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Operationalizing strategic environmental assessment under the BBNJ Agreement: legal frameworks, national practices, and implementation pathways

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The conclusion of the BBNJ Agreement marks a pivotal advancement in the development of the international law of the sea, particularly through the integration of Strategic Environmental Assessment (SEA) into the governance of areas beyond national jurisdiction. This article analyzes the requirements of SEA under the BBNJ Agreement and explores the potential challenges for states to meet its requirements by critically examining the legal frameworks and national practices on SEA in the European Union, the United States and Canada, and Pacific Small Island Developing States. It identifies persistent challenges such as legal fragmentation, disparities in institutional and technical capacity, and the absence of coordinated implementation mechanisms across jurisdictions in current SEA practices. The practice of SEA in ABNJ remains disjointed, hindering the formation of a cohesive international regime. To address these gaps, the article advances three strategic recommendations: (1) the development of non-binding technical guidance by the BBNJ Agreement's Scientific and Technical Body to promote harmonized SEA practices; (2) the establishment of international coordination mechanisms to resolve conflicts between national and sectoral SEA rules; (3) the embedding of SEA-specific capacity-building and technology transfer support into the Agreement's implementation architecture to empower developing states; and (4) leveraging Marine Protected Areas under the BBNJ framework as entry points for operationalizing SEA. As of 2024, MPAs cover only about 1.45% of the total ABNJ surface. Incorporating SEA into the planning and management of these MPAs under the BBNJ regime can support more transparent and evidence-based expansion efforts, contributing to the achievement of the global 30x30 target. These approaches aim, as outlined above, to overcome structural and normative barriers while enhancing the role of SEA in protecting marine biodiversity and ensuring sustainability in ABNJ.

KEYWORDS

strategic environmental assessment, BBNJ Agreement, areas beyond national jurisdiction, national practices, implementation pathways

1 Introduction

The ocean is the common heritage of humankind, and the degradation of the marine environment poses a threat to the survival and development of all humanity (Warner, 2012). With advances in science and technology and the increasing capacity for resource exploitation, human activities have expanded beyond national jurisdiction, placing increased pressure on marine biodiversity. This has led to habitat degradation and the over-exploitation of biological resources (Halpern et al., 2019), prompting growing concerns over the environmental consequences of expanding maritime trade and infrastructure development (Wang et al., 2025). In 2015, the United Nations General Assembly, through Resolution 69/292, decided to launch negotiations on a legally binding international instrument on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ), under the framework of the United Nations Convention on the Law of the Sea (UNCLOS) (Humphries, 2025). As a major supplement to UNCLOS, the BBNJ Agreement creates a new legal framework for activities in the areas beyond national jurisdiction, marking a new era in global ocean governance (Jiang et al., 2025). From 9 to 13 June 2025, the third United Nations Ocean Conference was held in Nice, France. During the conference, numerous delegations made commitments and pledged concrete actions. Notably, 22 states announced their ratification of the BBNJ Agreement, bringing the total number of ratifying States to 50—just 10 short of the 60 required for the Agreement to enter into force (UN, 2025).

Strategic Environmental Assessment (SEA) refers to a formal, systematic, and comprehensive process for evaluating the environmental impacts of proposed plans, programmes, and policies—including their alternatives—at a strategic level (Hassanali and Mahon, 2022). It has long been regarded as a critical tool for integrating environmental protection and sustainable development into decision-making processes (Do Rosário Partidário, 2012). Recent quantitative research on the Northeast Arctic Passage has shown that variables such as sea ice dynamics, energy exports, and international transit demands can exert significant, and sometimes contradictory, impacts on maritime activity (Xu et al., 2025a). SEA can help integrate these diverse factors into early-stage planning, thereby supporting more adaptive and coordinated actions under complex cross-jurisdictional settings. The BBNJ Agreement introduces SEA as an innovative component of its regulatory framework (Morgera et al., 2023). Given disparities in domestic legal systems and institutional capacities among States, the implementation of SEA under the BBNJ Agreement will likely continue to depend on national frameworks (Basu and Mandal, 2024). As of 2018, more than 40 countries worldwide have established basic legal frameworks for SEA (UNEP, 2018), in recent years, SEA has continued to gain traction globally, with most developing countries gradually introducing legal obligations for SEA (Gong, 2023). It is therefore reasonable to estimate that over 60 countries have now adopted some form of SEA legal framework, reflecting a growing international recognition of its importance in supporting

long-term sustainability planning. However, in practice, the application of SEA in ABNJ remains at an early stage (Warner, 2016). As such, the extent to which Parties have developed and implemented SEA serves as a practical indicator of their readiness to operationalize SEA in ABNJ. While there has been growing interest in Marine Protected Areas (MPAs) and Environmental Impact Assessment (EIA) under the BBNJ Agreement, relatively little academic attention has been paid to SEA. Moreover, existing SEA studies largely focus on individual countries or regions, without situating SEA within the broader institutional and legal framework of the BBNJ Agreement (Tessnow-von Wysocki and Vadrot, 2020). This article addresses this gap by adopting a global comparative approach. It selects three representative case studies: the European Union (EU), the United States and Canada, and Pacific Small Island Developing States (SIDS). These jurisdictions exemplify distinct typologies of SEA legal development and practice. Framing the analysis in this way enables a more nuanced assessment of both the implementation potential and the structural challenges of SEA under the BBNJ Agreement. Against this backdrop, this study focuses on three interrelated research questions:

1. What are the SEA requirements under the BBNJ Agreement? What are the obligations shall be met by the contracting parties once it entered into force?
2. To what extent have states developed their own SEA frameworks? How could these practices influence their enforcement of SEA under the BBNJ Agreement?
3. What practical insights and challenges can be drawn from national SEA practices?

This article begins with an overview of the requirements of SEA under the BBNJ Agreement, followed by an analysis of the current SEA legal frameworks at regional and national levels in the EU, the United States, Canada, and Pacific SIDS. Through documentary analysis and case studies, it explores how these jurisdictions have applied SEA in practice. It then examines the challenges these States face when attempting to implement SEA in ABNJ, focusing on both States-specific experiences and broader issues. Finally, the article recommends the adoption of soft-law instruments, the development of international capacity-building and technical support, and the establishment of international coordination mechanisms as pathways for strengthening the operationalization of SEA under the BBNJ Agreement, and also evaluates the potential of MPAs as an entry point for SEA implementation in ABNJ.

2 Methodology

This study employs a comparative legal analysis of selected national jurisdictions to evaluate SEA practices in light of the BBNJ Agreement's SEA provisions. The methodology involves five steps: (1) selecting representative states based on typologies derived from the BBNJ SEA provisions; (2) reviewing each state's domestic legal framework for SEA and marine environmental protection practices;

(3) assessing the strengths and weaknesses of SEA implementation in those jurisdictions; (4) comparing those national practices against the objectives and requirements of the BBNJ Agreement's SEA provisions; and (5) formulating suggestions to improve the BBNJ SEA regime after the Agreement's entry into force.

2.1 Selection of representative jurisdictions

Based on the SEA requirements under the BBNJ Agreement, the study selects three jurisdictions to represent three categories of legal systems for case studies, each representing a distinct typology of SEA legal development and practice.

The first category consists of jurisdictions with well-developed SEA frameworks and extensive practice, typified by the EU. The EU has institutionalized SEA as a mandatory process for a wide range of public plans and programmes under Directive 2001/42/EC, and SEA is routinely applied in marine spatial planning and related sectors.

The second category consists of jurisdictions with moderately developed SEA practices, where strategic assessments are integrated within general environmental frameworks rather than codified as independent legal instruments. The United States and Canada serve as examples. In the U.S., the National Environmental Policy Act of 1969 introduced programmatic and policy-level Environmental Impact Statements, functioning as strategic assessments. Canada's Impact Assessment Act 2019 and the Cabinet Directive on SEA provide mechanisms for evaluating the environmental implications of federal policies and initiatives at a strategic level.

The third category includes States with limited SEA rules and little to no practice, exemplified by SIDS. These states generally lack a unified SEA legal framework and rely only on non-binding guidance. Their SEA practice remains at an early stage, often dependent on external support and voluntary initiatives. For instance, the Secretariat of the Pacific Regional Environment Programme (SPREP) issued the first regional SEA Guidelines in 2020 to assist Pacific Island governments in integrating environmental considerations into policies, plans and programmes – a testament that in many SIDS, SEA is still nascent and driven by soft-law guidance rather than enforceable law.

In selecting the representative jurisdictions for this study, consideration was given not only to the typological diversity of SEA legal development but also to the evolving legal and political context surrounding the BBNJ Agreement. As of August 2025, the BBNJ Agreement is nearing entry into force, with 139 participants having signed and 52 having completed ratification (UN, 2025). The EU and its 27 Member States, the United States, Canada, and all 14 Pacific SIDS examined in this study are signatories to the BBNJ Agreement. Among them, the EU and 15 of its Member States, as well as 8 Pacific SIDS such as Fiji and the Solomon Islands, have formally completed ratification. In light of these Parties' active participation in the signing and ratification process, their national SEA experiences are particularly significant for understanding future regulatory pathways, especially as they are likely to shape

the core SEA rules during the upcoming Preparatory Commission meetings and the first Conference of the Parties (COP). In this context, this tripartite typology was chosen to reflect the global diversity in SEA regulatory frameworks and implementation capacity. States outside these categories were not included as most of them fall within similar patterns of legal development. By choosing a representative from each typology, it was possible to avoid redundant case studies and instead highlight the range of common issues and unique circumstances across jurisdictions (Myers et al., 2013). The selected jurisdictions thus provide a representative cross-section of global SEA approaches, enabling a focused analysis of how such divergence may affect SEA implementation under the BBNJ Agreement.

2.2 Sources and materials

To ensure accuracy and comprehensiveness, the methodology relies on a diverse range of academic and legal sources in both English and Chinese. The primary materials include international treaties and instruments (e.g. UNCLOS, the Convention on Biological Diversity and its guidelines, and the 2023 BBNJ Agreement itself) which set the global context for SEA. For instance, Article 206 of UNCLOS and Article 14(1)(b) of the CBD are examined as precursors to SEA in international law (requiring states to consider environmental impacts of activities, programmes, or policies). The BBNJ Agreement (as adopted by the UN General Assembly in 2023) is a central source, with specific provisions (Articles 27, 38, 39) reviewed to extract the new obligations and institutional arrangements for SEA.

Additionally, domestic legislation and regulations from the selected jurisdictions are analyzed, such as the EU SEA Directive, national environmental assessment laws, and subordinate regulations or policy directives (for example, U.S. Executive Orders and agency guidelines under NEPA, and Canada's Cabinet Directive on SEA). These legal texts are supplemented by governmental and intergovernmental guidelines/standards – for example, the CBD's voluntary Aichi SEA Guidance (2006 and 2012) which provides international best-practice recommendations for biodiversity-inclusive SEA, and the SPREP 2020 Pacific SEA Guidelines noted above. Such documents serve as references for what constitutes sound SEA procedure and are used to evaluate the states that primarily rely on soft law.

The research also consults academic commentary, case law, and reports to capture implementation realities and interpret contentious issues. Academic journal articles offer insights into areas such as the integration of SEA in marine governance, the performance of SEA systems, and proposals for reform. Judicial decisions and arbitral awards are referenced where they clarify legal obligations – for example, the ICJ's judgment in *Pulp Mills* (2010) and in *Certain Activities* (2015), which, while focused on EIA, illuminate state duties relevant to SEA by analogy. Finally, official reports and case studies, such as national SEA evaluation reports, UN Technical Reports, and workshop outcomes, are used to gather

empirical evidence of how SEAs have been conducted or why they have not.

All sources are carefully cited to ensure verifiability, and preference is given to the most up-to-date materials (post-2010, and especially recent analyses around the BBNJ negotiations) to reflect the latest developments. This combination of sources enables a well-rounded understanding of both “law on the books” and “law in action” for SEAs in the selected jurisdictions. By grounding the methodology in authoritative legal texts and scholarly research, the study maintains a high level of rigor and credibility consistent with the standards of peer-reviewed legal scholarship.

3 SEA provisions under the BBNJ agreement

3.1 Overview of SEA provisions in the BBNJ Agreement

The SEA provisions under the BBNJ Agreement are of critical importance for advancing SEA practices in ABNJ. The Agreement not only incorporates the objective of SEA into its general framework (UN, 2023), but also delineates the responsibilities of key institutional bodies—such as the COP and STB—in the context of SEA (UN, 2023). Furthermore, Article 39 is dedicated specifically to the conduct and oversight of SEA.

Article 27 of the BBNJ Agreement explicitly states that one of the objectives of the EIA section is to “provide for strategic environmental assessments” and to support the establishment and enhancement of Parties’ capacities to prepare, conduct and evaluate EIA and SEA. Although both the UNCLOS and the CBD contain references to environmental assessment procedures, the former does not include any provisions on SEA (UN, 1982), while the latter merely calls on Parties to “introduce appropriate procedures” to ensure that the environmental consequences of programmes and policies likely to have significant adverse impacts on biological diversity are duly taken into account (Ma et al., 2016; UN, 1992). Under Article 38 of the BBNJ Agreement, the STB is authorized to develop standards and guidelines pertaining to SEA, underscoring its anticipated central role in shaping the future development of SEA mechanisms in ABNJ. Given the STB’s mandate to provide scientific and technical advice to the COP, it is reasonable to interpret that oversight functions related to SEA should also fall within the STB’s institutional responsibilities (Gaebel et al., 2024).

The core provisions concerning SEA in the BBNJ Agreement are Article 39. Paragraph 1 stipulates that Parties shall consider undertaking SEA for relevant plans and programmes related to activities conducted in ABNJ. Although this provision does not impose a binding obligation to conduct SEA, it can be interpreted as requiring Parties to take certain measures to assess whether SEA is necessary and to engage in discussions on this issue with relevant domestic stakeholders and other States within bilateral, multilateral, regional, or global institutional frameworks. Paragraph 2 sets out the responsibilities of the COP, granting it the authority to initiate SEA for a specific area or region. Under this paragraph, SEA may be

conducted not only by individual Parties, but also by the COP. In situations where a Party is unwilling or unable to act independently, this provision offers an alternative mechanism by which SEA can be pursued collectively through COP decision-making, even in the face of opposition from individual States (Harrison, 2024). Paragraph 3 addresses the relationship between SEA and EIA, requiring Parties to “take into account the results of relevant strategic environmental assessments carried out under paragraphs 1 and 2 above” when carrying out an EIA. Although the Agreement does not explicitly define how SEA interacts with other parts of the instrument, the principles articulated in Article 7—such as the precautionary approach, the ecosystem approach, and integrated ocean management—suggest that SEA outcomes may influence the implementation of other provisions of the Agreement (Kachelriess, 2023). Finally, Paragraph 4 mandates the COP to develop guidance for the implementation of each category of SEA under Article 39, thereby facilitating the effective and consistent application of SEA across different contexts.

3.2 Existing challenges in the SEA regime under the BBNJ Agreement

3.2.1 Excessive simplification of SEA provisions

At present, the SEA provisions in the BBNJ Agreement remain relatively limited in scope and lack detailed operational guidance, resulting in significant challenges for implementation in practice (Mendenhall et al., 2023). Although Article 39 establishes the general framework and identifies the primary actors responsible for conducting SEA, it does not articulate procedural requirements—such as the scope of content, assessment methodologies, participatory mechanisms, or oversight standards. This regulatory ambiguity creates space for divergent interpretations, thereby undermining the consistency and effectiveness of SEA implementation (Song et al., 2024). In the absence of clearly defined rules, Parties may apply SEA mainly based on their own interests, exercising broad discretion that may lead to both procedural and substantive inconsistencies (Craik and Gu, 2022). Such fragmentation in practice ultimately weakens the overall enforceability of the SEA regime under the Agreement.

3.2.2 Divergences concerning the scope of SEA

Disagreements over the scope of SEA have persisted among states for many years. On the one hand, some states express concern that an overly expansive interpretation of SEA may infringe upon their autonomy in ocean governance, particularly in sensitive areas related to national defense or economic development (Shi and Chen, 2020). On the other hand, an overly narrow definition may prevent the effective identification and prevention of policies and programmes that could pose significant threats to marine biodiversity (Desmond, 2007). This ambiguity regarding the scope of SEA is not only evident in the textual provisions of the BBNJ Agreement, but also reflected in the divergent understandings held by States. Some States prefer to limit SEA strictly to policies and programmes directly associated with environmental protection,

while others advocate for the inclusion of economic and industrial policies that may exert indirect environmental effects (Ricard, 2024). Such divergences have made it difficult to reach consensus on uniform standards for SEA implementation, thereby impeding the effectiveness of SEA as a coordinated global mechanism.

Moreover, the lack of clarity concerning the scope of SEA leaves implementing bodies without reliable reference points or evaluative benchmarks, further complicating the procedural execution of SEA and increasing uncertainty (Ma et al., 2016). As a result, the original preventive and strategic function of SEA is often diminished in practice, with the risk of it being reduced to a formalistic exercise rather than serving as a substantive environmental governance tool.

3.2.3 Limited and uneven international practice

In contrast to the advanced development of EIA, SEA remains a relatively novel instrument in the context of ocean governance. To date, practical experience in conducting SEA in ABNJ remains limited, and implementation varies considerably across States (Warner, 2021). Many developing countries, in particular small island developing States, face significant constraints in institutional frameworks, technical capacity, and financial resources. These disparities have resulted in a highly uneven global landscape for SEA operation. While certain developed countries and regions—such as the European Union—have accumulated practical experience through regional cooperation and comprehensive domestic legal systems, the dissemination and transfer of such experience at the global level remain limited (Sadler and Dusík, 2015).

In addition, due to SEA's inherently interdisciplinary and cross-sectoral nature, its implementation often involves a wide range of stakeholders. Effectively coordinating diverse interests and mobilizing resources remains a major challenge for the international community in improving the efficiency and effectiveness of SEA (Zhang et al., 2019). The lack of harmonized international standards and guidance also hinders the comparability and cross-border utilization of data, information, and assessment results generated through SEA processes, significantly limiting its contribution to global ocean environmental governance (Ardito et al., 2023). Furthermore, many states' SEA practices are largely confined to areas within national jurisdiction, with little experience applicable to ABNJ

(Lamers et al., 2013). This experiential gap further compounds the challenges of operationalizing SEA in ABNJ, rendering its effective implementation in these areas a continuing and formidable task.

4 SEA rules and practices in the selected jurisdictions

4.1 Overview of SEA frameworks and practices in the selected jurisdictions

The legal frameworks and implementation practices of SEA vary significantly among the selected jurisdictions, reflecting differing institutional contexts and capacities, as summarized in Table 1. Collectively, these jurisdictions illustrate a global spectrum of SEA development—from the highly institutionalized and systematic frameworks established by the EU, through moderately developed mechanisms employed by the United States and Canada, to the emerging voluntary approaches found among Pacific SIDS. These variations highlight distinct pathways and experiences, shaped by regional governance structures, legislative traditions, and technical capabilities, influencing how each jurisdiction applies SEA principles in marine environmental governance, including in ABNJ.

4.2 European Union

The EU has long been at the forefront of developing regulatory frameworks and practical experience in the field of SEA (Sadler and Dalal-Clayton, 2012). Among the more than 60 countries with SEA legislation, all 27 EU Member States are included, illustrating the EU's comprehensive regional alignment and institutional leadership in SEA implementation (Hipondoka et al., 2016). During the early stages of the BBNJ Agreement negotiations, the EU advocated for the application of SEA in ABNJ to prevent adverse impacts of human activities on marine biodiversity. The EU and its Member States have played an active role in advancing the SEA regime under the BBNJ Agreement, a position largely supported by their

TABLE 1 Comparison of SEA frameworks and implementation across selected jurisdictions.

Jurisdiction	Legal Basis	Scope of application	Characteristics
European Union	SEA Directive, MSF Directive, MSP Directive, Kyiv Protocol	Routinely applied in marine planning with legal integration	Institutionalized, with rigorous procedural standards, public participation, and extensive scientific assessments
United States	NEPA, Executive Order 12114	Applied in marine planning with case-specific implementation and agency discretion	Regularly applied to maritime sectors but with lower level of institutionalization
Canada	the Cabinet Directive, IAA	Applied in offshore resource management, national marine initiatives	
Pacific SIDS	In general, no unified framework; only non-binding guidelines	Early-stage, reliant on external support and voluntary action	Institutional practice is nascent and heavily dependent on external support, primarily from developed countries and international organizations

substantial accumulation of scientific data and extensive practical experience in environmental assessment.

4.2.1 Legal framework for SEA in the EU

Since the early 2000s, the EU has established a relatively comprehensive legal framework for SEA (Bottero and Mondini, 2020). The EU's SEA system is primarily based on Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (the SEA Directive). This Directive applies broadly to public plans and programmes across various sectors, including land use, transport, energy, waste, and agriculture. Its scope covers two principal categories: first, plans and programmes that set the framework for future development consent of projects requiring EIA—where “setting the framework” refers to decisions made regarding specific aspects such as project location or scale; second, plans and programmes that Member States independently determine should be subject to environmental assessment (EU, 2001).

In addition, several of the EU's marine-related policy instruments are closely aligned with the SEA regime. The Marine Strategy Framework Directive (2008/56/EC) (the MSF Directive) requires Member States to develop marine strategies aimed at achieving good environmental status in marine waters (EU, 2008). While the MSF Directive itself does not constitute an SEA procedure, it entails the assessment of environmental status and proposed measures, thus reflecting SEA-like analytical components. The Maritime Spatial Planning Directive (2014/89/EU) (the MSP Directive) explicitly references the SEA Directive, stipulating that where maritime spatial plans are likely to have significant environmental effects, they must undergo SEA in accordance with the SEA Directive (EU, 2014). In this context, MSP serves as a high-level planning tool that sets the strategic framework for various maritime activities. However, at the implementation stage, SEA remains essential for conducting systematic evaluations of long-term environmental impacts, thereby providing both scientific guidance and legal justification for decision-making. SEA is therefore regarded as a unifying mechanism that integrates multiple planning objectives and procedural requirements (Ardito, 2021). It enables MSP processes to simultaneously comply with other EU environmental standards, including the Habitats Directive and transboundary consultation obligations under the Espoo Convention on Environmental Impact Assessment in a Transboundary Context (Craik and Gu, 2019).

In addition to the aforementioned directives involving SEA, the EU and its Member States have also been at the forefront of international practice in the area of transboundary SEA. The Protocol on Strategic Environmental Assessment (the Kyiv Protocol) to the Espoo Convention applies to plans and programmes likely to have significant environmental effects, including effects on human health. It excludes plans and programmes related exclusively to national defense, civil emergencies, or fiscal and budgetary matters. The Protocol also includes, in an annex, a list of plans and programmes that require SEA, thereby providing a legal framework for Parties to conduct SEA at the national planning level (UNECE, 2003). Although the

Protocol is open to all United Nations Member States, its current ratification base is largely confined to the EU (Song et al., 2024). By acceding to the Protocol, EU Member States have committed to applying SEA procedures to plans and programmes with potential transboundary effects, with the goal of preventing environmental harm that may extend beyond national borders (Sheate et al., 2005). This mechanism further exemplifies the EU's leadership in advancing SEA practices and has contributed to laying the groundwork for broader global discussions on SEA under international frameworks such as the BBNJ Agreement (De Mulder, 2011).

4.2.2 Practices of SEA in the EU

Leveraging its institutional and technical strengths, the EU has accumulated substantial experience in applying SEA to marine-related planning. Within the EU framework, SEA has been increasingly employed in cross-sectoral maritime planning processes (EC, 2025). For instance, when spatial conflicts arise between offshore energy development and tourism activities, SEA serves as a critical tool for evaluating issues such as noise pollution and ecological disturbance. In such cases, tourism developers may prepare a “tourism impact statement,” which can be used as a basis for determining whether SEA or EIA procedures are required (Ardito, 2021). This approach facilitates the early identification and prevention of potential environmental risks at the planning stage and provides essential environmental data to support the subsequent refinement of site selection. In doing so, it enhances the foresight and operational feasibility of MSP as a whole, reinforcing its role as a forward-looking and integrative planning instrument.

In EU Member States, the implementation of SEA within areas under national jurisdiction has become a routine requirement and a standard procedural component of marine governance. Most states have integrated SEA obligations into their national marine legislation to ensure that major maritime spatial plans undergo SEA prior to adoption (Ardito, 2021). Mechanisms such as public participation and transboundary consultation are commonly employed to enhance the quality and legitimacy of SEA processes (Ardito, 2021).

In 2009, Germany conducted an SEA in parallel with the development of its first round of MSPs for the North Sea and the Baltic Sea within its federal exclusive economic zone. Following the adoption of the EU MSP Directive, Germany amended its Federal Spatial Planning Act (Raumordnungsgesetz, ROG) to mandate SEA as a legal requirement during the formulation of MSPs (VASAB & HELCOM, 2024). The latest German federal MSP entered into force in September 2021. The planning process strictly adhered to SEA procedures and included assessments of the cumulative environmental impacts of various maritime activities—such as shipping, offshore wind energy, and fisheries—within the Exclusive Economic Zone (EEZs) of the North Sea and the Baltic Sea (Pinkau and Schiele, 2021).

Similarly, the Netherlands has demonstrated strong engagement with the development of SEA provisions under the BBNJ Agreement and has emerged as a frontrunner in the implementation of SEA at the national level (Blanchard, 2022). Its

North Sea Programme 2022–2027, which forms part of both the national MSP and marine strategy, incorporated SEA from the outset (Noordzeeloket, 2021). The SEA assessed environmental impacts associated with proposed designations for new offshore wind farms, as well as measures for marine ecological protection, and included comparative analyses of alternative options. The Netherlands places particular emphasis on public participation and cross-border consultation in SEA. During the development and subsequent amendments of the North Sea Programme 2022–2027, the Dutch environmental authorities initiated a transboundary SEA consultation process under the Espoo Convention, inviting neighboring states such as Germany and Belgium to comment on the scope and details of the SEA (BSH, 2023).

In ABNJ, EU Member States have not only actively promoted the integration of SEA principles into global high seas governance through the BBNJ Agreement negotiations, but have also explored strategic assessment practices in the establishment of marine protected areas (MPAs) under regional conventions (Duan and Shen, 2024). Along the Northeast Atlantic coast, EU Member States have collectively developed a regional governance framework for MPAs in ABNJ through the Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention), establishing the world's first regional MPA network beyond national jurisdiction (Duan and Shen, 2024; OSPAR Commission, 1992). The integration of SEA into MPA designation under the OSPAR framework is particularly noteworthy. As early as 2010, the OSPAR Commission adopted the Bergen Statement, which explicitly identified the ecosystem approach as a core principle for regional assessments guiding MPA site selection and management measures—marking a critical point of convergence between SEA and MPA governance (OSPAR Commission, 2010). Within this framework, EU Member States such as France, Germany, and the Netherlands have actively promoted SEA-informed decision-making at the regional level. These efforts involve comprehensive ecological data collection, interdisciplinary expert assessments, and broad stakeholder consultations to support strategic planning and informed decisions regarding MPAs. Prior to the designation of high seas MPAs, holistic evaluations are carried out to assess the ecological condition and management needs of candidate areas, ensuring that MPA zoning and regulatory measures are grounded in robust scientific evidence.

By 2021, EU Member States had jointly designated 11 MPAs in ABNJ under the OSPAR framework. In Opinion 2021/01, the OSPAR Commission defined SEA as “a procedure to ensure that environmental consequences of relevant new plans and programmes are identified and assessed during their preparation and before their adoption,” and called on Contracting Parties to consider undertaking EIA or SEA, where appropriate, for any human activities under their jurisdiction or control that may conflict with the conservation objectives of the area, whether individually or in combination with other activities (OSPAR Commission, 2023). In line with this guidance, the newly designated “North Atlantic Current and Evlanov Sea Basin MPA”

(NACES) underwent extensive scientific review prior to formal adoption. Experts from various jurisdictions conducted strategic-level ecological assessments and spatial analyses, compiling and integrating multi-dimensional data—including seabird migratory routes, critical habitats for marine mammals, the condition of deep-sea ecosystems, and the intensity of human activities. This allowed for a comprehensive evaluation of the ecological significance of the proposed area for seabirds, fish stocks, and benthic habitats, as well as spatial patterns of anthropogenic pressures. Ultimately, the area—covering over 600,000 square kilometers—was identified as a critical trans-Atlantic foraging and resting habitat for migratory seabirds, necessitating regionally coordinated measures to mitigate the impacts of fisheries, shipping, and other activities (OAP, 2023).

4.3 The United States and Canada

Both the United States and Canada are major maritime nations with foundational institutional structures for SEA. However, as a strategic-level decision-making tool, SEA in these states still faces limitations in terms of institutionalization, procedural standardization, and depth of implementation (Sadler and Dalal-Clayton, 2012). Although their overall breadth and depth of SEA practice remain less developed than those of EU Member States, the United States and Canada were among the earlier adopters of SEA approaches. Through decades of environmental governance, they have accumulated a number of cases and operational experiences that offer valuable reference points for the global advancement of SEA frameworks.

4.3.1 Legal framework for SEA in the United States and Canada

The core legal instrument underpinning SEA in the United States is the National Environmental Policy Act (NEPA), enacted in 1969, which marked the first formal incorporation of SEA principles into domestic legislation. Section 102 of NEPA mandates that all federal agencies prepare a detailed Environmental Impact Statement (EIS) for any major federal actions significantly affecting the quality of the human environment—including policies, plans, and programmes—thus introducing environmental considerations into decision-making processes (NEPA, 1969). Although NEPA does not explicitly use the term “Strategic Environmental Assessment,” nor does it provide specific provisions tailored to the strategic nature of SEA, it establishes procedural environmental review requirements that are functionally aligned with internationally recognized SEA practice (Sadler and Dalal-Clayton, 2012). In this sense, NEPA provides a de facto legal foundation for conducting SEA.

In the marine domain, NEPA imposes clear obligations on relevant federal agencies—such as the Bureau of Ocean Energy Management (BOEM), the National Oceanic and Atmospheric Administration (NOAA), and the Environmental Protection Agency (EPA)—to assess and disclose the potential significant environmental impacts of proposed ocean-related policies, plans, and major projects. This ensures that strategic-level decisions

concerning ocean use and management are subject to environmental scrutiny at an early stage (Clark et al., 2012).

In addition, Executive Order 12114—titled “Environmental Effects Abroad of Major Federal Actions”—issued by President Carter in 1979, explicitly requires federal agencies to assess the environmental impacts of major actions undertaken outside the territory of the United States, including in areas such as the high seas, the global atmosphere, and Antarctica (U.S. Department of Energy, Office of National Programs, 1979). This Executive Order addresses the extraterritorial limitations of NEPA (Therivel, 1993), thereby establishing a foundational requirement for the U.S. government to conduct basic environmental reviews when engaging in activities in ABNJ.

Canada’s SEA regime originated not from direct legislation but through executive policy instruments. The conceptual influence of NEPA—particularly its inclusion of policies, plans, and programmes within the scope of environmental assessment—played a significant role in shaping Canada’s approach (Therivel and Partidário, 2013). In 1990, the Canadian federal government issued the Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals (the Cabinet Directive), which requires that any policy, plan, or programme submitted for approval to a minister or the federal Cabinet must undergo environmental assessment prior to decision-making (Canadian Environmental Assessment Agency, 2010). This directive laid the foundational framework for SEA in Canada.

The Cabinet Directive has since undergone several updates to expand its scope and improve implementation. Notably, in 2024 it was broadened and renamed the Cabinet Directive on Strategic Environmental and Economic Assessment, thereby extending its coverage to include economic considerations alongside environmental impacts (Environment and Climate Change Canada, 2024). In parallel, the Impact Assessment Act (IAA), which entered into force in 2019, provides for the first time a clear statutory basis for SEA at the federal level. Under Section 95 of the IAA, the Minister of Environment and Climate Change may authorize the Impact Assessment Agency of Canada or a designated committee to conduct assessments of: (1) any proposed or existing federal policy, plan, or programme related to impact assessment; and (2) specific issues arising from impact assessments of designated projects. The IAA also outlines procedural requirements for SEA, including the preparation of Terms of Reference by the Minister, the use of best available scientific information and Indigenous knowledge, and the provision of public participation opportunities (Impact Assessment Agency of Canada, 2019). It is important to note that SEAs conducted under the IAA differ from those required under the Cabinet Directive. While the Directive imposes an internal self-assessment obligation on federal institutions, SEAs under the IAA are carried out at the Minister’s discretion and follow a more formalized process governed by the Act.

Canada’s SEA legal framework is further supported by several sectoral marine statutes. The Fisheries Act, as amended in 1977 (Department of Justice Canada, 1985), introduced a prohibition against the “harmful alteration, disruption or destruction” (HADD)

of fish habitat—a stringent ecological protection requirement that serves as a legal foundation for SEA. The Oceans Act mandates the Minister of Fisheries and Oceans to lead the development and implementation of national integrated ocean management plans and to establish a network of MPAs aimed at conserving representative marine ecosystems (Canadian Legal Information Institute, 1996). SEA is recognized as a key instrument for advancing integrated management under the Act. According to official guidance from Department of Fisheries and Oceans (DFO), the establishment of new MPAs under the Oceans Act must be preceded by comprehensive ecological and socio-economic assessments of proposed sites, culminating in the completion of an SEA report before formal designation (DFO, 2024).

4.3.2 Institutional practices of SEA in the United States and Canada

Under their respective legal frameworks, the United States and Canada have carried out a number of SEA practices. In the U.S., federal agencies conduct environmental assessments of ocean-related policies and plans pursuant to NEPA. For instance, the BOEM under the Department of the Interior prepares Programmatic Environmental Impact Statements (PEIS) for its Outer Continental Shelf (OCS) oil and gas leasing five-year development programmes (CRS, 2024). In line with NEPA requirements, these strategic-level assessments evaluate the potential cumulative impacts of the overall leasing programme on the marine environment and compare alternative development scenarios. The PEIS provides scientific evidence to support decision-making concerning offshore oil and gas development (Comay, 2021).

In the context of MPAs, the NOAA is required under NEPA to conduct environmental assessments prior to the designation of new National Marine Sanctuaries (NOAA, 2023). Federal regulations explicitly classify such MPA designations and other forms of ocean spatial planning as major federal actions, thereby requiring the preparation of an EIS to publicly assess associated environmental impacts.

In Canada, SEA has been applied across a range of marine-related strategic planning processes. On the east coast of Canada, SEA have supported the initial phases of offshore oil and gas rights issuance, including industry nominations, formal government calls for nominations, and calls for bids (Doelle et al., 2013). More broadly, SEA has also informed national-level initiatives such as the 2016 Oceans Protection Plan (OPP), a multi-year, cross-departmental program launched by the federal government to enhance maritime safety, strengthen environmental emergency response, and safeguard marine ecosystems across Canadian waters (Environment and Climate Change Canada, 2016). During the plan’s renewal and extension phases, SEA was conducted in accordance with the Cabinet Directive to systematically assess the cumulative environmental impacts of its various component projects (Gill, 2018). Similarly, As the concept of Green Shipping Corridors (GSCs) gains increasing global attention as a means to reduce greenhouse gas emissions (Song et al., 2025; Ismail et al., 2024), Transport Canada conducted an SEA for the Green Shipping

Corridor Initiative in 2023, which seeks to decarbonize marine shipping along the Great Lakes–St. Lawrence Seaway and coastal routes shared with the United States (Transport Canada, 2023). This SEA provided a strategic-level evaluation of the impacts of proposed interventions—such as the use of shore power and clean fuels—on air quality, greenhouse gas emissions, and aquatic ecosystems. Following implementation, Transport Canada publicly released the SEA findings, demonstrating that environmental considerations had been fully integrated and adverse effects minimized. These examples illustrate that SEA is progressively becoming embedded in multiple layers of ocean governance in both the United States and Canada (Mageau et al., 2015). From resource development planning to marine environmental protection initiatives, SEA is increasingly employed to ensure that strategic decisions are grounded in science and promote environmental sustainability.

The SEA practices of the United States and Canada in ABNJ are primarily reflected through their participation in regional ocean governance mechanisms. In the Arctic region, both states have collaborated under the Arctic Environmental Protection Strategy and the Arctic Council to develop the Guidelines for Environmental Impact Assessment in the Arctic, which serve as a reference for assessing transboundary marine activities in the Arctic (UNECE, 1997). In 2018, the United States, Canada, and eight other parties signed the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAOFA), which entered into force in 2021 with a duration of 16 years (AFSC, 2018). Adopting a precautionary and science-based approach, CAOFA imposes a temporary moratorium on commercial fishing in the high seas of the Central Arctic Ocean. The parties agreed to prohibit commercial fisheries for the duration of the agreement and to permit only scientific exploratory fishing. This measure is intended to allow scientists to first assess the ecological condition and fishery resources of the region before determining whether to permit future fishing activities. By deferring exploitation in favor of scientific assessment, the agreement effectively introduces a strategic-level environmental review prior to potential resource development (Balton, 2022). Some scholars have characterized this as a de facto “SEA-style” initiative, aligning with SEA’s core principles of anticipatory assessment and informed decision-making (Molenaar, 2024). As active participants in the negotiation and scientific cooperation under CAOFA, the United States and Canada have demonstrated their commitment to the protection of Arctic high seas ecosystems. The agreement is widely regarded as a successful example of international marine environmental governance (Shahbazi, 2022).

4.4 Pacific small island developing states

The international community commonly refers to low-lying, economically underdeveloped island nations as Small Island Developing States (SIDS). Most Pacific SIDS fall within the category of developing or least developed countries. According to

the United Nations Economic and Social Council’s latest 2024 report, 8 of the 58 recognized SIDS are still classified as least developed countries, with 4 of them located in the Pacific region (UN, 2024). These States face significant challenges in terms of legislative infrastructure, technical capacity, and financial resources, which has resulted in substantial institutional gaps and practical difficulties in implementing SEA.

During the negotiations of the BBNJ Agreement, Pacific SIDS actively advocated for the inclusion of SEA in ABNJ, aiming to reshape the existing UNCLOS-based environmental assessment framework (Shi and Chen, 2020). Their objective was to participate meaningfully in the reconfiguration of global ocean governance and to establish a new international regulatory mechanism for overseeing the environmental impacts of ocean development activities led by developed countries (Mendenhall et al., 2023).

4.4.1 Legal framework for SEA in Pacific SIDS

In the face of mounting threats and challenges posed by global climate change and marine pollution, Pacific SIDS—whose economies and livelihoods are highly dependent on healthy ocean ecosystems—have demonstrated a growing need for SEA. These states are actively adjusting their national ocean development strategies to align with sustainable development priorities, and are seeking to establish SEA guidance frameworks at both national and regional levels to address the previous gap in policy- and planning-level assessments, which had traditionally relied solely on EIA (Polido et al., 2014). However, to date, SEA practices in Pacific SIDS remain largely grounded in policy guidance or voluntary implementation, with few binding legal provisions in place to mandate their application (Uitto et al., 2017).

At the regional level, The Secretariat of the Pacific Regional Environment Programme (SPREP) did not release its Strategic Environmental Assessment (SEA): guidelines for Pacific island countries and territories (SEA Guidelines) until 2020 (SPREP, 2020). The SEA Guidelines aim to assist national and sectoral authorities in integrating SEA into policies, plans, and programmes, thereby advancing sustainable development across the region. In the foreword to the SEA Guidelines, then-SPREP Director General Kosi Latu noted that SEA remains a relatively new concept for Pacific SIDS. He highlighted the importance of the Guidelines in addressing emerging challenges posed by new ocean-based activities such as deep-sea mining. According to a policy brief published by the International Institute for Sustainable Development (IISD), SPREP’s Strategic Plan 2017–2026 explicitly identifies SEA as a key tool for strengthening national sustainable development planning, emphasizing that SEA should be used to systematically incorporate environmental and climate change considerations into the formulation of development strategies and sectoral policies (IISD, 2020). Moreover, Pacific Islands Framework for Nature Conservation and Protected Areas 2021–2025 also call on states to establish and implement comprehensive, inclusive, and equitable SEA and MSP processes at national, subnational, and community levels, with the aim of progressively improving cross-sectoral coordination in ocean space management (SPREP, 2021).

At the subregional level, there has also been early recognition of the precautionary principle associated with SEA. Member States of the Melanesian Spearhead Group (MSG) have in recent years expressed joint concern over environmental governance issues (May, 2011). In 2023, they adopted the Udaune Declaration on Climate Change, which established a moratorium on deep-sea mining within their national waters until sufficient scientific evidence can demonstrate that such activities will not cause significant harm to ecosystems or fisheries (Cannon, 2023).

At the national level, most Pacific SIDS have incorporated EIA requirements into their domestic legislation, whereas SEA remains a relatively new concept within their legal frameworks (Turnbull, 2004). In Fiji, the Environment Management Act of 2005 explicitly mandates EIA for various categories of development projects, and the EIA Process Regulations adopted in 2007 further elaborate the procedural requirements (Barr, 2007). Similarly, Vanuatu's Environmental Protection and Conservation Act requires that all development activities with the potential to cause significant environmental impacts be subject to EIA (Bradley and Swaddling, 2018). Other Pacific SIDS—such as Samoa, the Solomon Islands, and Kiribati—have also established comparable mandatory EIA mechanisms through environmental or planning legislation to ensure that development proposals undergo environmental review prior to approval (Polido et al., 2014). There have also been early attempts to introduce SEA through legislative means. For example, Fiji once drafted a Sustainable Development Bill aimed at establishing a legal basis for environmental assessment at the policy and planning levels. However, the bill ultimately failed to pass, leaving SEA without a binding legislative foundation in the state (Jope Davetanivalu, 2023).

4.4.2 Institutional practices of SEA in Pacific SIDS

In April 2023, SPREP, through the Pacific Network of Environmental Assessment (PNEA), hosted an online workshop titled Making informed decisions for a healthy and resilient Pacific (SPREP, 2023). The event brought together stakeholders engaged in environmental decision-making across the Pacific region. Building on SPREP's SEA Guidelines, the workshop explored the unique challenges and opportunities facing the region, and provided an in-depth introduction to the principles and practice of SEA, with the goal of enhancing its applicability in Pacific contexts. At the event, SPREP Director General Sefanaia Nawadra emphasized the importance of using the platform to facilitate continued knowledge exchange and mutual learning among participants, in order to support the implementation of SEA guidelines and contribute to building a more sustainable and resilient Pacific region.

Since SEA practices in Pacific SIDS remain at an early stage, it has relatively few documented cases of successful implementation. At the national level, SEA is still primarily carried out through voluntary initiatives and policy guidance rather than mandatory legal requirements. MSP is emerging as a critical vehicle for operationalizing SEA in these states (Lombard et al., 2019). In 2018, the Solomon Islands formally adopted its National Oceans Policy (Ministry of Environment, 2018), which designates MSP as a

priority tool and underscores the necessity of achieving cross-sectoral coordination in marine resource management. The policy further specifies that environmental protection and sustainable use objectives should be integrated during the planning phase (UN, 2018). Similarly, Fiji released its first National Ocean Policy (2020–2030) in 2020, with plans underway to enshrine it into law. Fiji has committed to achieving sustainable management of 100% of its EEZs by 2030, including designating 30% of its waters as MPAs (Sloan, 2021). This ambitious commitment to large-scale marine protection necessitates the application of SEA during the planning stage to ensure that MPA designation and management measures are based on ecosystem science while balancing socio-economic considerations. Kiribati has also demonstrated an SEA-oriented approach through the establishment of a vast MPA. According to a report issued by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Phoenix Islands Protected Area (PIPA) in Kiribati, formally designated in 2008 and spanning 408,250 square kilometers, was at the time the world's largest marine protected area aimed at systematically conserving extensive marine ecosystems (UNESCO). The establishment process for PIPA included strategic considerations of fisheries, ecological integrity, and economic impacts, making it a widely recognized example of successful SEA application in marine conservation policy (Rotjan et al., 2014). Through the use of MSP and the designation of large-scale MPAs, these Pacific SIDS have proactively incorporated environmental considerations into spatial planning and resource allocation decisions. This approach fundamentally aligns with SEA's principle of integrating environmental assessments at the earliest stages of decision-making.

In practice, several Pacific SIDS have attempted to apply SEA to specific sectors or regions to support sustainable development. For instance, Tonga conducted a SEA of the Neiafu Master Plan in 1996, commissioned by the Secretariat for the Pacific Regional Environment Programme. This SEA evaluated the cumulative environmental and social impacts of proposed development projects in Neiafu, highlighting the critical role of local ownership in championing SEA recommendations. It also noted the necessity of effective public engagement strategies, although stakeholder consultations primarily drew upon earlier engagements outside the SEA process itself. Moreover, the assessment underscored the tiered nature of SEA by categorizing projects based on environmental risks, distinguishing those that should be avoided from those requiring comprehensive EIAs (Foliaki, 2020). Lessons from Tonga's SEA emphasized the value of integrated assessments across environmental, agricultural, and fisheries sectors and recommended participatory approaches for identifying socially acceptable solutions, alongside deeper examination of waste management and social impacts in future EIAs.

Similarly, Fiji applied SEA in the context of tourism development through an assessment of its national Tourism Development Plan (TDP) (Levett and McNally, 2003). Supported by the Asian Development Bank (ADB) and WWF's South Pacific Programme, this SEA provided a structured framework for systematically evaluating the environmental and social impacts of tourism. Notably, it found that critical ecosystems, especially coral

reefs, were approaching ecological tipping points due to tourism-related pressures. Additionally, the SEA revealed that economic benefits from tourism were not effectively retained locally, highlighting significant underlying land-use and landownership conflicts. Consequently, the assessment underscored the necessity of establishing robust institutional and regulatory frameworks, enhancing local capacity-building, and implementing effective enforcement mechanisms. Stakeholder participation—including landowners, developers, government entities, and NGOs—was identified as essential to fostering consensus and supporting practical, sustainable tourism strategies. Importantly, the Fiji case emphasized that institutionalizing SEA through supportive laws, policies, and regulations is fundamental to ensuring long-term sustainable tourism outcomes. Together, these experiences from Tonga and Fiji clearly demonstrate SEA's effectiveness in integrating social, economic, and environmental considerations into strategic planning processes within Pacific SIDS. Nevertheless, most Pacific SIDS still rely primarily on EIA to manage individual development projects, making it difficult to detect and prevent cumulative ecological changes across broader marine areas in a timely manner.

Overall, domestic legislation on SEA remains underdeveloped in most Pacific SIDS, and only a few states have initiated preliminary efforts to implement SEA at the national level. These developing States often lack the specialized knowledge, technical expertise, and institutional capacity required for SEA. As a result, they are heavily reliant on external support from developed countries, particularly in terms of technical assistance and financial resources. One notable example is the EU-supported African, Caribbean and Pacific Multilateral Environmental Agreements Programme (ACP-MEAs), which has organized SEA training workshops in the Pacific region (ACP-MEAs)—such as the 2024 workshop held in Kiribati—to raise awareness of SEA's importance and equip national officials with practical implementation skills (SPREP, 2024). Through such initiatives, SEA is gradually transitioning from isolated pilot applications to more systematic and institutionalized practice in the region.

5 Analysis of practical experiences and challenges

The institutional differences represented by three selected jurisdictional models highlights the uneven global development of SEA mechanisms. At the same time, it offers a valuable comparative perspective for the implementation of SEA provisions under the BBNJ Agreement. In particular, as the BBNJ Agreement seeks to introduce SEA as an innovative governance tool for ABNJ, understanding the legal instruments, procedural designs and transboundary coordination practices employed by different States provides critical policy insights.

Accordingly, this section will identify key elements of good practice drawn from these jurisdictions and systematically examine the challenges and structural barriers revealed in their institutional application. The aim is to offer concrete guidance and practical

support for the design and operationalization of SEA under the BBNJ Agreement.

5.1 Insights from national/regional experiences

Based on the comparative analysis of SEA regimes in the EU, the United States and Canada, and Pacific SIDS, three key pathways of experience can be distilled as valuable reference points for informing the SEA provisions under the BBNJ Agreement.

The EU exemplifies a highly institutionalized and coordinated SEA system. SEA enjoys a distinct legal status within the EU legislative framework and is closely integrated with instruments such as MSP, thereby enhancing the coherence and foresight of environmental governance. This model offers important lessons for the BBNJ Agreement in terms of top-level institutional design.

The United States and Canada illustrate a flexible approach to SEA implementation. Although neither state has adopted a dedicated SEA law, SEA functions have been effectively embedded within broader environmental legislation—such as NEPA in the U.S. and the IAA in Canada. This flexible legislative pathway accommodates diverse national contexts with varying levels of SEA development. For the BBNJ Agreement, this suggests that SEA implementation could be operationalized through enabling provisions that link with Parties' existing domestic environmental governance frameworks, thus facilitating institutional internalization and localization of the Agreement's obligations.

The experience of Pacific SIDS underscores the urgent need of SEA capacity-building mechanisms. In the absence of comprehensive legal and technical infrastructure, these States have pursued SEA awareness-raising and pilot initiatives through regional guidelines and collaborative platforms. With the support of external factors such as the EU, they have also engaged in multiple rounds of technical training and project-based assistance. This experience highlights the tension between “normative universality” and “capacity realities.” Accordingly, the BBNJ Agreement should complement its SEA provisions with accompanying measures for technical assistance, financial support, and regional cooperation platforms, thereby providing developing countries with the institutional means necessary for effective implementation.

5.2 Challenges across jurisdictions

Building upon the preceding analysis, SEA faces three fundamental implementation challenges across jurisdictions: fragmented legal frameworks, significant disparities in institutional capacity, and weak incentives for action. These systemic gaps not only limit the coherence of SEA practice but also hinder effective cooperation under the BBNJ Agreement.

5.2.1 Fragmented legal and regulatory frameworks

As reflected from above cases, the diversity of legal framework has shown the difficulties to establish a unified and coherent legal

framework at international level. Legal fragmentation will emerge as a major obstacle to the effective implementation of SEA in ABNJ. Although many states and regions have incorporated SEA concepts to varying degrees, they differ significantly in terms of applicable legal norms and institutional pathways.

The EU, as a regionally integrated body, has developed a robust legal regime centered on the SEA Directive, the Espoo Convention, and its Kyiv Protocol. While this framework functions effectively within the EU, its direct applicability outside the region is limited. In contrast, the United States and Canada implement SEA primarily through embedded or indirect mechanisms within their domestic environmental legislation and regional governance structures. However, their legal texts generally lack explicit SEA obligations and enforceable institutional arrangements, resulting in limited regulatory strength. Pacific SIDS, on the other hand, rely heavily on regional guidance frameworks and policy tools, such as the SEA Guidelines issued by SPREP. Yet these instruments are soft-law in nature and lack binding legal force and implementation mechanisms, making it difficult to establish institutional rigor at the national level. This legal pluralism and fragmentation weakens the overall authority and effectiveness of SEA as a tool in global ocean governance. It also poses significant challenges for cross-regional coordination and implementation, ultimately undermining the feasibility of SEA deployment in ABNJ.

5.2.2 Uneven capacity to implement SEA

Although the EU, the United States and Canada, and Pacific SIDS all recognize, to varying extents, the value of SEA as an effective tool for marine environmental management (Therivel and Partidário, 2013), the preceding analysis reveals profound disparities in their levels of SEA implementation and institutional capacity. These discrepancies constitute a major obstacle to the effective global application of SEA.

The EU, supported by its longstanding practical experience, comprehensive legal framework, and substantial economic and technical resources, has developed a systematic, mature, and institutionalized SEA regime. It continues to seek a leadership role in international negotiations and practice. By contrast, while the United States and Canada possess relatively strong technical capacities and domestic institutional foundations, they have adopted a more cautious stance regarding the internationalization of SEA—particularly its application in ABNJ. In some cases, policy hesitation or reservations on this issue have limited the external influence of their SEA systems. Pacific SIDS face even more severe structural constraints. Their domestic SEA foundations remain weak, and their system-building efforts are still in the early stages, with significant legislative and operational gaps. As a result, they remain heavily dependent on financial, technical, and training support from developed countries. This wide gap in SEA practice and capacity undermines SEA's potential as a tool for international cooperation. It also hinders consensus-building and effective

coordination among States, exacerbating the risks of institutional and operational fragmentation in the broader context of global ocean governance.

5.2.3 Weak incentives for conducting SEA

The practices of SEA in above cases, even the best player - EU, has problems in applying SEA as broad as EIA in their environment strategy. This may reflect further a combination of limited political will and insufficient institutional capacity in applying SEA. This lack of underlying impetus has resulted in SEA being inconsistently implemented in practice, with the risk of it being weakened or marginalized.

For the EU, despite having established a comprehensive and mature SEA regime, its member States—like many developed countries—often prioritize resource access and economic interests over environmental protection, particularly in ABNJ. The International Court of Justice, in the Pulp Mills on the River Uruguay case, affirmed that when proposed industrial activities pose a risk of significant transboundary harm to shared resources, conducting an EIA constitutes a requirement under customary international law. In practice, many States conduct EIAs primarily to comply with international legal obligations and avoid liability (Mendenhall et al., 2022). Similarly, the implementation of SEA is often driven less by proactive environmental concern and more by legal compliance. Against this backdrop, even within the EU, environmental considerations risk being subordinated to economic priorities, especially in contexts beyond national jurisdiction. The United States and Canada have adopted a more overtly economic-oriented stance, frequently emphasizing the principle of economic freedom in both international negotiations and domestic policy. SEA is often perceived as a regulatory burden or constraint on economic activity. During the BBNJ negotiations, both states expressed strong reservations regarding the necessity and applicability of SEA, reflecting an “economy-first” mindset that has posed a significant barrier to advancing SEA provisions. Pacific SIDS, by contrast, have vocally supported the inclusion of SEA in ABNJ, primarily due to their environmental vulnerability and sustainable development concerns. However, these states face persistent economic pressures and limited financial resources. As a result, the actual implementation of SEA is often compromised by the urgency of advancing development projects, undermining efforts to prevent cumulative ecological damage.

Taken together, these dynamics reveal a structural challenge: developed countries often perceive SEA in ABNJ as a threat to their economic interests, while developing countries struggle to operationalize SEA due to limited resources and competing development priorities. This combination of limited political will among the former and constrained capacity among the latter has led to a pervasive lack of motivation to conduct SEA in ABNJ, posing a fundamental obstacle to its effective advancement under the BBNJ framework.

6 Recommendations for advancing SEA under the BBNJ Agreement

6.1 Develop flexible standards and guidelines for SEA to enhance global coordination of diverse national practices

The current provisions on SEA in the BBNJ Agreement remain relatively general and do not provide detailed guidance regarding its scope of application, procedural stages, or substantive assessment content. This lack of specificity has led to divergent interpretations and practices among Parties. To address the longstanding debate over the scope of SEA and promote a harmonized understanding, there is an urgent need to develop a scientifically grounded, authoritative, and operational set of international guidelines. Such guidelines could serve as a key instrument for standardizing SEA implementation under the Agreement (Wang and Pan, 2025).

In the broader field of international environmental law, non-binding standards and guidelines have long played a critical role in shaping environmental assessment regimes. Compared to legally binding treaty provisions, they are often more readily accepted by States due to their flexible and non-prescriptive nature. This makes them well-suited to serve as a foundation for building a coherent and coordinated international SEA framework (Li and Zhang, 2024). For example, in 2012 the COP to the CBD adopted the Revised Voluntary Guidelines for the Consideration of Biodiversity in Environmental Impact Assessments and Strategic Environmental Assessments in Marine and Coastal Areas (CBD, 2012). These guidelines have provided valuable reference points for both States and international institutions in the development of SEA rules, and they articulate more concrete requirements for biodiversity-related assessments. While such instruments are not legally binding, they offer scientific and procedural guidance that can help reduce disparities in SEA implementation across jurisdictions.

According to Article 38 of the BBNJ Agreement, the STB is authorized to develop standards and guidelines for the implementation of SEA. Under this mandate, the STB could take the lead in formulating a set of Guidelines for SEA Implementation in ABNJ to address the persistent disagreements among States regarding SEA's scope of application, assessment criteria, and procedural design. These guidelines should clearly define the categories of policies and programmes to which SEA applies, establish criteria for identifying "potentially significant impacts," and provide guidance on how to address sensitive matters such as national defense and economic planning (Li and Jiang, 2025). Accordingly, the STB could develop a tiered and categorical approach to SEA applicability, providing Parties with a differentiated framework that enhances both the flexibility and acceptability of SEA (Kim, 2024).

In addition, the STB could initiate a global call for submissions of SEA case studies to compile a Best Practices Manual for SEA in ABNJ. This manual could highlight exemplary approaches drawn from EU transboundary planning, the U.S. NEPA regime as applied to the Outer Continental Shelf, and Arctic regional cooperation initiatives. Disseminating such proven, operational models would

facilitate the global uptake of practical SEA applications. To address the particular needs of developing countries—including Small Island Developing States—the guidelines should also include capacity-building components. This may involve the creation of tiered technical manuals tailored to the specific circumstances of States with well-established SEA systems and those still developing foundational capabilities, thereby enabling targeted and effective support (Wang, 2023). Finally, to promote widespread adoption and ensure real-world effectiveness, the STB should establish an interactive platform or centralized database for sharing SEA success stories and implementation experiences across regions. This platform should be subject to periodic review and continuous improvement based on feedback from Parties and stakeholders, ensuring that SEA standards and guidelines remain both relevant and responsive to evolving needs.

6.2 Enhancing international coordination mechanisms for resolving SEA rules conflicts

In the current context of highly fragmented global SEA practices, the absence of robust international coordination mechanisms will allow conflicts between national and sectoral SEA rules to intensify, thereby undermining efforts to establish a coherent governance framework for ABNJ under the BBNJ Agreement. Recent research on international shipping governance illustrates how fragmented legal regimes can hinder collective progress on shared environmental goals such as carbon emissions reduction (Xu et al., 2025b). It is therefore essential to develop a systematic coordination mechanism within the BBNJ Agreement to ensure mutual compatibility, procedural alignment, and operational comparability of SEA regimes, in turn reducing legal conflicts and enhancing overall coherence and cooperation.

In line with the intent of Article 5(2) of the BBNJ Agreement, which underscores the importance of promoting coherence and coordination with other relevant international instruments, frameworks, and institutions (UN, 2023), the strengthening of coordination on SEA is not merely a matter of best practice but a normative expectation embedded within the Agreement (Langlet and Vadrot, 2023). In this light, by establishing a structured coordination mechanism encompassing information sharing, cooperative assessment processes, and regional adaptation, the BBNJ Agreement can effectively address SEA rule conflicts. This integrative approach lays the foundation for cohesive global SEA governance, significantly enhancing the environmental management and sustainability of marine biodiversity in ABNJ.

A promising approach involves developing a dedicated SEA coordination platform linked to the BBNJ Agreement's existing institutional structures, particularly the COP and the STB, supplemented by the Clearing-House Mechanism (Song et al., 2024). This platform could facilitate information exchange regarding upcoming strategic plans and programmes, sharing of best practices, and transparent dissemination of SEA reports and data. By promoting early-stage cross-jurisdictional communication,

this mechanism would preempt potential conflicts, enable cross-border application of assessment results, and enhance transparency. Furthermore, encouraging joint or cooperative SEA procedures represents another essential pathway for reducing transboundary disputes (Shi, 2020). Drawing inspiration from existing international models such as the Espoo Convention and its Kyiv Protocol, the BBNJ Agreement could introduce analogous cooperative procedures. Specifically, when proposed activities or plans potentially impact multiple states or the global commons, the involved Parties could collaboratively conduct SEAs, engaging affected states in early consultations and joint assessments. This collaborative model would transform SEA from a unilateral procedure to a cooperative exercise, aligning closely with ABNJ's "common heritage" principle and ensuring robust and widely acceptable outcomes. Regional coordination networks should also be leveraged, recognizing diverse regional conditions and institutional capacities. Establishing regional SEA focal points or utilizing existing regional ocean governance bodies such as OSPAR could facilitate the adaptation of global SEA guidelines to specific regional contexts (Langlet and Vadrot, 2023). These regional bodies would coordinate joint strategic assessments and feed their results into the global Clearing-House, creating a cohesive, multi-layered architecture that harmonizes efforts across jurisdictions and reduces rule fragmentation.

