



OCEANIC ARCHIPELAGOS, THE LAW OF THE SEA AND SUSTAINABLE OCEAN GOVERNANCE: THE CONTRIBUTION OF MACARONESIA AND THE AZORES TO MARINE CONSERVATION

ARQUIPÉLAGOS OCEÂNICOS, DIREITO DO MAR E GOVERNAÇÃO DOS OCEANOS: O PAPEL DA MACARONÉSIA E DOS AÇORES NA CONSERVAÇÃO MARINHA

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ABSTRACT:

Objective: This article aims to analyse the international, European and national legal framework governing the oceans, with particular emphasis on the role of the Macaronesian archipelagos and the Azores in marine biodiversity conservation. It seeks to demonstrate the importance of maritime spatial planning as a key instrument for the sustainable management of marine resources and the protection of ocean ecosystems.

Methodology: The study adopts a qualitative, doctrinal and normative legal approach, based on an analysis of the United Nations Convention on the Law of the Sea (UNCLOS), European Union and Portuguese legislation on maritime spatial planning, as well as a review of the relevant scientific literature and international instruments concerning ocean governance, marine conservation and environmental sustainability. The research also examines the case of Macaronesia and the Azores as strategically important regions for integrated ocean governance.





Results: The findings demonstrate that the Macaronesian archipelagos play a crucial ecological and geostrategic role in marine biodiversity conservation and sustainable ocean governance. The study shows that maritime spatial planning is an essential tool for reconciling the economic use of marine resources with ecosystem protection. Nevertheless, significant challenges remain, including institutional fragmentation, the need for stronger multi-level governance, the impacts of climate change, and enhanced international cooperation.

Conclusions: The article concludes that effective ocean protection requires a multi-level governance framework grounded in the integration of the Law of the Sea, European Union law and national legislation. It advocates strengthening maritime spatial planning, scientific and institutional cooperation, the establishment and effective management of marine protected areas, and the development of public policies that reconcile sustainable development, the blue economy and marine biodiversity conservation. Within this context, the Azores and the wider Macaronesian region play a strategic role in advancing innovative models of ocean governance.

KEYWORDS: Law of the Sea. Ocean Governance; Maritime Spatial Planning; Macaronesia; Azores; Marine Biodiversity Conservation; Sustainable Development.

RESUMO:

Objetivo: O artigo tem como objetivo analisar o enquadramento jurídico internacional, europeu e nacional da governação dos oceanos, com especial enfoque no papel dos arquipélagos da Macaronésia e dos Açores na conservação da biodiversidade marinha. Pretende demonstrar a relevância do ordenamento do espaço marítimo como instrumento de gestão sustentável dos recursos marinhos e de proteção dos ecossistemas oceânicos.

Metodologia: Adotou-se uma metodologia qualitativa, de natureza jurídico-doutrinária e normativa, baseada na análise da Convenção das Nações Unidas sobre o Direito do Mar (CNUDM), da legislação europeia e portuguesa relativa ao ordenamento do espaço marítimo, bem como na revisão da literatura científica e de instrumentos internacionais sobre governação dos oceanos, conservação marinha e sustentabilidade ambiental. A investigação assenta igualmente na análise do caso da Macaronésia e dos Açores enquanto regiões estratégicas para a gestão integrada dos oceanos.

Resultados: A investigação evidencia que os arquipélagos da Macaronésia desempenham uma função ecológica e geoestratégica essencial para a conservação da biodiversidade marinha e para a governação sustentável dos oceanos. Os resultados demonstram que o ordenamento do espaço marítimo constitui um instrumento indispensável para compatibilizar a exploração económica dos recursos marinhos com a preservação dos ecossistemas, embora persistam desafios relacionados com a fragmentação institucional, a coordenação multinível, as alterações climáticas e a necessidade de reforçar a cooperação internacional.

Conclusões: O artigo conclui que a proteção eficaz dos oceanos exige uma governação multinível assente na articulação entre o Direito Internacional do Mar, o direito da União Europeia e a legislação nacional. Defende-se o reforço do ordenamento do espaço marítimo, da cooperação científica e institucional, da criação e gestão eficaz de áreas marinhas protegidas e da integração de políticas públicas que conciliem desenvolvimento sustentável, economia azul e conservação da





biodiversidade. Os Açores e a Macaronésia assumem, neste contexto, um papel estratégico para a implementação de modelos inovadores de governação oceânica.

Palavras-chave: Direito do Mar. Governação dos Oceanos; Ordenamento do Espaço Marítimo; Macaronésia. Açores; Conservação da Biodiversidade Marinha; Desenvolvimento Sustentável.

1 INTRODUCTION

The legal framework governing the oceans is founded upon the United Nations Convention on the Law of the Sea (UNCLOS). This Convention divides the world's oceans into distinct maritime zones, each subject to a specific legal regime. In doing so, it clearly defines the rights and responsibilities of coastal States within each maritime area. The delimitation of these zones establishes the legal boundaries of State jurisdiction, enabling governments to exercise sovereign rights over the exploration, exploitation, conservation and management of natural resources, particularly within the Exclusive Economic Zone (EEZ) and the continental shelf. Collectively, these provisions provide a coherent legal framework for the orderly governance and sustainable use of the marine environment.

The application of these legal rules presents particular challenges for island territories. UNCLOS establishes a specific legal regime for archipelagic States, allowing them to draw straight archipelagic baselines connecting the outermost points of their islands and thereby enclosing the waters within as archipelagic waters. However, this regime does not extend to archipelagos that form part of continental States. Consequently, maritime zones surrounding such archipelagos must be measured individually from each island rather than from a unified archipelagic baseline. This legal distinction has significant implications for the Macaronesian region. In the Azores, Madeira and the Canary Islands, maritime governance is shaped by the interaction of national, European Union and international legal frameworks, creating a complex multi-level system of regulation and administration.

From a biological perspective, the Macaronesian archipelagos function as important ecological transition zones within the North Atlantic. Their volcanic origin has shaped a complex seabed topography that promotes the upwelling of nutrient-rich waters, supporting high levels of marine productivity and biodiversity. Coastal waters also serve as significant carbon sinks, contributing to climate regulation through the sequestration of atmospheric carbon dioxide. However, these ecosystems are





increasingly threatened by anthropogenic pressures. Coastal pollution continuously alters seawater chemistry, while intensive maritime shipping facilitates the introduction of non-indigenous species through commercial ports and ballast water discharge. Together, these pressures pose a serious threat to benthic ecosystems and the rich biodiversity of the seabed.

Addressing these challenges requires a more effective and integrated approach to maritime governance. European Union legislation calls for the implementation of maritime spatial planning as a key policy instrument to balance sustainable economic development with the protection of marine ecosystems. In Portugal, this objective is pursued through the National Maritime Spatial Planning Situation Plan (Plano de Situação do Ordenamento do Espaço Marítimo Nacional – PSOEM), which allocates and regulates the various uses of the national maritime space. A dedicated subdivision of this plan has been developed specifically for the Azores, reflecting the archipelago's unique geographical, ecological and administrative characteristics. Against this background, this article examines how international legal frameworks can be effectively integrated with maritime spatial planning to ensure that island ecosystems remain resilient in the face of increasing pressures arising from the exploitation of marine resources.

2 THE INTERNATIONAL LEGAL FRAMEWORK GOVERNING THE OCEANS

The international legal framework governing the oceans is founded upon the United Nations Convention on the Law of the Sea (UNCLOS), which establishes the legal basis for the governance of maritime spaces through the division of the oceans into distinct maritime zones, each subject to a specific legal regime. This framework provides the foundation for the administration of both insular and oceanic areas. UNCLOS establishes the legal regime applicable to archipelagic States, permitting the drawing of straight archipelagic baselines connecting the outermost points of the islands of an archipelago (United Nations, 1982, Art. 47). These baselines define the archipelagic waters over which the State exercises sovereignty, including the superjacent airspace, the seabed and the subsoil. From these baselines, coastal States measure their Exclusive Economic Zone (EEZ), within which they enjoy sovereign rights for the exploration, exploitation, conservation and management of





natural resources (United Nations, 1982, Art. 56). Nevertheless, while UNCLOS remains the cornerstone of the international law of the sea, its provisions are complemented by subsequent international agreements and legal instruments designed to address emerging challenges relating to marine environmental degradation, biodiversity conservation and the sustainable use of ocean resources.

With regard to environmental protection, UNCLOS imposes a general obligation upon States to protect and preserve the marine environment, including the conservation of rare or fragile ecosystems and the habitats of threatened, endangered and other vulnerable species (United Nations, 1982, Art. 194). As Kojima (2023, p. 2) observes, this dimension of the Convention has progressively incorporated principles of international environmental law, enabling it to evolve in response to emerging environmental challenges. Concepts such as the ecosystem-based approach, the precautionary principle and the prevention of environmental harm have gradually been integrated into international judicial and arbitral practice, becoming key interpretative tools for resolving contemporary disputes concerning the protection and sustainable management of the marine environment (Kojima, 2023, p. 3).

The United Nations Fish Stocks Agreement (UNFSA) provides a clear example of the integration of the law of the sea with contemporary principles of international environmental law. The Agreement requires States to apply the precautionary approach to the conservation and management of straddling fish stocks and highly migratory fish stocks, making it clear that the absence of adequate scientific information shall not be invoked as a reason for postponing or failing to adopt conservation measures (United Nations, 1995, Art. 6). It further requires that conservation and management measures adopted for the high seas and those applied within areas under national jurisdiction are compatible, thereby ensuring the effective protection of fish stocks throughout their entire range (United Nations, 1995, Art. 7). Accordingly, the Agreement establishes a comprehensive framework of international cooperation, obliging States to coordinate their conservation and management efforts in order to secure the long-term sustainability of fish stocks that migrate across national jurisdictions and the high seas (United Nations, 1995, Art. 8).

In areas beyond the jurisdiction of any single State, ocean governance has traditionally been characterised by a fragmented legal and institutional framework. Early initiatives to establish marine protected areas on the high seas relied primarily on regional agreements, such as the OSPAR Convention and the Convention on the





Conservation of Antarctic Marine Living Resources (CCAMLR) (Jiang & Guo, 2023, p. 3). Although these instruments represented important milestones in the development of international marine conservation, their legitimacy and effectiveness have been questioned. The negotiation of these regional regimes excluded many developing States and several United Nations bodies, raising concerns regarding the inclusiveness and representativeness of their law-making processes (Jiang & Guo, 2023, p. 7). Furthermore, because their legal obligations apply only to contracting parties, such agreements face inherent limitations in governing areas that constitute the common heritage of the international community.

In response to these shortcomings, the Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ Agreement) was adopted under the auspices of the United Nations. The primary objective of the Agreement is to ensure the conservation and sustainable use of marine biological diversity through a comprehensive framework of international cooperation (United Nations, 2023, Art. 2). Unlike earlier regional approaches, the BBNJ Agreement establishes a genuinely global institutional framework in which all States may participate on an equal footing within the Conference of the Parties. In doing so, it seeks to promote a more inclusive, transparent and representative system of global ocean governance, preventing decision-making from being concentrated in the hands of a limited number of States (Jiang & Guo, 2023, p. 10).

Furthermore, the BBNJ Agreement requires that activities undertaken in areas beyond national jurisdiction be subject to environmental impact assessments prior to their authorisation, ensuring that potential adverse effects on the marine environment are identified, assessed and, where appropriate, mitigated (United Nations, 2023, Art. 28). The Agreement also establishes a comprehensive legal framework governing marine genetic resources, including provisions on the fair and equitable sharing of the monetary and non-monetary benefits arising from their utilisation, with particular consideration for the interests and needs of developing States (United Nations, 2023, Art. 14). While respecting the mandates of existing international organisations and legal instruments, the Agreement seeks to strengthen global ocean governance by providing a coherent and coordinated framework for marine biodiversity conservation, thereby reducing the fragmentation that has historically characterised international ocean governance (Jiang & Guo, 2023, p. 8).





Contemporary ocean governance must also address the challenges posed by climate change and the emergence of new marine technologies. Among these are negative emissions technologies, which seek to enhance the ocean's capacity to absorb atmospheric carbon dioxide through interventions such as ocean alkalinity enhancement. As Röschel and Neumann (2023, p. 2) observe, the regulation of these technologies remains fragmented, relying upon a complex network of pre-existing international legal instruments that were not originally designed to govern climate intervention measures. Existing treaties addressing marine pollution, biodiversity conservation and ocean dumping provide only limited direct or indirect regulation of research involving such technologies (Röschel & Neumann, 2023, p. 10). Furthermore, the large-scale deployment of these interventions may generate significant ecological risks for marine and coastal ecosystems and potentially conflict with obligations established under other international legal regimes, including those relating to the conservation and sustainable management of fish stocks under the United Nations framework (Röschel & Neumann, 2023, p. 11).

The convergence of these challenges calls for a fundamental transformation in contemporary ocean governance. Moving away from traditional, centralised models of decision-making towards more inclusive and collaborative governance frameworks has become essential, particularly in the management of coastal and marine environments. Effective governance mechanisms must integrate marine biodiversity conservation with climate change adaptation and mitigation strategies in order to address the interconnected nature of current environmental challenges (Ferse, 2023, p. 2). Equally important is the meaningful participation of local and Indigenous communities, whose traditional knowledge is increasingly recognised as a valuable component of equitable and resilient governance systems capable of supporting the long-term sustainability of marine ecosystems (Ferse, 2023, p. 3). Consequently, the international legal framework governing the oceans must evolve in a manner that effectively reconciles global legal obligations with the particular geographical, ecological and institutional realities of island territories, ensuring both the equitable use of marine resources and the long-term protection of the marine environment.

2.1 THE UNITED NATIONS CONVENTION ON THE LAW OF THE SEA (UNCLOS)





The United Nations Convention on the Law of the Sea (UNCLOS) constitutes the cornerstone of the international legal framework governing the world's oceans. As noted by Zou and Telesetsky (2023, p. 1), the Convention comprises a preamble, seventeen parts, 320 articles and nine annexes, establishing a comprehensive legal regime that regulates the use and governance of maritime spaces. Its provisions address a broad range of issues relating to maritime jurisdiction and the allocation of rights and responsibilities among States, encompassing the delimitation of maritime zones, the conservation and sustainable use of marine resources, the protection and preservation of the marine environment, marine scientific research, navigation, and the peaceful settlement of disputes. Through this integrated legal framework, UNCLOS provides the foundation for the orderly, equitable and sustainable governance of the oceans.

UNCLOS structures the governance of the oceans by dividing maritime space into a series of distinct legal zones, within which the degree of coastal State jurisdiction progressively diminishes with increasing distance from the coastline. Within this framework, the Convention establishes the legal status, extent and regulatory regime applicable to maritime zones, including internal waters, the territorial sea extending up to twelve nautical miles, the contiguous zone, the Exclusive Economic Zone (EEZ), and the continental shelf (Arugu & Anabraba, 2022, p. 32). The delineation of these maritime zones provides the legal basis for the exercise of State jurisdiction over natural resources, maritime activities and environmental protection, while ensuring the orderly regulation of international navigation and the balanced allocation of rights and obligations under international law.

A distinct component of UNCLOS is Part IV, which establishes the legal regime applicable to archipelagic States. Under Article 46 of the Convention, an archipelagic State is defined as a State constituted wholly by one or more archipelagos and may include other islands. An archipelago, in turn, is understood as a group of islands, together with the interconnecting waters and other natural features, which are so closely interrelated that they form an intrinsic geographical, economic and political entity, or have historically been regarded as such (United Nations, 1982, Art. 46). This definition provides a specific legal basis for the governance of archipelagic States, recognising their distinctive geographical configuration and establishing a tailored legal regime for the administration of their maritime spaces.





The adoption of UNCLOS across numerous jurisdictions represented a significant step towards ensuring the effective implementation of its legal framework, including the provisions governing archipelagic States. The official translation of the Convention into Portuguese provided Portuguese-speaking States with island territories with an authoritative legal text upon which to organise and regulate their maritime zones in accordance with international law (Bastos, 2024, p. 40). The availability of this common legal framework greatly facilitated the incorporation of UNCLOS into domestic legal systems, promoting greater consistency between national legislation and the international law of the sea.

With regard to the delimitation of maritime boundaries, UNCLOS permits archipelagic States to employ a system of straight archipelagic baselines. Under Article 47 of the Convention, these baselines may be drawn by joining the outermost points of the outermost islands and drying reefs of an archipelago, provided that the ratio of the area of water to the area of land enclosed by those baselines lies between 1:1 and 9:1 (United Nations, 1982, Art. 47). These archipelagic baselines constitute the reference points from which the breadth of the territorial sea, the contiguous zone, the Exclusive Economic Zone (EEZ) and the continental shelf is measured. By establishing a coherent method for defining maritime jurisdiction, this legal regime provides archipelagic States with a unified framework for the governance and management of their maritime spaces in accordance with international law.

