship and boat building (14.1) and Water transportation (6.5), underscoring its diversified marine industrial base.
- British Columbia shows moderate specialization across multiple sectors: While not dominant in any one area, BC has above-average values in Ship and boat building (2.8) and Water transportation (2.7), indicating a balanced and diverse ocean economy.



Note: Relative specialization index (RSI), 0 = no activity, 1 = neutral position, 2 = twice as specialized, etc.
Source: Statistics Canada.

- Newfoundland & Labrador is the only province with strong specialization in oil and gas (8.9), reflecting its reliance on this sector, whereas Alberta and Saskatchewan show smaller but notable concentrations (3.1 and 4.8 respectively). This should be interpreted with caution because no data are available on the offshore portion of oil and gas industry.
- Northern territories and inland provinces have limited specialization: With few exceptions (e.g., NWT in water transport: 4.1; Nunavut in fishing: 5.0), most territories and prairie provinces show low or negligible specialization in ocean-related industries.

Five Sectors Hold the Key to Canada's Blue Economy Growth

Canada's Blue Economy presents substantial growth potential across five sectors, each offering unique opportunities for innovation, investment, and sustainable development. Canada's Ocean Supercluster anticipates the following developments:

Energy
- Projected growth from $9 billion in 2019 to $100 billion by 2035.
- Future centred on offshore wind and hydrogen for clean marine transport.
- Requires major infrastructure investment to capitalize on natural wind/water assets.

Seafood
- Aims to triple the sector from $8 billion in 2019 to $25 billion by 2035.
- Growth driven by sustainable aquaculture, wild fisheries, and new protein markets.
- Emerging areas include seaweed, fish alternatives, and circular economy models

Ocean Technology
- $20 billion target by 2035.
- Includes robotics, digital twins, ocean sensors, and marine biotechnology.
- Growing global demand for climate-adaptive, made-in-Canada solutions.

Marine Transport
- Backed by National Shipbuilding Strategy and Ocean Supercluster investment.
- Focus on vessel electrification, renewable fuels, and smart coatings.
- Supply chain resilience depends on modernizing port infrastructure and logistics tech.

Tourism & Recreation
- Nearly 30% of global ocean economy; Canada aiming for $30 billion by 2035.
- Expanding marine tourism sector needs strategic investment and coordination.
- Growth tied to sustainability, experiential travel, and climate-friendly operations.

Scaling the Blue Economy Will Require Aligning with Regional Strengths

Future research should explore regional sector-specific growth constraints to better align policies with areas of highest potential. This will help guide strategic investment, policy, and workforce planning for Canada's sustainable Blue Economy. For instance, targeted studies could assess the infrastructure and workforce readiness of high-specialization provinces like Newfoundland & Labrador (energy), Nova Scotia (shipbuilding and transport), and Prince Edward Island (fisheries) to scale up their strengths. Additionally, research on productivity bottlenecks in slower-growing sectors—such as aquaculture and fish processing—could inform policy levers for improving economic output while ensuring sustainability.

3. Workforce Demand and Hiring Trends

Technological innovation and sustainability imperatives are reshaping workforce needs across the ocean economy. Emerging tools like drones, underwater vehicles, and AI-based modeling systems are transforming how ocean data is collected, processed, and applied—demanding new technical and analytical skillsets. As traditional sectors adapt to meet environmental regulations and leverage new opportunities, a wide range of employment opportunities are being created that bridge ocean science, engineering, environmental stewardship, and technology in support of a sustainable Blue Economy.

Marine & Coastal Tourism

A shift towards sustainability will foster job creation that supports environmental protection, a circular economy, and renewable energy. There will be fewer jobs linked to mass tourism, such as cruise tourism, with associated climate and pollution impacts. New skills in ocean conservation, marine technology, sustainability consulting, and services rendered by hospitality will be required to fill the new market needs (Ocean Panel, 2025).

Coastal Conservation Managers

- Integral to restoring and protecting coastal ecosystems.
- Oversee protected areas and implement conservation measures.
- Engage and collaborate with local communities and stakeholders.

Climate Reslience Operators and Ocean Health Monitors

- Design and execute strategies for climate adaptation and disaster risk reduction.
- Apply coastal engineering and climate science expertise to protect coastlines.
- Monitor ocean health data to guide decision-making and long-term planning.

Ecotourism Operators and Guides

- Deliver experiences that support wildlife conservation and cultural heritage.
- Educate visitors about marine environments and local traditions.
- Foster responsible tourism practices to reduce environmental impact.

Source: Ocean Panel, 2025.

Marine Fishing, Marine Aquaculture & Marine Fish Processing

The seafood sector is undergoing a major shift from wild capture fisheries to sustainable aquaculture, creating new jobs in climate adaptation, ecosystem management, and regenerative practices. While this transition may reduce employment in traditional fishing, it offers growth in areas like monitoring, enforcement, and sustainable project development. Challenges from climate change and pollution, however, threaten marine ecosystems and job stability. The sector's future depends on investment in innovation and a focus on sustainability to drive long-term employment and resilience (OECD, 2025).

Environmental Scientists and Specialists

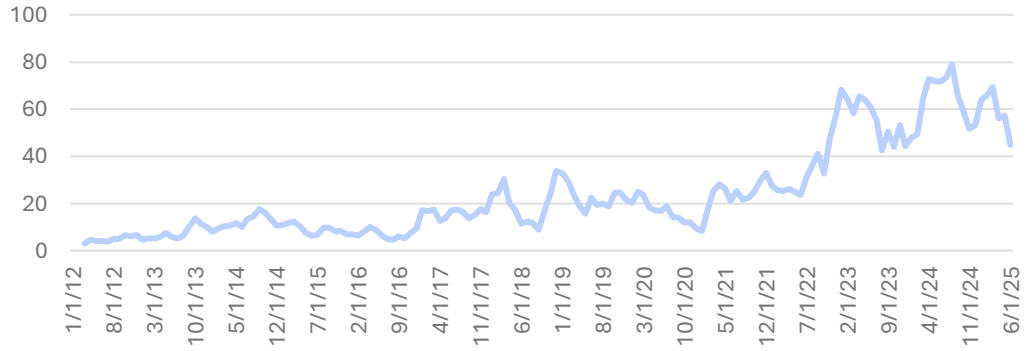
- Monitor ocean ecosystems and assess pollution impacts.
- Support climate adaptation and ecosystem resilience.
- Contribute to sustainable seafood and habitat management.

Conservation Scientists

- Promote sustainable marine resource use.
- Guide policies on overfishing and protected areas.
- Strengthen marine conservation and climate readiness.

*Source: O*NET; O*NET.*

The Sector Has Shown Overall Employment Growth Since 2012 with a Post-2022 Surge.



Note: Monthly job postings; 3-month moving average. Fluctuations support seasonal hiring patterns and project-based labour demand.

Source: Lightcast, NAICS 114 (Fishing) and NAICS 311 (Seafood Product Preparation & Packaging).

Maritime Shipbuilding & Maritime Equipment Manufacturing

Maritime transport and shipbuilding are undergoing a transformation as global trade grows and environmental regulations tighten. The sector is shifting toward cleaner fuels and advanced vessel technologies to meet decarbonization targets, driving demand for new skills in green ship design, fuel systems, and logistics (OECD, 2025).

Marine Engineers & Naval Architects

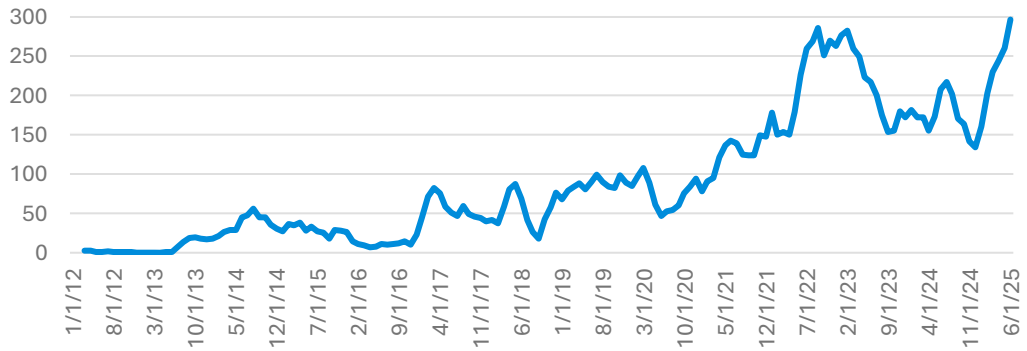
- Design and develop marine vessels and propulsion systems.
- Retrofit ships with low-emission technologies.
- Evaluate vessel performance and ensure regulatory compliance.

Mechanical Engineers

- Design and plan mechanical systems for marine applications.
- Oversee installation, operation, and maintenance of equipment.
- Support energy-efficient and reliable ship operations.

*Source: O*NET; O*NET.*

Demand for Maratime Manufacturing Talent Has Risen Since 2020.

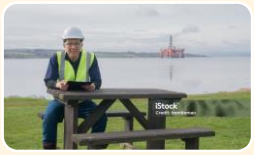


Note: Monthly job postings; 3-month moving average. Growth is likely linked to major shipbuilding contracts, defense procurement, and investments in marine infrastructure.

Source: Lightcast, NAICS 336611 (Ship Building and Repairing) and NAICS 336612 (Boat Building).

Offshore Oil & Gas Extraction

Offshore oil and gas remains a significant economic driver, but its long-term outlook is shaped by rising renewable energy investments, stricter climate policies, and aging infrastructure. As the sector evolves, demand is growing for technical roles in platform maintenance, decommissioning, and carbon-reducing innovations such as carbon capture and storage (OECD, 2025).



Geoscientists

- Analyze Earth's structure for resource exploration.
- Apply geology, physics, and math to offshore energy projects.
- Support site assessment, land use, and environmental planning.

Oil and Gas Roustabouts

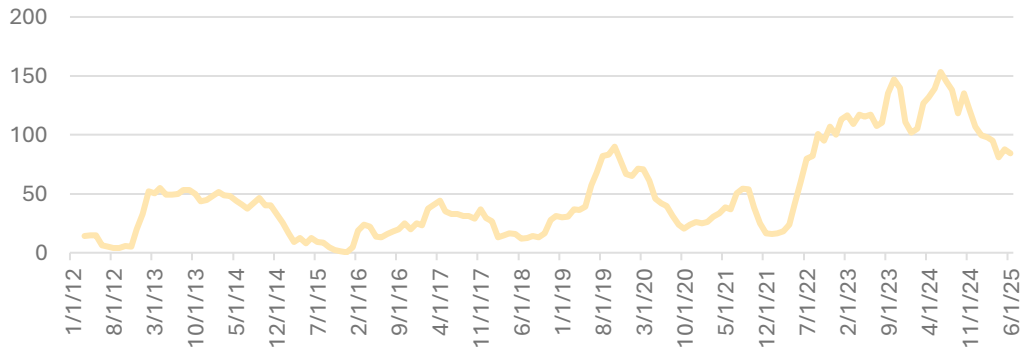
- Assemble and repair offshore drilling equipment.
- Operate hand and power tools on rigs and platforms.
- Support general maintenance of field operations.

Industrial Machinery Mechanics

- Maintain and repair offshore systems (pumps, turbines, compressors).
- Ensure equipment reliability and operational safety.
- Troubleshoot mechanical issues in production facilities.

*Source: O*NET; O*NET, U.S. Bureau of Labor Statistics.*

Postings Surged Post-2022, But Demand Is Currently Slowing.



Note: Monthly job postings; 3-month moving average.
Source: Lightcast, NAICS 211130 (Natural Gas Extraction).

Maritime Transport & Maritime Ports

The future of employment in sustainable maritime transport and ports will be defined by a shift towards green shipping and digital roles. Workers in the industry will need to adapt to new technologies and sustainability practices, requiring continuous learning and flexibility. As the industry evolves, traditional roles may decline, and new opportunities will arise to ensure a more sustainable future for maritime transport and ports (Ocean Panel, 2025).

Decarbonization Experts

- Guide transition to zero-carbon fuels like hydrogen and ammonia.
- Navigate evolving maritime environmental regulations.

Alternative Fuel Engineers

- Design engines and vessels powered by sustainable fuels.
- Support adoption of clean propulsion systems across fleets.

Zero-Waste Operations Coordinators

- Implement recycling, reuse, and waste-reduction strategies.
- Apply sustainability practices in marine logistics and port ops.

Autonomous Vessel Operators & Technicians

- Manage, maintain, and monitor autonomous marine systems.
- Oversee fleet operations and troubleshoot automation tech.