6.3 Strengthening international capacity-building and technical support mechanisms to systematically identify gaps

The effective implementation of SEA in ABNJ is contingent upon robust capacity-building and technical support. By its nature, SEA is a governance tool that depends on high-level environmental management capabilities and long-term strategic planning. It requires significant resources and technical expertise for accessing environmental data, applying scientifically sound assessment methodologies, and establishing inclusive public participation mechanisms (Sun et al., 2025). To address the current disparities in SEA implementation capacities among States and the general lack of practice under the BBNJ Agreement, there is a pressing need to strengthen the international architecture for SEA capacity-building and technical assistance.

The BBNJ Agreement has already acknowledged the structural challenges that developing countries may face, particularly through Part IV on "Capacity-Building and the Transfer of Marine Technology" (CBTT) (Harden-Davies and Snelgrove, 2020). This section explicitly identifies the enhancement of developing Parties' scientific and technological capacities for the conservation and sustainable use of marine biodiversity in ABNJ as a core objective. It emphasizes the role of capacity-building and technology transfer in enabling developing countries to meet various obligations under the Agreement, including those related to EIA (Mendenhall et al., 2022). However, as currently defined in Annex II of the Agreement, the categories of CBTT do not explicitly

include SEA. As previously discussed, integrating SEA into the scope of CBTT would be of considerable significance. Pursuant to Article 44(3) of the BBNJ Agreement, the COP may, upon the recommendation of the CBTT Committee, expand the list of CBTT types included in Annex II. This would provide a formal basis for incorporating SEA capacity-building and technology transfer into the implementation architecture of the Agreement.

Specifically, a phased training mechanism for SEA personnel could be established for developing country Parties, drawing on the EU's experience in organizing SEA workshops in the Pacific region. Such a mechanism would assist developing States in cultivating local experts and technical professionals. Through the creation of SEA training programmes or certification schemes, and the delivery of technically oriented curricula, these initiatives would enhance the capacity of developing country Parties to conduct environmental assessments at the policy and programme level—thereby reducing their dependence on external consultants (Harden-Davies et al., 2024). In parallel, emerging digital tools and intelligent infrastructure have been increasingly recognized as critical enablers of modern environmental assessment. These include Internet of Things (IoT) technologies, automated data platforms, and decision-support systems. Recent bibliometric studies on intelligent maritime shipping emphasize the potential of these technologies to support transparent, adaptive, and real-time policy responses in complex marine environments (Zou et al., 2025). Building upon this foundation, a structured, three-phase capacity-building roadmap may be established under the BBNJ Agreement to guide long-term SEA implementation. In Phase I (Foundational), developing States could undertake needs assessments and receive entry-level training through regional workshops and online modules tailored to local governance contexts. These activities would promote basic awareness of SEA procedures and help translate technical guidelines into accessible formats. Phase II (Institutionalization) would focus on developing national legal frameworks and establishing dedicated SEA units within environmental agencies. Pilot projects with mentorship from international experts could be launched to test SEA methodologies and gradually embed them into decision-making processes. Phase III (Sustainable Integration) aims to consolidate SEA as a routine policy tool. During this phase, countries may establish regional centers of excellence, adopt continuous professional development mechanisms, and engage in peer-review of SEA practice through the BBNJ Clearing-House Mechanism. Each phase would be monitored by the capacity-building committee mandated under the Agreement, ensuring iterative adjustments and strategic alignment with national development goals.

6.4 Promote the operationalization of SEA through MPAs implementation under the BBNJ framework

Within the framework of the BBNJ Agreement, the establishment of MPAs constitutes a critical vehicle and pathway

for advancing the practical application of SEA. As one of the Agreement's core institutional innovations, MPAs inherently support regional ecosystem-based governance and intersectoral coordination, offering a concrete and context-specific platform for SEA implementation (De Lucia, 2024). In ABNJ, however, the establishment of MPAs remains particularly challenging due to the fragmented and complex legal regime governing these areas. To date, only about 1.45% of ABNJ—which comprises approximately 61% of the global ocean—has been designated as protected areas (UNEP-WCMC & IUCN, 2024). By leveraging MPAs as a targeted governance tool, it becomes possible not only to reconcile competing interests between environmental protection and resource use, but also to explore practical solutions to current challenges facing SEA—such as ambiguities in legal rules and inconsistencies in procedural practice.

The BBNJ Agreement explicitly incorporates MPAs into a broader framework of integrated ocean management, which aligns closely with the ecosystem approach and precautionary principle advocated by SEA (Ferreira et al., 2022). The designation, delineation, and management processes associated with MPAs offer a strategic decision-making platform through which SEA can be concretely applied.

In the North-East Atlantic, the OSPAR Convention has institutionalized the ecosystem approach as the foundation for establishing and managing MPAs. It explicitly identifies regional SEA as a prerequisite for selecting MPA sites and formulating corresponding regulatory measures. This form of regional strategic assessment enables the early identification and prevention of potential environmental risks, while also providing a structured methodological basis for SEA. It enhances both consensus-building and implementation efficiency in cross-border cooperation (Sander, 2016). Moreover, linking SEA to MPA development can help alleviate international disputes over the scope of SEA. As MPAs are geographically defined management areas, they inherently delimit the scope and object of SEA, thereby reducing the sensitivity associated with national sovereignty concerns (De Santo, 2018). Drawing from EU practice, differentiated and progressive SEA standards tailored to specific MPAs can mitigate risks of sovereignty-based conflict while ensuring that environmental protection objectives are effectively met.

Specifically, SEA procedures should be incorporated at both the designation and management stages of MPAs. At the designation stage, when a marine area is proposed for protected status, a science-based assessment should be conducted to evaluate the area's ecological characteristics, biodiversity status, and existing threats. This assessment would establish the necessity of protection and inform the design of appropriate management measures, thereby providing an evidence-based foundation for future regulation of human activities. Building on this logic, the integration of SEA into the full lifecycle of MPAs—from initial area selection to post-designation monitoring—offers a structured and adaptive planning pathway under the BBNJ regime. Broad areas of

interest (AOIs) for potential MPAs may first be identified based on biodiversity significance, ecological connectivity, and vulnerability to threats. An SEA can then be conducted for the selected AOIs to establish environmental baselines, analyze human pressures and cumulative impacts, and compare alternative protection scenarios. The resulting insights would guide the formal selection of MPA sites, the delineation of boundaries, and the development of area-based management tools tailored to identified stressors and sensitive habitats. After designation, SEA findings may continue to inform MPA management through ongoing monitoring, the use of performance indicators, and periodic SEA updates to respond to ecological and governance changes. This SEA-MPA linkage strengthens the scientific foundation and legitimacy of spatial conservation measures, while supporting precautionary and ecosystem-based planning approaches. Similar frameworks have already been applied in regional marine initiatives, such as in the North-East Atlantic and the Southern Ocean, to enhance the ecological coherence of MPA networks (OAP, 2023).

7 Conclusion

Through a comparative analysis of SEA legislation and practices in the EU, the United States, Canada, and Pacific SIDS, this article has identified both valuable institutional experiences and common structural challenges. It has further explored the feasibility of promoting SEA implementation under the BBNJ Agreement through four complementary approaches: the development of technical standards and guidelines, the establishment of robust international coordination mechanisms to resolve SEA rule conflicts, the strengthening of capacity-building and technology support mechanisms, and the strategic integration of SEA into MPA processes. Nevertheless, this study has certain limitations. Due to constraints of length and methodological focus, the analysis has primarily relied on existing legal frameworks and policy practices, without fully accounting for broader contextual variables such as cultural characteristics or ecological diversity. This may limit the comprehensiveness of the conclusions regarding factors influencing national SEA implementation. Future research should adopt a more interdisciplinary perspective to explore the multifaceted dynamics shaping SEA in ABNJ.

As SEA implementation in ABNJ remains at a nascent stage, its effective realization will depend on coordinated and sustained action among all stakeholders. During the interim period prior to the BBNJ Agreement's entry into force, States and institutions have substantial preparatory work to undertake. By strengthening institutional design, enhancing technical capacity, and addressing the persistent challenges of legal fragmentation, uneven capabilities, and competing interests, the international community can lay the groundwork for an operational SEA regime. These efforts will be essential for advancing the rule of law in global ocean governance and ensuring the long-term conservation and sustainable use of marine biodiversity in the high seas.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

ZY: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. YBZ: Software, Validation, Visualization, Writing – review & editing. YXZ: Project administration, Resources, Supervision, Writing – review & editing. QW: Funding acquisition, Project administration, Resources, Writing – review & editing.

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