The legal regimes governing the Exclusive Economic Zone (EEZ) and the continental shelf were designed to establish a coherent framework for the sustainable economic use of marine resources. By granting coastal States sovereign rights over the exploration, exploitation, conservation and management of natural resources within the EEZ, extending up to 200 nautical miles from the baselines, UNCLOS provides legal certainty regarding access to marine resources and reduces the potential for jurisdictional disputes in areas of economic activity (Armstrong, 2024, p. 17). In this respect, the Convention establishes a clear allocation of economic rights and responsibilities, forming a fundamental component of the international legal order governing maritime spaces and reinforcing the authority of coastal States over the resources within their maritime jurisdiction.

With respect to the waters enclosed by archipelagic baselines, UNCLOS recognises a distinct legal status that affirms the sovereignty of the archipelagic State. Under Article 49 of the Convention, such sovereignty extends to the archipelagic





waters, irrespective of their depth or distance from the coastline, and encompasses the superjacent airspace, the seabed, the subsoil and all natural resources contained therein (United Nations, 1982, Art. 49). This legal recognition provides the foundation for the exercise of State jurisdiction over these maritime areas, enabling national authorities to regulate navigation, manage marine resources and implement measures for the conservation and sustainable management of the ecosystems associated with archipelagic environments.

Alongside the delimitation of maritime spaces, UNCLOS establishes a comprehensive legal framework for the protection and preservation of the marine environment. The Convention imposes a general obligation upon States to prevent, reduce and control marine pollution and, as Röschel and Neumann (2023, p. 8) observe, requires the adoption of appropriate measures to address environmental risks arising from activities such as marine dumping and the deployment of emerging marine technologies. These obligations are primarily set out in Part XII of the Convention, which provides the principal legal framework for marine environmental protection. Through this regime, UNCLOS establishes a system of environmental governance that requires States to regulate and monitor activities undertaken both within areas under national jurisdiction and, where applicable, beyond national jurisdiction, thereby promoting the conservation and sustainable use of the marine environment.

To reconcile the sovereignty of archipelagic States with the requirements of international navigation, UNCLOS establishes a specific legal regime governing the passage of foreign vessels and aircraft through archipelagic waters. Under Article 53 of the Convention, archipelagic States may designate sea lanes and air routes suitable for the continuous, expeditious and unobstructed passage of foreign ships and aircraft through their archipelagic waters and adjacent territorial sea (United Nations, 1982, Art. 53). This regime seeks to strike a balance between the sovereign rights of archipelagic States over their maritime territory and the international community's interest in maintaining the freedom and efficiency of global maritime and air navigation. It therefore reflects one of the central objectives of UNCLOS: reconciling the exercise of State sovereignty with the collective interests of the international community in the governance and use of the oceans.

The legal framework established by UNCLOS was the product of extensive negotiations conducted during the Third United Nations Conference on the Law of the Sea. The Convention was ultimately adopted as a package deal, requiring States to





accept the treaty in its entirety rather than selectively adopting only those provisions that best served their national interests (Arugu & Anabraba, 2022, p. 29). This approach prevents States from claiming the benefits conferred by the Convention while disregarding the corresponding obligations relating to marine environmental protection, the conservation of marine resources or the peaceful settlement of disputes. By ensuring the integrity of the Convention as a comprehensive legal instrument, the package deal principle has been fundamental to the coherence, effectiveness and universal acceptance of the contemporary law of the sea.

The architecture of UNCLOS extends beyond the establishment of substantive legal rules, creating a comprehensive institutional framework to support the implementation and development of the international law of the sea. As Zou and Telesetsky (2023, p. 2) observe, the Convention established several specialised institutions, including the International Tribunal for the Law of the Sea (ITLOS), the International Seabed Authority (ISA) and the Commission on the Limits of the Continental Shelf (CLCS). Together, these bodies perform essential functions within the international legal order, including the settlement of disputes, the regulation of activities in the Area beyond national jurisdiction, the assessment of submissions concerning the outer limits of the continental shelf, and the promotion of the peaceful and equitable governance of maritime spaces. This institutional framework reinforces the effectiveness of UNCLOS by providing dedicated mechanisms for the implementation, supervision and enforcement of its provisions.

With regard to maritime areas beyond national jurisdiction, the original framework established by UNCLOS requires complementary legal mechanisms to ensure the effective conservation of marine biodiversity. The traditional system, which relies primarily upon the jurisdiction of the flag State, has proved insufficient for the coordinated establishment and management of marine protected areas on the high seas (Armstrong, 2024, p. 19). This practical limitation demonstrates that the spatial division of maritime zones under UNCLOS, although fundamental to the international law of the sea, must be supplemented by additional international agreements capable of addressing ecological processes and marine species that transcend national boundaries. The development of such complementary legal instruments reflects the growing recognition that effective biodiversity conservation depends upon cooperative governance extending beyond the limits of State jurisdiction.



The growing significance of the legal regimes governing the territorial sea and the management of marine resources has been accompanied by substantial developments in both academic scholarship and public policy. As Bastos (2024, pp. 56–57) notes, systematic legal research in this field expanded considerably following the adoption of UNCLOS, particularly through studies examining the Exclusive Economic Zone (EEZ), maritime delimitation and the legal status of island territories. The incorporation of the Convention's legal framework into academic research and policy analysis has greatly enhanced the understanding of coastal States' rights and obligations under international law, while contributing to the consistent interpretation and practical implementation of the law of the sea.

In response to growing ecological changes affecting the marine environment, UNCLOS requires States to adopt appropriate mechanisms for environmental assessment and regulatory oversight within areas under their jurisdiction. As Röschel and Neumann (2023, p. 9) observe, the Convention provides a legal framework requiring the assessment of the potential environmental impacts of planned industrial activities and marine interventions before they are undertaken. These provisions demonstrate that the exercise of State jurisdiction under UNCLOS is intrinsically linked to environmental monitoring, assessment and control, ensuring that activities carried out within the territorial sea, the Exclusive Economic Zone (EEZ) and other areas under national jurisdiction are conducted in a manner consistent with the protection and preservation of the marine environment.

The relationship between the governance of archipelagic States and the conservation of marine living resources is reflected in the provisions of UNCLOS concerning fisheries management within the Exclusive Economic Zone (EEZ). Under Article 61 of the Convention, the coastal or archipelagic State is responsible for determining the allowable catch of living marine resources within its EEZ and for adopting appropriate conservation and management measures to ensure that fish stocks are not endangered by over-exploitation (United Nations, 1982, Art. 61). In exercising these sovereign rights, States are required to base their decisions on the best available scientific evidence and to promote the long-term sustainability of marine living resources. These provisions establish the legal foundation upon which island territories may develop fisheries management regimes that safeguard marine biodiversity while ensuring the sustainable use of the resources upon which their economies and communities depend.





2.2 MARITIME JURISDICTION ZONES ESTABLISHED UNDER THE UNITED NATIONS CONVENTION ON THE LAW OF THE SEA (UNCLOS)

Contemporary ocean governance is founded upon the legal division of maritime space, a process that combines technical and legal principles to allocate rights and responsibilities among States. The establishment of distinct maritime zones provides the framework through which marine resources are managed and human activities regulated by means of a structured system of State jurisdiction. Within this legal framework, the delimitation of maritime space constitutes one of the fundamental functions of the international law of the sea, creating a coherent legal order for the governance of an environment that covers the greater part of the Earth's surface (Tanaka, 2022, p. 3). By allocating specific rights and obligations to coastal States within clearly defined maritime zones, this system facilitates the effective management of marine resources while promoting legal certainty and the orderly administration of ocean activities.

The principal instrument establishing these maritime zones is the United Nations Convention on the Law of the Sea (UNCLOS), which divides the oceans into distinct maritime areas measured from officially recognised baselines. Within maritime zones closest to the coast, namely internal waters and the territorial sea, the Convention recognises the sovereignty of the coastal State over the waters, the seabed, the subsoil and the superjacent airspace (United Nations, 1982, Art. 2). This sovereignty provides the legal basis for the application of the State's civil, criminal and administrative laws within these maritime areas. The principal limitation to this sovereignty is the obligation to permit the right of innocent passage for foreign vessels through the territorial sea, thereby balancing the sovereign rights of coastal States with the interests of international navigation.

The delimitation of these maritime zones is a technically complex process, particularly when applied to islands and remote archipelagos. Under UNCLOS, islands are entitled to generate their own territorial sea, contiguous zone, Exclusive Economic Zone (EEZ) and continental shelf, on the same basis as continental territories, provided that they satisfy the legal criteria for island status by being capable of sustaining human habitation or an economic life of their own, rather than being classified merely as rocks (Carvalho, 2023, p. 173). This capacity to generate a full range of maritime zones constitutes the legal foundation for the extensive maritime areas associated with island





groups such as Macaronesia, significantly enhancing their strategic, economic and environmental importance within the international law of the sea.

In the context of the exploitation of transboundary living marine resources, the rights and responsibilities of States vary according to the maritime zone in which fishing activities take place. Within areas under national jurisdiction, academic scholarship observes that disputes concerning the existence, extent or exercise of the coastal State's sovereign rights are governed by the dispute settlement mechanisms established under international law (Schatz, 2023, p. 91). The regulation of access to these resources constitutes a fundamental instrument of marine biodiversity conservation and sustainable fisheries management, particularly for island territories whose economies and ecosystems depend heavily upon the responsible management of shared fish stocks.

As the scope of coastal State jurisdiction extends further offshore, full sovereignty gives way to more limited sovereign rights and functional powers. The contiguous zone, which extends up to 24 nautical miles from the baselines, does not form part of the State's sovereign territory. Instead, it grants the coastal State the authority to exercise the control necessary to prevent and punish infringements of its customs, fiscal, immigration and sanitary laws and regulations committed within its territory or territorial sea (United Nations, 1982, Art. 33). The purpose of this legal regime is therefore not to confer territorial sovereignty, but to enable coastal States to safeguard the effective enforcement of their domestic laws against unlawful activities originating beyond their territorial sea.

The close proximity of maritime zones between neighbouring or opposite States frequently necessitates formal delimitation procedures in order to prevent overlapping claims and jurisdictional disputes. State practice and international jurisprudence demonstrate a clear preference for establishing a single maritime boundary that simultaneously delimits both the Exclusive Economic Zone (EEZ) and the continental shelf through the application of a single delimitation line (Franckx, 2023, p. 2). This integrated approach promotes legal certainty, enhances consistency in the interpretation of international law, and reduces the practical complexities associated with the administration of adjacent maritime areas governed by different legal regimes.

The Exclusive Economic Zone (EEZ) constitutes the principal maritime area for both economic development and the implementation of marine conservation policies, extending up to 200 nautical miles from the coastal baselines. Within this zone, the





coastal State enjoys sovereign rights for the exploration, exploitation, conservation and management of natural resources. As Gil Antunes (2023, p. 255) notes, the archipelagos of the Azores and Madeira provide Portugal with one of the largest Exclusive Economic Zones in Europe. The exercise of these sovereign rights carries corresponding responsibilities, requiring public authorities to ensure the sustainable management of marine resources through effective regulatory frameworks, continuous environmental monitoring and regular assessments of the ecological impacts arising from increasing commercial activities and other human pressures on the marine environment.

The continental shelf comprises the seabed and subsoil extending beyond the territorial sea and constitutes the principal maritime area in which many strategically important mineral resources are located. Under international law, coastal States exercise sovereign rights for the exploration and exploitation of the natural resources of the continental shelf, including valuable marine mineral deposits such as ferromanganese crusts and polymetallic sulphides (Madureira & Pinto Ribeiro, 2023, p. 240). The exploitation of these seabed resources presents significant opportunities for economic and industrial development. However, the exercise of these sovereign rights is accompanied by corresponding obligations under international environmental law, requiring that exploration and extraction activities be conducted in accordance with rigorous environmental standards and impact assessment procedures to minimise adverse effects on marine ecosystems.

For coastal States whose continental shelf extends naturally beyond the 200-nautical-mile limit, the law of the sea establishes a detailed technical procedure for extending jurisdiction over the seabed. Following the submission of comprehensive scientific and geological data, the outer limits of the continental shelf are determined by applying the criteria set out in Article 76 of UNCLOS, including formulae based on sediment thickness and fixed-distance measurements from the foot of the continental slope (Santos de Campos, 2023, p. 194). This process provides the legal and scientific basis for establishing the final outer limits of the continental shelf, thereby defining the boundary between areas subject to the sovereign rights of the coastal State and the seabed beyond national jurisdiction, which is governed under the international regime established by UNCLOS.

The waters beyond the Exclusive Economic Zone (EEZ) and the seabed lying beyond the outer limits of the continental shelf fall outside the jurisdiction of any





individual State and are legally recognised as the high seas and the Area, respectively. The increasing intensity of human activities in these spaces has highlighted the need for a more comprehensive international legal framework to ensure the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. As Gameiro (2023, p. 59) notes, this need ultimately led to the negotiation of a dedicated international agreement designed to strengthen the governance of marine biological diversity in these global commons. The resulting framework introduces mechanisms for the establishment of networks of marine protected areas, the implementation of environmental impact assessments, and the promotion of coordinated international action to safeguard marine ecosystems beyond national jurisdiction.

The stability of this system of maritime delimitation ultimately depends upon respect for international legal norms and the availability of effective mechanisms for the peaceful settlement of disputes between States. In this regard, Becker-Weinberg (2023, p. 77) emphasises the importance of maintaining a clear distinction between disputes concerning maritime entitlements and those relating to territorial sovereignty over land territory. This distinction enables international courts and tribunals to delimit maritime boundaries without first having to determine sovereignty over islands, rocks or other maritime features. By separating these legal questions, the international law of the sea promotes greater legal certainty, facilitates the peaceful resolution of disputes and contributes to the stability and predictability of the international maritime order.

The body of law governing maritime zones continues to evolve in response to emerging technologies and the increasingly complex environmental challenges affecting the world's oceans. Unlike the earlier phases in the development of the law of the sea, the contemporary legal framework comprises a sophisticated network of treaties, implementing agreements and regulatory instruments that requires a clear distinction between legally binding obligations and the various standards, guidelines and best practices applicable to different maritime sectors (Loureiro Bastos, 2023, p. 20). This progressive development enables the international law of the sea to respond effectively to new scientific, technological and environmental realities while preserving the coherence and stability of the legal regime governing maritime spaces. In doing so, it ensures that the spatial organisation of the oceans remains firmly grounded in international law and capable of meeting the challenges of future ocean governance.



2.3 THE LEGAL STATUS OF ARCHIPELAGOS UNDER THE INTERNATIONAL LAW OF THE SEA

The international law of the sea establishes a comprehensive legal framework governing island territories, defining the scope of State jurisdiction over the maritime areas surrounding them. The introduction of the legal concept of the archipelagic State under the United Nations Convention on the Law of the Sea (UNCLOS) represented a significant development in the law of the sea by recognising the distinctive geographical character of States composed wholly of one or more archipelagos. Article 46 of the Convention defines an archipelagic State as a State constituted entirely by one or more archipelagos and which may also include other islands (United Nations, 1982, Art. 46). This legal status entitles such States to draw straight archipelagic baselines connecting the outermost points of their outermost islands, thereby enclosing the waters within as archipelagic waters subject to State sovereignty. The establishment of these baselines provides a unified legal framework for measuring the breadth of the territorial sea, the contiguous zone, the Exclusive Economic Zone (EEZ) and the continental shelf, thereby facilitating the effective governance and sustainable management of extensive maritime areas.

Notwithstanding the effectiveness of this legal regime, UNCLOS draws a clear distinction between archipelagic States and archipelagos forming part of continental States. During the negotiations of the Third United Nations Conference on the Law of the Sea, proposals advanced by several States to extend the system of straight archipelagic baselines to their overseas or dependent archipelagos were ultimately rejected (Redgwell & Tzanakopoulos, 2023, p. 582). The principal justification for this exclusion was the concern that permitting continental States to enclose extensive archipelagic waters could unduly restrict the freedoms of international navigation and overflight, thereby disrupting global commercial and military maritime routes. Consequently, archipelagos belonging to continental States do not benefit from the legal regime established under Part IV of UNCLOS. Instead, the maritime zones surrounding each island must be measured individually from the relevant baselines, in accordance with the general rules of the Convention, rather than from a single unified archipelagic baseline.

For island territories that do not fall within the formal definition of an archipelagic State, international law determines the extent of their maritime entitlements according





to their physical characteristics. Under Article 121 of the United Nations Convention on the Law of the Sea (UNCLOS), the decisive legal criterion is whether an island is capable of sustaining human habitation or an economic life of its own, independently of external resources (Hobbs & Rothwell, 2024, p. 613). This distinction clearly differentiates islands, which are entitled to generate a territorial sea, contiguous zone, Exclusive Economic Zone (EEZ) and continental shelf, from rocks, which, although capable of generating a territorial sea, are not entitled to an EEZ or continental shelf. The correct application of this provision is of considerable practical importance, as it determines the spatial extent of coastal State jurisdiction and defines the maritime areas within which public authorities may exercise powers relating to maritime spatial planning, fisheries management, marine resource conservation and the protection of marine biodiversity.

The Macaronesian region provides an ideal case study for examining the practical implications of this legal framework, as it enables a direct comparison of the application of international maritime law across archipelagos with differing constitutional and political statuses. The contrasting governance capacities of the European Union's outermost regions and the sovereign island States of Africa illustrate that effective marine conservation requires legal and institutional solutions tailored to the specific realities of local governance structures. These differences raise important questions as to whether the existing framework of the international law of the sea provides adequate legal tools to ensure the effective governance of fragmented island territories and the sustainable management of their extensive maritime spaces. In this context, the Macaronesian archipelagos highlight both the strengths and the limitations of the current legal regime, demonstrating the need for governance models capable of integrating international legal obligations with regional ecological and institutional realities.

An examination of the institutional and geographical characteristics of Macaronesia reveals a model of marine governance characterised by the interaction of multiple levels of legal and administrative authority over the same maritime spaces. Three of the archipelagos comprising the region, the Canary Islands, the Azores and Madeira, are legally constituted as autonomous regions of continental European States and are therefore subject to the general legal regime applicable to islands under the United Nations Convention on the Law of the Sea (UNCLOS). By contrast, Cape Verde is a sovereign archipelagic State governed by the specific legal regime established for





archipelagic States under Part IV of the Convention (Casimiro et al., 2026, p. 3). This divergence in legal status means that, within the same geographical region, international law, European Union law and national legal systems operate simultaneously, creating a complex multi-level governance framework. The coexistence of these overlapping legal regimes necessitates effective cross-border cooperation and institutional coordination to ensure the coherent management of marine protected areas and the sustainable regulation of economic activities, including ecotourism, while safeguarding the ecological integrity of the region's marine ecosystems.

Beyond their legal classification, all island formations are required to comply with the environmental obligations arising under public international law. Recent decisions of international courts affirm that the duty to preserve the marine environment encompasses an obligation to prevent, reduce, and control pollution resulting from greenhouse gas emissions and their contribution to ocean acidification (International Tribunal for the Law of the Sea, 2024, p. 151; Bhattachary, Sachdev, Rodrigues & Rodrigues, 2025).

Observance of this rule demands that archipelagic territories, as custodians of vulnerable marine areas, apply the standard of due diligence and the precautionary principle in their decision-making processes. Institutional responsibility is grounded in the implementation of environmental impact assessments capable of ensuring the continued functioning of marine habitats in the face of physical and chemical changes affecting the ocean.

3 THE ECOLOGICAL FUNCTION OF ARCHIPELAGOS IN GLOBAL MARINE ECOSYSTEMS: THE PARTICULAR CASE OF MACARONESIA

Understanding the ecological function of archipelagos within global marine ecosystems requires an examination of their geology and their interaction with ocean currents. In the Macaronesian region, volcanic formation generates an island life cycle that extends from submarine construction to gradual subsidence through erosion, ultimately resulting in flat-topped seamounts. This process shapes seabed habitats at multiple depths and establishes the physical conditions necessary for biodiversity.





The emergence of these volcanic blocks (Fernández-Palacios, 2010, p. 17) creates corridors that operate as passage stations for marine fauna, particularly during sea-level fluctuations associated with glacial periods. The presence of this relief disrupts the uniformity of abyssal plains and induces the upward movement of nutrients towards the surface, sustaining high levels of productivity in open-ocean areas.

To understand this in a practical and straightforward way, islands and their coastlines function as natural filters that cleanse both water and air. Situated in regions where cold and warm currents intersect, the surrounding ocean captures a significant share of the polluted air produced in urban areas, drawing it downwards and storing it on the seabed. Research data show that, particularly during the colder winter months, the coastal waters of these archipelagos absorb and retain the carbon dioxide that contributes to global warming. Protecting the seas around our islands ensures that the climate does not become increasingly harmful for all of us (Curbelo-Hernández et al., 2023, p. 16). This makes islands highly effective locations for reducing daily pollution.

From a geographical and evolutionary perspective, the islands of Macaronesia function as locations where marine species become retained and diversify. The interaction between Atlantic currents—such as the Canary Current—and local topography enables the encounter of tropical and temperate-water species, generating assemblages on island platforms that do not occur elsewhere. Studies on deep-sea invertebrates, including amphipod crustaceans, reveal higher levels of species diversity that are unique to these islands and exceed those recorded in nearby continental areas (Dauvin et al., 2025, p. 604).

This genetic differentiation between island and continental populations demonstrates that archipelagos are active centres of evolution. Their capacity to serve as refuges during periods of temperature change makes these surrounding seas valuable genetic reservoirs for the long-term conservation of life in the northeastern Atlantic.

The geographical position of Macaronesia increases its vulnerability to human activities, particularly the continuous introduction of non-native species. Artificial marine structures, such as ports and marinas, act as pathways for the transfer of organisms transported on vessel hulls. Research conducted in the region's port facilities shows that the establishment of these species (Castro et al., 2023, p. 2) depends on temperature differences and the resilience of local communities.





The arrival of such organisms alters the original structure of the environment and competes for physical space and food resources with species that are unique to the islands. This susceptibility to biological invasions requires the creation of biosafety rules to prevent disruption of the islands' food webs and to ensure that their biodiversity does not become homogenised with that of other regions.

Put simply, if we do not control the number of vessels, coastal construction, and daily waste, marine life can disappear rapidly. Many fishing families and local communities depend on a clean ocean for their livelihoods and food security. It is therefore essential to organise ourselves through practical rules and to determine which areas of the sea may be used for work (Larrea et al., 2023, p. 2) and which must be protected so that fish populations can grow.

By respecting the ocean's natural rhythms and avoiding damage to the seabed, we ensure that future generations will also be able to rely on nature's resources. It is a practical task that benefits everyone equally. To address environmental change and ensure the resilience of island ecosystems, ocean governance promotes maritime spatial planning and the strengthening of marine protected areas. Establishing conservation zones is a basic requirement, yet their effectiveness depends on management capacity and continuous monitoring to assess whether biological objectives are being met. In this context, the planning of low-impact activities (Casimiro et al., 2025, p. 3), such as marine ecotourism, operates as a strategy for generating direct funding for conservation.

However, technical indicators are necessary to demonstrate compliance with sustainability rules. Applying such models facilitates the equitable distribution of economic benefits among local communities and prevents marine degradation. In this way, a balance is achieved between human use and the maintenance of the region's ecological conditions (Fernández-Palacios, 2010, p. 11).

Long-term planning for these measures in archipelagic regions must be grounded in the continuous collection of oceanographic data, enabling the assessment of the effects of global change on the marine environment. Scientific observation networks show that carbon uptake on island platforms and in coastal areas occurs at a faster rate than in the open ocean. Water dynamics make the coastlines of archipelagos efficient carbon sinks, while simultaneously rendering them more susceptible to ocean acidification.





The incorporation of all these chemical and biological data into international databases is a priority for producing accurate estimates regarding the survival of calcareous deep-sea organisms (Curbelo-Hernández et al., 2023, p. 16). Only with a clear understanding of the magnitude of carbon fluxes and their impact on water chemistry will it be possible to implement policies that safeguard the ecological functions performed by islands.

4 MULTILEVEL OCEAN GOVERNANCE

Ocean governance forms an integral part of global governance and operates through the interaction of multiple actors, both within and beyond the State (Rodrigues & Cabete, 2024; Rodrigues, Bhattacharya & Cabete, 2023; Rodrigues & Cabete, 2022). In recent decades, the management of marine spaces has shifted from a model based solely on national jurisdiction to a polycentric system in which non-governmental organisations, private companies, and international bodies assume regulatory responsibilities. Within this context, Chen and Liu (2023, p. 1) argue that new technologies and environmental crises have reshaped the geopolitical landscape, increasing the number of participants and reinforcing the need to establish common cooperative mechanisms.

This development defines the model of multilevel governance, a practical and necessary approach for creating regulatory frameworks in a context of divided competences that directly affects the protection of the marine environment.

In waters beyond national jurisdiction, the creation of legal rules reveals the challenges of coordinating different levels of authority. The growing number of regional treaties establishing marine protected areas on the high seas has generated debates concerning the legitimacy and scientific basis of such measures in relation to other States. To address these practical shortcomings, the international community drafted the Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ), a global instrument that organises equitable obligations and reduces the influence of political interests through mechanisms of indicative law (Jiang & Guo, 2023, pp. 1–2).

To ensure the effectiveness of these governance dynamics, academic literature suggests that international normative frameworks must be accompanied by rigorous





local implementation. High-level international regulations have limited practical value if local administrations, regional governments, and direct resource users do not establish daily coordination processes. The effectiveness of ocean governance requires global guidelines to be translated into local scales, using clear communication that enables the participation of all stakeholders in maintaining marine ecosystems.

At the macro-regional level, the European Union has implemented specific directives to organise the maritime policies of Member States through spatial-planning tools. The action plan for the Atlantic Maritime Strategy seeks to harmonise the criteria governing the use of marine space among coastal countries, promoting economic growth in the sector and biological conservation in line with the 2030 Agenda. An examination of the national strategies of Atlantic-basin States shows that climate-change adaptation and nature conservation are central priorities within domestic legislation, although the pace of implementation varies due to differences in internal administrative systems (Marques et al., 2022, p. 3).

The practical implementation of these international norms requires the development of analytical methods that go beyond traditional ocean-sector research. Marine governance needs transdisciplinary processes that integrate scientific data collection, policy design, and the knowledge of local fishing communities from the earliest planning stages. This model of information production extends beyond the academic sphere, enabling decisions on water management to be based on a joint assessment of physical and socio-economic variables (Hills & Maharaj, 2023, p. 1).

The practical translation of international directives into domestic law is evident in the structuring of Portugal's maritime public policy. The government has incorporated sustainable-development objectives into its national ocean strategies, creating specialised departments to jointly manage commercial shipping and the ecological preservation of its exclusive economic zone. Studies of governmental documents indicate that Costa and Santos (2024, pp. 1–2) show how Portuguese institutions have assimilated the patterns of multilevel governance, linking the goals set out in United Nations reports with the technical administration of its archipelagos and Atlantic territories.

One of the limitations observed in island management lies in the temporal mismatch between legislative-formulation processes and the speed of physical changes in the marine environment, such as sea-level rise and coastal erosion. Delays in the preparation of administrative plans contrast with the rapid degradation of littoral





habitats, reducing the capacity of institutions to respond effectively. To protect coastal zones in a meaningful way, public administration must optimise its procedures, reducing the bureaucratic barriers that slow the implementation of technical solutions required by current climatic pressures.

In the Macaronesian region, territorial control faces a decentralised administrative organisation that imposes additional management demands. The case of the Canary Islands illustrates how the mixture of competences held by the State, the autonomous government, island councils, and municipalities creates an institutional fragmentation that delays the implementation of adaptation plans in response to rising sea levels (González et al., 2025, p. 5). To correct these coordination failures and resolve authority conflicts, management theory recommends establishing decision-making mechanisms that can be periodically reviewed, based on regular evaluation of outcomes and the formal inclusion of governmental agencies and societal actors (Day, 2022, p. 4).

The success of this multilevel system ultimately depends on the regulation and practical functioning of coastal marine protected areas. These zones operate as spatial-management instruments that require regular funding and acceptance by the resident population. (Rodrigues, Bhattacharya & Cabete, 2023). Low-impact productive activities, such as marine ecotourism, act as economic drivers that facilitate the financial valorisation of nature and prevent the exclusion of local economies, provided that a decentralised governance structure is consolidated to oversee compliance with use rules within the conservation area (Casimiro et al., 2023, p. 2).

In summary, multilevel ocean governance enables the coordination of different levels of decision-making and actors in the protection of marine ecosystems. Its effectiveness depends on institutional cooperation, the local implementation of regulations, and the integration of scientific and territorial knowledge.

5 THE EUROPEAN FRAMEWORK FOR THE GOVERNANCE OF THE OCEANS

5.1 THE EUROPEAN OCEAN PACT

International law of the sea establishes the legal framework governing both international and national maritime zones, defining the rights and responsibilities of





States over marine resources and the seabed. The European Union administers an Exclusive Economic Zone (EEZ) covering approximately 25 million square kilometres, giving it a direct strategic interest in maritime governance.

Within this public international law context, the European institutions have adopted the European Ocean Pact, a policy framework designed to strengthen implementation, improve coherence across sectoral policies, and integrate existing maritime legislation into a more unified governance system. The Pact also lays the foundations for a future Ocean Act, which aims to establish Maritime Spatial Planning (MSP) as a legally binding governance instrument.

Maritime Spatial Planning is intended to manage the coexistence of multiple uses of marine space, balancing economic activities—such as fisheries, shipping, renewable energy, and resource extraction—with the protection and restoration of marine ecosystems. To support this governance framework, the Pact envisages the development of a common set of indicators and the establishment of a governance board responsible for assessing conservation outcomes in the marine areas managed by Member States, including the EU's outermost regions, which constitute the Union's maritime frontiers (European Commission, 2025, pp. 2–3).

The application of maritime law in areas beyond national jurisdiction follows a model of governance that the scholarly literature describes as pragmatic multilateralism (Riddervold, 2023, p. 1153). This approach is based on the need to regulate interactions within the global maritime domain in order to preserve the openness of international shipping routes while developing environmental protection mechanisms through cooperation in intergovernmental forums.

The European Union's external maritime policy seeks to prevent the unilateral appropriation of the high seas by promoting legally binding international agreements and supporting governance frameworks that establish obligations for mitigating the environmental impacts of human activities. European maritime diplomacy also prioritises the peaceful settlement of maritime boundary disputes and the establishment of marine protected areas through the dispute settlement mechanisms provided under the United Nations Convention on the Law of the Sea (UNCLOS). This approach favours legal harmonisation and institutional cooperation over coercive or military measures, while promoting the adoption of blue economy principles and international maritime governance standards within the domestic legal frameworks of third countries.





Maintaining this system of global maritime governance requires the development of operational maritime security mechanisms capable of enforcing public international law in both adjacent and distant waters. These enforcement strategies are designed to counter transnational illicit activities, referred to in the literature as blue crimes (Bueger & Edmunds, 2023, p. 68), including the unauthorised exploitation of marine resources, smuggling, and violations of international navigational safety regulations.

To optimise the deployment of naval assets, the European Union has introduced the concept of Coordinated Maritime Presences (CMP). This framework enables participating naval forces to retain their national chains of command while operating within a coordinated structure for information sharing and operational awareness in designated Maritime Areas of Interest, such as the Gulf of Guinea. The implementation of capacity-building programmes for the coast guards and maritime authorities of partner countries, together with the standardisation of civilian and military maritime surveillance capabilities, enhances the collection and integration of radar and other maritime domain awareness data. These measures improve situational awareness, strengthen regional maritime security, and facilitate the detection and interception of unregulated and illicit activities at sea.

At the multilateral level, the consolidation of ocean governance depends on the adoption, ratification, and effective implementation of international agreements addressing biodiversity conservation and the mitigation of climate change. Within the framework of the United Nations, negotiations seek to establish a legally binding instrument for the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction, complementing the objectives of the Kunming–Montreal Global Biodiversity Framework.

Throughout the treaty negotiation process, the European Union has consistently advocated the designation of 30% of the world's marine areas as protected areas by 2030, together with the introduction of standardised environmental impact assessments prior to authorising activities related to deep-sea resource exploitation (Scholaert, 2022, p. 3). In this context, the European Union has maintained a precautionary approach towards deep-sea mining, supporting an administrative pause on commercial exploitation until sufficient scientific evidence is available. Accordingly, the development of regulatory frameworks for seabed mining is made contingent upon independent scientific research capable of determining acceptable thresholds for physical, chemical, and acoustic disturbance within deep-sea ecosystems.





The integration of these international legal obligations into island territories requires a structured and context-specific administrative framework. This entails the establishment of technical procedures capable of translating the principles and requirements of global agreements into the day-to-day management of local marine resources. Standardised assessment protocols enable decisions on coastal and marine spatial planning to be informed by reliable and measurable data, including the physicochemical properties of seawater and the availability of marine biomass.

The application of these indicators facilitates the technical designation of maritime areas for commercial shipping, renewable energy development, and strictly protected conservation zones. In this way, the implementation of conservation measures is based on harmonised criteria and systematic monitoring procedures, ensuring that resource extraction, maritime transport, and biodiversity protection are managed in accordance with consistent regulatory standards throughout areas under national jurisdiction.

The regulation of the exploitation of living marine resources constitutes a central pillar of the law of the sea, reflected in legislative efforts to eradicate illegal, unreported and unregulated (IUU) fishing. The European Union's trade and fisheries policy requires the implementation of robust traceability mechanisms (European Commission & High Representative, 2022a, pp. 6–12), including the EU's digital catch certification system, to prevent illegally harvested seafood products from entering the market and to ensure fair competition among operators.

At the same time, the European Union's outermost regions, including the Macaronesian archipelagos and the Azores, possess distinctive geographical and environmental characteristics that require tailored policy approaches for both sustainable development and ecological conservation. Maritime Spatial Planning in these territories must reconcile environmental protection objectives with the deployment of strategic maritime infrastructure.

Achieving this balance requires investment in satellite networks and local ocean-observing systems capable of generating standardised physical and biological datasets. These data support the development of digital hydrological forecasting models, strengthen scientific diplomacy, and provide an empirical foundation for the formulation and implementation of international maritime governance standards (European Commission & High Representative, 2022b, p. 7).



The European Ocean Pact represents a significant step towards a more integrated and coherent framework for ocean governance. Its success depends on effective coordination between European, international, and local levels, combining legal instruments, scientific knowledge, and sustainable management practices to ensure the long-term protection and use of marine resources.

5.2 MARITIME SPATIAL PLANNING IN THE EUROPEAN UNION

Maritime Spatial Planning is founded upon the jurisdictional and sovereignty regimes established under public international law, which define the legal authority of coastal States over the maritime areas adjacent to their territories. International law divides the ocean into distinct maritime zones, granting coastal States sovereign rights to explore, conserve, and manage natural resources within their Exclusive Economic Zone (EEZ) (United Nations, 1982, Art. 56). This legal framework requires national administrations to manage the multiple human activities taking place within the same marine area, balancing the exploitation of marine resources and the development of maritime infrastructure with their obligations to protect the marine environment.

The allocation of marine space for navigation, fisheries, submarine pipelines and cables, offshore energy development, and marine scientific research requires a coordinated planning process capable of preventing conflicts between competing sectors while minimising the degradation of the ocean's physical, chemical, and ecological conditions. Maritime Spatial Planning therefore provides an integrated governance framework through which economic development, environmental conservation, and the sustainable use of marine resources can be pursued in a coherent and legally structured manner.

Within the European system of maritime governance, the need to organise the use of marine space emerged in response to the measurable increase in demand arising from maritime industries, transport, and biodiversity conservation. Assessments conducted by the institutions of the European Union concluded that fragmented, sector-specific approaches to marine management created administrative inefficiencies and undermined the long-term resilience of marine ecosystems. In response to these shortcomings, the European Commission developed an integrated policy framework for Maritime Spatial Planning, providing a structured decision-making



process to reconcile competing maritime interests while minimising their environmental impacts (European Commission, 2008, p. 2).

The establishment of this governance framework was formalised through the adoption of the Maritime Spatial Planning Directive, which requires all coastal Member States to develop and implement maritime spatial plans within their marine waters. The Directive obliges national authorities to organise human activities at sea while taking full account of land–sea interactions. At the same time, it does not prescribe a uniform planning methodology or spatial configuration, thereby respecting the principle of subsidiarity and allowing decisions to be taken at the most appropriate governance level (European Parliament & Council, 2014, Art. 4).

The Directive further requires the standardised collection and exchange of data, coordination with neighbouring States, and the continuous assessment of environmental, social, and economic interactions affecting the marine environment. For archipelagic and island regions, this planning process must also incorporate their distinctive geographical and ecological characteristics to ensure that maritime spatial plans are adapted to local conditions while remaining consistent with the broader objectives of European maritime governance.

Maritime Spatial Planning operates in close conjunction with the European Union's environmental acquis, serving as an implementation mechanism for marine conservation legislation. In particular, the Marine Strategy Framework Directive (MSFD) provides the environmental foundation of this planning system by requiring Member States to adopt measurable programmes of measures aimed at achieving or maintaining Good Environmental Status (GES) in their marine waters.

To ensure that marine policies reflect ecological and oceanographic variability, the Directive divides European marine waters into distinct marine regions and sub-regions for management purposes. Within this framework, the Macaronesian marine sub-region, encompassing the waters surrounding the Azores, Madeira, and the Canary Islands, is formally recognised as a distinct biogeographical unit requiring coordinated environmental management (European Parliament & Council, 2008, Art. 4). This regional approach enables conservation objectives and maritime planning measures to be tailored to the specific ecological characteristics of each marine area while contributing to the coherent implementation of European marine environmental policy.





To support the practical implementation of Maritime Spatial Planning across the European Union's diverse sea basins, the Union has established dedicated funding mechanisms and institutional support programmes. The Regulation on the implementation of the Integrated Maritime Policy provides financial resources for the development of cross-sectoral governance instruments (European Parliament & Council, 2011, Art. 2), including Maritime Spatial Planning itself and the creation of integrated maritime information-sharing systems.

These funding arrangements are intended to facilitate the transition of coastal, island, and outermost regional economies towards more sustainable patterns of development by strengthening institutional capacity and promoting integrated marine governance. They also support the harmonisation of bathymetric, oceanographic, and biological datasets, thereby improving the scientific evidence available for regional conservation strategies, maritime risk assessment, and ecosystem-based management. Such measures enhance the effectiveness of Maritime Spatial Planning by enabling policy decisions to be informed by consistent and interoperable marine data across the European Union.

Marine spatial planning is a structured administrative process through which marine areas are allocated and managed according to compatible and sustainable uses. This approach establishes clearly defined spatial and temporal boundaries for different maritime activities, preventing conflicts between competing uses while ensuring that ecologically sensitive areas are protected from intensive exploitation. By providing a coherent framework for the allocation of marine space, Maritime Spatial Planning promotes the orderly coexistence of economic development, environmental protection, and social interests within the marine environment.

The implementation of this governance instrument strengthens institutional oversight of marine resource exploitation and establishes harmonised criteria for regulatory intervention across all maritime sectors. By applying consistent planning and management standards, it enhances legal certainty for stakeholders, improves regulatory coordination, and supports the sustainable and predictable use of marine resources in accordance with the objectives of European maritime policy.

The transposition of the Maritime Spatial Planning Directive into national legal systems has resulted in differing administrative approaches across the European Union, reflecting variations in domestic planning traditions and governance structures. While some Member States have adopted highly centralised models in which





responsibility for Maritime Spatial Planning is concentrated within national environment ministries, others have distributed planning and regulatory functions across multiple levels of government, including regional and local authorities.

In Portugal, the national governance framework is based on a Situation Plan (Plano de Situação), which establishes the general framework for the use of maritime space, complemented where necessary by Allocation Plans (Planos de Afetação) governing specific activities or areas. Within this legal framework, the Autonomous Regions of the Azores and Madeira are entrusted with the administrative and technical authority to prepare and implement maritime spatial planning instruments applicable to their respective maritime areas, reflecting their constitutional autonomy and the distinctive geographical characteristics of the archipelagos (Zaucha et al., 2025, p. 6).

The preparation of maritime spatial plans requires the incorporation of analytical criteria that extend beyond the allocation of areas for resource exploitation to include measurable indicators of procedural fairness and the distribution of social and economic impacts on coastal communities. Research on ocean governance demonstrates that public participation should be systematically integrated into planning and decision-making processes in order to avoid the marginalisation of communities whose livelihoods depend on primary maritime sectors (Abdel-Fattah et al., 2024, p. 102).

Comparative analyses of Maritime Spatial Planning practices further highlight the importance of establishing transparent consultation mechanisms that ensure the equitable representation of all relevant stakeholders as new maritime industries expand. Such participatory processes enable local ecological knowledge and practical experience of coastal dynamics to be incorporated into the design of maritime activity zones, thereby improving both the legitimacy and the effectiveness of planning decisions while supporting the sustainable management of marine resources.

Within the ecological dimension of Maritime Spatial Planning, spatial management must address the technical challenge of quantifying, maintaining, and enhancing ecological connectivity between marine ecosystems exhibiting different levels of anthropogenic fragmentation. Systematic conservation approaches advocate the designation of ecological corridors that physically connect Marine Protected Areas (MPAs) with other effective area-based conservation measures. These connectivity networks are increasingly supported by three-dimensional spatial models incorporating larval dispersal patterns and the migratory movements of adult marine organisms,





thereby strengthening the scientific basis for ecosystem-based management (Podda & Porporato, 2023, p. 2).

The development of interconnected ecological networks has become an essential component of contemporary marine governance, providing a means of mitigating the progressive degradation of oceans and seas resulting from the cumulative effects of multiple anthropogenic pressures. These include nutrient enrichment originating from land-based sources, pollution associated with commercial shipping, and other forms of environmental disturbance that compromise ecosystem resilience. Strengthening ecological connectivity within maritime spatial plans therefore contributes not only to biodiversity conservation but also to the long-term ecological integrity and sustainability of marine environments (European Economic and Social Committee, 2008, p. 31).

The long-term projection of maritime spatial planning requires the consolidation of permanent observation infrastructures and the generation of computer forecasting models that assess the functioning of the assigned uses in the face of climatic and oceanographic variations. The long-term effectiveness of Maritime Spatial Planning depends upon the establishment of permanent marine observation infrastructures and the development of predictive modelling tools capable of assessing the performance of allocated maritime uses under changing climatic and oceanographic conditions. Reviews of existing national maritime spatial plans indicate that the consistent application of the ecosystem-based approach and climate change adaptation continues to be constrained by the lack of standardised methodologies and comprehensive environmental data. Addressing these shortcomings requires improved monitoring systems and harmonised analytical frameworks capable of supporting evidence-based planning and adaptive management.

The development of integrated assessment tools will play a decisive role in determining the effectiveness of ocean governance and its capacity to reconcile the expansion of the marine energy sector with the conservation of marine biodiversity, including both benthic and pelagic ecosystems. Strengthening these scientific and technical capacities will enable Maritime Spatial Planning to respond more effectively to environmental change while ensuring the sustainable management of marine resources across European sea basins (Zaucha et al., 2025, p. 13).

The European Ocean Pact represents a significant step towards a more integrated and coherent framework for ocean governance. Its success depends on effective coordination between European, international, and local levels, combining





legal instruments, scientific knowledge, and sustainable management practices to ensure the long-term protection and use of marine resources.

6. MARITIME SPATIAL PLANNING IN PORTUGAL

6.1. THE SITUATION PLAN OF THE NATIONAL MARITIME SPATIAL PLAN

The administration of marine areas requires a governance system capable of regulating extensive maritime spaces, encompassing both the continental shelf and the maritime zones associated with Portugal's island territories. Portugal exercises jurisdiction over one of the largest Exclusive Economic Zones (EEZs) in Europe, which constitutes an important biogeographical transition area within the North Atlantic owing to the presence of the Azores and Madeira archipelagos. The need to coordinate overlapping industrial, commercial, and conservation activities across this maritime domain has driven the development of a comprehensive legal framework for Maritime Spatial Planning (MSP).

The continuous assessment of these interacting uses is fundamental to ensuring that economic development remains compatible with the strict protection of marine biodiversity (Calado et al., 2024, p. 2). Accordingly, Portugal's maritime spatial planning framework seeks to promote the rational allocation of marine space by balancing productive economic activities with the conservation of marine ecosystems and the mitigation of physical, chemical, and ecological degradation affecting both pelagic and benthic environments.

The legal foundation of Portugal's maritime spatial governance is established through the interaction between international and domestic legal frameworks, which define the extent of the State's rights and jurisdiction over the marine environment. Under international law, coastal States enjoy sovereign rights to explore, conserve, and manage the natural resources within designated maritime zones, particularly the Exclusive Economic Zone (EEZ) (United Nations, 1982, Art. 56). These provisions form the legal basis upon which States exercise authority over the use and management of marine resources.

At the national level, Portuguese legislation defines the limits of the maritime zones subject to Portuguese sovereignty and jurisdiction by incorporating the principles of international law into the domestic legal order. In doing so, it establishes the spatial scope within which maritime planning instruments are applied (Assembly of





the Republic, 2006, Art. 1). The formal delimitation of the territorial sea, the Exclusive Economic Zone, and the extended continental shelf constitutes the essential legal prerequisite for exercising regulatory authority and for organising the allocation and management of activities both within the water column and on the seabed.

Within this governance framework, the principal instrument for the administration of Portugal's marine space is the Situation Plan of the National Maritime Spatial Plan (PSOEM), which has been developed to implement the objectives of national and European maritime policy. The PSOEM allocates existing and potential maritime uses across both space and time, integrating them within the boundaries of Portugal's maritime domain (Abdel-Fattah et al., 2024, p. 102). Its function extends beyond the spatial allocation of economic activities by requiring the identification of areas of ecological significance for nature conservation, biodiversity protection, and the maintenance of ecosystem services. As such, the Plan serves as a key instrument for mitigating the adverse environmental impacts associated with human activities at sea. By organising maritime space into designated functional zones, the PSOEM enhances compatibility between competing uses while ensuring that industrial development remains consistent with the ecological resilience of marine ecosystems.

The legal content and documentary requirements of the Situation Plan are prescribed in detail to ensure legal certainty, administrative transparency, and regulatory consistency. Portuguese legislation requires the Plan to incorporate both textual and cartographic components identifying the precise spatial distribution of activities such as aquaculture, marine scientific research, biotechnology, and the exploration of mineral and energy resources (Government of Portugal, 2015, Art. 10). In addition, it must map navigation routes, submarine cables, artificial reefs, and underwater cultural heritage sites, linking these spatial representations to specific regulatory provisions and public-interest restrictions. This comprehensive documentation facilitates the establishment of conservation regimes and provides the legal and administrative basis for granting licences and other rights relating to the private use of Portugal's maritime space.

Maritime Spatial Planning constitutes a structured governance process through which marine space is classified and allocated according to compatible and sustainable uses. This approach establishes clearly defined spatial and temporal boundaries for different maritime activities, preventing conflicts arising from the overlapping of physical infrastructure while ensuring that ecologically vulnerable areas





remain protected from intensive resource exploitation. By coordinating competing uses within the same marine environment, Maritime Spatial Planning promotes the efficient and sustainable management of marine resources.

The systematic application of this planning instrument strengthens regulatory oversight of productive activities and establishes harmonised operational standards for all maritime users. In doing so, it provides a predictable and integrated framework for marine governance, enhancing legal certainty, reducing conflicts between competing sectors, and supporting the long-term conservation of marine ecosystems alongside sustainable economic development.

The implementation of Portugal's maritime spatial planning framework takes into account the distinctive geographical and jurisdictional characteristics of its outermost regions by dividing the national maritime domain into specific operational subdivisions. The component of the Situation Plan relating to the Azores covers the maritime area adjacent to the archipelago, including its internal waters, territorial sea, and the corresponding sub-area of the Exclusive Economic Zone (EEZ).

The development of this regional plan was informed by assessments of sectoral trends and land–sea interactions, drawing on cooperative initiatives aimed at improving the spatial organisation and governance of the Macaronesian maritime region (Council of Ministers, 2024, p. 14). The adoption of the Azores' maritime spatial plan strengthens the protection of deep-sea habitats while aligning regional governance with Portugal's national maritime strategy for the Atlantic. In doing so, it provides an integrated framework for balancing sustainable economic development with the conservation of marine ecosystems in one of the European Union's most ecologically significant ocean regions.

The long-term effectiveness of Maritime Spatial Planning depends on its ability to respond to the evolving blue economy and the increasing demand for the multiple use of marine space. The growing coexistence of emerging sectors—including offshore renewable energy, marine biotechnology, and other innovative maritime industries—within the same marine areas requires integrated assessments capable of evaluating the cumulative pressures exerted on marine ecosystems. Such assessments are essential for ensuring that economic development proceeds in a manner consistent with the principles of ecosystem-based management.

Advances in spatial data science, together with research on multi-use offshore platforms, provide the technical foundations for evaluating the effectiveness of





environmental legislation and for designing regulatory frameworks that promote the coexistence of compatible maritime activities (Guyot-Téphany et al., 2024, p. 3). