Ocean Alliance Canada

SBEP | DESIGNATION

SBEP Body of Knowledge

Sustainable Blue Economy Professional

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Introduction

The *Sustainable Blue Economy Professional (SBEP) Body of Knowledge* (BOK) establishes the foundational expectations, standards, and competencies required for effective and ethical practice across the blue economy. As a two-part document—comprised of the **Guidelines for Ethical Practice** and the **Core Knowledge Areas**, the BOK defines both *how* Sustainable Blue Economy Professionals are expected to conduct themselves, and *what* they must know to uphold the integrity, credibility, and public trust of the profession.

The **Guidelines for Ethical Practice** interpret and put into practice the SBEP Code of Ethics, providing practical guidance to help professionals navigate their responsibilities related to marine stewardship, blue economy advocacy, professional accountability, ethical decision-making, and confidentiality. These guidelines reflect the unique role SBEPs play as stewards of ocean and coastal systems, and as leaders who balance environmental protection, community well-being, and economic development.

The **Core Knowledge Areas** outline the interdisciplinary body of knowledge essential to SBEP competence, including ocean governance, marine ecosystems and biodiversity, blue economy sectors and technologies, sustainability and climate resilience, marine resource management, community engagement and Indigenous Knowledge Systems, and ocean data and innovation. Together, these knowledge areas ensure that SBEPs possess a holistic understanding of marine systems, regulatory frameworks, and emerging practices across the global ocean economy.

The BOK serves as a primary reference for SBEP candidates. It informs the design of the SBEP examination, provides structure for continuing professional development, and promotes a shared professional language across ocean sectors, disciplines, and contexts. Whether working in research, industry, government, community organizations, or policy environments, SBEPs use this BOK to guide informed decision-making, uphold ethical conduct, and contribute to a resilient, inclusive, and sustainable blue economy.

A Note for International Applicants

While the principles, ethics, and knowledge areas outlined in this Body of Knowledge are globally relevant, their specific applications vary across regional, national, and cultural contexts. International applicants are strongly encouraged to explore examples, legal frameworks, governance arrangements, and case studies from their own regions to understand how the concepts in this document apply within their local professional environments. Doing so will support exam preparation, strengthen practical understanding, and ensure that SBEPs around the world are able to apply these principles responsibly, ethically, and in alignment with regional ocean governance, Indigenous and local knowledge systems, and sectoral practices.

1.0 Guidelines for Ethical Practice

The **SBEP Guidelines for Ethical Practice**, a companion document to the SBEP Code of Ethics, uses practical examples for SBEPs to interpret and apply the SBEP Code of Ethics in their work.

In the context of a profession serving society and the environment, the SBEP Code of Ethics shapes individual practice.

By adhering to the SBEP Code of Ethics, SBEPs:

1. Share a standard set of values within the profession, offering a reliable professional service to the public. Practicing competently and ethically is vital to maintaining a relationship of trust with clients and the public at large.
2. Provide societal and blue economy leadership. Trust is a fundamental element as SBEPs guide society in adopting responsibilities for the advancement of economic growth, social inclusion, and livelihoods while at the same time ensuring environmental sustainability. The public is looking to SBEPs for this leadership, particularly because of the increasing advancements in the marine economic world.

The **SBEP Code of Ethics** outlines the values and expected behaviours that guide Sustainable Blue Economy Professionals (SBEPs) in all activities related to their professional duties. By committing to these values and adhering to the expected behaviours, SBEPs strengthen and inspire the public's confidence in sustainable practices for ocean management.

The SBEP Code of Ethics comprises five tenets that all certified and in-training members must adhere to remain a member in good standing.

The five tenets include:

1. Marine Stewardship
2. Blue Economy Advocacy
3. Professional Responsibility
4. Ethical and Moral Standards
5. Confidentiality

SBEP designation staff, volunteers, and board and committee members must abide by the SBEP Code of Ethics. This section describes each of these five central tenets of the SBEP Code of Ethics.

1.1 Marine Stewardship

SBEPs recognize the value of environmental efficiency and sustainability, determine the benefits and costs of additional marine and aquatic stewardship, and continue to implement sustainable solutions.

As part of their responsibilities, SBEPs must also:

- Champion Marine Stewardship
- Embrace SBEP Roles and Responsibilities
- Strive to Leave a Legacy
- Use Scientific and Traditional Knowledge
- Support and Promote Aquatic Ecological Resilience

1.1.1 Champion Marine Stewardship

Marine Stewardship involves thorough efforts to protect the global ocean systems and minimize the impacts of human activity. Although all citizens are responsible for sustaining the viability of our marine environment, SBEPs must champion marine stewardship with a focus on sustainability.

Society must reconcile these marine stewardship needs with an SBEP's need for responsible sustainable development. SBEPs should take an active and cooperative role in helping society meet present and upcoming marine environmental challenges. SBEPs are accountable for maintaining their knowledge in areas that have a bearing on the quality and effect of their work.

When acting professionally, SBEPs are obligated to consider the implications of their work regarding the prevention and mitigation of marine pollution. Many aspects of a project can directly or indirectly affect marine ecology and water quality. These effects can be both positive and negative. All stages of a project (for example, marine construction or renewable energy projects) have environmental consequences, including adverse impacts on aquatic species and habitats, that must be considered early in the project. Therefore, a systematic evaluation procedure is needed to address such environmental issues effectively. Developing effective prevention or mitigation strategies requires an integrated project planning approach. SBEPs should ensure these integrated project planning and evaluation procedures are in place to affirm they protect, steward, and promote the marine environment and coastal communities when conducting their work.

1.1.2 Embrace SBEP Roles and Responsibilities

Blue Economy work is best undertaken by a multi-disciplinary team comprising SBEPs, marine industry professionals, businesses, non-profit organizations, communities, and governmental agencies. Due diligence requires that all reasonable steps be taken to ensure the team comprises the necessary expertise and that this expertise is applied appropriately.

As part of SBEPs' service to society, they are accountable for their professional practice, for the professional practice of those under their supervision, and generally, for the profession itself. This marine environmental and public interest bias must take precedence over self-interest. Protection of the marine environment and the public from unethical or incompetent practices is a top priority for SBEPs. Clients and employers depend on SBEPs not only for their competence in the sustainable blue economy but also for the confidence the public has in them. In addition, SBEPs must be credible in their character and integrity to serve the public effectively.

SBEPs' duty to public service extends beyond the SBEP Code of Ethics. SBEPs should continually strive to give back to their communities through service to public bodies that draw on professional expertise. SBEPs are also encouraged to participate in activities that contribute to their communities that require professional and ethical behaviour but not necessarily the application of blue economy knowledge.

1.1.3 Strive to Leave a Legacy

SBEPs must uphold and enhance the honour, dignity, and reputation of their profession serving the marine sector and the public interest. SBEPs must strive to leave a sustainable ocean legacy while maintaining opportunities for future generations to drive responsible ocean health practices.

SBEPs recognize marine impairment as a risk to public welfare. In response, members of society are being urged to protect, preserve, and enhance the quality of the oceans and coastal communities. The long-term objectives of SBEPs and professionals in the marine sector are to sustain the viability of our ocean ecosystems and safeguard the well-being of future generations, ensuring that their well-being is not compromised by our activities today.

SBEPs recognize that marine stewardship is a responsibility shared by all citizens: the public has a rightful role in setting goals for sustainable ocean management, and public expectations are evolving and vary widely.

Integrating ocean sustainability with social and economic considerations will require SBEPs to be innovative and creative in their planning and design. In the broader context, SBEPs are encouraged to look ahead and foresee how their role will shape the future. Not only through today's innovations but by showing others how innovations advance in the interest of the marine environment; public safety, health, and welfare; risk minimization and management; and social and cultural values.

1.1.4 Use Scientific and Traditional Knowledge

SBEPs know that the projects they work on may involve scientific knowledge, which relies on (maritime or environmental) laws that have been established by applying the scientific method. SBEPs must also consider and apply Indigenous and Local Knowledge (ILK), which has been developed over centuries through the experiences of coastal communities and adapted to local culture and environment, such as sustainable fishing and marine practices.

The recognition of industry experts in this area is paramount. An SBEP must be vigilant in selecting a process or assembling a team with the appropriate knowledge for the proposed project. SBEPs must also recognize values applicable to the social and economic effects of projects. These values could include local and neighborhood concerns, quality of life, specific-effect concerns (e.g., visual, sound, odor), as well as traditional and cultural values, which all gained acceptance as pertinent and definable criteria that many jurisdictions are now interpreting and applying.

1.1.5 Support and Promote Aquatic Ecological Resilience

SBEPs must support and promote aquatic ecological resilience by incorporating information about natural variation, cumulative impacts, climate change, and ocean technology where appropriate or possible. An SBEP should evaluate and investigate the potential effects of its work on nearby coastal and marine micro-ecosystems. These impacts can be individual or cumulative and may have social and economic implications. SBEPs should, wherever applicable, monitor the effects of a changing climate on standard design practices and adapt their decisions and project designs to accommodate these changes as they evolve.

SBEPs must, at a minimum, comply with all relevant legislation, approvals, and orders related to the sustainable treatment of marine resources and the disposal of these resources and their by-products. In addition, even where not required by legislation, approvals, or orders, SBEPs should aim to increase the lifecycle of a resource to improve ocean sustainability.

SBEPs understand that they are building resilience into an ecosystem by supporting the health and function of associated sensitive marine habitats, organisms, and ecosystem processes affected by their work. For ecological systems, an SBEP understands the importance of biodiversity and functional redundancy in helping ecosystems become more resilient to changes in coastal, foreshore, tidal, intertidal, and subtidal environments. With this knowledge, an SBEP will employ diverse strategies and methods to build a resilient marine ecosystem that can cope with and adapt to oceanic change.

1.2 Blue Economy Advocacy

SBEPs empower coastal communities around them, enhancing the dignity and reputation of both the profession and the designation, while respecting the welfare, health, and safety of all persons and the environment through competency, honesty, and transparency.

SBEPs can advocate for the blue economy by promoting and practicing the blue economy principles:

- Respect Indigenous rights
- Restore the Ocean and the Coasts
- Reduce Ocean Pollution
- Protect 30% of the Ocean by 2030
- Rebuild Wild Fish Stocks

- Phase Out Harmful Industrial Activities
- Fight Climate Change

As part of their responsibilities for blue economy advocacy, SBEPs must also:

- Exercise Due Diligence
- Inspire Others and Show Value in Making Ocean Health-Conscious Decisions
- Facilitate and Promote Environmentally Positive Changes
- Restrict Professional Practice to Areas of Competency and Expertise

1.2.1 Exercise Due Diligence

SBEPs shall practice due diligence and apply reasonable care in all work. SBEPs should:

- **Stay informed** about the major marine environmental issues facing society so that they can consider the potential impact of these issues on their professional activities.
- **Recognize** how their professional activities can affect the marine environment and coastal communities.
- **Develop** a system of marine monitoring tools and applications to maintain a reasonable level of understanding and awareness of ocean health issues and shipping impacts related to their expertise.
- **Developing and implementing** marine best management practices (BMPs) to carry out blue economy activities with optimal avoidance, prevention, mitigation, and restoration practices for ocean health and coastal communities.
- **Recognize the value** of Environmental Management Systems (EMS) in identifying, controlling, and reducing negative impacts on the marine environment and coastal communities.
- **Consult other specialists**, such as Environmental Professionals (EPs), in areas beyond SBEP's own expertise.
- **Comply** with municipal, provincial, and federal regulatory requirements for marine management and industry activities (i.e., marine shipping, port operations, incident command protocols etc.) and endeavor to exceed or better them by applying the best available cost- effective technologies and procedures.
- **Apply professional and responsible judgment** in their considerations of aquatic ecosystems.
- **Integrate** marine (environmental) planning and management into all their activities.
- **Consider the costs** of ocean protection and promotion among the essential factors used to evaluate the economic viability of projects.
- **Recognize the value** of ocean sustainability, consider the benefits and costs of marine stewardship, and endeavor to implement efficient and sustainable solutions.
- **Openly engage** with and solicit input from stakeholders and strive to address marine environmental concerns promptly.
- **Disclose** information necessary to protect public safety to the appropriate authorities.
- **Work actively with others** to improve marine sustainability and practices.

1.2.2 Inspire Others and Show Value in Making Ocean Health-Conscious Decisions

SBEPs must demonstrate the benefits of engaging in pro-ocean behavior and encourage clients, colleagues, employers, and the public to act towards making ethical decisions at an individual level, corporate, and public interest level that support the mitigation of ocean pollution and other impacts.

SBEPs recognize that no single definition of "ocean health and public interest" exists, and that environmental, technical, economic, and social issues related to marine sustainability and environmental projects are complex and interrelated. Trade-offs are frequently required.

Substantial pressure can be applied to a project based on the unidimensional agenda of a particular interest group. SBEPs must make decisions in the best interest of ocean sustainability, even when these choices are not the most financially feasible or the most straightforward path forward. SBEP community.

The solution to complex long-term ocean issues and threats requires the participation of industry, governments, and academia. SBEPs are encouraged to interact with others to translate concepts from theoretical research into applied practice, as well as collaborate to develop eco-friendly initiatives that sustainably support the ocean economy.

1.2.3 Facilitate and Promote Environmentally Positive Changes

SBEPs are encouraged to be actively involved with ocean and other environmental issues. They should go beyond merely facilitating improvements: SBEPs must promote ocean-friendly behavior change to promote the health of the oceans and coastal communities. By being actively involved, SBEPs can be proactive—they can anticipate and prevent negative impacts on the marine environment rather than being reactive and responding late to marine pollution.

SBEPs are encouraged to develop effective prevention or mitigation strategies that support marine environmental management. This requires integrated project planning and ongoing commitment. SBEPs should verify that such evaluation procedures are in place and are followed, demonstrating their vigilance. This commitment indicates that effective marine protection strategies are integral to their activities and environmental effect prevention and mitigation will always be considerations for SBEPs when executing their work. Because of this, many projects present an opportunity to consider planning and designing alternatives that may positively affect the marine environment and the ocean economy. Employers and clients would then have the opportunity to help manage from both a project and financial perspective, avoiding negative impacts on marine environments and maximizing positive impacts on society.

SBEPs are uniquely poised between the two extremes of absolute preservation and unfettered development.

Three strategies for creating positive change include:

1. SBEPs should understand and exercise "no" when they know that the right decision is not being adequately considered or executed—speaking up in the interest of ocean health and not of 'self'.

2. SBEPs should be part of or involved with organizations constituted to formulate maritime laws and their enforcement.

3. The public should see SBEPs as faithful stewards of the marine environment—professionals who have practical, knowledge-based solutions that serve the best interests of ocean health, marine sustainability, and the public.

1.2.4 Restrict Professional Practice to Areas of Competency and Expertise

SBEPs must restrict their advice, opinions, and practice to their areas of competency and expertise. When an ocean issue or an aspect of a project falls outside the SBEP's specialty, they are responsible for consulting an appropriate subject matter expert. Marine and ocean science practice requires integrating diverse disciplines and philosophies. Therefore, many projects will need a team of specialists to address complex ocean issues and threats. SBEPs should engage, or recommend that their clients and employers engage, other experts or specialists to best serve the client's or employer's best interests. SBEPs shall only undertake work they can perform based on their training and experience.

Before accepting assignments, SBEPs should ensure that their clients and employers understand the extent of their professional responsibilities. Defining the SBEP's professional responsibilities and developing their scope of services involves listing the SBEP's tasks within the terms of engagement and performance expectations. All parties, the SBEP, the employer and the client, should benefit from accurately representing skills, abilities, and expectation.

1.3 Professional Responsibility

The SBEP is committed to ongoing learning and development. Because the sector is growing and continually changing, the SBEP needs to adapt and evolve in response. SBEPs will adhere to the ethical guidelines, understand the rules of conduct, and uphold the standard of practice. They will also maintain accountability, understand their responsibility, work within the rules and regulations, and always conduct themselves to the maximum of their expertise.

SBEPs must remember that they need the public's trust for their decisions to be impactful, respected and sought out.

SBEPs have a responsibility to:

- Promote the value of being an SBEP
- Maintain competencies and continuously improve
- Recognize when compliance is not enough
- Use the precautionary principle
- Hold others accountable and report unethical practices
- Conduct practice towards other professionals with courtesy
- Provide high quality services
- Abide by the law, regulatory guidelines, and policies
- Communicate respectfully
- Be mandate-oriented, follow policy, and agree to value a specific code (including ethics and consequences)

1.3.1 Promote the Value of Being an SBEP

At all times, SBEPs should endeavor to communicate the value of their SBEP designation to their peers, employers, and the public. Obtaining the SBEP designation validates the knowledge gained through educational and employment paths, the skill sets acquired, and the ability to meet a professional standard. The SBEP designation certifies the experiences the professional has gained in their environmental role(s) and attests to their dedication to ocean sustainability and the blue economy.

When an SBEP is presenting, speaking at an event, or writing a proposal, affirming their qualifications by highlighting their SBEP status will help them gain credibility, as well as grow the legitimacy of the SBEP community.

1.3.2 Maintain Competencies and Continuously Improve

SBEPs must maintain competencies and continuously improve professional and ethical knowledge through education and skills enhancement. SBEPs have a responsibility to keep a

knowledgeable interest within their specialization which has the potential to impact the public interest. Environmental, technical, and professional standards of conduct are set, revised, maintained, and enforced by SBEPs.

Mutual accountability within the SBEP designation and amongst SBEPs must be stringent, so they are always seen to merit societal trust. If each member of a working group is highly professional, it enhances the overall professionalism of the entire group. It is up to the SBEPs to continue their professional development to maintain the standard expected of them through the designation. Such standards may be provincial, national, or global and may address the following issues:

Code of Ethics – protecting the public from unethical and/or incompetent practice in the highest esteem

Technical Requirements – engaging in skilled practice ensures the protection of the marine environment and the public's well-being and safety.

Continuing Competence – concerning personal and professional development and adherence to standards and guidelines in all areas of the sustainable blue economy, including:

- Fisheries and Aquaculture
- Ocean Technologies
- Offshore Minerals and Resources
- Marine Renewable Energy
- Marine Transport, Ports, and Shipping
- Coastal and Marine Tourism

Discipline – disciplining members who fail to comply with proper standards of marine environmental practice and ethical conduct.

1.3.3 Recognize When Compliance is Not Enough

When SBEPs recognize that compliance is not enough or is not the best they can do, they must set a higher standard. The SBEP's primary responsibility is to protect the welfare of oceans, coastal communities, and the public, whether the work is paid or voluntary. This responsibility is not reduced or diminished when the SBEP provides service to the public through an employer. Therefore, employed SBEPs are still bound by these ethical responsibilities and obligations, even if they are influenced by others, such as employers, clients, or the public. This may create a conflict between company loyalty and professional responsibility.

When an SBEP takes a professional stance, their career may be negatively affected. SBEPs must ensure that they take appropriate action or notify the proper authorities when they believe that public safety or the (marine) environment is endangered or when relevant legislation, approvals, or orders are required. SBEPs share corporate responsibility for the quality of products and services delivered.

When faced with these conflicting situations as either a consultant or an employee, SBEPs must use reasoned judgment based on their accumulated knowledge and experience. Recognizing ethical

dilemmas and determining the actions to address them are essential skills for SBEPs. If necessary, ECO Canada and the SBEP designation can help professionals make ethically sound decisions through clarifications within the the SBEP Code of Ethics.

SBEPs must understand that meeting the minimum standard is insufficient—they should always strive for higher standards. For SBEPs to have a real impact, their professional competence and project delivery should be rated as "*excellent*".

1.3.4 Use the Precautionary Principle

There is not always a certainty that an activity can lead to something negative or cause harm to the marine environment. However, SBEPs have an obligation to actively try to prevent marine pollution. In Professional Practice, when there is no scientific proof upfront, an SBEP should use professional judgement based on their expertise to try and anticipate harm. SBEPs must understand and use the precautionary principle, meaning they must minimize harm wherever and whenever possible. SBEPs must keep pace with society's growing awareness of activities that can impact ocean health and economic activity; this awareness will inform an SBEP's contribution to designing and implementing solutions, recognizing the potentially significant effects of their professional activities on the marine and coastal environment.

A SBEP is expected to respect the law in their conduct; they should not engage in activities outside of their professional practice that may compromise their professional or personal reputations, bringing discredit to their professions. If an SBEP is presented with a situation that may compromise their reputation or the reputation of the profession, they should exercise prudence and take extra care, even while awaiting further evidence.

1.3.5 Hold Others Accountable and Report Unethical Practices

Although they may not have formal authority, SBEPs have a responsibility to lead by example and demonstrate competence and ethical conduct of business in their organizations. To many employers,

this leadership is an asset and often a contributing factor towards offering employment to SBEPs. When a disagreement arises between two SBEPs, the individual who bears professional responsibility for the recommendation must ensure that their facts and recommendations are accurate and that the information and assumptions are communicated clearly and concisely. For contentious issues, communication should be conducted in writing, by phone, or in person. If the senior SBEP chooses to overrule the other SBEP's recommendation, in full knowledge of its basis, the senior SBEP consciously takes responsibility.

When someone questions an SBEP's recommendation, the SBEP must value their opinion and seek to understand. Although the other party may not possess the necessary marine environmental technical knowledge to fully appreciate both the rationale of the recommendation and the potential consequences of failure, their opinion should still be addressed. The SBEP must explain, describe, and defend their recommendation, and if necessary, seek support from their managers or superiors

to help resolve the conflict. In such instances, the SBEP should ensure that an appropriate decision is made.

As mentioned throughout the SBEP Code of Ethics, an SBEP has a duty of care to protect public welfare and report unethical practices if necessary.

1.3.6 Conduct Practice Towards Other Professionals with Courtesy

An SBEP's behaviour toward employers and clients sets an example and demonstrates the quality of their professional brand. SBEPs must conduct their practice with courtesy and good faith toward other professionals. For example, when an SBEP administers a contract on behalf of a client or employer, they should act with fairness and justice towards all parties, including fellow professionals.

When providing services to a client, SBEPs should consider themselves as part of the client's organization or team. The foundation of an SBEP-client relationship involves the SBEP's duty of care for a client's interests, which should not supersede the SBEP's duties to protect public safety and other duties that may conflict with a client's interests. SBEPs should prioritize their clients' interests over their personal biases and conduct themselves with respect and accountability towards other professionals.

The relationships between SBEPs and their business associates should be friendly but independent and free from obliging favours.

SBEPs are expected to have proper regard for all individuals. They must uphold the human rights of others and refrain from discriminating based on race, national or ethnic origin, religion, age, sex, sexual orientation, gender identity, marital status, disability, or any other protected ground under provincial, national and international legislation.

SBEPs should take responsibility and precautions not to injure the professional reputation of another SBEP or person through troublesome or frivolous statements.

1.3.7 Provide High Quality Services

SBEPs must provide high-quality services on time. SBEPs have an obligation to their clients to complete the project and its deliverables to the best of their ability, meeting both the contract requirements and public interest. Providing timely service does not mean doing a fast job. It means being efficient and effective in addressing concerns promptly. Providing efficient customer service is part of the SBEP designation, and it is gaining a positive reputation in the marine and environmental sector.

In addition, SBEPs have an obligation to their clients to provide timely notifications and advise their clients when they believe a project will not be successful or will not meet the original agreed- upon timelines.

1.3.8 Abide by the Law, Regulatory Guidelines, and Policies

SBEPs must abide by the law, regulatory guidelines, and policies and ensure that personal actions respect marine and environmental laws. This includes marine regulatory frameworks and laws set forth by government agencies (i.e., Fisheries and Oceans Canada, Canadian Coast Guard, etc.). SBEPs must identify all applicable marine and environmental laws at the earliest stage of a project's timeline. This due diligence ensures compliance with applicable municipal, provincial, or federal environmental laws.

SBEPs should consider consulting with municipal, provincial, and federal authorities at the project scoping and planning stage. This guideline is intended to be universally applied, regardless of the size of the activity or project. Some projects will require a full environmental impact assessment and in contrast, others will necessitate careful thought and planning to integrate sustainable development and minimize marine pollution (environmental disruption), even if the disruption appears minor.

Marine and environmental legislation can place responsibility for marine pollution (and environmental impairment in general) on an individual. In such cases, if the individual took all reasonable measures to prevent the offence, then they can demonstrate that they exercised their due diligence. The basis for judging these measures for an SBEP should be determined by evaluating their standard practices and compliance with any legislation, approval, or order requirements related to the project in question.

Furthermore, in recent Canadian environmental legislation, an individual can be considered party to an offence if they were complicit in its commission.

To ensure that their personal and professional actions comply with maritime and environmental laws, SBEPs should abide by the following principles:

1. SBEPs shall develop and maintain knowledge and understanding of legislation, regulations, approvals, codes, and guidelines, including their purposes and limitations and any changes to these requirements. SBEPs must also apply these requirements both on a procedural and substantive basis.

    SBEPs must:

    - **Ensure** that proper documentation of adherence to (marine) environmental procedures, protocols, and regulations is maintained and that relevant information is provided to regulatory agencies promptly.
    - **Have regard** for both the reality and the trend of maritime and environmental legislation to assign personal responsibility for both action and omission. SBEPs shall reflect this reality in their professional duties accordingly as it relates to themselves, their employer, colleagues, and clients.
    - **Exceed** the standards and regulatory requirements to protect the health and

well-being of the environment, the ocean, and the public. SBEPs are encouraged to collect evidence of cumulative, persistent, and synergistic marine environmental effects where they may not be fully considered in standards or regulations.

2. SBEPs shall disclose, accurately represent, and provide information concerning marine and terrestrial environmental effects to regulatory authorities,

including:

- **Informing** public regulatory authorities of all ocean pollution and environmental effects of any assignment they are involved in through the normal regulatory review and approval process.
- **Maintaining** client and employer confidentiality unless otherwise required by relevant legislation, approvals, or orders. Where confidential information is disclosed to public authorities, SBEPs shall advise their employers and clients of such disclosure as soon as practicable.

They shall ensure that appropriate action or notification of proper authorities occurs in any instance where they believe that public safety or the (marine) environment is endangered, or where required by relevant legislation, approvals, or orders.

1.3.9 Communicate Respectfully

SBEPs will need to communicate with many different stakeholders and represent themselves, their organization, their clients, the public, and the SBEP profession. SBEPs must communicate respectfully to all parties. Respectful communication involves being able to effectively convey one's own views and fully listen to the views of others. When there is a disagreement or a difference of opinion, the objective should be to engage in healthy discussions. An SBEP should be open to dialogue, to share their insights and collaborate utilizing the strengths of different contributors to achieve a common goal.

An SBEP understands that how they communicate with others is a reflection not only on themselves, but also on the SBEP designation and profession.

1.3.10 Be Mandate-Oriented and Follow Policy, Agree to Value a Certain Code (Includes Ethics and Consequences)

The daily actions of SBEPs impact the public's trust in the profession and their perception of an SBEP's ability to handle increasing public expectations, specialization, and complexity, as well as multiple constituents or stakeholders. If SBEPs are aware of and consciously consider these issues, they can address them better.

SBEPs must, therefore, manage expectations. SBEPs must inform clients of their professional responsibilities and the legal, ethical, and practical limitations of the service provided. SBEPs could provide this information through general documents (i.e., practice standards or guidelines), targeted

campaigns, or, more specifically, within service contracts and company information. When applicable, SBEPs should provide relevant policy through resources such as *the National Occupational Standards for a Blue Economy* and Fisheries and Oceans Canada's *Blue Economy Strategy* to clients, employers, and other stakeholders.

SBEPs are leaders in organizations and on projects. They must be vigilant in areas beyond their direct professional responsibility; SBEPs have an obligation to report conditions or changing circumstances that present a material, immediate threat to safety, health, welfare, or the environment (or the marine environment or both terrestrial and marine environments?) in either the workplace or on the project site. Specifically, SBEPs will be involved in managing the risks and impacts associated with marine and port operations, navigation channels, and spill/emergency response regimes. SBEPs must report these conditions first to the professionals responsible. If a satisfactory response is not forthcoming, the SBEP must report the matter to the appropriate corporate or regulatory authorities.

Note: *This facet is designed to inform responsible professionals about unknown or changing circumstances that require action or response. It does not empower those not directly involved in the decision to challenge, without all the facts, the environmental judgments, or recommendations of those responsible*

1.4 Ethical and Moral Standards

SBEPs are relied upon for their expertise in marine sustainability, environmental protection, and related concerns. Because much of their work has a direct impact on public health and safety as well as the future of the marine environment, they must abide by an ethical code that ensures objectivity. This code requires them to conduct themselves with complete integrity and serve in the interest of public health and safety, as well as the marine environment. SBEPs need to advocate for those who cannot advocate for themselves.

SBEPs must:

- Conduct all professional practice honestly and with integrity
- Present facts accurately and seek understanding
- Maintain integrity
- Maintain objectivity and respect for other opinions
- Remain transparent and declare conflicts of interest
- Uphold ethical environmental requirements and practices
- Protect vulnerable sectors of the population

SBEPs should also incorporate the "three-pillar" sustainability concept encompassing environmental, social, and economic practices. When SBEPs practice ethical and moral standards to support sectors such as fisheries, aquaculture, maritime transport, offshore energy, and marine biotechnology, environmental protection, social equity, and economic growth should be considered.

1.4.1 Conduct all Professional Practice Honestly and with Integrity

SBEPs must conduct their professional practice honestly, with integrity, fairly, in good faith, and with due care to the public and the marine environment. SBEPs should recognize how their activities and professional membership can influence society. They should realize the value of proactive involvement and action over reactive responses.

SBEPs are encouraged to share their expertise and knowledge of sustainability and the blue economy with other members, governments, and the public. By collaborating with other disciplines, SBEPs can help integrate theoretical and technological research into practical applications.

SBEPs can encourage professionalism through mentoring and demonstrating their professional behaviour. In groups, SBEPs can foster professionalism by engaging in environmental, technical, or professional areas and by promoting corporate professional responsibility.

SBEPs should maintain professional objectivity and avoid actions that could be perceived as political activism in their professional capacity. SBEPs have the right to make political contributions, but they also have a duty under the SBEP Code of Ethics to avoid actions that could impact their professional reputation, may be damaged or exposed, or their intentions may be misunderstood.

1.4.2 Present Facts Accurately and Seek Understanding

SBEPs must present facts honestly and accurately and speak directly and plainly to ensure the recipients understand. SBEPs should clearly distinguish between facts, assumptions, and opinions in their professional work, in public discussion, or in published articles related to their professional work. When expressing opinions or participating in public discussions on professional matters, they should clearly disclose on whose behalf they are giving opinions or statements.

SBEPs should express opinions on marine sustainability and the blue economy that are informed by their knowledge, experience, and honest convictions. SBEPs should ensure, to the best of their ability, that any statements related to marine, coastal, and environmental matters accurately reflect their professional opinion.

Advertisements, proposals, presentations, and other solicitations for professional engagement should be factual, clear, and professional in tone. The statement's intent is clear, and advertising and presentations should complement the SBEP's image and the professionalization of the blue economy.

In contrast, some behaviors can damage an SBEP's image and professional reputation.

Some examples include:

- Exaggerating project involvement, experience, or level of expertise
- Negatively comparing or commenting on competing professionals
- Suggesting or implying solutions not founded in fact
- Making misleading claims, self-praise language, and sensationalism that diminish the dignity of the individual and, by association, the dignity of the entire profession.

SBEPs possess specialized expertise in both competence and ethical matters related to marine sustainability and the blue economy. This expertise offers a reliable resource to industry and the public.

1.4.3 Maintain Integrity

SBEPs should undertake assignments only when they are competent to complete the work. This rule clearly does not prevent SBEPs from tackling new challenges and learning new skills, provided that the successful completion of the assignment is not jeopardized, and honesty is maintained with the client or employer. Similarly, SBEPs should not overlook the fact that today's marine, coastal, and the ocean economy sectors demand specialized knowledge.

Most importantly, SBEPs should regularly review their capabilities and those of their organization, to provide specific services to the public. Many proven specialty companies are available to help when required. However, if specialized help is needed, SBEPs should evaluate the company's credentials. This due diligence is particularly important when a lack of capability could result in adverse consequences. When sub-consultant expertise is retained, it should be with the client's approval.

An SBEP shall not take credit for work done by others. An SBEP shall accept responsibility for their work through authorship or acknowledgement. SBEPs should not allow their name to be associated with work that has been altered.

1.4.4 Maintain Objectivity and Respect for Other Opinions

SBEPs should faithfully perform their duties and responsibilities to their clients and employers and always act with fairness and justice to all. SBEPs must maintain objectivity and respect the opinions of others, even when facing emotionally driven issues.

To maintain objectivity and respect for another's point of view, SBEPs must:

- Express the results of their work clearly and accurately
- Qualify the results, if necessary, when a matter is only partially resolved
- Avoid bias due to political, economic, or other non-technical factors

In both corporate and societal settings, SBEPs should focus their discussion on the facts of an issue and accurately represent their professional opinions. When presenting complex issues to a non-environmental or technical audience, SBEPs are encouraged to use plain language principles and simplify their discussion without losing the critical elements, ensuring that their audience understands. This communication approach avoids misinterpretation or misunderstanding.

Although this subsection is not meant to dissuade an SBEP from stating their personal or political interests, they should consider that their personal views may differ from their professional practice and obligations. SBEPs must present and rely on facts when expressing professional opinions.

1.4.5 Remain Transparent and Declare Conflicts of Interest

SBEPs must remain transparent and avoid as well as declare, conflicts of interest. An SBEP will hold the interests of their clients or employers in high regard. However, some of an SBEP's duties take precedence over the interests of their clients or employers.

These duties include:

- The duty to protect the health of the ocean, environment, and public
- The duty to act fairly and justly to all parties when administering a contract on behalf of a client or employer.

As stated previously in this document, one of the primary objectives of the SBEP designation is to protect the public and maintain professional integrity. These objectives are achieved through careful examination of each member in the SBEP designation. For an SBEP to maintain professional integrity, they must be transparent in their intentions and actions. SBEPs should make provisions to ensure that clients and employees under their responsibility are aware of and comply with the laws that affect their work.

An SBEP must disclose any influence, interest, or relationship that impairs or affects their professional judgement or objectivity. Failure to disclose any real, perceived, or potential conflict of interest situation with an employer, a client, or a stakeholder constitutes conflict of interest.

Under normal circumstances before accepting assignments, SBEPs should inform their clients and employers of any special interests, business connections, personal relationships, conflicts of interest, or other circumstances that could influence their professional services or judgment. They should never offer or accept any covert payment or benefits.

1.4.6 Uphold Ethical Environmental Requirements and Practices

SBEPs must uphold ethical environmental requirements and practices. When an SBEP becomes aware of public concerns related to an assignment they are involved in matter should be investigated

promptly. Once they have determined the validity of the concern, the SBEP should quickly communicate the information through the standard lines of responsibility.

SBEPs are encouraged to seek a second opinion (professional or specialist) on the technical validity of their conclusions whenever possible particularly when there appears to be a difference of opinion with other responsible parties regarding marine environmental effects.

When disclosing information about marine environmental effects, SBEPs should communicate this information through established lines of responsibility. Where, in the opinion of the SBEP, withholding confidential information poses a potential threat to the marine environment, the SBEP should make reasonable effort to contact responsible parties before disclosing the information to the proper regulatory authority. SBEPs must recognize, however, their individual responsibilities for reporting threats to the marine environment in accordance with legislation requirements.

There are several legal uncertainties surrounding the disclosure of confidential business information or intellectual property when an SBEP is involved in the design or supervision of a project that may pose a threat to the public or marine environment. This situation may present a dilemma to the SBEP. Hence, the SBEP must remember that it is their responsibility to protect the public's well-being and safety. This responsibility may conflict with their duty to a client or their employer to act as a loyal agent and not disclose, without consent, confidential information concerning the client's or employer's business affairs, technical methods, or processes. Since the duty to the public is paramount, an SBEP in such conflict is required to advise the employer or client, preferably in writing, of a concern regarding the material threat to the public. Suppose the problem is ignored or overruled, and the client or employer continues to follow a course of action that is harmful. In that case, the SBEP should inform their employer or client that they are ethically bound to present the concern to the appropriate authorities and may perhaps even disassociate themselves from the project.

SBEPs must not disclose the employer's or client's confidential information gained during the term of employment (except as required by law). If the SBEP, believes that withholding confidential information would jeopardize public safety, then they should make every effort to contact all parties before disclosing this information to the proper authority.

1.4.7 Protect Vulnerable Sectors of the Population

SBEPs must prioritize the protection of underserved and vulnerable communities. They must recognize the importance of social and economic values in the environmental assessment process and consider local, neighborhood, traditional, and cultural criteria through stakeholder involvement.

Understanding the vulnerability of a group requires more than just analyzing the direct impacts their project may have on an economic, social, cultural, institutional, political, or psychological level. SBEPs should address the effects on human rights and the (marine and terrestrial) environments of the group and assess any future considerations, which may include hazards, natural or otherwise, on a larger scale.

SBEPs are responsible for developing a protection plan if the projects they are working on will in any way affect a vulnerable group. In addition, an SBEP shall immediately advise their employer or client of any concerning potential adverse effects within a vulnerable group; these concerns can arise from the work an SBEP is directly involved in or from information they discover through the project(s) on a peripheral level. If they do not receive a prompt response from their employer, client or both, then the SBEP must know how to escalate the situation to the appropriate representatives. For example, an SBEP may need to address potential conflicts between the rights of coastal Indigenous communities.

1.5 Confidentiality

SBEPs hold in strict confidence, except as required by law, all information they acquire during their professional relationship. SBEPs should not use this information for personal gain.

SBEPs must both safeguard confidential information and understand and respect contractual obligations.

1.5.1 Safeguard Confidential Information

SBEPs should maintain the confidentiality of all information acquired during their professional duties, including the business affairs of present or past clients or employers. This obligation of confidentiality ends if the information is legally made public. SBEPs must not use client or employer confidential information for personal gain. This confidential information is proprietary and is only provided to an SBEP to assess a situation for a specific project.

All processed information and confidential information received during professional services are the exclusive property of the client or employer. They can only be disclosed to others with the owner's prior approval. Care should be taken regarding trade practices that may be unique and practices that identify the owner's special attributes.

When applicable, SBEPs must:

***Disclose confidential information to legal authorities*.**

Confidential information may be disclosed if the prior permission of the client or employer, or both the client and employer, is obtained or if disclosure is required by law. If disclosure of confidential information is required by law, it should be made only to the extent required by law. Present or past clients or employers should be advised of such disclosure as soon as possible. Under certain circumstances, an SBEP should understand that withholding information is contrary to the public's safety. As a result, the SBEP should disclose only the information necessary to protect public safety to the appropriate authorities.

Maintain confidentiality when approached by two or more competing parties.

Extraordinary circumstances may arise. For example, when a second client approaches a consulting SBEP to work on a program for which they have already worked for another client, or when an SBEP is approached separately by two parties competing for a proposed project. Even disclosing to the second client that another client was actively considering a job or project would reveal competitive information about the original client. In such cases, the SBEP should use them professional judgement to decide if the second assignment can be fulfilled using their general professional knowledge without being influenced by the first assignment. Suppose there is a significant risk of influence by the first assignment or disclosure of proprietary information of the first client. In that case, the assignment should be declined without disclosing the interest of the first client.

Ensure client consent before using and distributing of material.

The client maintains the exclusive rights and ownership of published content and designs. The SBEP must not duplicate published content or designs for others without the client's permission.

Request permission to apply confidential information in new works.

Suppose projects that SBEPs are working on or clients they are working for require the use of confidential knowledge obtained through other projects. In that case, the SBEP can proceed only with the consent of all parties connected to the prior confidential information or projects. Technical knowledge gained by an SBEP through work experience may be freely used in subsequent projects without consent from other parties.

1.5.2 Respect Contractual Obligations

An SBEP must clearly understand and respect all contractual obligations. By agreeing to and signing a contract, the SBEP assumes full responsibility for meeting the agreed-upon deliverables and adhering to all specified terms and conditions. A solid grasp of contractual responsibilities enables SBEPs to perform their duties effectively, address unexpected or legal issues appropriately, and, when necessary, renegotiate terms in good faith.

SBEPs should dedicate sufficient time to their work to ensure that their directions, reports, and estimates accurately reflect site conditions and project progress. They should also agree with clients that all relevant project information will be shared either before the contract is finalized or as the project unfolds.

While clients may oversee project progress and express preferences for certain solutions or outcomes, SBEPs may sometimes face pressure to alter results in ways that conflict with scientific data or professional judgment. In such cases, the SBEP must communicate the situation transparently to both the client and their employer, reaffirming their ethical duty to report any illegal or unethical practices, regardless of contractual obligations.

Finally, SBEPs should seek to negotiate contract terms that uphold integrity, transparency, and the broader public good.

2.0 Core Knowledge Areas

Sustainable Blue Economy Professionals (SBEPs) require not only specialized technical expertise related to their field of ocean practice, but also a broad and integrated understanding of ocean systems, governance structures, and sustainability issues. Section C, Core Knowledge Areas, outlines the Body of Knowledge (BOK) essential for the success of the Sustainable Blue Economy Professional. This will be referred to as the SBEPBOK.

An SBEP's awareness and understanding of this BOK will enable them to:

- Appreciate, understand, and integrate ecological, social, and economic dimensions of the blue economy.
- Apply legislative and regulatory frameworks that guide ocean and coastal resource management.
- Understand and evaluate technical requirements, standards, and monitoring systems in marine environments.
- Assess and manage environmental, operational, and socio-economic impacts of ocean-based activities.
- Effectively communicate findings, data, and recommendations to stakeholders and decision-makers and
- Foster and maintain professional and intercultural relationships among governments, industries, shared resource users, and Indigenous partners.

Overview of Core Knowledge Areas in the SBEP BOK

This section provides an overview of each core knowledge area and its relevant terms and definitions. The concepts presented in each subsection build on the detail provided in previous sections.

The core SBEP knowledge areas are:

Ocean Governance and Regulatory Frameworks

This knowledge area deals with the systems of laws, conventions, and institutions that define the stewardship and management of marine and coastal resources. It emphasizes Canada's role under the *United Nations Convention on the Law of the Sea (UNCLOS)*, the *Oceans Act (1996)*, and international conventions such as the International Convention for the Prevention of Pollution from Ships (*MARPOL)* and the International Convention for the Safety of Life at Sea (*SOLAS)*. The section also considers Indigenous rights, co-management, and marine spatial planning as key governance mechanisms for achieving sustainable outcomes.

Marine Ecosystems, Biodiversity, and Conservation

This knowledge area covers the structure and function of marine ecosystems, biodiversity dynamics, and the use of area-based conservation tools such as Marine Protected Areas (MPAs) and Ecologically and Biologically Significant Areas (EBSAs). It highlights Canada's conservation targets under the Blue Economy Strategy 2030 and explores the ecological indicators used to track marine health and resilience.

Blue Economy Sectors & Technologies

This knowledge area highlights the diversity of Canada's Blue Economy sectors—from shipping, aquaculture, and offshore energy to biotechnology and marine tourism—and the technologies enabling and transforming them. Through initiatives such as the Ocean Alliance Canada (OAC), the Ocean Supercluster, and the Blue Economy Strategy (2022), Canada is advancing cleaner, smarter, and more resilient ocean industries. Sustainable Blue Economy Professionals (SBEPs) are expected to understand how innovation, automation, and circular economy principles drive growth while reducing environmental impact and supporting inclusive, sustainable ocean development.

Sustainability & Climate Resilience

This knowledge area examines how sustainability and climate resilience guide every aspect of ocean management. It connects science, policy, and practice to reduce carbon emissions, adapt to changing marine conditions, and safeguard coastal communities. Drawing on Canada's Net-Zero Emissions Accountability Act (2021) and the Paris Agreement, SBEPs learn to apply nature-based solutions, blue carbon restoration, and low-carbon technologies to build adaptive, resilient, and sustainable ocean economies.

Marine Resource Management

This knowledge area focuses on the sustainable use, protection, and restoration of marine and coastal resources through approaches like Ecosystem-Based Management (EBM**)** and Marine Spatial Planning and Management (MSPM)**.** Guided by Canada's Oceans Act (1996)**,** Fisheries Act (2019), and international agreements such as the Convention on Biological Diversity (CBD), SBEPs learn to balance ecological integrity with social and economic needs. By applying tools such as cumulative effects assessment and adaptive management, professionals help ensure that decisions support biodiversity, food security, and long-term sustainability—protecting the ocean as both a natural system and a shared source of prosperity.

Community Engagement & Indigenous Knowledge

Sustainable ocean governance begins with people. This knowledge area emphasizes the importance of inclusive partnerships, drawing on Indigenous Knowledge Systems (IKS), local experience, and cultural stewardship. Guided by Section 35 of the Constitution Act (1982) and the Truth and Reconciliation Commission's Calls to Action (2015)**,** SBEPs engage communities through co-management, equity, and capacity-building to ensure that the Blue Economy

supports shared prosperity, intergenerational learning, and respect for Indigenous rights and traditions.

Ocean Data & Innovation

This knowledge area explores how data, technology, and innovation are reshaping decision-making for ocean sustainability. Using platforms such as Ocean Networks Canada, the Global Ocean Observing System (GOOS), and Canada's Digital Ocean Strategy (2022), SBEPs apply tools like artificial intelligence, remote sensing, and autonomous systems to enhance monitoring and forecasting. By promoting open science, data ethics, and collaboration, they help ensure that technological progress supports transparent, equitable, and climate-resilient ocean management.

Core Definitions for the Sustainable Blue Economy Professional

Table 1 provides key definitions used throughout this BOK. SBEP's must be aware of these terms to help form a common body of professional language in interaction with colleagues, clients, and the public.

Table 1: Core Terms for the Sustainable Blue Economy Professional

CORE TERM	DEFINITION / DESCRIPTION
SUSTAINABLE BLUE ECONOMY	An approach to ocean-based economic growth that balances environmental protection, social inclusion, and economic prosperity. It recognizes the ocean as a living system supporting innovation, livelihoods, and climate resilience.
SUSTAINABLE BLUE ECONOMY PROFESSIONAL (SBEP)	A professional who integrates ecological, social, and economic perspectives to promote sustainability across ocean sectors. SBEPs possess interdisciplinary knowledge of marine governance, resource management, technology, and community engagement.
OCEAN GOVERNANCE	The systems of laws, institutions, and policies that regulate the use, protection, and management of ocean spaces and resources. It includes international conventions (e.g., UNCLOS, MARPOL, SOLAS) and national frameworks (e.g., Canada's Oceans Act 1996).
REGULATORY FRAMEWORKS	The collection of legal and policy instruments that guide how marine activities are conducted, monitored, and enforced to ensure safety, sustainability, and equity.

UNITED NATIONS CONVENTION ON THE LAW OF THE SEA (UNCLOS)	The 1982 global treaty that defines maritime zones, resource rights, and environmental obligations. Known as the "Constitution for the Oceans," it underpins modern ocean governance and dispute resolution.
MARINE ECOSYSTEM	A dynamic network of organisms, habitats, and physical processes that interact to maintain ecological balance in the ocean environment.
BIODIVERSITY	The variety of life within marine ecosystems, encompassing genetic, species, and ecosystem diversity. It underpins ecosystem resilience and productivity.
MARINE PROTECTED AREA (MPA)	A clearly defined marine space managed to achieve conservation of biodiversity, ecosystem services, and cultural values while supporting sustainable use.
ECOSYSTEM-BASED MANAGEMENT (EBM)	A holistic approach to managing human activities in marine areas that considers ecological, social, and economic interactions to maintain ecosystem health.
MARINE SPATIAL PLANNING and Management (MSPM)	A process that organizes human activities in marine areas to achieve ecological, economic, and social objectives through spatial zoning and stakeholder engagement.
INTEGRATED COASTAL MANAGEMENT (ICM)	A governance framework that coordinates coastal resource use and development while maintaining ecosystem integrity and community well-being.
BLUE CARBON	Carbon stored in coastal and marine ecosystems—such as seagrasses, mangroves, and salt marshes—that capture and sequester carbon dioxide from the atmosphere.
CIRCULAR ECONOMY	An economic system that minimizes waste and maximizes resource efficiency through reuse, recycling, and regeneration, applied here to ocean industries.
MARINE RESOURCE MANAGEMENT	The sustainable use, protection, and restoration of ocean resources, integrating science, policy, and community input to balance economic growth with ecosystem health.
COMMUNITY ENGAGEMENT	The process of involving local and Indigenous communities in decision-making, planning, and stewardship of marine resources through participatory, equitable approaches.

INDIGENOUS KNOWLEDGE SYSTEMS (IKS)	Holistic, place-based knowledge developed by Indigenous Peoples over millennia, emphasizing reciprocity, stewardship, and balance with nature.
TRADITIONAL ECOLOGICAL KNOWLEDGE (TEK)	Indigenous knowledge about relationships among species, ecosystems, and environmental changes, passed down through generations and integrated into modern resource management.
FREE, PRIOR AND INFORMED CONSENT (FPIC)	A principle ensuring that Indigenous communities have the right to give or withhold consent to projects affecting their territories and resources, grounded in UNDRIP (2007).
OCEAN DATA AND INNOVATION	The use of digital technologies such as AI, remote sensing, and autonomous systems to collect, analyze, and share ocean information for sustainable management.
GLOBAL OCEAN OBSERVING SYSTEM (GOOS)	An international framework that coordinates ocean data collection to support science, climate monitoring, and sustainable policy decisions.
OPEN SCIENCE	A movement promoting accessibility, transparency, and collaboration in data sharing, essential for inclusive and equitable ocean research.
RESILIENCE	The ability of marine ecosystems, communities, and industries to anticipate, absorb, and recover from environmental or socio-economic disturbances.
CLIMATE ADAPTATION	Actions taken to adjust natural or human systems in response to actual or expected climate impacts to reduce harm or exploit beneficial opportunities.
NATURE-BASED SOLUTIONS (NBS)	Strategies that use ecosystems and biodiversity to address societal challenges such as climate adaptation, disaster risk reduction, and food security.
GOVERNANCE ETHICS	Principles guiding fair, transparent, and inclusive decision-making processes in ocean management, ensuring accountability and social justice.

2.1 Ocean Governance & Regulatory Frameworks

Ocean governance refers to the collective systems through which nations manage, share, and protect the ocean's resources to ensure their sustainable use and conservation. It integrates international conventions, national legislation, and institutional mechanisms that shape ocean policy, stewardship, and accountability. Foundational instruments such as the United Nations Convention on the Law of the Sea (UNCLOS, 1982), Canada's Oceans Act (1996), and the Fisheries Act (2019) establish the principles governing jurisdictional boundaries, marine conservation, and the sustainable balance between economic development and ecological protection (Government of Canada, 2019, United Nations, 1982).

For Sustainable Blue Economy Professionals (SBEPs), a comprehensive understanding of these frameworks is essential for informed practice. This includes interpreting how legal regimes and governance institutions interact to shape marine transportation, fisheries, energy production, and coastal planning. SBEPs are expected to apply these principles in operational contexts—ensuring compliance, advancing intersectoral collaboration, and promoting ocean stewardship aligned with sustainability and equity goals (FAO, 2022).

Effective ocean governance must also reflect inclusivity and cultural integrity. Central to this is the recognition of Indigenous rights and co-management, as affirmed in Section 35 of the Constitution Act (1982) and supported by Canada's commitment to reconciliation and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP, 2007). Complementary conventions such as MARPOL (1973/78), SOLAS (1974), and the Convention on Biological Diversity (CBD, 1992) reinforce global standards for environmental protection, maritime safety, and equitable use of ocean resources (International Maritime Organization [IMO], 2023, Convention on Biological Diversity, 2022).

Ultimately, ocean governance connects people, policy, and the planet. For SBEPs, it represents the integration of science, law, and ethics to ensure that Canada's oceans are managed not only for economic opportunity but also for ecological resilience, cultural respect, and intergenerational well-being. Through informed decision-making, inclusive policy design, and adaptive leadership, SBEPs contribute to a sustainable Blue Economy grounded in transparency, collaboration, and stewardship.

2.1.1 International Ocean Law and Conventions

The ocean belongs to everyone — and to no one alone. Its vastness connects nations, economies, and ecosystems, demanding cooperation that transcends borders. To manage this shared responsibility, the global community has developed a network of international laws and conventions that define how countries use, protect, and govern the sea. These agreements form the backbone of modern ocean governance, setting standards for safety, pollution prevention, conservation, and equitable resource use.

For Sustainable Blue Economy Professionals (SBEPs), they provide the legal and ethical compass for decision-making — guiding how nations coordinate shipping operations, protect marine biodiversity, manage fisheries, and respond to emerging challenges such as climate change and deep-sea mining. Together, these conventions create a common language of stewardship — one that ensures the world's oceans remain a source of life, connection, and opportunity for generations to come.

The following international agreements represent the cornerstone of global ocean governance and form the legal foundation upon which Canada's ocean policies and Blue Economy initiatives are built. Each convention addresses a specific aspect of ocean use — from defining maritime boundaries and ensuring safety at sea, to preventing pollution, conserving biodiversity, and supporting sustainable trade and fisheries. Together, they reflect a shared global commitment to balance economic opportunity with ecological responsibility.

For Sustainable Blue Economy Professionals (SBEPs), familiarity with these conventions is not only a matter of compliance but of leadership and professional integrity — understanding how international law shapes national action, and how informed professionals can turn global principles into meaningful, sustainable practice.

2.1.2 United Nations Convention on the Law of the Sea (UNCLOS, 1982)

The United Nations Convention on the Law of the Sea (UNCLOS), adopted in 1982 and entering into force in 1994, is often called the *"Constitution for the Oceans."* It is the global agreement that defines how countries use, share, and protect the ocean. After almost ten years of negotiation, UNCLOS created a common language for maritime nations — setting the rules for how far a country's jurisdiction extends, how the seabed is managed, and how marine resources must be conserved for the benefit of all. UNCLOS is administered by the United Nations Division for Ocean Affairs and the Law of the Sea (DOALOS) in New York, and its influence stretches across every aspect of modern ocean governance — from shipping and fisheries to marine conservation and scientific research.

For Sustainable Blue Economy Professionals (SBEPs), UNCLOS is more than just a legal document — it is the foundation upon which all ocean policy, planning, and practice rest. It shapes how Canada manages its vast ocean territory, balances economic use with environmental protection, and works collaboratively with the international community to ensure the long-term health of our shared seas.

A Brief History

In the middle of the 20th century, countries began asserting control over ocean areas to protect fisheries, energy reserves, and shipping routes. But without clear global rules, disputes quickly followed. The need for order and fairness led to a series of United Nations conferences, culminating in the Third United Nations Conference on the Law of the Sea (1973–1982).

When the Convention was finally adopted in Montego Bay, Jamaica, it marked a turning point. For the first time, the world had a single framework to govern nearly three-quarters of the planet's surface. It established balance — granting nations rights over nearby resources while reminding them of their shared duty to protect the ocean for future generations.

What UNCLOS Covers

UNCLOS sets the boundaries — literally and figuratively — for ocean use and management. It defines how far a country's control extends from its coastline and what responsibilities come with that control.

Maritime Zones

Countries have sovereignty over the Territorial Sea (12 nautical miles), enforcement rights in the Contiguous Zone (24 nm), and exclusive resource rights in the Exclusive Economic Zone (EEZ) — extending up to 200 nautical miles from shore. Beyond that lies the High Seas, a global common belonging to everyone and managed through cooperation.

Continental Shelf and the Deep Seabed

UNCLOS gives countries rights to explore and use the resources of their continental shelf, even beyond 200 nm, while declaring the deep seabed as the *"common heritage of humankind."* The International Seabed Authority (ISA), based in Kingston, Jamaica, ensures that mining or exploration in those areas benefits all nations, not just a few.

Environmental Protection and Marine Science

The Convention requires states to protect and preserve the marine environment, prevent pollution, and cooperate in scientific research. It laid the groundwork for future environmental treaties like MARPOL and the London Convention.

Peaceful Dispute Resolution

To resolve maritime conflicts, UNCLOS established the International Tribunal for the Law of the Sea (ITLOS) and mechanisms for arbitration — emphasizing diplomacy over confrontation.

UNCLOS in Canada

Canada ratified UNCLOS in 2003, aligning its national laws with this international framework. The principles of UNCLOS are embedded in Canada's Oceans Act (1996), which introduced integrated ocean management and ecosystem-based planning.

Under UNCLOS, Canada manages one of the largest Exclusive Economic Zones (EEZs) in the world — spanning nearly 5.8 million square kilometers. This includes stewardship of the Arctic Ocean, where UNCLOS provides the basis for continental shelf claims and international cooperation under Article 76. Through the work of Fisheries and Oceans Canada (DFO), the Canadian Coast Guard, and Global Affairs Canada, the country upholds UNCLOS commitments — from safe navigation and resource management to Arctic sovereignty and environmental protection.

Why UNCLOS Matters to the Blue Economy

For Canada, the Blue Economy is about balancing prosperity with protection — and UNCLOS makes that balance possible. It provides the legal certainty businesses, researchers, and governments need to plan marine projects, develop offshore energy, expand shipping, and conserve biodiversity responsibly.

For SBEPs, understanding UNCLOS means understanding how law, science, and sustainability connect. It equips professionals to interpret maritime zones, manage marine spatial planning, and navigate the complexities of shared ocean spaces with confidence and integrity. UNCLOS ensures that no matter how we use the ocean — for energy, food, transport, or innovation — we do so within a global framework that values fairness, cooperation, and stewardship.

Global and Ethical Perspective of UNCLOS

Nearly every coastal nation in the world now follows UNCLOS. It's a rare example of global consensus — a shared promise that the oceans will be governed by reason and respect, not power.

As the world faces new challenges like climate change, deep-sea mining, and biodiversity loss beyond national jurisdiction, UNCLOS remains the foundation for negotiation and adaptation. It reminds us that the ocean is not a limitless frontier but a living system that connects all nations.

2.1.3 International Convention for the Prevention of Pollution from Ships (MARPOL, 1973/78)

The International Convention for the Prevention of Pollution from Ships (MARPOL) is one of the most influential environmental agreements in maritime history. Adopted in 1973 and strengthened by the 1978 Protocol, MARPOL was developed to address the growing recognition that ocean health and global shipping are deeply interconnected. Administered by the International Maritime Organization (IMO) in London, United Kingdom, it provides a unified legal and operational framework to prevent both accidental and operational pollution from ships.

MARPOL was born out of tragedy and awareness. The devastating *Torrey Canyon* oil spill of 1967, which contaminated coastlines across Europe, exposed the urgent need for an international approach to pollution prevention. Since then, MARPOL has evolved through amendments and new annexes to reflect advances in ship design, fuel systems, waste treatment, and environmental science. It has become a living framework — adapting to new challenges such as air pollution, waste management, and greenhouse gas emissions — while continuing to uphold the shared principle that economic activity on the ocean must not come at the expense of environmental integrity.

For Sustainable Blue Economy Professionals (SBEPs), MARPOL forms the cornerstone of environmental governance in marine operations. It bridges global sustainability commitments with national legislation, guiding Canadian ports, shipping companies, and offshore industries in responsible maritime practices. The Convention reinforces Canada's broader commitments under the Oceans Act (1996), the Canada Shipping Act (2001), and the Blue Economy Strategy (2022) — all

of which seek to ensure that economic growth at sea is achieved through innovation, accountability, and stewardship.

Structure and Scope

MARPOL is divided into six technical Annexes, each addressing a specific type of pollution caused by ships. Together, they form a holistic framework for clean and sustainable shipping operations, align closely with Canada's marine protection goals, and provide a practical roadmap for compliance, monitoring, and continuous improvement.

Annex I – Prevention of Pollution by Oil (in force since 1983)

Annex I established rules to prevent oil discharges and minimize pollution from ships, marking a turning point in international environmental policy. It requires vessels to carry Oil Record Books, install Oil Filtering Equipment, and maintain Segregated Ballast Tanks. These measures greatly reduced the risk of contamination from routine ship operations.

For Canadian professionals, this Annex connects directly with the Arctic Waters Pollution Prevention Act and the Marine Liability Act, which enforce strict liability for oil spills in Canadian waters. SBEPs working in shipping, energy, or coastal management must understand oil spill contingency planning, environmental risk assessment, and cross-agency coordination — skills that uphold both ecological integrity and maritime safety.

Annex II – Control of Pollution by Noxious Liquid Substances in Bulk (in force since 1983)

Annex II regulates the carriage and discharge of liquid chemicals transported in bulk, classifying substances based on their potential harm to marine life. It also defines strict cleaning procedures for chemical tanks to prevent contamination during and after cargo transfer.

In Canada, this Annex is implemented through the Pollution Prevention Regulations (SOR/2021-122) under the Canada Shipping Act, which ensures safe handling of chemicals in ports and coastal zones. SBEPs apply this knowledge in chemical shipping, marine auditing, and emergency preparedness — reinforcing a culture of prevention in industrial maritime activities.

Annex III – Prevention of Pollution by Harmful Substances in Packaged Form (in force since 1992)

Annex III expands protection to include packaged hazardous materials transported in containers or portable tanks. It mandates clear labeling, documentation, and stowage standards to prevent accidental release of harmful goods during transport.

For SBEPs, this Annex is particularly relevant to Canada's growing logistics and port operations. It underscores the importance of traceability, hazard communication, and

supply chain transparency, ensuring that maritime trade remains both safe and environmentally responsible.

Annex IV – Prevention of Pollution by Sewage from Ships (in force since 2003)

Annex IV focuses on reducing nutrient and microbial pollution caused by sewage discharges from ships. It requires the installation of sewage treatment plants or holding tanks and regulates where and how effluent can be released.

In the Canadian context, these measures are enforced through the Vessel Pollution and Dangerous Chemicals Regulations, protecting sensitive habitats and marine biodiversity. SBEPs working in marine tourism, offshore industries, or Arctic operations must ensure compliance with these rules to safeguard public health, water quality, and ecosystem resilience.

Annex V – Prevention of Pollution by Garbage from Ships (in force since 1988)

Annex V addresses the growing issue of solid waste pollution, including plastics, food waste, and other debris. It prohibits the discharge of plastics into the ocean and requires ships to manage garbage responsibly through segregation, recycling, and port waste reception facilities. This Annex aligns closely with Canada's Ocean Plastics Charter (2018), which commits to reducing plastic waste and marine litter.

For SBEPs, it reinforces the value of circular economy principles — reducing waste at the source, reusing materials, and promoting sustainable port operations. It also emphasizes community engagement and education in reducing waste impacts across Canada's coasts.

Annex VI – Prevention of Air Pollution from Ships (in force since 2005)

Annex VI extends MARPOL's protection from sea to air by limiting emissions of Sulphur oxides (SOx), nitrogen oxides (NOx), and greenhouse gases (GHGs). It introduced Emission Control Areas (ECAs) and energy efficiency standards such as the Energy Efficiency Design Index (EEDI) and Ship Energy Efficiency Management Plan (SEEMP).

Canada participates in the North American Emission Control Area (ECA) and promotes cleaner fuels and technologies as part of its 2030 Emissions Reduction Plan. For SBEPs, Annex VI opens a path for innovation in green shipping technologies, alternative fuels like hydrogen and ammonia, and carbon management systems that help decarbonize maritime transport.

Implementation of MARPOL in Canada

Canada enforces MARPOL through a series of interlinked statutes and strategies. The Canada Shipping Act (2001) provides the legislative foundation for pollution prevention, while the Vessel Pollution and Dangerous Chemicals Regulations ensure compliance across shipping and offshore operations. National initiatives like the Ocean Protection Plan (2016) and Blue Economy Strategy

(2022) extend MARPOL's principles into local contexts — integrating environmental protection with innovation, economic opportunity, and community engagement.

Global and Professional Relevance of MARPOL

MARPOL has been ratified by over 150 countries, representing more than 98% of the world's shipping tonnage. Its influence extends beyond compliance — it defines a shared moral and professional responsibility among nations to preserve ocean health.

For Sustainable Blue Economy Professionals, MARPOL represents the intersection of policy, science, and ethics. It empowers practitioners to integrate pollution prevention practices into daily operations, drive clean shipping innovation, and collaborate across industries and governments to uphold the principles of sustainability at sea.

Ultimately, MARPOL is more than a treaty — it is a living embodiment of global cooperation for ocean stewardship. By aligning technological innovation with environmental responsibility, it supports Canada's vision for a Blue Economy where prosperity and planetary care move forward together

2.1.4 International Convention for the Safety of Life at Sea (SOLAS, 1974)

The International Convention for the Safety of Life at Sea (SOLAS) is widely recognized as one of the most important maritime safety treaties in existence. Adopted in 1974 and administered by the International Maritime Organization (IMO) in London, SOLAS establishes comprehensive standards for the construction, equipment, and operation of ships to ensure the safety of human life at sea. It embodies the international community's collective response to the tragic Titanic disaster of 1912, which first exposed the critical need for global maritime safety regulation.

SOLAS ensures that vessels operating across international waters maintain consistent, high-level safety practices — from the integrity of ship design to safety audits and the operation of navigation and communication systems. It is a living treaty that has evolved over time, incorporating amendments and technological advancements in digital navigation, emergency response, cybersecurity, and environmental safety.

For Sustainable Blue Economy Professionals (SBEPs), SOLAS holds deep significance. It provides the foundational safety and operational standards that enable all other aspects of the blue economy — from shipping and offshore energy to marine tourism and research — to function effectively and responsibly. Safety is not just an operational requirement; it is a cornerstone of sustainable development and a measure of ethical leadership at sea.

Historical Context and Evolution

The first version of SOLAS was adopted in 1914 following the sinking of the *RMS Titanic*, but it never came into force due to World War I. Successive versions followed in 1929, 1948, 1960, and finally 1974, which remains the operative framework today. The 1974 version introduced an important feature: a simplified amendment process to ensure that the Convention could evolve alongside new maritime challenges and technologies.

Today, SOLAS applies to more than 99% of the world's merchant fleet, with its chapters covering everything from ship stability and machinery systems to fire safety, navigation, and crew preparedness.

Structure and Key Chapters of SOLAS

The 1974 Convention is organized into 14 chapters, each focusing on a core aspect of maritime safety. Some of the most relevant to SBEP practice include:

Chapter I – General Provisions
Establishes requirements for survey, certification, and inspection of ships to verify compliance with safety standards.

Chapter II-1 and II-2 – Construction and Fire Safety
Regulates ship stability, watertight integrity, and fire prevention systems, ensuring that vessels are structurally sound and equipped for emergencies.

Chapter III – Life-Saving Appliances and Arrangements
Mandates lifeboats, life rafts, and emergency drills, reinforcing preparedness as a fundamental maritime culture.

Chapter IV – Radio Communications
Requires ships to maintain continuous communication with coastal and rescue authorities, a precursor to today's Global Maritime Distress and Safety System (GMDSS).

Chapter V – Safety of Navigation
Applies universally to all ships on all voyages, ensuring proper navigation equipment, voyage planning, and the safe use of electronic chart systems (ECDIS).

Chapter IX – Safety Management (ISM Code)
Introduces the International Safety Management (ISM) Code, which requires shipping companies to implement safety management systems (SMS) that promote continuous improvement and accountability.

Chapter XI-2 – Security Measures
Incorporates the International Ship and Port Facility Security (ISPS) Code, introduced after 9/11, linking maritime security with operational safety and resilience.

Canadian Implementation of SOLAS

In Canada, SOLAS is implemented primarily through the Canada Shipping Act (2001), the Marine Personnel Regulations, and the Marine Transportation Security Regulations. Transport Canada ensures compliance through vessel inspections, safety certification, and incident investigations. The Canadian Coast Guard and Marine Communications and Traffic Services (MCTS) play key roles in maintaining maritime safety, navigation, and emergency response systems.

The SOLAS framework supports Canada's broader marine governance objectives under the Oceans Act (1996) and Arctic Waters Pollution Prevention Act, particularly in safeguarding northern and coastal communities reliant on marine transport.

Relevance of SOLAS to the Blue Economy

SOLAS underpins the operational safety foundation of the Blue Economy. Without safe vessels, trained crews, and effective emergency systems, sustainable maritime commerce and innovation would not be possible. The Convention ensures that all sectors — from fisheries and renewable energy to ocean research and shipping — operate under a culture of prevention, responsibility, and human-centered design.

For Sustainable Blue Economy Professionals, understanding SOLAS is essential to integrating safety with sustainability. It encourages proactive hazard assessment, system thinking, and leadership in ensuring that human life remains central to the blue economy's expansion.

Global Relevance of SOLAS

SOLAS represents the maritime world's shared commitment to preserving life at sea. It demonstrates that sustainability extends beyond environmental care to include social and ethical responsibility — protecting the people whose work and well-being depend on the ocean. In today's rapidly changing maritime landscape — shaped by automation, climate adaptation, and energy transition — SOLAS remains a living instrument guiding both innovation and accountability. It ensures that as we build a prosperous Blue Economy, we do so upon a foundation of safety, respect, and resilience.

2.1.5 London Convention and Protocol (1972 / 1996)

The London Convention (1972), formally known as the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, was one of the world's earliest and most comprehensive global agreements to protect the marine environment from human-induced pollution. Administered by the International Maritime Organization (IMO) and headquartered in London, United Kingdom, this landmark convention aimed to control the deliberate disposal of wastes at sea — marking a pivotal moment in the shift toward preventive, science-based ocean governance.

The Convention emerged at a time when ocean dumping was a common method of waste disposal for industrialized nations. Chemical by-products, sewage sludge, and even radioactive materials were often released into marine waters, with little understanding of the long-term ecological consequences. The 1972 Stockholm Conference on the Human Environment catalyzed a new era of environmental consciousness, leading to the establishment of the London Convention as a global mechanism to "promote the effective control of all sources of marine pollution."

Scope and Purpose

The London Convention regulates the intentional disposal of waste and other matter at sea, excluding operational discharges from ships (which are governed by MARPOL). It requires states to

issue permits before allowing any material to be dumped and establishes a system of classification based on the potential environmental harm of substances.

This framework was further modernized through the 1996 London Protocol, which strengthens environmental safeguards and shifts the focus from "allowing unless prohibited" to "prohibiting unless specifically permitted." The Protocol embodies a precautionary approach, ensuring that only materials shown to pose minimal environmental risk can be dumped, and only under strictly controlled conditions.

Key Provisions and Evolution

The London Convention (1972) and the London Protocol (1996) work in tandem, evolving from control-based to prevention-based regulation. It includes the following provisions:

Permitting System

The Convention introduced a "black and grey list" of substances — with highly toxic materials such as mercury and radioactive waste strictly banned.

Environmental Impact Assessments (EIA)

The Protocol requires comprehensive EIAs before any dumping activity, ensuring decision-making is grounded in science and precaution.

Reverse Listing Approach

The 1996 Protocol allows only specific, low-risk materials (e.g., dredged materials, organic matter, or inert geological material) to be considered for dumping.

Carbon Sequestration and Geoengineering

Amendments to the Protocol in 2006 and 2013 address emerging issues like carbon capture and storage (CCS) and marine geoengineering, ensuring new technologies are assessed for their long-term ecological impacts.

Together, these provisions have shaped a global norm — that the ocean is not a waste repository, but a shared and finite ecosystem demanding stewardship.

Canadian Implementation of the London Protocol

Canada was among the early signatories to the London Convention and later ratified the London Protocol in 2000, embedding its principles into domestic law through the Canadian Environmental Protection Act (CEPA, 1999). Under CEPA's Disposal at Sea Regulations, any proposed dumping of dredged material, fish waste, or inert geological matter requires a detailed environmental assessment, permit review, and post-disposal monitoring. These measures are enforced by Environment and Climate Change Canada (ECCC), in collaboration with the Canadian Coast Guard and Transport Canada. Canada's implementation reflects its dual priorities — protecting marine ecosystems and supporting sustainable maritime infrastructure projects such as port dredging, which are essential to its Blue Economy Strategy (2022).

Relevance of the London Protocol to the Blue Economy

For Sustainable Blue Economy Professionals, the London Convention and Protocol illustrate how science-based policy safeguards economic opportunity. Ports, shipping routes, aquaculture zones, and offshore industries all rely on clear, predictable, and ethical environmental standards. This framework ensures that essential marine operations — like dredging for navigational safety or laying submarine cables — proceed without degrading ocean ecosystems.

SBEPs apply these principles when conducting environmental impact assessments, advising on marine spatial planning, or developing waste mitigation strategies for industrial and community projects. By promoting responsible marine waste management, the London Convention aligns with the United Nations Sustainable Development Goals (SDG 14: Life Below Water) and complements Canada's commitments under the Oceans Act and Marine Protection Areas (MPAs) initiatives.

Global and Professional Relevance of the London Protocol

The London Convention and Protocol represent a profound evolution in how humanity views the ocean — not as an infinite sink for industrial waste, but as a living system deserving protection and respect. Today, over 100 countries have committed to its principles, forming a global alliance for clean, healthy, and productive seas. For SBEPs, this agreement reinforces the ethical dimension of professional practice: decisions made on land reverberate through the ocean. The Convention challenges professionals to innovate in waste reduction, environmental monitoring, and sustainable port design, ensuring that Canada's ocean economy grows in harmony with ecological resilience.

2.1.6 Convention on Biological Diversity (CBD, 1992)

The Convention on Biological Diversity (CBD), adopted at the 1992 Rio Earth Summit, is one of the most significant global agreements guiding how we conserve, use, and share the benefits of the world's biodiversity. It recognizes that biological diversity — from microscopic plankton to vast kelp forests and coral reefs — is essential to human well-being, economic stability, and planetary health.

The CBD marked a shift from viewing conservation as purely ecological to understanding it as a foundation for sustainable development. It weaves together science, ethics, and social responsibility, calling on nations to protect ecosystems while ensuring that the use of genetic and natural resources benefits everyone — particularly Indigenous and local communities whose knowledge sustains biodiversity.

Scope and Purpose

The Convention rests on three main objectives:

1. The conservation of biological diversity.
2. The sustainable use of its components and
3. The fair and equitable sharing of benefits arising from genetic resources.

These goals connect directly to the Sustainable Blue Economy by promoting healthy, resilient marine ecosystems that sustain livelihoods, fisheries, energy, and tourism. For Canada, the CBD provides the foundation for ocean protection laws, such as the Oceans Act (1996) and the Fisheries Act (2019) and informs major initiatives like Canada's Marine Protected Areas (MPAs) and the National Biodiversity Strategy.

Historical Context

When the CBD was opened for signature at the Rio Earth Summit in 1992, the world was beginning to grasp the scale of biodiversity loss caused by human activity — deforestation, overfishing, pollution, and climate change. The Convention responded by reframing biodiversity as a shared global asset requiring shared responsibility.

Canada was among the first nations to sign and ratify the CBD, becoming a leader in implementing its commitments. The Convention now has 196 Parties, making it one of the most universally supported environmental treaties in history. It's the Conference of the Parties (COP) meetings — such as the Kunming-Montreal Global Biodiversity Framework (2022) — that continue to shape global conservation priorities.

Key Provisions and Mechanisms

The CBD provides a flexible but comprehensive framework for conservation and sustainable use.
Key areas include:

Ecosystem Approach
Managing land, water, and living resources in a balanced way that maintains biodiversity and human well-being.

Protected Areas
Encouraging the establishment of terrestrial and marine protected zones to safeguard critical habitats and species.

Traditional Knowledge
Recognizing Indigenous knowledge systems as vital for sustainable resource management (Article 8(j)).

Access and Benefit Sharing (ABS)
Ensuring equitable sharing of benefits derived from genetic resources through agreements like the Nagoya Protocol (2010) and

Strategic Action Plans
Guiding countries to develop national biodiversity strategies and action plans (NBSAPs).

For the ocean, these principles guide policies on marine protected areas (MPAs), species conservation, and habitat restoration, as well as Canada's leadership in international forums on marine biodiversity beyond national jurisdiction (BBNJ).

Implementation in of CBD Canada

Canada's biodiversity commitments under the CBD are carried out through a coordinated framework involving Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO), and Parks Canada. Together, these agencies lead initiatives to restore habitats, reduce species at risk, and strengthen marine protection.

Canada has set ambitious biodiversity goals under the Kunming-Montreal Global Biodiversity Framework, co-hosted in 2022, *including:*

- Protecting 30% of marine and coastal areas by 2030 ("30x30" goal).
- Restoring degraded ecosystems and rebuilding fish populations.
- Integrating biodiversity values into national and regional planning and
- Supporting Indigenous-led conservation initiatives such as Indigenous Protected and Conserved Areas (IPCAs).

Marine biodiversity work in Canada also links directly to the Oceans Protection Plan (2016), the Blue Economy Strategy (2022), and collaborative regional efforts like the Atlantic and Pacific MPA Networks.

Relevance of CBD to the Blue Economy

Biodiversity is the life support system of the Blue Economy. From fisheries and aquaculture to tourism and renewable energy, every ocean sector depends on healthy ecosystems. The CBD ensures that economic growth does not come at the cost of ecological loss.

For SBEPs, understanding the CBD means seeing how policy, ecology, and equity intertwine. It enables professionals to connect global biodiversity targets with local marine management, build inclusive partnerships with Indigenous and coastal communities, and align industry practices with conservation ethics.

By embedding CBD principles into Blue Economy planning, SBEPs contribute to a future where marine productivity, ecosystem integrity, and human prosperity coexist.

Global and Ethical Relevance of CBD

The CBD reminds us that biodiversity is not just about nature — it's about justice, knowledge, and shared survival. Every coral reef, seagrass meadow, and migratory species connects communities and economies across the world. As ocean industries expand and climate pressures intensify, the CBD's principles serve as both a moral compass and a scientific guide. For Canada, they reinforce that true leadership in the Blue Economy means protecting the very ecosystems that make it possible.

2.1.7 Agreement on Port State Measures (PSMA, 2009)

The Agreement on Port State Measures (PSMA), adopted in 2009 and administered by the Food and Agriculture Organization (FAO) of the United Nations, represents a landmark global effort to combat Illegal, Unreported, and Unregulated (IUU) Fishing — one of the gravest threats to ocean sustainability. As the first binding international agreement of its kind, the PSMA strengthens port controls to deny haven to vessels engaged in unlawful fishing, ensuring that illicitly caught seafood never enters legitimate global markets.

This agreement embodies the global recognition that the ocean's living resources are finite, and that unsustainable exploitation undermines food security, biodiversity, and coastal livelihoods. By closing ports to illegally operating vessels, the PSMA transforms the world's harbors into the first line of defense for marine conservation and ethical trade.

Scope and Purpose

The PSMA establishes a framework for inspecting foreign-flagged fishing vessels when they enter ports and for taking enforcement action when evidence of IUU activity is found. It requires advance notice of port entry, verification of catch documentation, and coordination among national authorities to share data and intelligence on suspicious vessels.

Unlike earlier voluntary guidelines, the PSMA creates legal obligations for member states to refuse port access or services (such as refueling, landing, or transshipment) to any vessel involved in IUU fishing. It also encourages transparency and cross-border cooperation, linking environmental protection to economic integrity.

Historical Context

Throughout the 1990s and 2000s, IUU fishing became a global crisis — accounting for an estimated 26 million tons of fish annually, worth between $10 billion and $23 billion USD (FAO, 2016). Such practices devastated fish stocks, distorted markets, and marginalized legal operators, particularly in developing and coastal states.

Recognizing this challenge, FAO members negotiated the PSMA to turn ports — traditionally gateways for commerce — into gatekeepers for sustainability. It entered into force in June 2016, and as of 2024, over 75 parties (representing nearly two-thirds of global fish landings) have ratified the agreement.

Key Provisions

Key provisions of the PSMA include:

Prior Notification

Vessels seeking to enter a port must provide information on identity, catch, and authorization status.

Inspection and Verification
Port States must inspect fishing vessels to verify compliance with international and national laws.

Denial of Entry or Use
Ports may deny entry, landing, or services to vessels engaged in or supporting IUU fishing.

Information Exchange
States are required to share inspection results and vessel lists through regional fisheries management organizations (RFMOs) and the FAO global information system and

Capacity Building
The Agreement promotes technical assistance and training for developing nations to strengthen inspection and enforcement systems.

Canadian Implementation of PSMA

Canada ratified the PSMA in 2019, reinforcing its role as a global leader in sustainable fisheries management. The Agreement is implemented through the Coastal Fisheries Protection Act and associated Regulations (CFPA, 2019), *which provide Canadian authorities the power to:*

- Inspect foreign vessels at designated Canadian ports.
- Deny entry or port services to vessels suspected of IUU fishing and
- Report violations through international databases such as the Northwest Atlantic Fisheries Organization (NAFO).

Canada's enforcement efforts are supported by Fisheries and Oceans Canada (DFO) and the Canadian Coast Guard, integrating the PSMA's requirements into the National Fishery Monitoring, Control, and Surveillance Program. These initiatives complement domestic strategies such as the Fish Stocks Provisions of the Fisheries Act (2019) and the Blue Economy Strategy (2022).

Relevance of PSMA to the Blue Economy

For Sustainable Blue Economy Professionals (SBEPs), the PSMA is a critical framework linking ocean governance, ethical trade, and food security. By curbing IUU fishing, it ensures that legitimate fishers and aquaculture operators compete on fair, sustainable terms — protecting both ecosystems and livelihoods.

The PSMA also reinforces the traceability and transparency essential to modern seafood markets. SBEPs engaged in fisheries policy, supply chain certification, and coastal management can leverage PSMA mechanisms to strengthen Canada's reputation for sustainability, uphold international standards (like the Marine Stewardship Council certification), and support equitable blue growth.

Global and Professional Relevance of PSMA

The PSMA demonstrates that sustainable ocean governance depends as much on ports and policy as on science and technology. It redefines ports as guardians of marine stewardship — linking economic infrastructure with ecological protection.

For Canada, this means integrating port management, fisheries surveillance, and coastal community resilience under a shared sustainability vision. For SBEPs, it emphasizes the power of governance to create real-world change — protecting marine biodiversity while supporting jobs, innovation, and fair global trade.

2.1.8 Ocean Governance and Regulatory Frameworks as a Core Competency for the SBEP

Ocean governance and regulatory frameworks provide the backbone of the global Blue Economy. For Sustainable Blue Economy Professionals (SBEPs), mastering these frameworks means more than understanding the law—it means being able to interpret, apply, and lead within complex systems that connect science, policy, technology, and ethics. SBEPs possess both the technical and interpersonal competencies necessary to translate legal frameworks into action, bridging local priorities with global commitments. Below are the core competencies that define professional capability in this domain:

Governance and Legal Literacy

SBEPs must demonstrate a clear understanding of international and national legal regimes that shape ocean use and protection. This includes familiarity with the United Nations Convention on the Law of the Sea (UNCLOS), MARPOL, SOLAS, London Convention, Convention on Biological Diversity (CBD), and Agreement on Port State Measures (PSMA).

Professionals should be able to:

- Interpret and apply maritime laws to support sustainable ocean practices and compliance in Canada's Exclusive Economic Zone (EEZ).
- Distinguish between federal, provincial, and Indigenous jurisdictions in ocean governance.
- Assess legal and regulatory implications in areas such as shipping, fisheries, energy, and conservation and
- Understand how emerging legal instruments—such as the BBNJ Agreement (2023)—impact Canada's policy and industry landscape.

Policy and Institutional Integration

Effective governance requires connecting legal frameworks with operational systems.

SBEPs should be skilled in:

- Analyzing how global treaties are implemented through Canada's Oceans Act (1996), Fisheries Act (2019), and Canada Shipping Act (2001).

- Developing policy recommendations that align with Canada's Blue Economy Strategy (2022) and the UN Sustainable Development Goals (SDG 14 – Life Below Water).
- Coordinating cross-sectoral planning among governmental, Indigenous, academic, and private stakeholders and
- Translating international obligations into coherent local actions and measurable outcomes.

Ethical and Inclusive Governance

SBEPs must approach governance through a lens of ethics, equity, and reconciliation.

They should be able to:

- Respect and apply Indigenous governance principles under Section 35 of the Constitution Act (1982) and UNDRIP (2007).
- Incorporate Indigenous and local knowledge into policy design and decision-making.
- Ensure equity, transparency, and accountability in ocean management and
- Recognize and address systemic barriers that limit participation or representation in marine governance.

This competency ensures that governance frameworks uphold Canada's commitment to reconciliation and inclusive stewardship, not merely procedural compliance.

Strategic Planning and Implementation

Governance is not only about creating policy, it's about turning policy into practice.

SBEPs should be able to:

- Design and apply integrated frameworks for marine spatial planning (MSP) and ecosystem-based management (EBM).
- Lead or contribute to projects that align environmental, social, and economic goals across multiple jurisdictions.
- Use scenario planning and risk assessment to anticipate and address challenges such as climate impacts, maritime security, and resource conflicts and
- Monitor governance outcomes and adapt strategies for continuous improvement.

Compliance, Enforcement, and Accountability

Ensuring that ocean regulations are upheld is central to sustainable management.

SBEPs must understand and apply mechanisms of compliance such as:

- Flag-state, port-state, and coastal-state enforcement under UNCLOS and PSMA.

- Inspection, monitoring, and reporting systems for pollution prevention and maritime safety.
- Performance auditing using key compliance indicators linked to Canada's marine policies and
- Promoting a culture of compliance and transparency through education, ethics, and leadership.

Communication, Negotiation, and Diplomacy

Because ocean governance is inherently collaborative, SBEPs must be skilled communicators and bridge-builders.

They should be able to:

- Translate complex legal and technical language into accessible information for decision-makers, communities, and industry.
- Facilitate multi-stakeholder dialogues and conflict resolution processes.
- Represent Canada's ocean interests in regional and international forums with professionalism and integrity and
- Communicate the value of the ocean as a shared global asset, reinforcing stewardship through informed advocacy.

Leadership in Ocean Stewardship and Innovation

Finally, SBEPs must lead with vision. They are not only practitioners but also ambassadors of a sustainable ocean ethic.

They should:

- Foster collaboration across science, policy, and business to advance blue innovation in governance.
- Champion evidence-based, inclusive, and climate-resilient ocean management.
- Promote continuous learning and adaptive leadership in response to evolving marine challenges and
- Integrate governance knowledge with emerging areas such as digital ocean systems, marine data ethics, and climate adaptation frameworks.

Mastery of Ocean Governance & Regulatory Frameworks enables SBEPs to function as ethical, informed, and proactive leaders in the Blue Economy. They understand how law, policy, and community intersect to create sustainable pathways for growth. By combining legal literacy, ethical awareness, and collaborative leadership, SBEPs ensure that Canada's ocean future is governed not just by regulation — but by responsibility, respect, and resilience.

2.2 Marine Ecosystems & Biodiversity

Marine ecosystems form the living backbone of the Blue Economy — dynamic, interconnected systems that sustain all life on Earth. They regulate global climate, generate oxygen, support fisheries and aquaculture, and nurture cultural and economic life across coastal communities (FAO, 2020 IPCC, 2021). Canada's marine ecosystems, stretching from the Arctic to the Pacific and Atlantic coasts, represent nearly 7.1 million km^2 of ocean territory — among the largest in the world (Government of Canada, 2023). These ecosystems include an extraordinary range of habitats including kelp forests, deep-sea coral reefs, seagrass meadows, estuaries, and polar ice zones. Together, they embody an intricate balance of biodiversity, productivity, and resilience that underpins Canada's blue economy and global ocean stewardship responsibilities.

Biodiversity — the diversity of life across genes, species, and ecosystems — is what keeps these systems resilient in the face of change. Diverse ecosystems are better able to absorb shocks such as pollution, overfishing, and temperature anomalies (Worm et al., 2006). Yet human pressures continue to threaten this balance. Habitat loss, ocean acidification, invasive species, and climate-driven shifts in species distribution are eroding the foundations of marine biodiversity (CBD, 2022). In this context, Sustainable Blue Economy Professionals (SBEPs) are called upon to bridge science, governance, and ethics — ensuring that ocean-based economic development enhances, rather than depletes, ecological wealth.

Canada's conservation framework follows an Ecosystem-Based Management (EBM) approach under the Oceans Act (1996) — a model that integrates environmental, social, and economic considerations into the planning and management of marine activities. Through initiatives such as Marine Protected Areas (MPAs), Marine Refuges, and Ecologically and Biologically Significant Areas (EBSAs), Canada is advancing the international "30x30" commitment to protect 30% of marine and coastal areas by 2030 (DFO, 2022). These efforts align with global frameworks including the Convention on Biological Diversity (1992), the Kunming–Montreal Global Biodiversity Framework (2022), and the United Nations Sustainable Development Goal 14: Life Below Water, which collectively advocate for halting biodiversity loss and restoring degraded ecosystems.

For SBEPs, understanding marine ecosystems and biodiversity means more than identifying species or habitats — it involves seeing the ocean as a complex, interdependent system of ecological, economic, and cultural relationships. The following subtopics outline the core knowledge and competencies required to translate this understanding into sustainable ocean action.

2.2.1 Marine Ecosystem Structure and Function

Marine ecosystems are networks of living and non-living components — from microscopic plankton to apex predators — that interact through energy flows, nutrient cycling, and ecological feedback. Understanding how these components connect allows professionals to interpret the health and functioning of the marine environment. For example, plankton communities regulate global oxygen production, coral reefs support one-quarter of marine life, and benthic organisms recycle organic matter (Levin et al., 2015).

SBEPs must be able to analyze food web dynamics, identify keystone species, and assess ecosystem thresholds to inform decisions that preserve system resilience. This scientific literacy provides the foundation for evidence-based marine management and ecological forecasting.

2.2.2 Ecosystem Services and Natural Capital

Marine ecosystems deliver a vast array of ecosystem services, from food provision and carbon sequestration to coastal protection and cultural identity (MEA, 2005). For instance, seagrass meadows and mangroves capture "blue carbon", storing up to five times more carbon per hectare than terrestrial forests (UNEP, 2020). Recognizing these benefits as "natural capital" reframes ecosystems not as extractive assets but as enduring sources of sustainable value.

SBEPs must be skilled in identifying, quantifying, and communicating these services using tools like ecosystem service valuation and natural capital accounting. By articulating the tangible and intangible benefits of biodiversity, professionals can influence policy, investment, and community planning that reflect the full value of healthy ecosystems.

2.2.3 Biodiversity Assessment and Monitoring

Biodiversity monitoring underpins adaptive management and policy evaluation. It involves field surveys, genetic sampling, satellite observations, and acoustic mapping to detect patterns of change across space and time (UNESCO-IOC, 2021).

SBEPs must be proficient in selecting biodiversity indicators, interpreting ecological data, and designing monitoring frameworks that capture both scientific and community-based perspectives. Integrating Traditional Ecological Knowledge (TEK) with modern monitoring tools enriches understanding and fosters trust with Indigenous and local stakeholders. These competencies enable professionals to identify trends early, to evaluate management effectiveness, and to contribute to Canada's reporting on international biodiversity targets.

2.2.4 Marine Protected Areas (MPAs) and Refuges

Marine Protected Areas (MPAs) serve as sanctuaries for ocean life, preserving habitats, rebuilding fish stocks, and maintaining ecosystem services. Canada's Network of MPAs and Marine Refuges aims to protect at least 25% of marine and coastal areas by 2025, with a trajectory toward the 30x30 target (DFO, 2022).

SBEPs must understand how MPAs are designed, governed, and evaluated. This includes knowledge of ecological representativity, connectivity, stakeholder engagement, and compliance mechanisms. Professionals must also be able to assess trade-offs between conservation and economic use and advocate for inclusive governance models that integrate Indigenous co-management and community participation.

2.2.5 Climate Change and Ocean Resilience

The ocean absorbs over 90% of excess global heat and nearly 25% of carbon emissions, buffering the planet from climate extremes (IPCC, 2021). However, this capacity comes at a cost: ocean warming, acidification, deoxygenation, and habitat migration are reshaping marine ecosystems.

SBEPs must be able to analyze vulnerability across ecosystems, species, and communities, and develop adaptation and mitigation strategies that strengthen resilience. Competencies include climate-risk assessment, restoration ecology, and integration of climate projections into marine spatial planning and management. By applying these tools, SBEPs help build climate-resilient ecosystems that sustain both biodiversity and livelihoods.

2.2.6 Invasive Species and Habitat Degradation

Human activities such as shipping, aquaculture, and coastal development have accelerated the spread of invasive species and degraded critical habitats. Examples include green crab invasions on Canada's coasts and nutrient pollution leading to hypoxic zones in estuaries (DFO, 2021).

SBEPs must understand ecological risk assessment, biosecurity protocols, and habitat restoration techniques. The ability to design early detection systems and mitigation plans enables professionals to prevent biodiversity loss and restore ecological balance. Addressing habitat degradation also involves collaboration across regulatory agencies, industries, and local communities to ensure long-term ecological health.

2.2.7 Indigenous Knowledge and Stewardship

Indigenous peoples have stewarded marine ecosystems for millennia through holistic, place-based knowledge systems that emphasize reciprocity, respect, and responsibility (Berkes, 2018). SBEPs must recognize that Traditional Ecological Knowledge (TEK) is not simply data — it is a worldview grounded in relationship. Integrating Indigenous knowledge with Western science enriches marine decision-making and supports reconciliation through shared governance. Competencies include ethical engagement, co-management facilitation, and knowledge co-production. By valuing Indigenous stewardship, professionals contribute to a more inclusive and equitable blue economy that honors cultural continuity and intergenerational responsibility.

2.2.8 Restoration Ecology and Blue Carbon

Restoring degraded habitats such as seagrass meadows, kelp forests, and salt marshes is critical to reversing biodiversity loss and enhancing carbon sequestration. "Blue carbon" ecosystems can store up to 200 million tons of carbon annually worldwide (UNEP, 2020).

SBEPs must understand the principles of restoration ecology, from site assessment and ecological design to post-restoration monitoring. They should be equipped to lead multi-stakeholder restoration projects that integrate science, policy, and community engagement. Competence in this area connects biodiversity conservation directly with climate action and circular economic growth.

Marine ecosystems and biodiversity form the lifeblood of the Sustainable Blue Economy. For SBEPs, understanding these systems is not an academic exercise — it is a professional and moral imperative. Mastery in this area enables professionals to interpret ecological relationships, assess human impacts, and develop solutions that harmonize conservation with responsible economic activity. Through scientific literacy, cultural awareness, and systems thinking, SBEPs help ensure that the ocean remains both a source of life and a foundation for sustainable prosperity.

2.2.9 Marine Ecosystems & Biodiversity as a Core Competency for the SBEP

Healthy marine ecosystems and rich biodiversity form the foundation of the Sustainable Blue Economy. Sustainable Blue Economy Professionals (SBEPs), competency in this domain extends far beyond ecological literacy — it involves applying science, policy, and ethics to manage living marine resources sustainably while balancing conservation, livelihoods, and innovation.