Port Automation Engineers

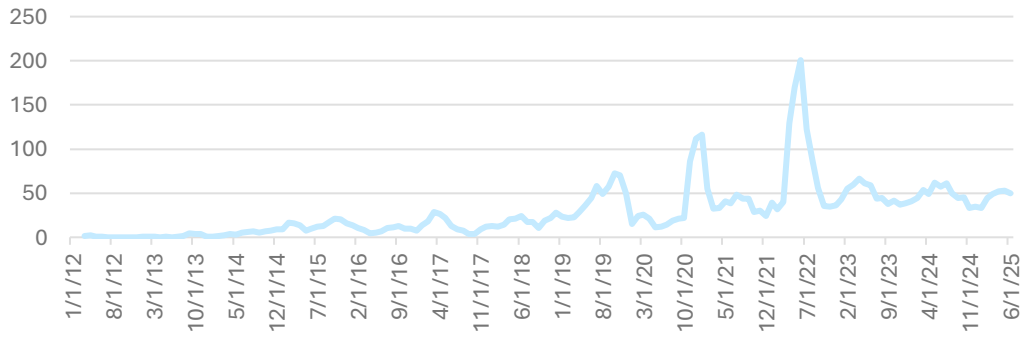
- Design and maintain automated cranes and cargo systems.
- Integrate AI-driven tools to streamline port operations.

Data Analysts & AI Specialists

- Optimize shipping logistics using big data and AI.
- Develop smart port systems and predictive analytics models.

Source: Ocean Panel, 2025.

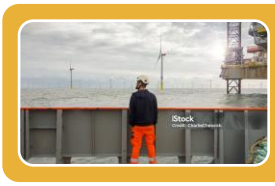
Growth Is Present, But Irregular



Note: Monthly job postings; 3-month moving average. Spike in 2022 likely reflects post-pandemic supply chain shifts, port congestion relief efforts, and investment in infrastructure and vessel maintence.
Source: Lightcast, NAICS 483 (Water Transportation) and NAICS 488 (Support Activities for Water Transportation).

Offshore Wind & Marine Renewables

The expansion of offshore wind and marine renewable energy is creating new employment opportunities at the intersection of engineering, environmental science, and clean energy infrastructure. As investment in ocean-based renewables accelerates, the sector demands a specialized workforce to design technologies, manage projects, ensure grid integration, and safeguard marine ecosystems (Ocean Panel, 2025).



Marine Engineers & Technicians

- Design and develop marine renewable energy systems.
- Maintain offshore wind, tidal, and wave energy technologies.
- Ensure reliability and performance of infrastructure.

Renewable Energy Project Managers

- Plan and oversee marine energy project development.
- Coordinate teams, timelines, and budgets.
- Ensure delivery of operational, on-time energy projects.

Grid Integration Specialists

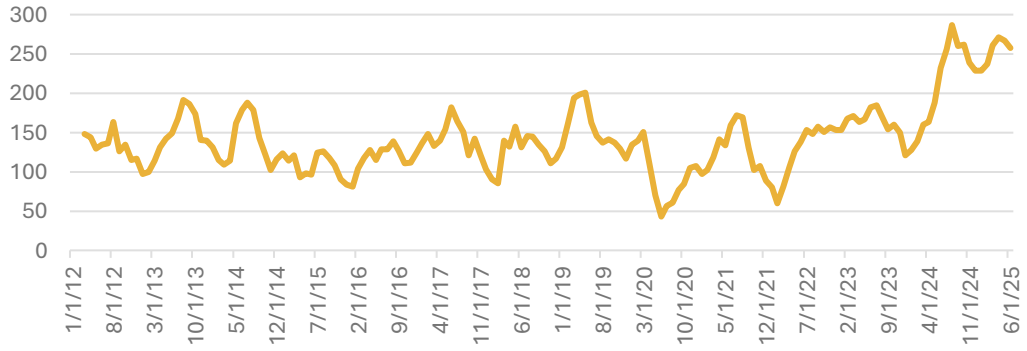
- Design solutions for connecting marine energy to power grids.
- Address technical and regulatory integration challenges.
- Enable stable and efficient energy distribution.

Environmental Scientists

- Assess ecological impacts of marine energy infrastructure.
- Develop and implement mitigation strategies.
- Ensure compliance with environmental regulations.

Source: Ocean Panel, 2025.

Hiring Activity Rose Sharply in August 2024



Note: Monthly job postings; 3-month moving average. Postings remain elevated in 2025, indicating sustained hiring momentum.

Source: Lightcast, NAICS 221115 (Wind Electric Power Generation) and NAICS 221118 (Other Electric Power Generation).

Marine Management, Protection, and Restoration

Marine protection and restoration are vital for safeguarding ocean ecosystems, preserving biodiversity and securing the long-term sustainability and resilience of marine resources for future generations. As human activities continue to impact marine environments, effective conservation and sustainable management becomes increasingly important (Ocean Panel, 2025).

Marine Biologists & Ecologists

- Assess the health of marine ecosystems.
- Conduct research to inform conservation strategies.

Marine Conservation Specialists

- Develop and implement conservation policies.
- Protect biodiversity and critical habitats.

Marine Restoration Specialists

- Restore degraded ecosystems like reefs and seagrass beds.
- Design and manage habitat rehabilitation projects.

Environmental Consultants

- Conduct impact assessments for marine project.
- Advise governments and industries on sustainable practices.

Marine Protected Area Managers

- Oversee operations of marine parks and sanctuaries.
- Ensure long-term ecological and community value.

Source: Ocean Panel, 2025.

Marine Biotechnology

Marine biotechnology is a rapidly growing field that leverages the unique properties of marine organisms for various applications, including pharmaceuticals, food, cosmetics and environmental remediation. The global marine biotechnology market is projected to reach $10.5 billion by 2027, with a compound annual growth rate of 15 percent from 2022 to 2027. As the sector expands, it presents a wealth of untapped employment opportunities (Ocean Panel, 2025).

Research Scientists

- Conduct R&D in marine biotechnology and genomics
- Apply bioinformatics to big data and environmental monitoring

Bioprocess Engineers

- Scale up lab discoveries for commercial production
- Design and optimize biotech manufacturing processes

Source: Ocean Panel, 2025.

Ocean Data and Monitoring

Ocean data and monitoring play a crucial role in understanding the health of our ocean and informing sustainable management practices. By collecting and analysing data on factors such as temperature, salinity, currents, biodiversity and pollution, scientists and policymakers can make informed decisions to protect marine ecosystems and promote sustainable resource use (Ocean Panel, 2025).

Marine Scientists & Researchers

- Specialize in oceanography, marine biology, and related fields
- Collect, analyse, and interpret ocean data
- Support evidence-based marine planning and conservation

Source: Ocean Panel, 2025.

Workforce Readiness Will Define the Success of Canada's Blue Economy

The Blue Economy is undergoing a shift in skill requirements, with traditional roles in extraction and exploration declining due to decarbonization, stricter regulations, and automation. As the sector pivots toward renewable energy and integrates advanced technologies like robotics, workers will need to adapt to new technical and maintenance-focused roles.

A promising research stream could examine the extent to which emerging skills and knowledge related to advanced technologies (e.g., autonomous systems, AI-powered ocean monitoring, marine robotics, and data analytics) are being integrated into new job postings across Canada's Blue Economy sectors. This study could analyze recent labour market data to identify growth in demand for digital, environmental, and engineering competencies tied to innovation in areas like offshore renewables, smart aquaculture, and marine logistics. The findings would inform workforce planning by revealing whether current training pipelines are keeping pace with technological shifts, and where targeted upskilling or curriculum reform may be needed.

4. Disruptive Trends and the Future of Work

Emerging technologies are helping ocean industries confront global climate challenges while opening new employment opportunities across the bue economy. As focus intensifies on ocean health and sustainability, sectors are increasingly integrating environmental stewardship with cutting-edge technological solutions. Traditional maritime industries are also adapting, leveraging innovation to meet regulatory pressures, improve efficiency, and access new markets. As outlined in recent work by the Ocean Panel, the future of work in the sustainable Blue Economy will depend on how effectively we navigate these transformations and capitalize on the possibilities they create.

Fewer Jobs, More Machines: The Future of Offshore Oil and Gas

Traditional employment in the offshore oil and gas sector is projected to decline substantially due to growing climate concerns and the global shift toward sustainability, including decarbonization and the phasing out of fossil fuels. This trend is driven by stricter environmental regulations, increased investment in renewable energy, and reduced reliance on fossil fuels, all of which are expected to diminish conventional extraction and exploration jobs.

While demand for oil and gas is likely to persist in the near term, employment levels are expected to plateau due to greater automation (e.g., robotics for inspection, maintenance, and repair) and a broader transition toward renewable energy sources.

Coastal Tourism Is Shifting from Mass Markets to Sustainable Models

The transition toward sustainability in marine and coastal tourism is expected to foster new job creation aligned with environmental protection, the circular economy, and renewable energy. In contrast, jobs tied to mass tourism (e.g., cruise-based or resort-centered tourism) are likely to decline due to their environmental footprint and vulnerability to climate change. Large coastal resorts, for example, face mounting challenges from rising sea levels, energy demands, and reduced financing opportunities, which could result in initial job losses as infrastructure becomes compromised.

Simultaneously, the move toward more sustainable, nature-oriented tourism is creating demand for jobs in areas like eco-friendly facility construction and maintenance, certified tour guiding, and community-based cultural experiences. Workers in this sector will need to develop new skills related to sustainable tourism operations, environmental conservation, renewable energy use, and responsible visitor engagement—all within the ecological limits of coastal systems.

Fishing Jobs Are at Risk, But New Roles Emerge in Ecosystem Management

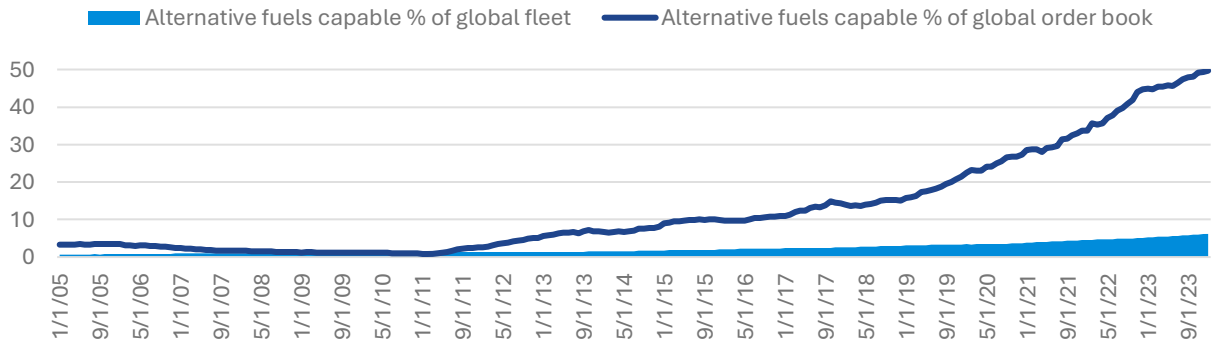
The seafood sector is undergoing a major transformation, shifting away from wild capture fisheries toward sustainable aquaculture. This transition, while potentially reducing traditional fishing jobs—especially in countries highly dependent on fish protein—is generating new opportunities in climate adaptation, regenerative aquaculture, and sustainable ecosystem management.

At the same time, the sector faces serious threats from climate change (e.g., shifting ecosystems, resource scarcity, extreme weather) and pollution (e.g., plastics, industrial runoff), which could further destabilize employment in vulnerable fisheries. The future of work in this sector will increasingly depend on sustainability practices, better resource management, and innovation. This includes rising demand for workers with expertise in monitoring, enforcement, and ecosystem management.

Targeted financial support and investment will be key to advancing integrated aquaculture systems, upgrading vessels, and attracting youth and women into the sector. While stricter fishing regulations may reduce employment in some areas, they also create new roles requiring specialized skills to enforce environmental compliance and build a more resilient seafood economy.

The Shipyards of the Future Are Building for Climate, Not Just Cargo

Shipbuilders are increasingly designing vessels to operate on alternative fuels (e.g., LNG, LPG, methanol) and integrating hybrid propulsion systems to meet the International Maritime Organization (IMO)'s net-zero targets. About 50% of global orders now specify fuel-flexible designs.



Source: OECD, Shipbuilding.

There's a strong shift toward digital vessels equipped with advanced monitoring, navigation, and propulsion optimization systems. Shipyards are adopting Industry 4.0 practices, including augmented reality and AI-driven hull design, to improve efficiency and reduce emissions. The aging global fleet (average age ~12.6 years) is prompting a surge in newbuilds and retrofits to incorporate green and digital technologies. Newbuild prices have hit decade highs due to demand for eco-friendly ships. Green finance instruments (e.g., export credits and emission-related subsidies) are increasingly leveraged to support low- and zero-emission ship construction (OECD, 2025).

