

BRITISH COLUMBIA CANADA



OCEAN



TECHNOLOGY

A Rising Leader in Ocean Technology

From establishing one of the world's first and largest undersea digital observatories to developing deep water submersibles and remotely-operated vehicles, British Columbia (B.C.) has consistently been at the forefront of developments in ocean technology — and with dynamic shipyard expansion, we continue to move forward on new commercial applications for established and leading-edge technologies.





A Maritime Economy

British Columbia has a long history of experience in shipbuilding and ship repair, ocean transportation, and marine engineering. Our ocean science & technology industry has built on that history to lead in areas such as:

- Offshore energy
- Defence and security
- Marine transportation, shipbuilding, and ship repair
- Environmental monitoring and ocean stewardship

British Columbia's maritime history, dynamic shipbuilding industry, and advanced technology are the foundation for a strong cluster of new technology companies and researchers. Find out how these strengths can support your business, whether you are planning to locate to British Columbia or need the products and services we have available.

BRITISH COLUMBIA COMPANIES ARE AT THE LEADING EDGE OF RESEARCH AND COMMERCIAL DEVELOPMENT OF ADVANCED OCEAN TECHNOLOGIES.

Diverse marine sector

The diverse marine sector in British Columbia includes shipbuilding and design, ship repair, marine transportation, aquaculture and fishing, tourism and recreation, government services and defence. B.C. companies are competing on the world stage in robotics and sensors, data analytics, and communication technologies to address climate challenges and meet the increased demand being placed on our oceans. B.C. ocean technology companies are well established in global markets, recognized worldwide for their leading solutions.

Established expertise

British Columbia companies are at the leading edge of research and commercial development of advanced ocean technologies. They have successfully developed, manufactured, and exported products and systems to government and private sector customers worldwide. The sector is seeing continued progress and innovation through grassroots, industry-led initiatives like the Vancouver Maritime Centre for Climate, dedicated to accelerating the transition to a zero-emissions shipping industry in British Columbia, and the Centre for Ocean Applied Sustainable Technologies, furthering creative solutions to industry challenges.

World-leading research network

Universities, research organizations and private companies in British Columbia work closely to share knowledge from the marine technology and science community and to commercialize data and components of its advanced research.

The Bamfield Marine Sciences Centre (BMSC) is a shared campus of the Universities of Victoria, British Columbia, Alberta, Calgary, and Simon Fraser University. Perched on the outer west coast of Vancouver Island, within the traditional territory of the Huu-ay-aht First Nation, BMSC provides access to a remarkable diversity of marine, terrestrial, freshwater, and cultural sites of the North East Pacific basin. With 3,000 square meters of modern laboratory space, it can support research in almost any field of study.

Organizations like the BC Innovation Council (BCIC) drive economic growth by matching innovators with industry challenges in clean tech and natural resources, including the oceantech sector. BCIC provides business coaching, hiring grants, and funding for research and development, pilots and scaling.

Highly educated workforce

British Columbia's advanced education system offers world-renowned programs in ocean sciences and technology. With highly respected programs in oceanography, environmental sciences, and marine technology, our post-secondary education system is training the future generation of oceantech innovators. The educated workforce at British Columbia's ocean technology companies can provide leading-edge solutions to the challenges of working in the ocean environment.

Strong government support

The Government of British Columbia offers strong support for buyers and investors in our economy. With competitive taxes, an open economy, international trade missions, trade and investment representatives, and active support in the pursuit of international trade agreements, British Columbia supports the growth of our ocean technology companies.



Industry Profile

A COASTAL PROVINCE WITH A GROWING TECHNOLOGY SECTOR

British Columbia is a province with an extensive coastline and a rich history built around ocean and marine opportunities. The ocean technology cluster in British Columbia has grown beyond its roots in industry, government research institutes, and academic expertise to successfully market its innovative products and services worldwide.