The following core competencies outline the knowledge, skills, and professional behaviors expected of SBEPs working within Canada's ocean and coastal contexts.

Ecological and Biodiversity Literacy

SBEPs must understand how marine ecosystems function and interconnect — from planktonic food webs and coral reef systems to Arctic ice environments and coastal wetlands.

They should be able to:

- Demonstrate a foundational understanding of marine ecology, trophic systems, and biodiversity dynamics (CBD, 1992).
- Explain the structure and function of ecosystems such as estuaries, seamounts, kelp forests, and pelagic zones.
- Recognize the ecological roles of keystone and indicator species and their relevance to ecosystem health assessments and
- Apply knowledge of species interactions and ecological connectivity to inform habitat restoration and conservation strategies (DFO, 2022).

Ecosystem-Based Management (EBM)

Ecosystem-Based Management lies at the heart of modern marine stewardship.

SBEPs should be able to:

- Integrate ecological, social, and economic dimensions in decision-making, balancing human activity with ecological integrity.
- Utilize cumulative effects assessment tools to evaluate overlapping pressures such as fishing, shipping, and coastal development.
- Apply principles of adaptive management, adjusting strategies in response to environmental monitoring results and emerging data and

- Contribute to multi-stakeholder planning processes such as Marine Spatial Planning and Management (MSPM) and Integrated Coastal Management (ICM), ensuring science-based and community-informed outcomes (Oceans Act, 1996).

Marine Protected Areas (MPAs) and Conservation Planning

SBEPs must understand Canada's commitments under the Convention on Biological Diversity (CBD, 1992) and the Kunming–Montreal Global Biodiversity Framework (2022) to protect 30% of marine and coastal areas by 2030.

They should be able to:

- Identify ecological, cultural, and socio-economic criteria for MPA designation.
- Support site selection, monitoring, and performance evaluation for marine conservation networks.
- Collaborate with Indigenous and coastal communities in establishing Indigenous Protected and Conserved Areas (IPCAs) that integrate Traditional Knowledge with Western science and
- Evaluate MPA effectiveness through biodiversity indicators and community benefit metrics.

Biodiversity Assessment and Monitoring Skills

Scientific observation and data analysis are essential to track ocean health.

SBEPs must be competent in:

- Applying field and remote-sensing techniques for species inventory, habitat mapping, and water-quality assessment.
- Using biodiversity databases such as OBIS (Ocean Biodiversity Information System), DFO Data Portal, and Global Biodiversity Information Facility (GBIF) for ecological analysis.
- Interpreting biological indicators to assess the impacts of climate change, pollution, and resource extraction and
- Employing GIS and modelling tools to visualize ecosystem patterns and support evidence-based management.

Climate Change and Resilience Integration

SBEPs must recognize the profound link between biodiversity and climate systems.

They should be able to:

- Evaluate the vulnerability of marine habitats to temperature rise, ocean acidification, and sea-level change (IPCC, 2023).

- Integrate nature-based solutions, such as blue-carbon ecosystems (mangroves, salt marshes, seagrass beds), into coastal adaptation projects.
- Support the development of climate-resilient fisheries and aquaculture policies and
- Communicate ecosystem-climate interactions in ways that support informed public and policy decisions.

Indigenous and Community-Based Stewardship

Biodiversity conservation must include cultural, ethical, and local dimensions.

SBEPs are expected to:

- Recognize Indigenous Knowledge Systems (IKS) as complementary to scientific inquiry (TRC, 2015; UNDRIP, 2007).
- Co-design stewardship projects with Indigenous and coastal communities, respecting rights, traditions, and governance.
- Support capacity-building initiatives that empower community leadership in conservation and
- Embed principles of equity and cultural humility in biodiversity research and marine management.

Ethical Leadership and Policy Application

SBEPs should connect ecological integrity with professional accountability.

They must:

- Uphold the precautionary principle and ecosystem approach in marine decision-making (FAO Code of Conduct for Responsible Fisheries, 1995).
- Integrate biodiversity ethics into corporate, academic, and governmental frameworks.
- Develop and communicate biodiversity policies that balance conservation with sustainable use and
- Advocate for transparency, inclusivity, and intergenerational equity in marine policy implementation.

By mastering these competencies, Sustainable Blue Economy Professionals (SBEPs) can interpret complex ecological data, integrate community and cultural insights, and influence policy toward the sustainable use of marine resources. They become the bridge between **science and society**, ensuring that Canada's marine biodiversity is protected not only as an ecological asset but as a source of cultural identity, economic opportunity, and planetary resilience.

2.3 Blue Economy Sectors & Technologies

The Blue Economy represents more than a cluster of ocean industries — it embodies a vision for economic growth that is environmentally sustainable, socially inclusive, and rooted in stewardship of marine ecosystems. It recognizes the ocean not just as a space for extraction or trade, but as a living economy that simultaneously supports innovation, livelihoods, and climate resilience (World Bank & UN DESA, 2017).

In Canada, the Blue Economy includes traditional sectors such as fisheries, aquaculture, shipping, and shipbuilding, alongside emerging industries like marine renewable energy, ocean technology, biotechnology, seabed resources, marine nutraceuticals, and marine tourism (Government of Canada, 2022). These sectors collectively contribute billions of dollars to the national GDP and support more than 350,000 jobs in coastal and Indigenous communities (OECD, 2020). The challenge for Sustainable Blue Economy Professionals (SBEPs) lies in balancing this growth with ecological protection, technological innovation, and social equity.

2.3.1 Fisheries and Aquaculture

Fisheries and aquaculture are foundational pillars of Canada's ocean economy. Wild fisheries supply food, export revenue, and cultural continuity, while aquaculture provides a growing share of global seafood production. However, both face mounting pressures from overexploitation, habitat degradation, and climate variability (FAO, 2022). This section explores the knowledge, tools, and technologies that drive the sustainable transformation of ocean industries. It emphasizes systems thinking — the ability to see connections across sectors and to identify opportunities for innovation that reduce environmental impact while strengthening economic resilience.

SBEPs must understand ecosystem-based fisheries management (EBFM) principles, traceability standards, and sustainable certification schemes such as the Marine Stewardship Council (MSC).

In aquaculture, professionals should be versed in integrated multi-trophic aquaculture (IMTA), disease management, and waste mitigation technologies. They should also be aware of social licensing requirements — including Indigenous rights, community consultation, and environmental transparency.

By integrating ecological data, policy frameworks, and emerging biotechnologies, SBEPs help drive fisheries and aquaculture toward sustainability, food security, and long-term economic viability.

2.3.2 Marine Transportation and Green Shipping

As 90% of global trade travels by sea, maritime transport is a cornerstone of the global economy and a major source of greenhouse gas emissions (IMO, 2020). The sector is undergoing a rapid transformation toward green shipping corridors, alternative fuels, and digitalized vessel operations.

SBEPs must understand the International Maritime Organization (IMO) decarbonization strategy, which aims to reduce emissions by at least 50% by 2050, and Canada's Green Shipping Corridors

Framework (2023). Competence in this area includes familiarity with low-carbon propulsion systems (e.g., hydrogen, ammonia, methanol), ship efficiency technologies (e.g., hull coatings, wind-assisted propulsion), and smart navigation systems that optimize energy use.

SBEPs should also be capable of engaging in multi-stakeholder initiatives linking ports, logistics providers, and regulators to accelerate green transitions. Knowledge of marine pollution prevention conventions, including MARPOL, and port state control measures under the Paris MOU, ensures professionals can align innovation with compliance and sustainability.

2.3.3 Marine Renewable Energy

Canada's vast coastline and tidal range provide exceptional potential for marine renewable energy (MRE) including tidal, wave, current, osmotic, offshore wind, floating solar photovoltaics, and ocean thermal energy conversion (OTEC). MRE technologies play a dual role, decarbonizing energy systems and stimulating regional economic development (IEA-OES, 2021).

SBEPs must understand the technical, regulatory, and environmental aspects of marine energy deployment. Competencies include site selection using oceanographic and geospatial data, environmental impact statements and assessments, and knowledge of permitting frameworks under the Canadian Environmental Assessment Act (2012) and Impact Assessment Act (2019).

SBEPs must also understand resource characterization methodologies, site selection requirements, grid integration challenges, grants and subsidy mechanisms, marine spatial planning and management, coastal community impacts, and strategies for balancing renewable development with marine biodiversity protection. As Canada aims for net-zero emissions by 2050, MRE stands as a vital sector for innovation-driven, climate-aligned growth.

2.3.4 Marine Biotechnology and Bioresources

The ocean's biodiversity holds immense potential for biotechnological innovation — from pharmaceuticals and nutraceuticals to biofuels and biomaterials. Marine biotechnology applies molecular and genetic tools to harness biological resources for sustainable applications (OECD, 2019). In Canada, research initiatives such as Genome Atlantic and Ocean Frontier Institute (OFI) are advancing marine bio-discovery and innovation in marine nutraceuticals and bioactive compounds including algal bioproducts, enzymes, and medicinal compounds.

SBEPs must understand ethical bioprospecting principles under the Nagoya Protocol on Access and Benefit-Sharing (2010) and ensure compliance with biodiversity protection frameworks. Competencies include identifying bioresource value chains, supporting research-industry collaboration, and evaluating commercialization pathways that align with sustainability and equity goals. This sector exemplifies how innovation can turn biodiversity conservation into an engine for sustainable prosperity.

2.3.5 Marine and Coastal Tourism

Marine tourism — from recreational boating and diving to cruise operations — is one of the fastest-growing sectors in the global Blue Economy, generating significant revenue for coastal regions (WTTC, 2021). However, unchecked growth can threaten fragile ecosystems and cultural heritage.

SBEPs must be able to design and promote sustainable tourism models that balance economic opportunity with conservation and community benefit. Competencies include visitor impact management, sustainable certification systems (e.g., Green Key, Blue Flag), and heritage preservation.

SBEPs should also recognize the importance of cultural integrity and Indigenous participation in marine tourism planning. By prioritizing low-impact practices and education, professionals help transform tourism into a force for environmental awareness and local empowerment.

2.3.6 Ocean Technology and Digital Innovation

The digital revolution is reshaping how we observe, understand, and manage the ocean. Technologies such as autonomous underwater vehicles (AUVs), satellite remote sensing, Internet of Things (IoT) sensors, and artificial intelligence (AI) are enabling near real-time ocean monitoring and predictive modeling (OECD, 2020). Canada's leadership in ocean technology — through clusters like Canada's Ocean Supercluster — demonstrates how innovation can enhance both productivity and sustainability.

SBEPs must understand the integration of data systems (e.g., Ocean Networks Canada, Digital Ocean), interoperability standards, and data ethics principles. Competence includes leveraging big data for marine spatial planning, risk assessment, and ecosystem forecasting. Digital innovation empowers professionals to move from reactive management to proactive, evidence-based decision-making in the marine environment.

2.3.7 Cross-Sector Integration and Systems Thinking

Perhaps the most critical skill for SBEPs in the Blue Economy is systems thinking — the ability to see the ocean as a complex socio-ecological system where all sectors intersect. Actions in one domain (e.g., shipping emissions) affect others (e.g., fisheries productivity, carbon budgets, coastal health).

SBEPs must be capable of integrating economic, environmental, and social considerations in policy and planning. This requires cross-sector communication, stakeholder facilitation, and the ability to evaluate trade-offs using holistic sustainability metrics. Professionals must also engage in scenario modeling, circular economy design, and adaptive governance. These competencies enable SBEPs to act as bridge-builders — connecting innovation with stewardship and ensuring that ocean technologies serve both people and the planet.

The Blue Economy's future depends on innovation that works with nature rather than against it. Each sector, from fisheries to biotechnology, offers opportunities for economic growth and environmental

regeneration when guided by science, ethics, and collaboration. For Sustainable Blue Economy Professionals, the challenge is to lead this transition: integrating technology, policy, and local knowledge to create ocean economies that are climate-resilient, inclusive, and just. By mastering the interconnectedness of these sectors, SBEPs can help shape a global model of sustainability grounded in the health of the ocean itself.

2.3.8 Blue Economy Sectors and Technologies as a Core Competency the SBEP

The Blue Economy represents the intersection of innovation, sustainability, and marine stewardship. For Sustainable Blue Economy Professionals (SBEPs), competency in this domain means understanding how ocean-related sectors — such as fisheries, aquaculture, marine transportation, renewable energy, biotechnology, and ocean technology — contribute to economic prosperity while maintaining ecological integrity and social inclusion. These professionals must be equipped to bridge technical, environmental, and policy knowledge to foster sustainable growth and innovation across Canada's ocean industries.

Sectoral Knowledge and Systems Thinking

SBEPs must demonstrate a strong understanding of the structure, interconnection, and contribution of major Blue Economy sectors.

They should be able to:

- Identify and explain the key components of ocean sectors including fisheries, aquaculture, marine shipping, offshore energy, marine biotechnology, and coastal tourism (OECD, 2021).
- Analyze how these sectors interact within broader economic and environmental systems.
- Evaluate cross-sectoral linkages — such as how shipping affects fisheries or how offshore energy development influences marine ecosystems and
- Apply a systems-thinking approach to identify synergies, trade-offs, and pathways for sustainable development.

Technological Literacy and Ocean Innovation

Technological advancement is reshaping how we use and understand the ocean.

SBEPs should be proficient in:

- Understanding and applying emerging technologies such as autonomous vehicles (AUVs and ROVs), satellite remote sensing, digital twins, and artificial intelligence (DFO, 2023).
- Assessing the environmental and operational implications of ocean technologies.

- Supporting research, development, and commercialization of sustainable marine technologies aligned with Canada's Blue Economy Strategy (2022) and
- Promoting digital transformation and data-driven innovation within marine sectors while adhering to principles of ethics, transparency, and interoperability.

Sustainable Resource Utilization and Circular Economy

SBEPs must understand how to manage and use marine resources efficiently and responsibly.

They should be able to:

- Apply life cycle thinking to minimize waste and pollution in ocean-based industries.
- Support the adoption of circular economy models that extend product life cycles through reuse, recycling, and energy recovery.
- Integrate sustainability metrics into industrial design, production, and operations and
- Evaluate and communicate the socio-economic benefits of sustainable marine practices such as eco-certification, renewable energy integration, and low-impact aquaculture (FAO, 2020).

Policy, Governance, and Regulatory Awareness

Sustainable sectoral growth depends on effective governance.

SBEPs are expected to:

- Interpret and apply sector-specific regulations such as the Fisheries Act (2019), Canada Shipping Act (2001), and Canadian Energy Regulator Act (2019).
- Align industry operations with international commitments including MARPOL, SOLAS, and UNCLOS frameworks.
- Contribute to the development of national and regional Blue Economy policies that balance development with conservation and
- Engage in intergovernmental, industry, and Indigenous partnerships to co-create inclusive governance mechanisms.

Innovation Management and Entrepreneurship

SBEPs play a key role in fostering innovation-driven economic growth in ocean sectors.
They should be able to:

- Identify opportunities for new products, services, and business models within the Blue Economy.
- Lead or support start-ups, incubators, and research-industry collaborations that promote sustainable technologies.

- Evaluate investment readiness and environmental risk for marine innovations and
- Understand intellectual property, commercialization processes, and funding structures relevant to ocean technology development.

Environmental and Social Accountability

Every Blue Economy professional carries a responsibility to integrate sustainability principles into sectoral activities.

SBEPs must:

- Assess the environmental impacts of sector operations and promote mitigation measures that align with Canada's Net-Zero Emissions Goals (2050).
- Ensure social inclusion by considering community well-being, gender equity, and Indigenous participation in project design and implementation.
- Implement Environmental, Social, and Governance (ESG) frameworks as a foundation for ethical and transparent sectoral performance and
- Foster a culture of sustainability, stewardship, and shared accountability across industries.

Workforce and Capacity Development

The growth of Canada's Blue Economy depends on skilled, future-ready professionals.

SBEPs should be able to:

- Support workforce planning and skills development aligned with emerging Blue Economy competencies (ECO Canada, 2022).
- Promote continuous professional learning in ocean technology, sustainability, and digital innovation.
- Develop partnerships with academia, industry, and Indigenous organizations to strengthen local and regional capacity and
- Serve as mentors, educators, and advocates for a sustainable, inclusive marine workforce.

By developing these competencies, SBEPs become catalysts for sustainable transformation across ocean sectors. They combine technical proficiency with environmental ethics, driving innovation that strengthens economic resilience and protects Canada's marine ecosystems. Their work ensures that the Blue Economy evolves not only as a source of prosperity, but as a model for global sustainability — balancing technological progress with ecological and social responsibility.

2.4 Sustainability & Climate Resilience

Sustainability and climate resilience lie at the heart of the Blue Economy. They represent a shift from resource exploitation to long-term stewardship, where environmental integrity, social equity, and economic prosperity coexist in balance. For Canada, a nation with the world's longest coastline and ocean territory spanning three basins, the stakes are profound. Climate change, biodiversity loss, and economic transitions are reshaping marine environments and coastal livelihoods, demanding that professionals adopt adaptive, inclusive, and systems-based approaches to ocean management (IPCC, 2021; Government of Canada, 2022).

For Sustainable Blue Economy Professionals (SBEPs), sustainability and resilience are not abstract ideals — they are practical competencies. They involve the ability to integrate ecological science, policy, and innovation to reduce risk, enhance adaptation, and promote equity across ocean sectors. This section explores the frameworks, knowledge, and strategies that enable professionals to lead the transformation toward a climate-resilient, sustainable ocean economy.

2.4.1 The Foundations of Sustainability in the Blue Economy

At its core, sustainability is about maintaining the ocean's capacity to support life, human and non-human, across generations. The Brundtland Report (1987) defined sustainable development as meeting present needs without compromising the ability of future generations to meet theirs. Within the Blue Economy, this means aligning marine resource use with ecological thresholds, community needs, and climate commitments.

SBEPs must understand global sustainability frameworks such as the United Nations Sustainable Development Goals (SDGs) — particularly SDG 13 (Climate Action) and SDG 14 (Life Below Water) — and how these intersect with Canada's Blue Economy Strategy and Net-Zero Emissions by 2050 goal. Professionals must also be able to apply sustainability indicators, conduct life-cycle assessments, and design projects that reflect the three pillars of sustainability: environmental protection, economic viability, and social well-being. Competence in sustainability requires systems thinking — recognizing that environmental degradation, inequality, and economic instability are interlinked challenges requiring integrated, collaborative solutions (Rockström et al., 2009).

2.4.2 Climate Change Impacts on Oceans and Coasts

The ocean is the planet's greatest climate regulator, absorbing over 90% of excess heat and nearly 25% of global CO_2 emissions (IPCC, 2021). Yet these functions come at immense cost: rising sea levels, ocean acidification, and warming are altering marine habitats, redistributing species, and intensifying coastal hazards (NOAA, 2020). For Canada, the effects are visible and urgent — sea ice loss in the Arctic, coastal erosion in Atlantic communities, and marine heatwaves affecting Pacific fisheries (Fisheries and Oceans Canada, 2021).

SBEPs must be able to analyze climate data, assess vulnerability across ecological and socio-economic systems, and translate these insights into adaptive management strategies. This includes

using climate models, risk mapping, and scenario planning tools to forecast impacts and guide decision-making. Competencies also include understanding the global frameworks that govern climate action, including the Paris Agreement (2015) and Canada's National Adaptation Strategy (2022), to ensure that marine and coastal initiatives align with international and national commitments.

2.4.3 Ecosystem-Based Adaptation (EbA) and Nature-Based Solutions (NbS)

Ecosystem-based approaches offer powerful, low-carbon solutions to climate adaptation. By restoring mangroves, seagrasses, salt marshes, and wetlands, nations can enhance coastal resilience while strengthening biodiversity and carbon storage (UNEP, 2020). These Nature-Based Solutions (NbS) reduce flood risks, stabilize shorelines, and provide essential habitats — simultaneously benefiting ecosystems, economies, and communities.

SBEPs must understand the design and implementation of NbS, including ecological principles, stakeholder engagement, and performance monitoring. Competencies include project planning using ecosystem services valuation, assessing co-benefits (carbon sequestration, water quality, biodiversity), and integrating traditional knowledge into restoration practices.

In Canada, programs such as the Coastal Restoration Fund and the Nature Smart Climate Solutions Fund illustrate how restoration and adaptation can work hand in hand to build climate resilience and community well-being (Environment and Climate Change Canada, 2022).

2.4.4 Blue Carbon and Climate Mitigation

Blue carbon ecosystems — including mangroves, salt marshes, and seagrasses — are among the planet's most effective natural carbon sinks. They sequester up to five times more carbon per hectare than terrestrial forests and store it for centuries in deep sediments (UNEP, 2020). For SBEPs, understanding the science and policy of blue carbon is critical to linking marine conservation with climate mitigation.

Professionals must be able to quantify carbon storage, assess ecosystem degradation, and integrate blue carbon into carbon accounting systems and climate finance mechanisms. Knowledge of emerging global initiatives, such as the Blue Carbon Initiative and the High-Level Panel for a Sustainable Ocean Economy, is essential. Competencies include evaluating carbon offset opportunities, supporting carbon market readiness, and ensuring that projects uphold ecological integrity and social equity — particularly for Indigenous and local communities reliant on coastal ecosystems.

2.4.5 Resilient Coastal Infrastructure and Adaptation Planning

Canada's coastal communities face growing exposure to flooding, erosion, and storm surges due to climate change. Traditional "grey" infrastructure like seawalls, dikes, and barriers often fails to adapt or support ecosystem health. SBEPs must be equipped to design or evaluate hybrid

infrastructure solutions, integrating green and grey systems to enhance resilience and reduce long-term costs.

Competencies include coastal vulnerability assessments, engineering-ecology collaboration, and cost-benefit analysis using natural capital frameworks.

SBEPs must also engage with municipal and provincial adaptation planning processes, ensuring that infrastructure investments reflect sustainability principles and equitable access to protection. By promoting adaptive design, professionals play a key role in safeguarding coastal communities and economic assets against future climate risks.

2.4.6 Sustainability Transitions and Circular Economy

A sustainable Blue Economy requires rethinking how we produce, consume, and manage marine resources. The circular economy model replaces the "take-make-dispose" approach with systems that minimize waste, extend product lifecycles, and recycle materials — particularly plastics, fishing gear, and ship components (Ellen MacArthur Foundation, 2019).

SBEPs must understand the principles of resource efficiency, life-cycle management, and circular design. Competence includes identifying value chains in which waste can be transformed into economic opportunity — such as recycling marine plastics into composite materials or repurposing decommissioned vessels. SBEPs should also engage in policy advocacy to reduce marine litter through extended producer responsibility and sustainable procurement. By embedding circular economy thinking in marine industries, professionals help drive innovation, reduce environmental footprints, and promote a culture of sustainability across ocean sectors.

2.4.7 Community Resilience and Climate Justice

True sustainability must be inclusive. Climate impacts disproportionately affect Indigenous, remote, and low-income coastal communities, whose livelihoods and cultures are closely tied to marine ecosystems. SBEPs must approach resilience through a climate justice lens, ensuring that adaptation and mitigation strategies are equitable, participatory, and grounded in local realities (Ford et al., 2020).

Competencies include facilitating community-based adaptation, supporting Indigenous co-management, and integrating traditional knowledge into resilience planning.

Professionals must also ensure that gender, youth, and social inclusion are central to sustainability programs. Empowering communities through education, governance participation, and access to green jobs is key to fostering resilience that lasts. Sustainability and climate resilience are the pillars upon which a thriving Blue Economy must stand. For SBEPs, this means leading with foresight, empathy, and innovation, using science and systems thinking to navigate uncertainty and ensure that economic growth reinforces environmental health and social equity. A resilient ocean economy is one that adapts, regenerates, and includes, guided by professionals who see beyond immediate outcomes to the legacy of their decisions for future generations.

2.4.8 Sustainability Principles and Frameworks as a Core Competency for the SBEP

SBEPs must have a comprehensive understanding of sustainability theory and practice as it applies to marine and coastal systems.

They should be able to:

- Explain key sustainability models such as the triple bottom line (environmental, social, economic) and systems-based approaches to resilience.
- Apply frameworks from the United Nations Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action) and SDG 14 (Life Below Water).
- Recognize the interdependence of ecological health, social equity, and economic opportunity in marine contexts and
- Integrate sustainability assessment tools such as life-cycle analysis, ESG metrics, and environmental foot printing into planning and operations (UNEP, 2022).

Climate Science and Ocean-Climate Interactions

Climate literacy is essential for SBEPs to interpret and address the ocean's changing dynamics.
They should be able to:

- Understand the mechanisms of climate change, including ocean warming, acidification, deoxygenation, and sea-level rise (IPCC, 2023).
- Interpret and use climate data, models, and projections to assess impacts on fisheries, marine infrastructure, and coastal ecosystems.
- Evaluate climate change implications for marine biodiversity, coastal communities, and ocean industries and
- Contribute to evidence-based climate adaptation and mitigation strategies within the Blue Economy framework.

Adaptation and Resilience Planning

SBEPs must be capable of developing adaptive systems that enhance both ecological and human resilience.

They should be able to:

- Conduct vulnerability and risk assessments for marine and coastal regions.
- Design and implement nature-based solutions such as mangrove restoration, seagrass protection, and living shorelines that buffer climate impacts.
- Develop and monitor climate adaptation plans for fisheries, ports, aquaculture, and coastal infrastructure and

- Integrate traditional and local knowledge into resilience planning to ensure culturally relevant, place-based solutions (TRC, 2015).

Carbon Management and Blue Carbon Strategies

As global carbon markets and net-zero goals expand, SBEPs play a vital role in developing blue carbon solutions.

They should be able to:

- Understand and apply carbon accounting methods for mangroves, salt marshes, and seagrass meadows (IPCC, 2019).
- Evaluate the carbon sequestration potential of marine ecosystems and their role in national emissions inventories.
- Support the development of carbon credit projects and ecosystem restoration initiatives that align with Canada's Net-Zero Emissions by 2050 strategy and
- Promote policies that integrate blue carbon into broader climate finance and conservation frameworks.

Sustainable Infrastructure and Coastal Adaptation

SBEPs must understand the design and governance of coastal infrastructure that balances development with resilience.

They should be able to:

- Evaluate the sustainability of marine and port infrastructure using green building standards (e.g., LEED, Envision).
- Apply ecosystem-based coastal engineering practices that reduce physical vulnerability while maintaining ecological functions.
- Collaborate with engineers, planners, and policymakers to integrate resilience into design and permitting processes and
- Identify opportunities to retrofit or repurpose existing coastal infrastructure for greater energy efficiency and adaptive capacity.

Policy Integration and Climate Governance

Climate resilience requires cross-sectoral governance and coherent policy frameworks.

SBEPs should be able to:

- Understand Canada's climate policy landscape, including the Canadian Net-Zero Emissions Accountability Act (2021) and the Pan-Canadian Framework on Clean Growth and Climate Change (2016).

- Contribute to national adaptation strategies such as Canada's National Adaptation Strategy (2022).
- Align institutional and industry-level actions with global agreements like the Paris Agreement (2015) and
- Promote intergovernmental coordination and policy coherence in implementing climate adaptation and sustainability objectives.

Ethical, Social, and Equity Dimensions of Climate Action

Climate resilience is as much a social responsibility as a scientific or technical challenge.

SBEPs are expected to:

- Ensure that climate adaptation plans address social justice, gender equity, and Indigenous rights.
- Recognize how climate impacts disproportionately affect vulnerable communities and design interventions accordingly.
- Foster inclusive stakeholder engagement, empowering communities to participate in resilience-building processes and
- Uphold the ethical principles of transparency, precaution, and intergenerational equity in climate decision-making (UNEP, 2022).

Communication, Leadership, and Advocacy

Effective climate action depends on the ability to translate complex science into clear, actionable messages.

SBEPs must:

- Communicate climate risks and solutions to diverse audiences including policymakers, industry leaders, and local communities.
- Build awareness and advocacy for sustainable practices across the Blue Economy sectors.
- Lead collaborative initiatives that integrate research, innovation, and public engagement and
- Serve as ambassadors for ocean-climate literacy, inspiring collective responsibility for ocean resilience.

SBEPs who master these competencies become catalysts for transformational climate leadership. They integrate sustainability principles into daily practice, design adaptive solutions that protect people and ecosystems, and influence the systemic change needed to build a resilient Blue

Economy. Through their work, they ensure that Canada's oceans remain productive, equitable, and resilient in the face of global climate challenges.

2.5 Marine Resource Management

Marine Resource Management (MRM) lies at the heart of a sustainable ocean economy. It is the process of using, protecting, and restoring ocean and coastal resources in ways that support ecological integrity, economic prosperity, and community well-being. In the context of the Sustainable Blue Economy, resource management is not about restriction — it is about responsibility. It asks how we can meet human needs without exhausting the ocean's capacity to renew itself, ensuring that prosperity today does not come at the expense of tomorrow.

For Sustainable Blue Economy Professionals (SBEPs), this means developing the knowledge and skills to balance the often-competing demands of conservation and economic development. SBEPs must understand how laws, ecosystems, communities, and industries intersect — and how to integrate science, governance, and ethics into every management decision.

2.5.1 Ecosystem-Based and Integrated Management

Modern marine management is grounded in the Ecosystem-Based Management (EBM) and Integrated Management (IM) approaches embedded within Canada's Oceans Act (1996). These frameworks recognize that the ocean is a living system — interconnected, dynamic, and deeply linked to human activities. EBM shifts management away from single-species or single-sector perspectives and toward a holistic view that considers cumulative impacts, climate change, and socio-economic conditions (DFO, 2021).

SBEPs must be competent in applying EBM principles by identifying ecological indicators, evaluating trade-offs, and adapting strategies based on monitoring and feedback. Integrated Management (IM), in turn, emphasizes cooperation across jurisdictions and stakeholders — including Indigenous governments, industry, and local communities — to ensure that ocean decisions reflect shared goals rather than isolated interests.

2.5.2 Fisheries and Food Security

Fisheries are both a cultural foundation and a source of economic resilience for many Canadian communities. Sustainable fisheries management is about maintaining ecological balance while securing food supply, livelihoods, and biodiversity. The Fisheries Act (2019) and its supporting regulations embed the precautionary principle and ecosystem-based fisheries management, emphasizing the need for science-informed quotas, habitat protection, and stock monitoring (FAO, 2022).

SBEPs must be able to interpret stock assessment data, assess fishing pressure, and integrate local and Indigenous knowledge into fisheries planning. Competencies also include understanding global sustainability standards such as the Marine Stewardship Council (MSC) and managing community-

based fisheries through co-management frameworks. This ensures that management systems are both scientifically sound and socially just.

2.5.3 Aquaculture and Sustainable Production

As demand for seafood grows, aquaculture provides a pathway to meet global needs while reducing pressure on wild stocks. However, sustainability in aquaculture depends on how production systems interact with surrounding ecosystems.

SBEPs must understand the environmental, technical, and social aspects of aquaculture — from site selection and nutrient cycling to biosecurity and social acceptance (FAO, 2020).

Competence includes evaluating Integrated Multi-Trophic Aquaculture (IMTA) systems, which mimic natural nutrient flows by combining species such as finfish, shellfish, and seaweeds. SBEPs should be able to conduct Environmental Impact Assessments (EIAs), apply best practices in waste management, and assess technological innovations such as offshore aquaculture and recirculating systems. The goal is to create production systems that feed communities while maintaining ecological harmony.

2.5.4 Marine Protected Areas and Conservation Tools

Marine Protected Areas (MPAs) are a cornerstone of marine resource management and biodiversity conservation. Canada's commitment to protecting 30% of its marine and coastal areas by 2030 underlines the importance of MPAs as both ecological sanctuaries and tools for sustainable use (Government of Canada, 2023).

SBEPs must understand how to design, monitor, and evaluate MPAs, including spatial planning, habitat mapping, and stakeholder engagement. Competencies include assessing ecological representativeness, applying adaptive management, and facilitating partnerships with Indigenous and coastal communities. By integrating MPAs into broader marine planning frameworks, professionals help ensure that conservation is compatible with economic and cultural realities.

2.5.5 Seabed Minerals and Deep-Sea Stewardship

The ocean floor holds valuable mineral resources — from cobalt and nickel to rare earth elements critical for renewable energy technologies. Yet deep-sea mining poses ethical and environmental challenges that test the limits of governance and science (ISA, 2021).

SBEPs must understand international frameworks such as the United Nations Convention on the Law of the Sea (UNCLOS) and the International Seabed Authority (ISA), which regulate seabed exploration and extraction. Competencies include applying the precautionary principle, conducting deep-sea impact assessments, and evaluating technological and ecological uncertainties. Professionals must also be able to advocate for policies that align exploration with sustainability, biodiversity protection, and intergenerational equity.

2.5.6 Monitoring, Evaluation, and Adaptive Learning

No management system is perfect — which is why adaptive learning is central to the SBEP skill set. Monitoring and evaluation enable professionals to measure progress, identify unintended impacts, and adjust actions accordingly (Holling, 1978).

SBEPs must be able to design performance indicators, manage data systems, and integrate both scientific and traditional knowledge into feedback mechanisms. Competence includes facilitating participatory monitoring with local stakeholders and applying quantitative and qualitative evaluation methods. By embedding learning into management, SBEPs help ensure that ocean policies remain flexible, transparent, and responsive to change.

2.5.7 Marine Resource Management as a Core Competency for the SBEP

Marine Resource Management is where the vision of the Sustainable Blue Economy becomes operational — it's about how people, policies, and technologies interact to use ocean resources responsibly. For Sustainable Blue Economy Professionals (SBEPs), this means developing the knowledge and judgment to balance productivity with protection, ensuring that living and non-living marine resources are managed for long-term ecological, economic, and social benefit. It requires a deep understanding of ecosystems, governance systems, risk management, and market dynamics, as well as the ability to lead integrated, evidence-based management across multiple ocean sectors.

Integrated Resource Management Knowledge

SBEPs must have a holistic understanding of how marine resources — from fisheries and aquaculture to minerals, energy, and genetic materials — are governed and used.

They should be able to:

- Understand the principles of Integrated Coastal and Ocean Management (ICOM) and how it connects ecological, social, and economic objectives (Oceans Act, 1996).
- Identify the interrelationships between fisheries, shipping, tourism, and energy in shared marine spaces.
- Apply the ecosystem-based approach to resource management, ensuring that extraction or development aligns with ecosystem carrying capacity.
- Conduct Risk Assessments to protect public and marine safety and
- Use systems thinking to evaluate the risk of trade-offs and of co-benefits among competing marine uses.

Fisheries and Aquaculture Management

Fisheries and aquaculture form the cornerstone of Canada's ocean economy and food security.

SBEPs must:

- Understand the biological, ecological, and economic dimensions of fishery systems.
- Apply the risk managed precautionary approach and maximum sustainable yield (MSY) principles in fisheries assessment and management (FAO, 2020).
- Support the implementation of ecosystem-based fisheries management (EBFM) that accounts for bycatch, habitat impacts, and food-web interactions.
- Evaluate sustainable aquaculture practices, including feed efficiency, water quality management, and disease prevention and
- Collaborate with Indigenous and local fishers to incorporate Traditional Knowledge into co-management frameworks.

Data-Driven Decision-Making and Marine Resource Assessment

Effective management depends on accurate, transparent data.

SBEPs should be able to:

- Collect, analyze, and interpret data related to fish stocks, seabed mapping, biodiversity indicators, and habitat conditions.
- Apply statistical and geospatial tools (e.g., GIS, satellite monitoring, and acoustic surveys) to assess resource status and trends.
- Use modeling tools such as Ecopath, Atlantis, or stock assessment models to inform sustainable harvest limits and
- Support data-sharing systems that enhance transparency and interagency collaboration in marine management.

Resource Economics and Valuation

Sustainable management requires an understanding of both ecological and economic value.

SBEPs must:

- Evaluate the economic, social, and environmental trade-offs of resource use.
- Apply methods of natural capital accounting and ecosystem service valuation to quantify marine contributions to the economy.
- Support the design of market-based incentives, such as eco-labeling, carbon credits, and resource royalties, that promote sustainability and

- Analyze how global supply chains, subsidies, and trade policies affect local resource management outcomes.

Marine Spatial Planning (MSP) and Resource Allocation

SBEPs should understand and apply spatial management tools to balance multiple uses in shared marine environments.

They must be able to:

- Contribute to Marine Spatial Planning (MSP) processes that integrate ecological, industrial, and cultural priorities.
- Interpret spatial data to support zoning decisions for fisheries, aquaculture, marine protected areas, and energy projects.
- Facilitate multi-stakeholder dialogues that promote equitable and transparent decision-making and
- Ensure that spatial plans are adaptive and responsive to new data, technologies, and climate impacts (Ehler & Douvere, 2009).

Governance, Policy, and Institutional Collaboration

Marine resource management operates across multiple governance levels — local, national, and international.

SBEPs are expected to:

- Understand and apply Canadian legislation such as the Fisheries Act (2019), Oceans Act (1996), and Canadian Environmental Protection Act (1999).
- Navigate international frameworks such as UNCLOS, the Convention on Biological Diversity (CBD), and the FAO Code of Conduct for Responsible Fisheries (1995).
- Work effectively across government, industry, Indigenous, and community organizations to design and implement resource management policies and
- Promote inclusive governance that recognizes Indigenous rights, gender equity, and community participation.

Monitoring, Compliance, and Enforcement

Ensuring sustainability requires consistent oversight and ethical compliance.

SBEPs must:

- Understand the principles of monitoring, control, and surveillance (MCS) systems for fisheries and marine industries.

- Support implementation of international frameworks such as the Port State Measures Agreement (PSMA, 2009) to combat Illegal, Unreported, and Unregulated (IUU) fishing.
- Develop compliance strategies using both technological tools (e.g., vessel monitoring systems, drones, eDNA) and community-based approaches and
- Evaluate the effectiveness of enforcement measures and recommend improvements that enhance fairness and accountability.

Restoration, Rehabilitation, and Adaptive Management

Resource management is not only about use — it's about renewal.

SBEPs should be capable of:

- Designing and implementing marine habitat restoration and rehabilitation projects for degraded ecosystems (e.g., coral, seagrass, shellfish reefs)
- Applying adaptive management frameworks to update practices based on monitoring feedback and changing conditions.
- Collaborating with scientists, local organizations, and policymakers to restore ecological function and build social resilience and
- Measuring success using ecological, social, and economic performance indicators.

Ethical, Cultural, and Indigenous Perspectives

True sustainability integrates culture and ethics into every management decision.

SBEPs must:

- Recognize Indigenous stewardship values and their alignment with ecosystem-based management.
- Respect and apply Traditional Knowledge (TK) and community-based governance models.
- Uphold principles of equity, justice, and shared benefit in marine resource access and use and
- Lead with ethical integrity, ensuring transparency and accountability in all management practices.

Sustainable Blue Economy Professionals who master these competencies can harmonize resource productivity with planetary boundaries. They understand that managing marine resources responsibly means looking beyond extraction — toward stewardship, renewal, and shared prosperity. Through their leadership, Canada's Blue Economy can model how economic growth, ecological integrity, and cultural respect can coexist in a thriving, resilient ocean future.

2.6 Community Engagement & Indigenous Knowledge

Community engagement and Indigenous knowledge are the heart and conscience of the Sustainable Blue Economy. Oceans are not merely economic spaces — they are cultural landscapes, sources of identity, and lifelines for communities that have lived with and cared for them for millennia. Effective marine management, therefore, must reflect both scientific understanding and the wisdom of those who depend on the ocean most directly.

For Sustainable Blue Economy Professionals (SBEPs), this means recognizing that equitable, inclusive engagement is not an optional practice — it is an ethical and professional imperative. Working with communities, particularly Indigenous and coastal peoples, requires respect, humility, and a commitment to shared stewardship. This section highlights the principles, processes, and competencies needed to integrate Indigenous Knowledge Systems (IKS) and participatory governance into sustainable ocean management.

2.6.1 Inclusive Ocean Governance

Inclusive governance begins with recognizing that ocean management must involve everyone who holds a stake in its future. Coastal communities, Indigenous governments, local fishers, youth, and civil society all bring perspectives that enrich decision-making.

SBEPs must be able to design participatory processes that are transparent, equitable, and culturally appropriate. This includes facilitating dialogue, ensuring accessible communication, and embedding Free, Prior, and Informed Consent (FPIC) into planning processes. Inclusive governance ensures that policy decisions reflect lived realities — transforming management from top-down control into shared responsibility.

In Canada, this aligns with federal commitments to reconciliation under the Truth and Reconciliation Commission Calls to Action (2015) and the implementation of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP, 2007). These frameworks call for Indigenous leadership in co-management and the protection of inherent rights to lands, waters, and resources.

2.6.2 Indigenous Knowledge Systems (IKS) and Traditional Stewardship

Indigenous Knowledge Systems represent generations of lived experience, observation, and adaptation to local ecosystems. This knowledge is relational rather than extractive — grounded in principles of reciprocity, respect, and intergenerational responsibility (Simpson, 2017).

For SBEPs, integrating IKS means more than simply “including traditional knowledge.” It requires creating conditions for co-production of knowledge, where Indigenous perspectives and Western science are placed on equal footing. Professionals should be skilled in collaborative research, ethical data management, and culturally safe engagement.

Section 35 of Canada’s Constitution Act (1982) recognizes the rights of Indigenous peoples to self-determination and resource management. Programs such as Indigenous Protected and Conserved

Areas (IPCAs) and Guardian Programs embody this integration, showing how IKS strengthen biodiversity protection and climate adaptation.

2.6.3 Community-Led Co-Management

Co-management is the bridge between governance and community action. It involves sharing authority, knowledge, and responsibility among governments, Indigenous nations, and local users. Successful examples — from Nunavut's fisheries co-management boards to British Columbia's marine planning partnerships — demonstrate that joint decision-making leads to more sustainable and equitable outcomes (Armitage et al., 2009).

SBEPs must be competent in building trust, facilitating power-sharing arrangements, and mediating among diverse interests. This requires cultural competency, conflict resolution skills, and an understanding of legal frameworks that support co-management. Effective co-management doesn't just distribute responsibility — it builds long-term capacity, ensuring communities can sustain marine stewardship independently.

2.6.4 Social Inclusion and Equity

A sustainable Blue Economy must work for everyone. This includes addressing barriers related to gender, youth, accessibility, and economic inequality. SBEPs should be able to identify and mitigate systemic barriers that prevent participation, ensuring that marginalized voices are represented in decision-making.

Social inclusion means integrating gender-responsive and intersectional approaches into marine planning and workforce development. It also means investing in education, mentorship, and capacity-building programs that empower youth and underrepresented groups to participate in the Blue Economy. By fostering inclusion, professionals contribute not only to social justice but also to innovation — as diverse perspectives lead to better, more creative solutions.

2.6.5 Cultural Sustainability and Intergenerational Learning

The ocean holds memory — it carries stories, songs, and teachings that shape identity and belonging. Cultural sustainability ensures that these intangible connections are preserved alongside ecological and economic goals.

SBEPs play a key role in supporting programs that integrate culture with sustainability — from Indigenous marine heritage education to community-based monitoring that combines science with storytelling. Competence in this area includes facilitating intergenerational learning, supporting Indigenous languages related to marine knowledge, and embedding cultural practices into resource management plans. By honoring cultural continuity, professionals help ensure that the Blue Economy strengthens, rather than replaces, the human relationships that make the ocean meaningful.

2.6.6 Community Engagement and Indigenous knowledge as a Core Competency for SBEPs

Community engagement and Indigenous knowledge lie at the heart of sustainable ocean governance. The ocean is not only an ecological system—it is a cultural, spiritual, and economic foundation for many communities, particularly Indigenous Peoples whose stewardship of marine spaces predates modern governance.

For Sustainable Blue Economy Professionals (SBEPs), this section explores the skills SBEPs need to bridge science, policy, and lived experience, ensuring that Blue Economy growth benefits all people while protecting the cultural and ecological integrity of Canada's ocean spaces. It emphasizes the capacity to engage respectfully and collaboratively with coastal and Indigenous communities, recognize multiple knowledge systems, and co-create solutions that advance both sustainability and social equity. Building community partnerships is not a symbolic exercise—it is a practice of listening, co-learning, and shared responsibility.

Cultural Competence and Respectful Engagement

SBEPs must begin by understanding and valuing the cultural, historical, and spiritual relationships that communities—especially Indigenous Nations—have with the ocean.

They should be able to:

- Demonstrate cultural humility and recognize the diverse governance traditions, rights, and worldviews of Indigenous Peoples (TRC, 2015).
- Apply the principles of Free, Prior, and Informed Consent (FPIC) when engaging with Indigenous communities (UNDRIP, 2007).
- Acknowledge and respect local stewardship practices that sustain coastal ecosystems and livelihoods and
- Engage in reciprocal learning—listening before leading—and ensure that community voices are integral to decision-making.

Integration of Indigenous Knowledge Systems (IKS)

Indigenous Knowledge Systems provide holistic, place-based insights into ecosystem dynamics, resource cycles, and resilience.

SBEPs should:

- Understand how IKS complements Western science in monitoring and managing marine resources (Berkes, 2018).
- Facilitate two-eyed seeing (Etuaptmumk), a framework that weaves Indigenous and scientific perspectives for more inclusive and effective decision-making (Bartlett et al., 2012).

- Respect intellectual property rights and ensure the ethical use of traditional knowledge in research and policy and
- Promote co-production of knowledge through partnerships that recognize Indigenous data sovereignty and guardianship.

Community Participation and Co-Management

Community participation is the cornerstone of equitable ocean governance.

SBEPs should be able to:

- Facilitate inclusive consultations and participatory planning processes that empower local voices.
- Support co-management frameworks that share decision-making power between governments, Indigenous Nations, and local stakeholders.
- Apply community-based management tools such as Local Ecological Knowledge (LEK) mapping and participatory GIS to capture community priorities.
- Build long-term trust and accountability by maintaining transparent communication, feedback loops, and shared monitoring.

Social Inclusion and Equity in the Blue Economy

Sustainable ocean development must serve all people, not just industry interests.

SBEPs must:

- Identify and address barriers that limit participation by women, youth, Indigenous Peoples, and marginalized communities in Blue Economy initiatives (UN Women, 2020).
- Promote policies that ensure equitable access to marine resources, education, and employment.
- Integrate gender-responsive and inclusive approaches into project design and evaluation and
- Recognize that true sustainability requires both ecological balance and social justice.

Indigenous Rights and Legal Frameworks

Understanding Indigenous rights is essential to ethical and lawful engagement.

SBEPs should:

- Interpret Section 35 of the Constitution Act (1982), which recognizes and affirms existing Aboriginal and treaty rights.

- Understand the implementation of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and how it guides federal and provincial policy.
- Support reconciliation-based partnerships grounded in respect, recognition, and co-decision-making and
- Ensure that marine planning, resource use, and conservation align with the spirit and intent of Indigenous law and governance traditions.

Communication, Facilitation, and Relationship-Building

Effective engagement depends on empathy and communication.

SBEPs should be able to:

- Use clear, inclusive, and culturally appropriate communication strategies for diverse audiences.
- Facilitate dialogues that balance scientific, community, and policy perspectives.
- Build sustained relationships through honesty, reliability, and shared outcomes and
- Act as connectors between institutions, communities, and industry—bridging sectors through mutual trust and shared purpose.

Ethical Stewardship and Shared Leadership

Engagement is not about consultation alone. It is about shared guardianship of the ocean.

SBEPs should:

- Champion ethical leadership rooted in respect, reciprocity, and responsibility.
- Recognize communities as equal partners in decision-making and stewardship.
- Foster collaborative monitoring and reporting mechanisms that uphold community ownership of data and outcomes and
- Encourage youth participation and intergenerational knowledge transfer to sustain cultural and environmental continuity.

SBEPs who cultivate these competencies will serve as trusted partners and bridge-builders in Canada's Blue Economy. They will know how to listen deeply, collaborate authentically, and apply Indigenous and local knowledge to strengthen marine stewardship. Through inclusive engagement and respect for Indigenous rights, they will help ensure that ocean governance is not only sustainable—but just, equitable, and reflective of the diverse communities who depend on and care for the sea.

2.7 Ocean Data & Innovation

In today's digital era, data is as vital to the ocean as water itself. The ability to observe, measure, and interpret marine systems is transforming how we understand and manage our blue planet. Ocean Data & Innovation sits at the crossroads of science, technology, and sustainability, empowering decision-makers to act with precision, transparency, and foresight. For Sustainable Blue Economy Professionals (SBEPs), this knowledge area is about more than collecting data; it's about turning information into insight and innovation into action.

2.7.1 The Digital Ocean Revolution

The ocean has always been vast and mysterious, but today, advances in digital technology are bringing it within reach. Through initiatives such as Ocean Networks Canada, the Global Ocean Observing System (GOOS), and Canada's Digital Ocean Strategy (2022), we are building an interconnected network of sensors, satellites, and autonomous systems that continuously monitor ocean conditions.

SBEPs must understand how these systems collect data on temperature, salinity, currents, biodiversity, and pollutants and how that data can be analyzed to guide sustainable policy and industry practices. The Digital Ocean represents a new frontier for innovation. It allows Canada and the world to forecast ocean changes, improve maritime safety, and manage resources with unprecedented accuracy.

2.7.2 Emerging Technologies in the Blue Economy

Innovation is reshaping every ocean sector. From artificial intelligence (AI) that predicts algal blooms to autonomous underwater vehicles (AUVs) that map the seabed, technology enables smarter, safer, and more sustainable operations. Remote sensing, unmanned surface vessels (USVs), Internet of Things (IoT) sensors, and digital twins are helping scientists, engineers, and policymakers visualize complex marine systems in real time.

SBEPs must be able to evaluate these technologies not only for efficiency but also for environmental and ethical implications. This includes understanding the life cycle impacts of marine tech, data ownership, intellectual property, cybersecurity, and digital equity. Professionals who can bridge the gap between technology and stewardship will lead the transformation toward a smarter, cleaner ocean economy.

2.7.3 Data Governance and Interoperability

As the volume of marine data grows, so does the challenge of managing it responsibly. Data governance ensures that information is accurate, accessible, secure, and ethically used. SBEPs must be familiar with open data principles, metadata standards, and FAIR (Findable, Accessible, Interoperable, Reusable) frameworks — which allow data from different sources to work together seamlessly (UNESCO-IOC, 2021).

Interoperability is critical: ocean data collected by research institutions, Indigenous Guardians, and private companies must be compatible to support national and international collaboration. The Canadian Integrated Ocean Observing System (CIOOS) exemplifies this approach, linking regional data networks into a unified national framework that supports policy development, research, and innovation.

2.7.4 Open Science and Data Ethics

Open science is about democratizing knowledge — ensuring that the benefits of ocean research are shared broadly. However, openness must be balanced with data ethics, particularly when working with Indigenous and community-based knowledge.

SBEPs must understand issues of data sovereignty, consent, and cultural sensitivity in how marine information is gathered and shared. Ethical data management means respecting ownership, protecting sensitive locations (such as sacred or culturally significant marine sites), and ensuring that communities benefit from the data they contribute. By adopting these principles, SBEPs help build trust and transparency while advancing equitable access to ocean intelligence.

2.7.5 Innovation for Climate and Sustainability

Ocean data and innovation are not just technological tools — they are powerful enablers of climate resilience and sustainability. Through integrated data systems, professionals can track carbon fluxes, monitor sea-level rise, model marine ecosystems, and evaluate restoration outcomes.

SBEPs who can interpret this data and communicate it effectively play a key role in bridging science and decision-making. For example, combining real-time monitoring with predictive modeling helps guide marine spatial planning, energy development, and conservation initiatives. Innovation in ocean data allows Canada to align its Blue Economy with the UN Sustainable Development Goals (SDGs), particularly SDG 14: Life Below Water.

2.7.6 Ocean Data & Innovation as a Core Competency for SBEPs

Ocean data and technology are the driving forces behind modern marine sustainability and economic growth. In the era of digital transformation, Sustainable Blue Economy Professionals (SBEPs) must not only understand the ocean — they must also know how to measure, model, and manage it.

This section focuses on how data-driven decision-making, emerging technologies, and innovation ecosystems empower SBEPs to enhance environmental stewardship, operational efficiency, and climate resilience. Canada's Blue Economy increasingly depends on digital tools such as autonomous underwater vehicles (AUVs), remote sensing, artificial intelligence (AI), and big data analytics. By integrating these innovations with ethical governance and open science principles, SBEPs can bridge the gap between ocean science, policy, and practice — ensuring that data serves both people and the planet.

Data Literacy and Ocean Observation Systems

SBEPs must understand how ocean data is collected, processed, and applied in real-world decision-making.

They should be able to:

- Interpret oceanographic and environmental datasets from platforms such as Ocean Networks Canada, the Global Ocean Observing System (GOOS), and Fisheries and Oceans Canada (DFO).
- Understand the principles of data acquisition, quality assurance, and metadata standards.
- Use tools such as GIS, remote sensing, and satellite imagery to analyze spatial and temporal ocean trends and
- Communicate complex data effectively to diverse stakeholders, ensuring accessibility and transparency (GOOS, 2022).

Application of Emerging Technologies

Innovation in the Blue Economy is driven by new technologies that enhance our ability to explore and protect marine environments.

SBEPs should:

- Understand how autonomous systems (AUVs, ROVs, and gliders) improve data collection in deep or hazardous waters.
- Apply AI and machine learning to analyze large datasets, predict ocean conditions, and optimize resource management.
- Use blockchain and IoT (Internet of Things) systems for supply chain transparency and sustainable seafood traceability and
- Support the adoption of renewable ocean energy technologies such as wave, tidal, and offshore wind systems that contribute to decarbonization of the energy economy.

Digital Ocean Infrastructure and Interoperability

Modern ocean governance depends on data that is open, integrated, and interoperable.

SBEPs must:

- Contribute to the development of Canada's Digital Ocean Strategy (2022) and regional data networks
- Understand principles of data interoperability, open-source standards, and data governance.

- Ensure ethical management of marine data, respecting privacy, sovereignty, and Indigenous data rights (OCAP® principles) and
- Collaborate across sectors to build data ecosystems that support innovation, monitoring, and equitable access.

Innovation and Entrepreneurship in the Blue Economy

Innovation is both a mindset and a skill. SBEPs must be able to transform scientific insights into practical, sustainable solutions.

They should:

- Understand the innovation lifecycle — from research and development (R&D) to commercialization and policy integration.
- Support public-private partnerships (PPPs) that foster technology transfer and innovation in marine industries.
- Engage in design thinking and systems innovation to co-create solutions with communities, industry, and academia and
- Promote entrepreneurship by mentoring startups and innovators in ocean technology sectors such as aquatech, clean shipping, and digital monitoring.

Big Data, Artificial Intelligence (AI), and Predictive Analytics

SBEPs must be able to leverage advanced computational tools to inform sustainability.

They should be able to:

- Integrate AI-driven models to forecast marine conditions, biodiversity changes, and resource availability.
- Apply predictive analytics to anticipate risks in shipping, fisheries, and climate adaptation.
- Evaluate ethical dimensions of data-driven decision-making, including algorithmic bias and accountability and
- Collaborate with data scientists and engineers to ensure that technology aligns with sustainability and governance priorities.

Cybersecurity and Data Ethics

With the growth of digital ocean infrastructure comes the responsibility of safeguarding it.

SBEPs should:

- Recognize cyber risks associated with marine operations, including autonomous vessels, sensors, and data centers.

- Support implementation of cyber resilience protocols aligned with IMO and ISO standards.
- Uphold data ethics through transparent, responsible, and equitable data use and
- Promote trust and accountability in digital ocean systems by integrating ethical design and stakeholder oversight.

Knowledge Translation and Decision Support

SBEPs act as intermediaries between data and decision-making.

They must be able to:

- Translate scientific findings into policy-relevant insights and operational recommendations.
- Use data visualization, dashboards, and decision-support tools to communicate complex information clearly.
- Develop participatory digital tools that empower local communities and policymakers to engage with data and
- Build capacity within organizations to use ocean intelligence for sustainability planning and impact monitoring.

Collaboration, Open Science, and Capacity Building

The future of ocean knowledge lies in collaboration.

SBEPs are expected to:

- Advocate for open science principles that encourage data sharing and transparency.
- Participate in national and international collaborations such as the UN Decade of Ocean Science for Sustainable Development (2021–2030).
- Mentor and train others in data management, innovation, and technology integration and
- Ensure that technological advances contribute to inclusive and equitable access to ocean benefits.

SBEPs with strong competencies in ocean data, technology, and innovation become catalysts of transformation. They use data not as an end, but as a tool for stewardship — guiding better decisions, fostering innovation, and ensuring transparency. By blending digital literacy with ethical leadership, they help Canada and the world move toward a smarter, more inclusive, and sustainable Blue Economy.

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