As Maritime Transport Decarbonizes, Jobs Shift Toward Tech & Infrastructure

The marine transport and port sector is undergoing major transformation due to climate change and evolving demand for ocean-based goods and services. While moderate growth is expected overall, advances in automation and digitalization may displace a substantial share of current roles—potentially affecting up to two-thirds of existing positions.

Decarbonization efforts are generating new job opportunities in areas such as ship retrofitting, green port operations, and the development of infrastructure for alternative fuels like hydrogen, methane, and electric propulsion systems. This shift toward low-emission maritime systems will require reskilling, particularly among engineers and maintenance workers, who must adapt to emerging technologies such as hybrid engines and electrified systems.

Employment patterns are also being reshaped by the growth of adjacent ocean sectors—including offshore renewable energy, sustainable aquaculture, and biotechnology—which are increasing demand for specialized logistics and infrastructure. Expanding sustainable seafood trade and ocean tourism are expected to generate additional roles in port operations and supply chain management.

Overall, the future of employment in maritime transport will be characterized by rising demand for green shipping expertise, digital literacy, and adaptability to emerging technologies, underscoring the need for continuous workforce upskilling.

Marine Renewables Are Poised for Growth, But Workforce Readiness Is Key

The marine renewable energy sector—particularly offshore wind—is positioned for robust growth as the global energy transition accelerates. Projections suggest the creation of 1.2 million new jobs globally by 2050, with technical roles such as marine engineers and naval architects expected to grow by 6 percent between 2020 and 2030 (Ocean Panel, 2025). This expansion will likely increase demand for skilled workers in engineering, construction, and project management for offshore wind, tidal, and solar marine energy projects. However, job growth in this field also depends on factors such as public acceptance of large-scale offshore infrastructure, rigorous environmental assessments (e.g. impacts on seabed habitats), and the influence of changing ocean conditions on energy generation potential. Despite these challenges, the sector offers substantial employment potential tied to sustainable energy innovation and ocean-based infrastructure development.

As Ocean Ecosystems Strain, Demand for Restoration and Protection Is Rising

Employment opportunities in marine protection and restoration are expected to grow in importance as efforts to preserve biodiversity and enhance ecosystem resilience gain urgency. The need for effective marine management is increasing due to the expanding human footprint on marine ecosystems. This creates demand for workers skilled in marine science, ecosystem restoration, environmental monitoring, and sustainable coastal development.

Marine Biotechnology Is Emerging as a Powerful Source of Innovation and Jobs

Marine biotechnology is an emerging and fast-expanding field that uses marine biological resources for innovations in pharmaceuticals, food production, cosmetics, and environmental remediation. With the global market projected to reach $10.5 billion by 2027, growing at 15 percent annually from 2022, this sector holds substantial untapped employment potential (Ocean Panel, 2025). New roles will require interdisciplinary skills across biology, bioinformatics, engineering, and regulatory science.

Ocean Data Is Becoming the Backbone of Marine Decision-Making

Ocean data and monitoring underpin evidence-based ocean governance by enabling the collection and interpretation of critical indicators such as ocean temperature, salinity, biodiversity, and pollution levels. As marine management becomes more data-driven, new employment opportunities are emerging for oceanographers, marine data analysts, and sensor technology specialists who can support sustainable resource use and early warning systems.

Career Transitions and Digital Readiness in a Changing Ocean Economy

In an ocean of trends, two research priorities stand out for their potential to shape the future of Blue Economy employment.

The first is cross-sector mobility. As traditional roles in oil and gas or wild fisheries decline, for example, there is an urgent need to understand how workers can transition into emerging sectors like offshore wind, aquaculture, and marine renewables. Future research could identify which skills are most transferable, where gaps exist, and how modular training or certification programs can enable smoother, lower-barrier career shifts.

The second is digital literacy. As the Blue Economy becomes more technology-driven, demand is rising for digital competencies across nearly every sector—from AI-powered ship design to sensor-based ocean monitoring. A systematic assessment of digital skill needs could help align workforce strategies with the accelerating pace of marine innovation.

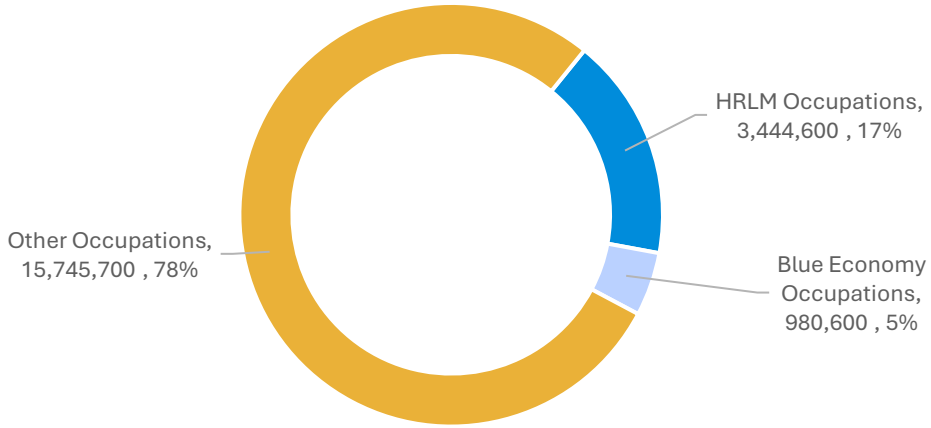
Together, these research areas offer a roadmap for building a more resilient, adaptable, and inclusive ocean workforce.

5. Transitional Worker Pathways

As Canada's Blue Economy expands toward global potential, ensuring inclusive workforce participation requires strategic pathways for workers transitioning from traditional and declining industries. With over 3.4 million workers currently employed in high-risk, low-mobility (HRLM) occupations, there exists both a significant opportunity and an urgent need to facilitate smooth career transitions into the Blue Economy positions. By mapping these transition pathways and minimizing retraining barriers, Canada can harness existing workforce expertise while building the skilled talent foundation necessary to lead global sustainable ocean development.

Blue Economy Jobs Provide a Modest But Important Transition Pathway

HRLM workers represent a substantial portion of the workforce at 3.44 million people, significantly outnumbering the 980,600 positions currently available in Blue Economy occupations. Despite the Blue Economy's relatively modest size compared to the large pool of HRLM workers needing transition opportunities, it represents a valuable and targeted pathway that could absorb nearly 30% of these at-risk workers into sustainable, forward-looking careers.



Note: Occupational employment, 2023.
Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Canadian Occupational Projection System (COPS).

Overall, Strong Skill Transferability Between HRLM and Blue Economy Jobs

When comparing pairs of HRLM and Blue Economy occupations in terms of proficiency on a scale of 1–5, 49% of all occupation pairs (2,561 out of 4,416) show either no gap or minimal differences (0.0-0.49) across skills, abilities, work activities, and knowledge areas. This high degree of skill alignment suggests that most HRLM workers possess foundational competencies that can be readily applied to Blue Economy roles with minimal to moderate training.

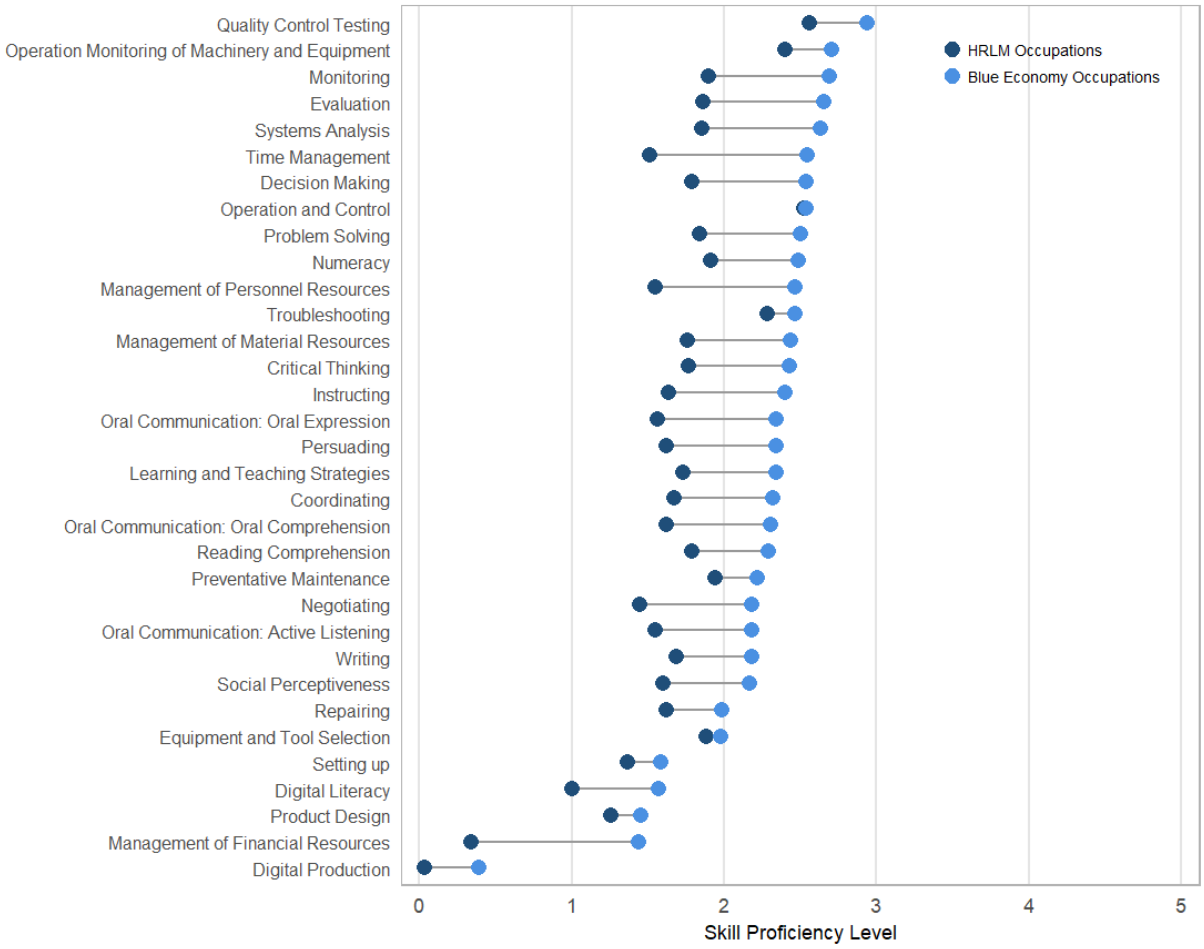
Differences on a 1–5 Proficiency Scale for HRLM-to-Blue Economy Transitions

	No gap	0.0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00 +
Skills	1,327	844	737	689	439	380
Abilities	1,752	1,234	777	462	156	35
Knowledge Areas	1,197	2,739	480	0	0	0
Work Activities	1,199	958	984	726	427	122

Note: Total transition pathways (4,416) equal HRLM occupations (92) x Blue Economy occupations (48).
Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