Over 1,000 companies are active in the industrial marine sector in British Columbia. Our technology companies sell throughout the international market, working with multi-national industry, research organizations, and other governments. Companies range from specialized technology developers to project integrators. Their capabilities include sophisticated navigation and undersea rescue systems, sensors, remote operated vehicles, and security technologies. They are complemented by companies with expertise in data management, integration, and communications.

The health and vigour of the industry is supported by several public universities, regional universities, colleges, and technical training institutes with specialty programs in the fields of ocean science and marine technology. In addition, several government research facilities and associations focus on the ocean and marine sector.

BRITISH COLUMBIA IS A COASTAL PROVINCE WITH AN EXTENSIVE COASTLINE AND A RICH HISTORY BUILT AROUND OCEAN AND MARINE OPPORTUNITIES.

British Columbia ocean technology includes:

- **Ship design, building, and repair** — advanced software, engineering, logistics, and techniques to fabricate, repair, and refurbish coastal and ocean-going ships
- **Acoustics systems and equipment** — equipment and systems that use sound underwater, such as sonars, echo sounders, data acquisition, and processing systems
- **Marine security** — ocean technology products or services for the naval market, such as anti-submarine warfare, military underwater vehicles, stealth buoys, and surveillance systems
- **Imaging oceans technology** — remote sensing equipment for ocean applications, such as software for visualization of large hydrographic data sets, geomatics, power propulsion, marine steering
- **Instrumentation and information systems** — sensors and systems that measure marine parameters, such as oceanographic instruments, drifting buoys, data collection systems, cabled seafloor observatories, and their components
- **Communications** — products for marine navigation, communications and information management, such as seaway information, marine geomatics, marine information skyway, marine intelligent systems, and wireless technologies
- **Platforms and vehicles** — equipment such as ocean vehicles, remotely operated vehicles (ROVs), autonomous underwater vehicles (AUVs), submersibles, ocean platforms, and handling systems
- **Ocean energy** — systems and technologies to use wind, wave, tidal, and current potential to develop new sources of power
- **Services** — technical services specialized for the marine environment, such as marine survey, engineering, naval architecture, environmental services, vessel operations



NEW DIRECTIONS FOR FUTURE GROWTH

British Columbia companies have gained knowledge and experience with successful commercial relationships in world markets, including work with energy, military, and science and environment organizations. While the domestic, U.S., and European markets remain key opportunities, a huge potential for customers in newer markets creates opportunities for expanding sales in the ocean technology sector.

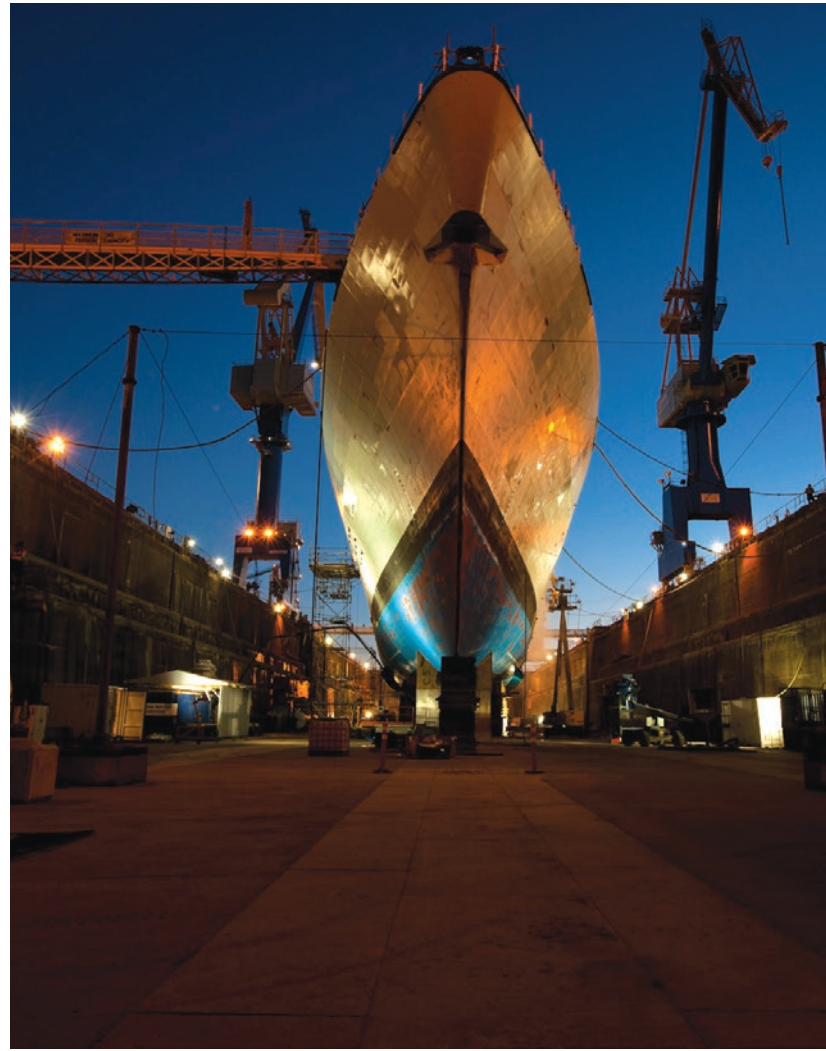
Many of British Columbia's successful ocean technology companies are small to medium-sized enterprises. They compete globally by leading in their niche markets and innovating continuously to maintain their market position. While many started as spin-offs from research initiatives, their business strategies are often based on collaboration with international partners so that they can attain a significant presence and resilience in a worldwide marketplace. They have a dynamic outward focus that is grounded in British Columbia but benefits the world.

STRONG GOVERNMENT SUPPORT

In 2021, Vancouver's Seaspan Shipyards was selected to construct a Polar Icebreaker under Canada's National Shipbuilding Strategy (NSS). As the selected shipyard to deliver non-combat vessels for the NSS, Seaspan has already delivered three Offshore Fisheries Science Vessels and is in the process of constructing the first of two Joint Support Ships for the Canadian Navy. In 2021, The B.C. government appointed an advisory committee to help develop a long-term provincial shipbuilding strategy to ensure the continued growth of this vibrant sector. Canada and British Columbia have also provided substantial funding to operate a network of research facilities on British Columbia's coast, including the world-leading Ocean Networks Canada and the Institute of Ocean Sciences.

MARINE CLUSTERS IN BRITISH COLUMBIA

Industrial marine clusters in British Columbia are based primarily in the southern coastal areas around the cities of Vancouver and Victoria. Over 1,000 companies are headquartered in and around the two cities, including Seaspan Marine with its multi-billion-dollar ship construction program for the Government of Canada. The clusters include associations, universities, research institutes, and a large naval presence. Innovative and eco-friendly initiatives like the Vancouver Maritime Centre for Climate and the Ocean Futures Innovation Hub demonstrate British Columbia's commitment to a sustainable future.



MULTI-BILLION DOLLAR PROGRAM REIGNITES BRITISH COLUMBIA SHIPBUILDING

British Columbia is the home of the multi-billion-dollar non-combat fleet renewal program awarded to Seaspan ULC under Canada's National Shipbuilding Strategy (NSS). As a result of the NSS, Seaspan has invested more than \$185M to upgrade its Vancouver and Victoria Shipyards, making Vancouver Shipyards one of the most modern shipbuilding facilities in North America.

In addition to creating jobs, Seaspan's NSS work has provided supplier, subcontracting and investment opportunities for B.C. As of December 2019, Seaspan has committed to supporting private sector developments in modern construction and technology, with a focus on emerging technologies that improve productivity and competitiveness in marine research, new processes, and new tools for the Canadian shipbuilding industry. Together with extensive private sector shipbuilding and maintenance work, British Columbia is looking forward to a lengthy period of growth and development for its marine industry.



Education and Research

Strong connections between British Columbia's research and academic institutions and our commercial sector build a strong and forward-looking culture.

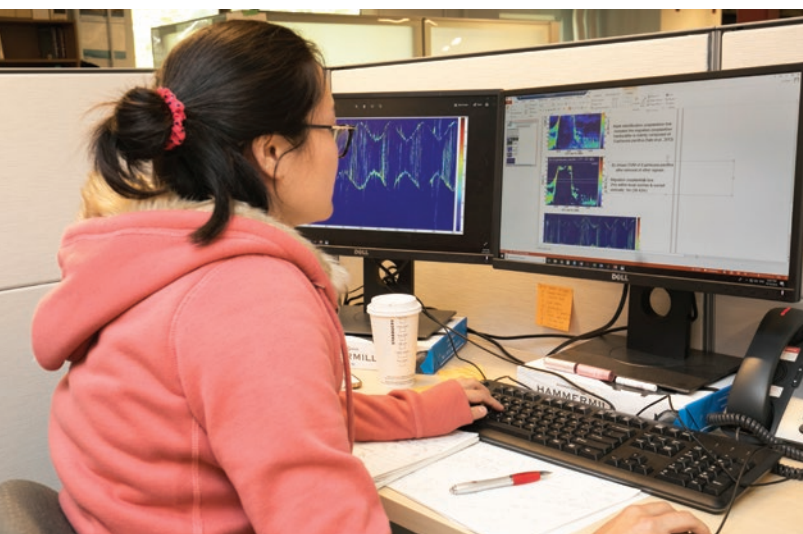
Leading research institutions and centres include:

University of British Columbia, Department of Earth, Ocean and Atmospheric Sciences

One of the largest and most diverse departments of its kind in the world, it offers graduate education and research in oceanography, a rich interdisciplinary science made up of biology, chemistry, geology, and physics. The UBC Institute for the Oceans and Fisheries leads the way to healthy and sustainable marine and freshwater systems through excellent research, inspirational education, and innovative societal engagement.

University of Victoria, School of Earth and Ocean Sciences

A global centre of excellence in ocean, earth, and atmospheric research, the school is active in world-class research covering the full geoscience spectrum from acoustical oceanography to climate modelling. The University of Victoria's Ocean Networks Canada includes an Innovation Centre to work with industry, over 100 researchers and experts in ocean data, real-time monitoring of all Canada's coasts and two large cabled observatories on the Pacific Coast: NEPTUNE in the North East Pacific and VENUS in the Salish Sea.



Fisheries and Oceans Canada

- Institute of Ocean Sciences
One of Canada's largest marine institutes, with more than 250 scientists and researchers, it has earned international recognition for its scientific work and expertise.
- Pacific Biological Station
The oldest fisheries research centre on the Pacific coast with scientists, technicians, support staff and ships' crews linked to a network of nine major science facilities across Canada.

Bamfield Marine Sciences Centre

A world-class teaching and research facility on the west coast of Vancouver Island jointly operated by the Universities of British Columbia, Victoria, Simon Fraser, Alberta, and Calgary. Facilities include research space, aquarium facilities, boats, diving equipment, library, lecture hall, and accommodations.

British Columbia Institute of Technology, Marine Studies

A waterfront marine campus with state-of-the-art bridge and engine room simulators provides training for the maritime industry in navigation, marine engineering, seamanship, maritime safety, and security.

Camosun College, Nautical Training

Transport Canada certified nautical training in nautical technology and ship management for professional seafaring careers.

Ocean Wise Research Institute

The Ocean Wise Research Institute is home to more than 30 researchers who conduct leading and collaborative research on ocean sciences, evaluate human impacts on coastal environments, and integrate information to produce high-level assessments of the state of the coastal ocean.

- Howe Sound Biodiversity
- Ocean Pollution Research Program
- Plastics Lab



BRITISH COLUMBIA COMPANY LEADING THE WAY IN UNDERWATER VEHICLE AND ROBOTIC SYSTEMS DEVELOPMENT

ISE Ltd. (International Submarine Engineering Ltd.) is a world leader in the design and development of subsea, land, and space robotic systems. The robotics sector of the company's business has expanded to encompass engineered solutions for the space, offshore, and industrial markets. This technology is integrated with realtime control and vision software, developed by ISE's Controls Group. ISE provides the know-how and the capability to complete large systems integration projects and to bring concepts to market. Since 1992, it has worked to develop a large autonomous underwater vehicle (AUV) for laying fibre-optic cable in ice-covered waters. This development led to the design and construction of Theseus, a 10.7 metre long AUV that successfully laid several 220-kilometre cables in 600-metre depths under a 2.5-metre-thick ice pack in the Canadian Arctic.

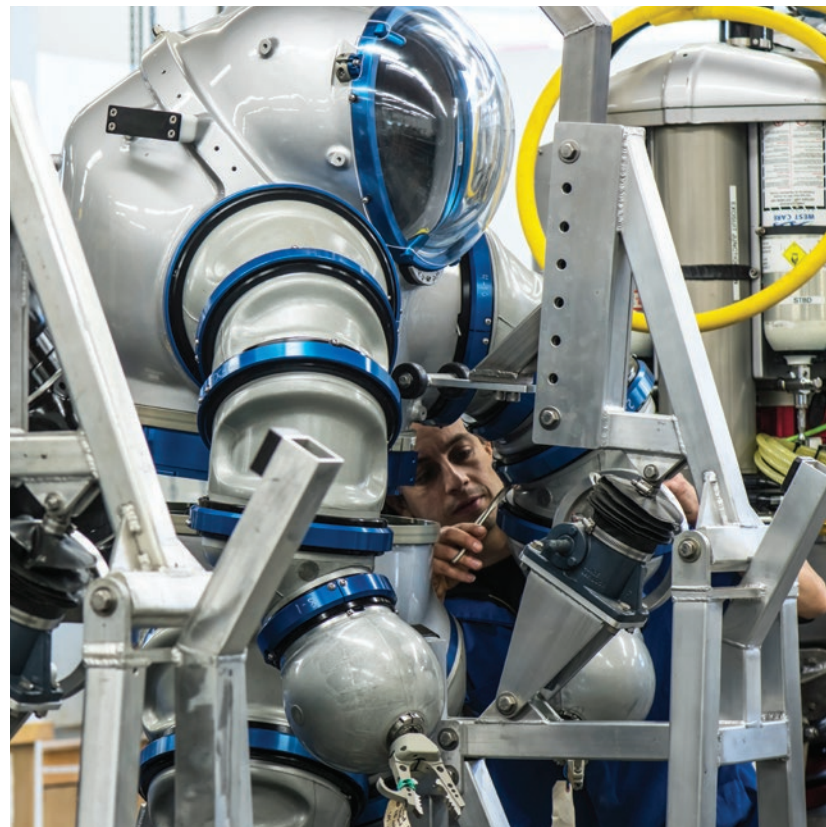




Image taken prior to March 2020.

Ocean Energy to Power the Future

British Columbia's significant wave, tidal, ocean, and river current resources help meet the growing demand for clean and renewable energy in Canadian and international markets. Coastal ocean energy capacity provides huge potential for clean energy applications in the North American market.

- Clean Energy BC is an industry association that promotes the growth of B.C.'s clean energy industry.
- Alacrity Canada is a not-for-profit organization that supports the scale up of BC clean technology companies.
- The West Coast Wave Initiative is Canada's premium wave energy research and development program that works to accelerate the development of the Canadian marine energy sector.



ASSOCIATIONS

Association of British Columbia Marine Industries

Represents the interests of the industrial marine sector and its supply chain.

www.abcmi.ca

Marine Renewables Canada

Aligns industry, academia, and government to provide ocean energy solutions to a world market.

www.marinerenewables.ca

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All figures are in Canadian dollars.



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