With That Said, There Are Still Substantial Gaps in Many Skills

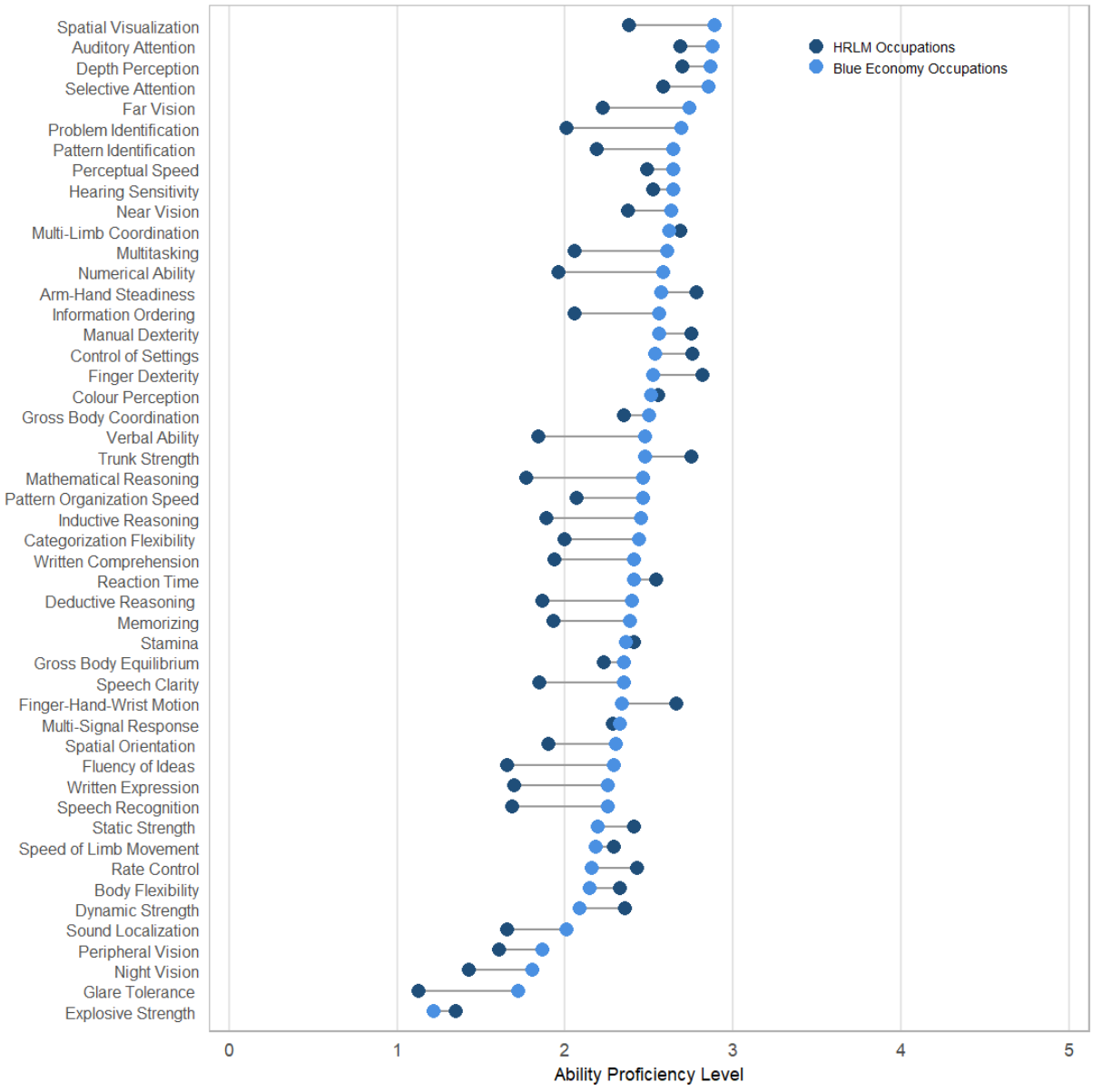
Blue Economy roles require higher proficiency levels across nearly all competencies compared to HRLM occupations. The most significant skill gaps are found in management areas, such as financial resources and time management, while smaller but still notable gaps exist in monitoring, evaluation, and systems analysis.



Note: Skills are sorted in descending order by the average proficiency level for Blue Economy occupations.
Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

Comparing Abilities Reveals a More Nuanced Skill Transferability Pattern

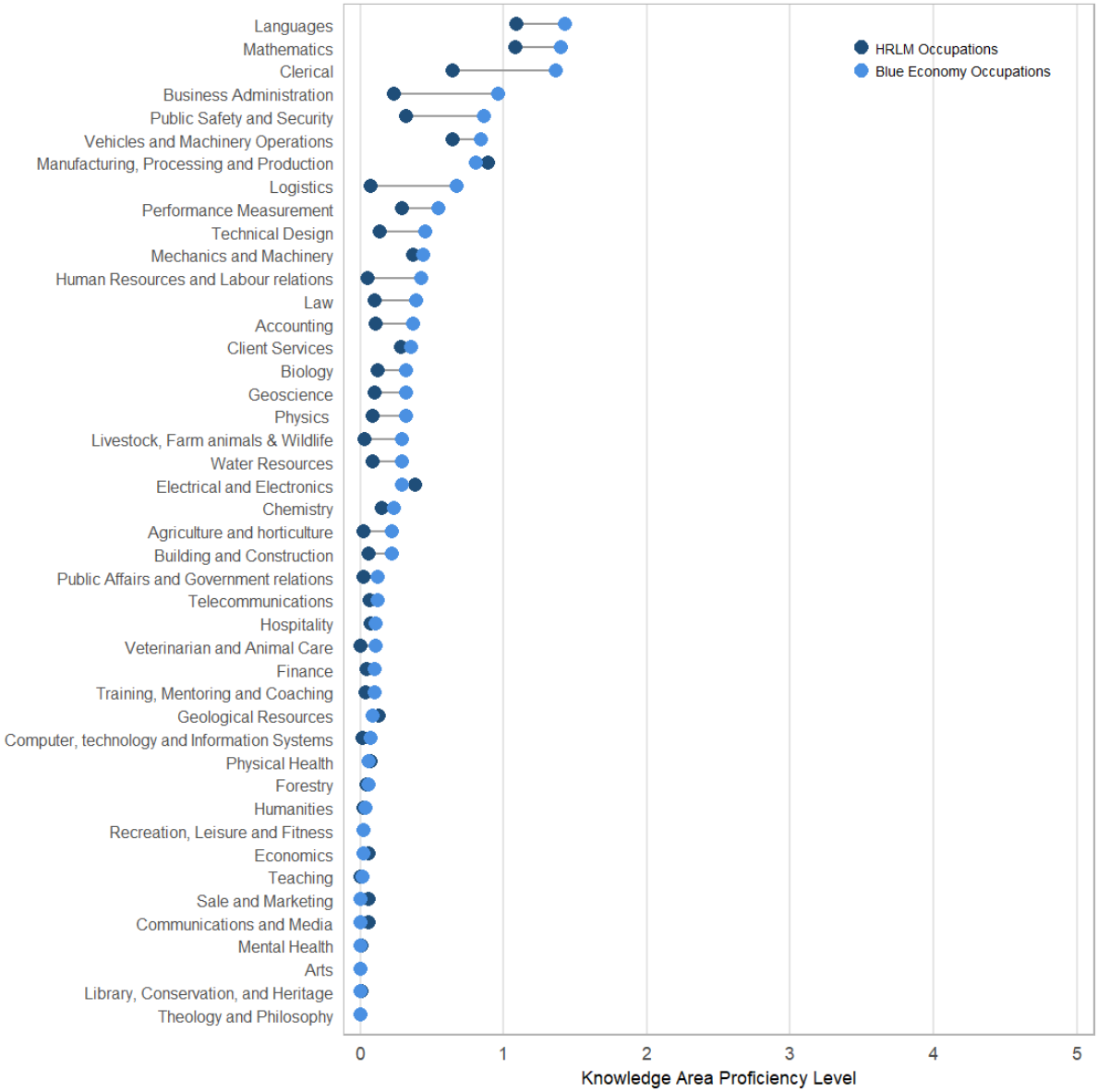
Blue Economy occupations require higher cognitive and perceptual abilities, while HRLM workers often possess superior physical and manual capabilities. Blue Economy roles demand significantly stronger analytical skills, like problem identification, mathematical reasoning, and verbal ability. Conversely, HRLM workers excel in manual dexterity, finger dexterity, and various strength-related abilities. This suggests that, while physical competencies transfer well, further development of cognitive and communication abilities will be essential for successful transitions into Blue Economy careers.



Note: Abilities are sorted in descending order by the average proficiency level for Blue Economy occupations.
Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

There Are Fewer Knowledge Area Gaps

Blue Economy occupations require significant additional learning in business and administrative domains. Blue Economy roles also demand stronger foundations in STEM fields like mathematics, physics, and biology, while HRLM workers possess greater expertise in manufacturing, processing and production as well as electrical and electronics. This pattern suggests that successful workforce transitions will require substantial investment in business acumen and regulatory knowledge rather than technical manufacturing skills, representing a fundamental shift from production-focused to management and compliance-oriented knowledge bases.

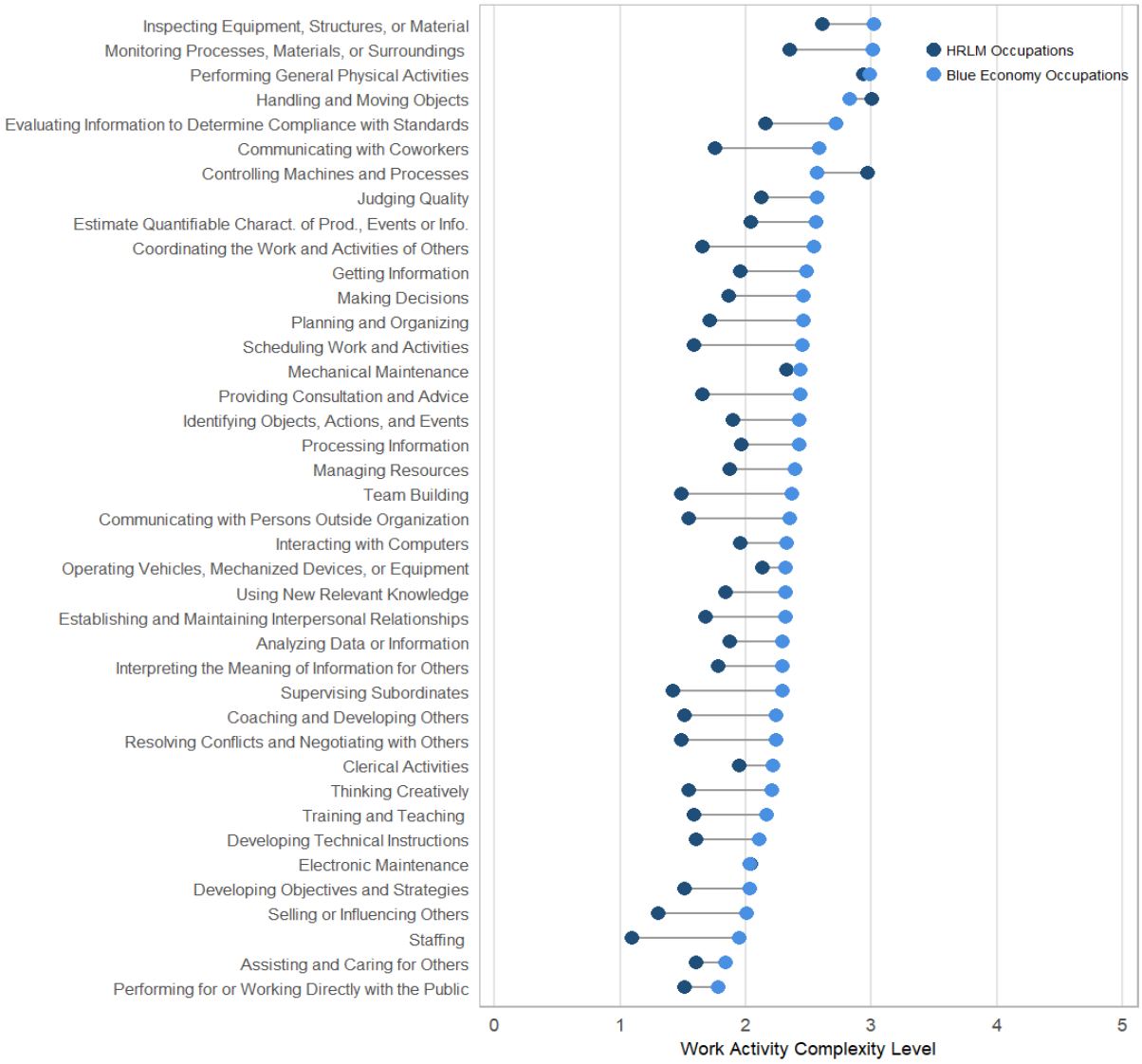


Note: Knowledge Areas are sorted in descending order by the average proficiency level for Blue Economy occupations.

Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

Lastly, Blue Economy Work Activities Are Generally More Complex

Blue Economy occupations demand significantly higher levels of communication, coordination, and analytical activities compared to HRLM roles. The largest gaps appear in coordinating work activities, supervising subordinates, and team building, indicating that Blue Economy jobs require substantial leadership and interpersonal skills that many HRLM workers lack. While HRLM workers excel in hands-on technical activities like controlling machines and handling objects, they will need considerable development in communication with coworkers, planning and organizing, and providing consultation to transition into management-oriented Blue Economy careers.



Note: Work Activities are sorted in descending order by the average complexity level for Blue Economy occupations.

Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

Better Data, Smarter Matching, Faster Training

Three high-impact research priorities could significantly strengthen Canada's approach to workforce planning and mobility in the Blue Economy.

More Precise Classification of Blue Economy Occupations

Current definitions used in national labour systems, such as ESDC's OaSIS database, cast too wide a net, often blending core Blue Economy roles with peripheral or broadly "green" occupations. This lack of precision makes it difficult to conduct accurate skills transferability analyses or to plan targeted interventions. Research is needed to refine classification frameworks and develop more granular criteria that clearly distinguish between core, adjacent, and transitional occupations. Doing so would enable more focused training investment and better alignment between labour supply and demand.

Regional Skills Matching and Geographic Mobility

With vast coastlines and highly localized Blue Economy activity, Canada's regional disparities pose both a challenge and an opportunity. Labour shortages in high-growth coastal areas often exist alongside surplus HRLM workers in other parts of the country. Research into patterns of geographic mobility, regional labour mismatches, and policy barriers could help inform strategies to better allocate talent across regions. A regional lens is critical for maximizing economic potential while supporting equitable access to opportunities.

Micro-Credentialing and Modular Training Pathways

Targeted, short-duration training could play a pivotal role in enabling faster transitions into Blue Economy roles. Research is needed to design modular programs that focus specifically on closing critical skill gaps in areas such as business administration, communication, and digital literacy—competencies that often complement existing technical strengths in displaced workers. These micro-credentials could offer cost-effective, accessible onramps into sustainable marine careers and should be tailored to the realities of adult learners, including those in mid-career transitions.

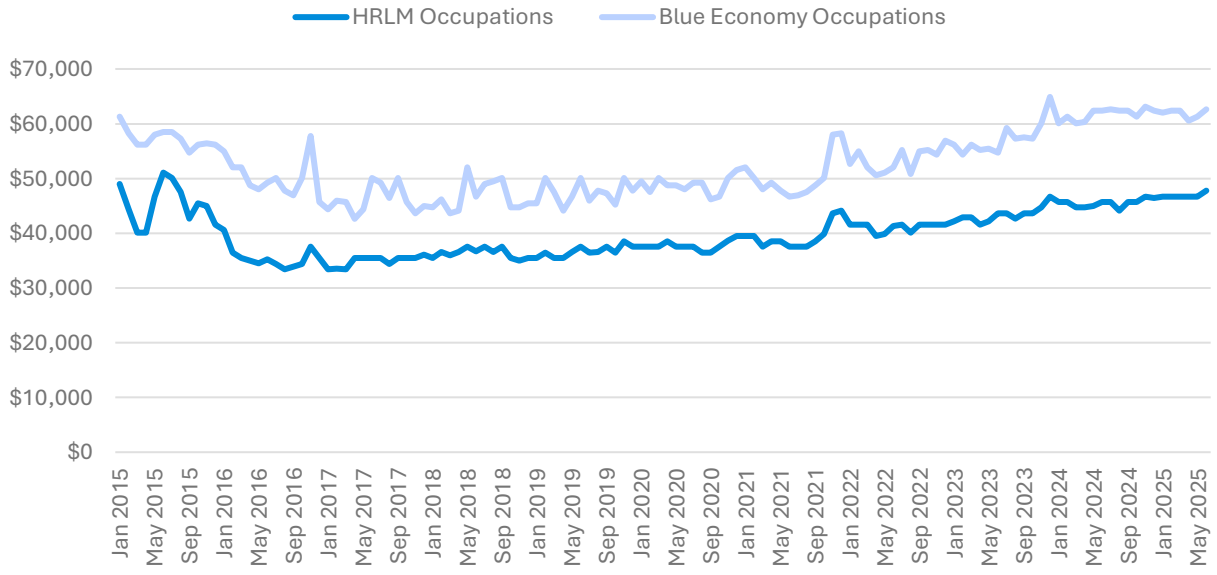
6. Wage Comparisons

Systematic, real-time data-driven wage analysis is crucial for transitions to the Blue Economy, as it reveals significant variations in financial incentives across experience levels, geographic regions, and career stages that fundamentally determine the economic viability of workforce transitions. This is particularly true for high-risk, low-mobility (HRLM) occupations, which represent a significant pool of individuals well-positioned to transition into future-safe careers.

Understanding these wage differentials enables workers to make informed decisions about retraining investments and helps policymakers design targeted support programs that account for regional economic conditions and career progression patterns rather than relying on generalized sectoral assumptions.

Blue Economy Occupations Pay Well Compared to HRLM Occupations

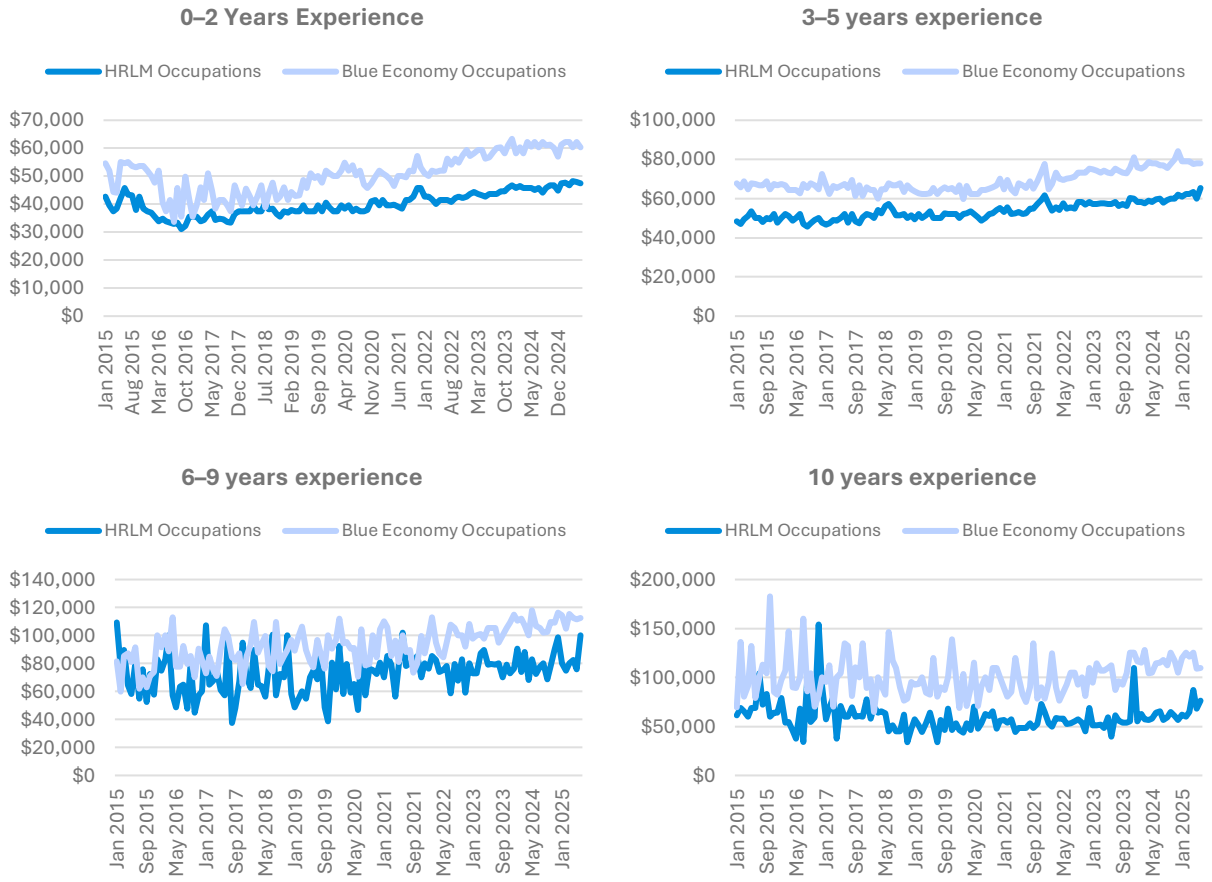
Blue Economy workers earn approximately $15,000–$20,000 more annually than their HRLM counterparts. This persistent wage gap represents a compelling financial incentive for HRLM workers to pursue Blue Economy transitions. The stable nature of this wage premium suggests that Blue Economy careers offer not only immediate financial benefits but also sustained earning potential that could justify investment in retraining and skill development programs. For policymakers, this data supports the economic rationale for developing targeted transition programs, as the wage differential provides clear financial returns on training investments for workers moving from declining HRLM sectors to growing Blue Economy opportunities.



Note: Median salary in job postings, 2015–2025; Two-tailed t-test for the difference in salaries for two groups of roles is statistically significant at the $p < 0.001$ level.
Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Lightcast.

Blue Economy Jobs Offer Increasingly Attractive Financial Advantages as Workers Advance in Their Careers

Entry-level workers with up to two years of experience can expect modest but growing Blue Economy premiums of $12,000–$15,000, while mid-career professionals with 3–5 years of experience benefit from substantially larger and more consistent differentials of $15,000–$22,000.



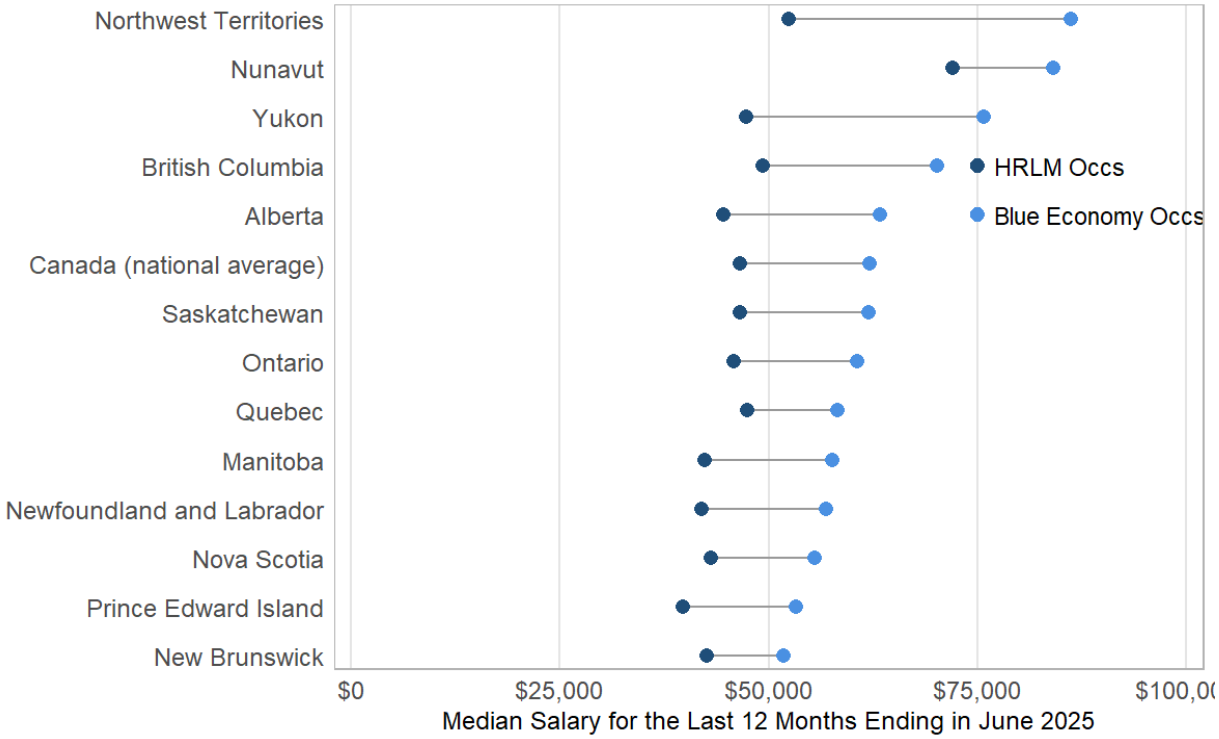
Note: Median salary in job postings, 2015–2025; Two-tailed t-test for the difference in salaries for two groups of roles is statistically significant at the p< 0.001 level.
Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Lightcast.

However, the data for workers with 6–9 years of experience shows extreme volatility and inconsistent wage advantages, likely due to the relatively small number of job postings. Senior professionals with 10+ years of experience are the most attractive transition candidates, with Blue Economy roles offering substantial annual premiums of $30,000–$60,000.

This experience-based wage progression indicates that career transition programs could prioritize senior workers who can achieve the highest financial returns on retraining investments, while also supporting mid-career professionals who face consistently favourable wage differentials, making Blue Economy transitions increasingly valuable as workers accumulate experience and expertise.

Northern and Western Regions Offer the Most Compelling Financial Incentives

The Northwest Territories provides the largest absolute wage premium at $33,792, followed by Yukon ($28,442) and British Columbia ($20,787), suggesting that remote and resource-rich regions with extensive coastlines or natural resource sectors create robust demand for Blue Economy skills.



Note: Median 12-month trailing salary ending in June 2025; Provinces and territories are sorted in descending order by the median salary for Blue Economy occupations.
Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Lightcast.

The Atlantic provinces exhibit more modest differentials, suggesting that regional economic conditions and industry concentrations have a significant impact on transition attractiveness. Workers considering Blue Economy careers should factor geographic mobility into their transition planning, as relocating to northern territories or western provinces could substantially enhance the financial returns on retraining investments, while those in eastern provinces may need to weigh smaller wage premiums against other career transition costs and benefits.

The Long View on Blue Economy Transitions

A compelling future area of research is a longitudinal analysis tracking individual workers transitioning from high-risk, low-mobility (HRLM) sectors into Blue Economy careers. Unlike cross-sectional studies that provide static snapshots, a longitudinal approach would capture the full arc of career shifts—offering critical insights into wage progression, employment stability, and long-term outcomes.

Such a study could explore the real-world dynamics of sectoral transitions: How long do wage penalties last during a career switch? Do wage premiums in Blue Economy roles materialize over time, and if so, how quickly? What retraining periods are typical, and how do relocation needs or temporary income losses affect outcomes?

By following individual workers, the research could identify which pathways prove most successful, both financially and professionally. This evidence would allow for smarter workforce planning, better targeting of training programs, and practical guidance for those navigating complex career changes in Canada's evolving ocean economy.

7. Green-to-Blue Economy Skills Transferability

Worker transitions between Green Economy and Blue Economy occupations represent a critical pathway for accelerating sustainable economic growth while maximizing existing human capital. Successful transitions require targeted interventions to address specific gaps in Blue Economy operations, physical capabilities, and business management skills, making strategic workforce development essential for unlocking the full potential of cross-sectoral employment opportunities.

Unsurprisingly, Green Economy and Blue Economy Jobs Are Strongly Aligned

When comparing pairs of Green Economy and Blue Economy occupations in terms of proficiency on a scale of 1–5, 73% of all occupation pairs show either no gap across skills, abilities, work activities, and knowledge areas. This suggests that Green Economy workers possess highly transferable competencies and would likely require minimal to no additional training to transition into the Blue Economy.

Differences on a 1–5 Proficiency Scale for Green-to-Blue Economy Transitions

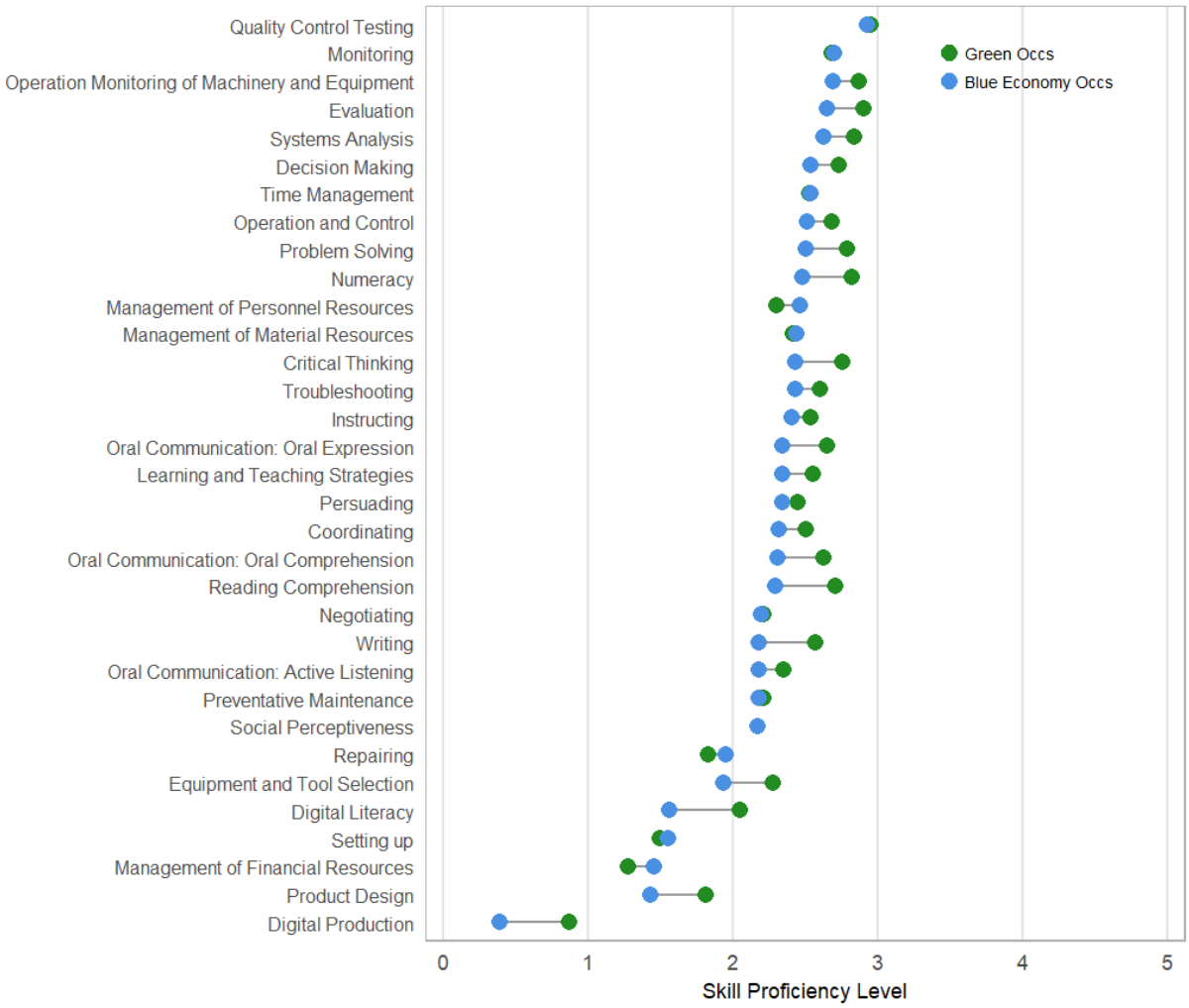
	No gap	0.0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00 +
Skills	4,513	598	413	324	168	128
Abilities	4,092	1,179	683	176	14	0
Knowledge Areas	4,321	1,641	182	0	0	0
Work Activities	4,508	734	518	278	94	12

Note: Total transition pathways (6,144) equal Green Economy occupations (128) x Blue Economy occupations (48).

Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

In Fact, Green Economy Skills Are Well-Suited for Blue Economy Jobs

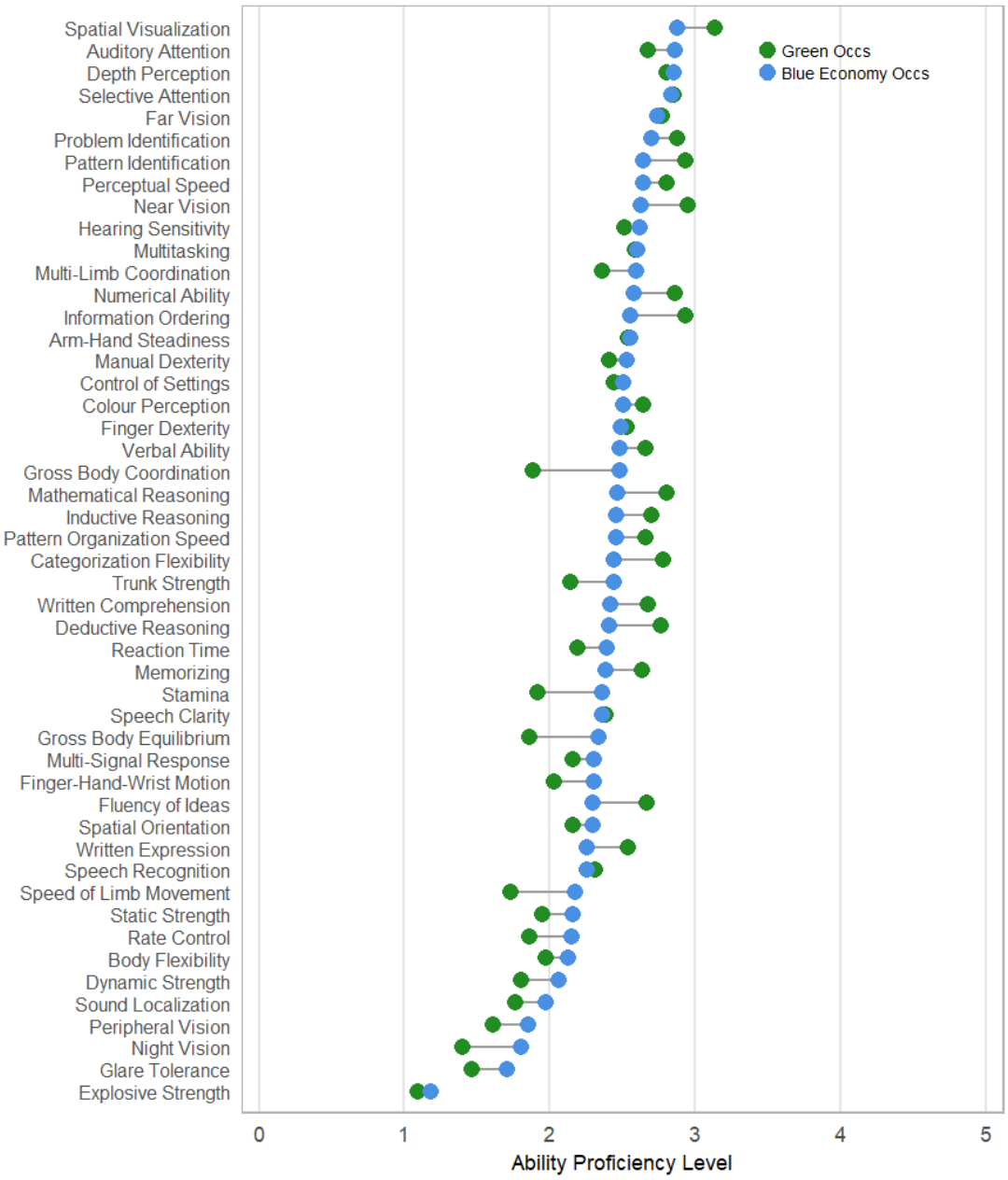
Green workers significantly outperform Blue Economy requirements in most technical and analytical areas, including critical thinking, reading comprehension, and digital literacy. This suggests they can bring valuable competencies to Blue Economy sectors. However, some skill gaps exist in areas where Blue Economy roles demand higher proficiency, particularly in the management of personnel resources and financial resources. This indicates that green workers would benefit from targeted training in business management and supervisory skills to fully capitalize on Blue Economy opportunities.



Note: Skills are sorted in descending order by the average proficiency level for Blue Economy occupations.
Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

Brains, Brawn, and the Blue Economy

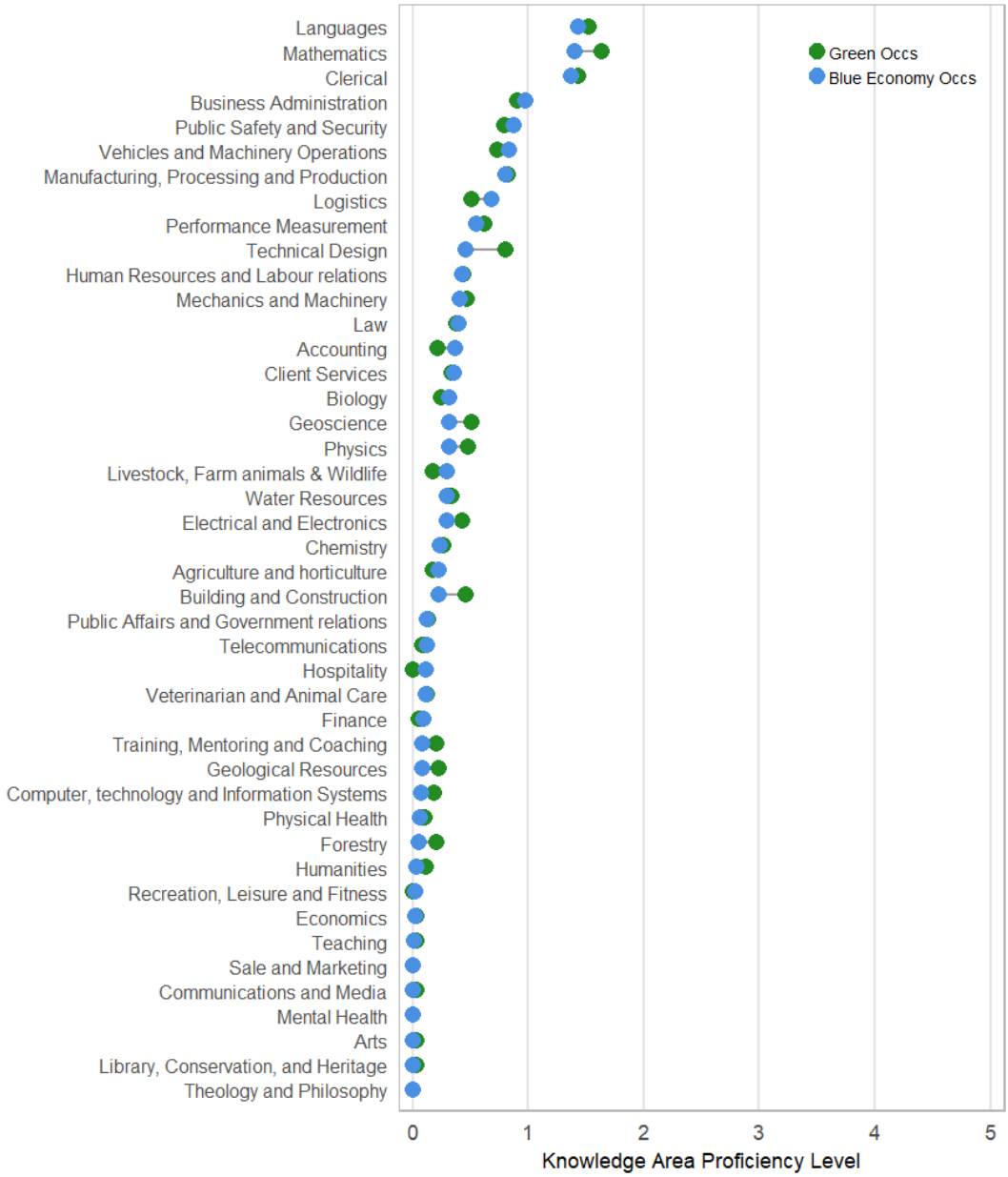
Green workers excel in high-level thinking skills, including mathematical reasoning, deductive reasoning, and information ordering, as well as strong visual processing abilities, such as spatial visualization and near vision. However, they show substantial deficits in physical competencies essential for Blue Economy work, including gross body coordination, stamina, and gross body equilibrium, suggesting that successful transitions will require targeted physical conditioning and manual skill development alongside leveraging their strong analytical foundations.



Note: Abilities are sorted in descending order by the average proficiency level for Blue Economy occupations.
Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

Turning Technical Strength into Sector Readiness

Green workers slightly exceed Blue Economy requirements in technical design, building and construction, and geoscience, as well as possessing superior knowledge of mathematics and physics. However, they show minor deficits in Blue Economy-specific areas, including logistics, accounting, and vehicles and machinery operations. This indicates that successful transitions will require targeted training in maritime business operations, financial management, and specialized equipment handling while leveraging their existing technical expertise.

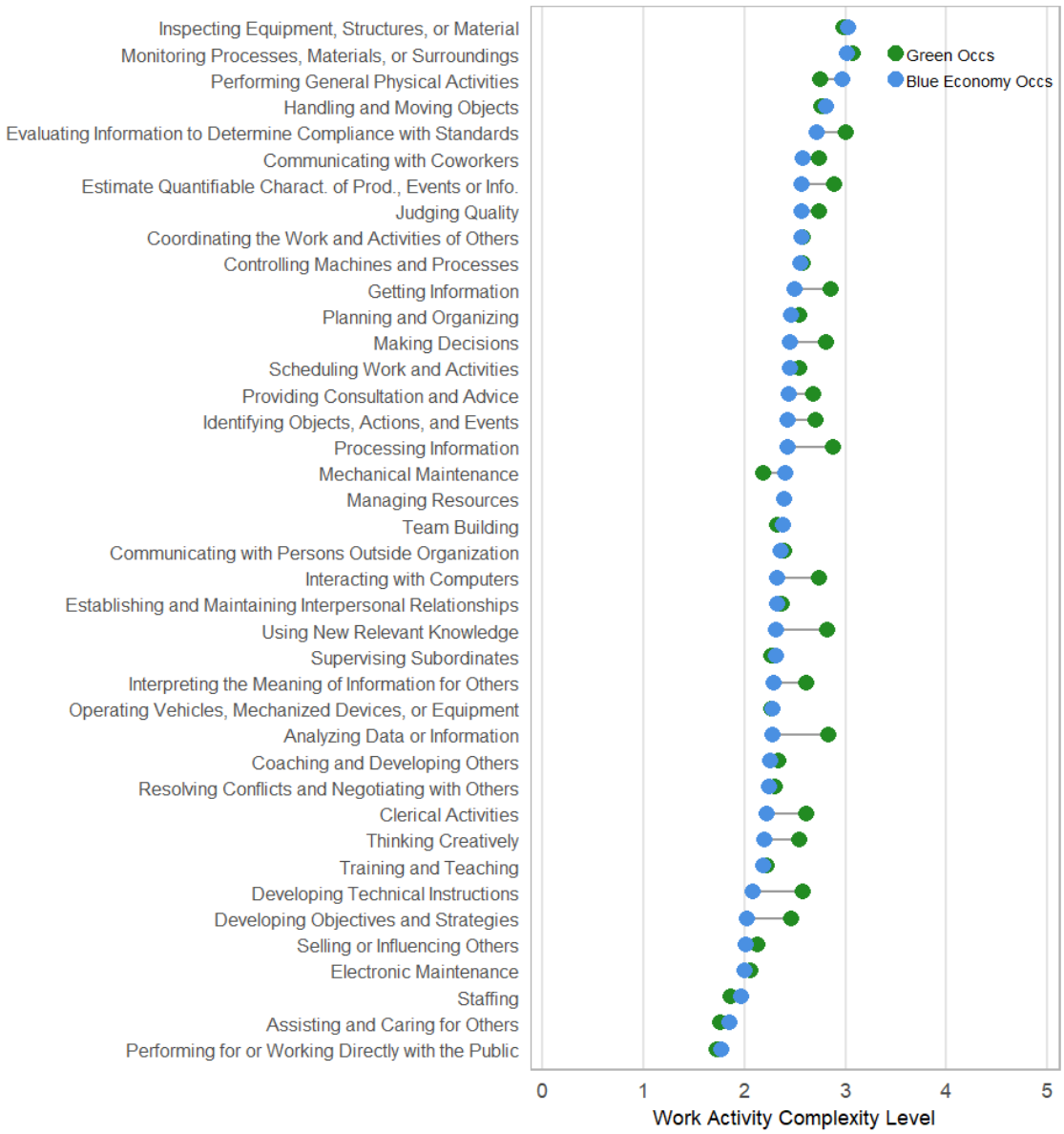


Note: Knowledge Areas are sorted in descending order by the average proficiency level for Blue Economy occupations.

Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

Analytical Edge Meets Operational Demands

Green workers substantially outperform Blue Economy requirements in complex cognitive activities, such as analyzing data, using new relevant knowledge, and developing technical instructions, as well as demonstrating superior performance in evaluating compliance standards and decision-making. However, they exhibit gaps in physical and mechanical activities, including performing general physical tasks, mechanical maintenance, and supervising subordinates, indicating that transitions will require practical training in maritime operations and hands-on equipment management, while capitalizing on their strong analytical expertise.



Note: Work Activities are sorted in descending order by the average complexity level for Blue Economy occupations.

Source: Statistics Canada Industry-Occupation Matrix (Custom Data); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).

Aligning Classifications and Competencies for the Future Blue Workforce

Two key research directions could meaningfully shape workforce development in Canada's evolving ocean economy.

First, the current classification of green occupations in ESDC's OaSIS database is too broad, often lumping together core environmental roles with peripheral ones that contribute to sustainability only incidentally. This lack of precision limits the usefulness of skills transferability analyses and weakens transition strategies for workers moving into Blue Economy careers. A more nuanced classification system—one that clearly distinguishes between deeply environmental roles and tangential ones—would enable sharper policy insights and more targeted upskilling programs. This would help ensure that workforce development investments are focused on those with the highest potential for successful transition.

Second, there's a significant opportunity to design digital bridge training for professionals in the Green Economy. While these workers already demonstrate strong baseline digital literacy and computer interaction skills, many Blue Economy roles now require specific technical capabilities—such as operating autonomous underwater vehicles, managing marine sensor systems, and analyzing maritime data streams. Research could explore how best to build on this digital foundation through short, modular training programs that prepare workers for ocean-sector technologies. By capitalizing on existing strengths while addressing emerging demands, these programs could play a pivotal role in preparing a digitally fluent Blue Economy workforce.

8. Upskilling and Training Pathways

Demand is rising for ocean sciences, engineering, IT, and management programs that build workforce capacity and leadership for both traditional and emerging blue economy sectors. Growth opportunities include associate and undergraduate programs in marine-related technical training, alongside graduate-level initiatives such as the Blue MBA, which integrates management and marine science.

Looking ahead, technical training and advanced studies will become increasingly important in areas such as fisheries, aquaculture, ocean technology, renewable energy, biotechnology, and marine finance. Developing new instructional programs presents an opportunity for stronger collaboration among industry, government, and academia to build a diverse and inclusive workforce for the expanding blue economy (Moran, 2021).

Workforce Readiness Is the Bottleneck in Canada's Blue Economy Growth

According to a recent study (2025) published by Canadian Marine Careers Association, Canada's seafaring workforce faces acute labour shortages, with vacancy rates more than three times the national average and 86 per cent of employers struggling to recruit qualified candidates. Over the next five years, demand for 8,300 additional workers—equivalent to more than 30 per cent of the current workforce—will place substantial pressure on the training ecosystem.

Key marine occupations such as navigation officers, engineers, and crew, which require federally regulated and highly specialized training, account for more than half of these new hires. Given the regional concentration of future hiring in the Ontario–Quebec, Atlantic, and Pacific regions, there is a clear need to expand training capacity and align program development with industry requirements to ensure the current training ecosystem can meet future workforce demands.

Atlantic Canada's growing offshore wind energy sector is expected to create up to 11,000 jobs at peak times (Marine Renewables Canada, 2025). This highlights the urgent need for expanded workforce training to meet rising demand. While the region has strong supply chain capabilities and skilled workers in marine operations, logistics, and consulting, training in specialized manufacturing, renewable technologies, and wind energy operations will be essential.

Investments in inclusive training programs, particularly supporting Indigenous participation, will further strengthen the sector's long-term competitiveness. Clear Seas (2024), for instance, focuses on Indigenous employment in the ocean sector and documents aging, low-diversity workforce. It is recommending Indigenous-led training, culturally relevant recruitment, and funded upskilling to expand capacity and meet long-term demand.

Similarly, to address the shortage of workers, Transport Canada expanded the Marine Training Program to the Western Arctic Marine Training Centre in Hay River, NWT, with the goal of helping attract, train, and employ a diverse range of candidates in the marine industry. Initiatives such as these will be necessary to unleashing the full potential of the Blue Economy.

Core Microcredentials and Certificate Programs

Nova Scotia Community College (NSCC)	• Offers microcredentials in Aquaculture Management that cover sustainable practices, Standard Operating Procedures (SOPs), and management planning. • Accessible, short-form training aimed at working professionals in marine sectors.
Fisheries and Marine Institute of Memorial University	• Provides a suite of certificate programs in aquaculture, including Aquaculture Management, Aquaculture Safety, Salmonid Aquaculture, Shellfish and Seaplant Aquaculture, and an Introduction to Aquaculture. • These are modular, offered online or in-person, and can be taken individually or stacked toward comprehensive credentials.
UBC Institute for the Oceans and Fisheries	• Offers a part-time, online micro-certificate in Analytics for Leaders in Ocean Management composed of two 8-week courses. • These build ocean data literacy, spatial models, and data-driven decision-making skills, and include bursary support for underrepresented groups.
Ocean Alliance Canada	• Enables professionals to pursue the Sustainable Blue Economy Professional (SBEP) designation, a nationally recognized competency-based credential aligned with Blue Economy workforce needs. • Includes digital learning pathways and mentorship.

Other Programs

Offshore Wind Safety Training via GWO Certifications in Canada

Some Canadian training providers deliver Global Wind Organization (GWO) safety training, which is essential for offshore renewable energy roles. For instance, Kee Safety in Calgary, Alberta offers GWO Basic Technical Training (electro-mechanical modules) Kee Safety, and TRR in Paradise, Newfoundland and Labrador provides GWO Basic Safety Training (BST), including first aid, working at heights, fire awareness, and manual handling on turbines.

Internships and Digital Platforms via Blue Futures Pathways

Canada's Ocean Supercluster runs the Blue Futures Pathways program, a $2.4 million initiative creating paid internships (~150 placements), mentorship, curated training, and a digital platform ("PORT") that connects youth—especially from remote, Indigenous, and underrepresented groups—with ocean careers. The PORT platform centralizes job opportunities, learning resources, mentorship, and stipend supports.

Ocean Research Training Networks for Data and Leadership Skills

The Ocean Frontier Institute (OFI)'s Ocean School Halifax, Nova Scotia enables its students to explore the ocean through immersive multimedia. Besides contributing to global ocean literacy, the school fosters critical thinking and problem-solving skills.

Expanding Access and Accelerating Blue Talent Pipelines

Two research areas stand out as critical to strengthening Canada's future ocean workforce.

The first is the geographic distribution and accessibility of Blue Economy training programs. Given the concentration of future hiring in coastal regions, there's a clear need to examine whether inland and northern workers have adequate access to these opportunities. Research could map the current distribution of training programs, assess barriers like transportation, accommodation, and cost, and explore how remote learning models and digital platforms (e.g., PORT) are—or aren't—reaching underrepresented groups. This would help identify high-potential regions where program delivery could be expanded, particularly through hybrid or mobile formats.

The second area is how to accelerate training program development through strategic collaboration between industry, academia, and government. With over 8,000 marine workers needed within five years—and 11,000 new jobs projected in Atlantic offshore wind alone—there's a pressing need for nimble, scalable training solutions. Research could evaluate which types of partnership models most effectively support rapid curriculum development, credential recognition, and program approval. It could also explore how international best practices might be adapted to the Canadian context, and which funding structures best balance speed with long-term sustainability.

Together, these research directions would support the development of an accessible, agile training ecosystem capable of meeting urgent labour needs while ensuring equity across Canada's diverse regions.

Appendix

There Are 48 Occupations With a Relatively High Concentration of Employment in the Blue Economy

Occupation with NOC	Concentration Quotient (CQ)
75100 Longshore workers	680.7
80022 Managers in aquaculture	553.4
83120 Fishing masters and officers	503.8
85102 Aquaculture and marine harvest labourers	478.2
72602 Deck officers, water transport	316.5
74201 Water transport deck and engine room crew	243.2
72603 Engineer officers, water transport	220.9
75210 Boat and cable ferry operators and related occupations	189.3
21399 Other professional engineers	75.6
64322 Outdoor sport and recreational guides	69.8
64313 Ground and water transport ticket agents, cargo service representatives and related clerks	68.8
92023 Supervisors, other mechanical and metal products manufacturing	56.5
92012 Supervisors, food and beverage processing	44.0
72405 Machine fitters	37.4
72423 Motorcycle, all-terrain vehicle and other related mechanics	36.8
72301 Steamfitters, pipefitters and sprinkler system installers	35.3
72201 Industrial electricians	30.7
22113 Conservation and fishery officers	25.8
85104 Trappers and hunters	23.9
72106 Welders and related machine operators	22.1
72500 Crane operators	21.8
70020 Managers in transportation	18.0
72105 Ironworkers	17.6
95102 Labourers in chemical products processing and utilities	14.0
72604 Railway traffic controllers and marine traffic regulators	13.6
65210 Support occupations in accommodation, travel and facilities set-up services	11.6
22111 Agricultural and fish products inspectors	11.2
13200 Customs, ship and other brokers	11.1
92024 Supervisors, other products manufacturing and assembly	9.1
64311 Pursers and flight attendants	8.6
94102 Glass forming and finishing machine operators and glass cutters	8.5
90010 Manufacturing managers	8.3
14405 Transportation route and crew schedulers	7.6
73400 Heavy equipment operators	7.3
80010 Managers in natural resources production and fishing	7.1
22301 Mechanical engineering technologists and technicians	6.8
72021 Contractors and supervisors, heavy equipment operator crews	6.6
95106 Labourers in food and beverage processing	6.4
82030 Agricultural service contractors and farm supervisors	6.0
75119 Other trades helpers and labourers	5.9
72999 Other technical trades and related occupations	5.8
21321 Industrial and manufacturing engineers	5.7
72023 Supervisors, railway transport operations	5.7

72429 Other small engine and small equipment repairers	5.6
20010 Engineering managers	5.5
21301 Mechanical engineers	5.3
92013 Supervisors, plastic and rubber products manufacturing	5.2
95101 Labourers in metal fabrication	5.2

Note: This approach identifies occupations within each Blue Economy sector based on a concentration quotient (CQ). The CQ measures the relative importance of any given occupation to each Blue Economy sector compared with the overall economy. The CQ formula is "Occupation's share of sectoral employment / Occupation's share of national employment". Values greater than 1 indicate that a given occupation is more important to the Blue Economy than the overall economy. Values less than 1 indicate that a given occupation is less important to the Blue Economy than the overall economy. Values equal to 1 indicate that a given occupation is equally important to the clean economy and the overall economy. Occupations that are classified as HRLM or those that are projected to shrink are excluded from the list.

Source: Statistics Canada Industry-Occupation Matrix (Custom Data).

There Are 128 Occupations Relevant to the Green Economy

Occupation with NOC
13201.01 Production logistics coordinators
13201.02 Transportation logistics coordinators
20010 Engineering managers
20011.01 Architecture and urban planning managers
20011.02 Science Managers
21102.01 Geoscientists
21102.02 Oceanographers
21103 Meteorologists and climatologists
21110.01 Biologists
21110.02 Microbiologists and cell and molecular biologists
21200 Architects
21201 Landscape architects
21202 Urban and land use planners
21232 Software developers and programmers
21300 Civil engineers
21301 Mechanical engineers
21310 Electrical and electronics engineers
21311.01 Computer and telecommunications hardware engineers
21311.02 Network system and data communication engineers
21320 Chemical engineers
21321 Industrial and manufacturing engineers
21331 Geological engineers
21390 Aerospace engineers
22100.01 Chemical technologists
22100.02 Chemical technicians
22101.01 Geological and mineral technologists
22101.02 Geological and mineral technicians
22110.01 Biological technologists
22110.02 Biological technicians
22112 Forestry technologists and technicians
22113 Conservation and fishery officers
22210 Architectural technologists and technicians
22212.01 Drafting technologists

22212.02 Drafting technicians
22214.01 Cartographic technologists and technicians
22214.02 Photogrammetric technologists and technicians
22214.03 Aerial survey and remote sensing technologists and technicians
22214.04 Geographic information system (GIS) technologists and technicians
22214.05 Meteorological technologists and technicians
22232 Occupational health and safety specialists
22233 Construction inspectors
22301.01 Mechanical engineering technologists
22301.02 Mechanical engineering technicians
22303 Construction estimators
22310.01 Electrical and electronics engineering technologists
22310.02 Electrical and electronics engineering technicians
22312 Industrial instrument technicians and mechanics
41210 College and other vocational instructors
41400.01 Ergonomists
41400.02 Occupational or industrial hygienists
41400.03 Patent agents
41400.04 Science policy and program officers
41400.05 Technology transfer officers
43202.01 Animal control officer
43202.02 By-law enforcement officers
43202.03 Commercial transport inspectors
43202.04 Garbage collection inspectors
43202.05 Liquor licence inspectors
43202.06 Parking control officers
43202.07 Taxi inspectors
43202.08 Zoning inspectors
70010 Construction managers
70020.01 Transportation managers, operations
70020.02 Transportation managers, freight traffic
72010 Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations
72013 Contractors and supervisors, carpentry trades
72020 Contractors and supervisors, mechanic trades
72100.01 Machinists
72100.02 Machining and tooling inspectors
72104 Structural metal and platework fabricators and fitters
72106.01 Welders
72106.02 Welding, brazing and soldering machine operators
72200 Electricians (except industrial and power system)
72201 Industrial electricians
72204 Telecommunications line and cable installers and repairers
72300 Plumbers
72310 Carpenters
72400.01 Construction millwrights and industrial mechanics
72400.02 Textile machinery mechanics and repairers
72401 Heavy-duty equipment mechanics
72403 Railway carmen/women
72406 Elevator constructors and mechanics
72410.01 Automotive service technicians
72410.02 Mechanical repairers, motor vehicle manufacturing

72410.03 Transport truck and trailer mechanics
72604.01 Railway traffic controllers
72604.02 Marine traffic regulators
73100 Concrete finishers
73200 Residential and commercial installers and servicers
73201 General building maintenance workers and building superintendents
73301.01 Bus and streetcar drivers
73301.02 School bus drivers
73301.03 Subway train and light rail transit operators
73401 Printing press operators
74200.01 Railway yard workers
74200.02 Railway track maintenance workers
74201.01 Engine room crew - water transport
74201.02 Deck crew, water transport
75101.01 Material handlers (manual)
75101.02 Material handlers (equipment operators)
75110 Construction trades helpers and labourers
75119 Other trades helpers and labourers
80020 Managers in agriculture
82020 Supervisors, mining and quarrying
82030.01 Agricultural service contractors
82030.02 Farm supervisors
83100 Underground production and development miners
84111 Silviculture and forestry workers
90010 Manufacturing managers
92012 Supervisors, food and beverage processing
94101.01 Mouldmakers and coremakers
94101.02 Metal casters
94101.03 Foundry furnace operators
94103.01 Concrete products forming and finiching machine operators and workers
94103.02 Clay products forming and finishing machine operators
94103.03 Stone forming and finishing workers
94106 Machining tool operators
94107 Machine operators of other metal products
94110 Chemical plant machine operators
94204.01 Mechanical assemblers
94204.02 Mechanical inspectors
94211.01 Other wood products assemblers
94211.02 Other wood products inspectors
94212.01 Plastic products assemblers and finishers
94212.02 Plastic products inspectors
94219.01 Product assemblers and finishers
94219.02 Product inspectors
95107 Labourers in fish and seafood processing

*Source: U.S. Bureau of Labour Statistics Occupational Information Network (O*NET); Employment and Social Development Canada (ESDC) Occupational and Skills Information System (OaSIS).*

There Are 92 High-Risk, Low-Mobility (HRLM) Occupations

Occupation with NOC
1111 Financial auditors and accountants
1241 Administrative assistants
1251 Court reporters, medical transcriptionists and related occupations
1411 General office support workers
1414 Receptionists
1422 Data entry clerks
1435 Collectors
1454 Survey interviewers and statistical clerks
1511 Mail, postal and related workers
2223 Forestry technologists and technicians
3211 Medical laboratory technologists
3219 Other medical technologists and technicians (except dental health)
3223 Dental technologists, technicians and laboratory assistants
6322 Cooks
6525 Hotel front desk clerks
6533 Casino occupations
6551 Customer services representatives - financial institutions
6552 Other customer and information services representatives
6611 Cashiers
6623 Other sales related occupations
6711 Food counter attendants, kitchen helpers and related support occupations
6741 Dry cleaning, laundry and related occupations
7201 Contractors and supervisors, machining, metal forming, shaping and erecting trades and related occupations
7231 Machinists and machining and tooling inspectors
7232 Tool and die makers
7233 Sheet metal workers
7236 Ironworkers
7237 Welders and related machine operators
7294 Painters and decorators (except interior decorators)
7302 Contractors and supervisors, heavy equipment operator crews
7322 Motor vehicle body repairers
7371 Crane operators
7372 Drillers and blasters - surface mining, quarrying and construction
7373 Water well drillers
7384 Other trades and related occupations, n.e.c.
7444 Pest controllers and fumigators
7445 Other repairers and servicers
7532 Water transport deck and engine room crew
7533 Boat and cable ferry operators and related occupations
7611 Construction trades helpers and labourers
7621 Public works and maintenance labourers
8262 Fishermen/women
8412 Oil and gas well drilling and related workers and services operators
8431 General farm workers
8432 Nursery and greenhouse workers
8441 Fishing vessel deckhands
8612 Landscaping and grounds maintenance labourers
8613 Aquaculture and marine harvest labourers
8614 Mine labourers

8615 Oil and gas drilling, servicing and related labourers
8616 Logging and forestry labourers
9241 Power engineers and power systems operators
9411 Machine operators, mineral and metal processing
9412 Foundry workers
9413 Glass forming and finishing machine operators and glass cutters
9414 Concrete, clay and stone forming operators
9415 Inspectors and testers, mineral and metal processing
9416 Metalworking and forging machine operators
9417 Machining tool operators
9418 Other metal products machine operators
9421 Chemical plant machine operators
9422 Plastics processing machine operators
9423 Rubber processing machine operators and related workers
9431 Sawmill machine operators
9432 Pulp mill machine operators
9433 Papermaking and finishing machine operators
9434 Other wood processing machine operators
9435 Paper converting machine operators
9436 Lumber graders and other wood processing inspectors and graders
9441 Textile fibre and yarn, hide and pelt processing machine operators and workers
9442 Weavers, knitters and other fabric making occupations
9445 Fabric, fur and leather cutters
9446 Industrial sewing machine operators
9447 Inspectors and graders, textile, fabric, fur and leather products manufacturing
9461 Process control and machine operators, food and beverage processing
9474 Photographic and film processors
9521 Aircraft assemblers and aircraft assembly inspectors
9522 Motor vehicle assemblers, inspectors and testers
9523 Electronics assemblers, fabricators, inspectors and testers
9524 Assemblers and inspectors, electrical appliance, apparatus and equipment manufacturing
9525 Assemblers, fabricators and inspectors, industrial electrical motors and transformers
9526 Mechanical assemblers and inspectors
9527 Machine operators and inspectors, electrical apparatus manufacturing
9531 Boat assemblers and inspectors
9532 Furniture and fixture assemblers and inspectors
9533 Other wood products assemblers and inspectors
9534 Furniture finishers and refinishers
9535 Plastic products assemblers, finishers and inspectors
9536 Industrial painters, coaters and metal finishing process operators
9537 Other products assemblers, finishers and inspectors
9612 Labourers in metal fabrication
9619 Other labourers in processing, manufacturing and utilities

Source: Conference Board of Canada, Responding to Automation: How Adaptable Is Canada's Labour Market?

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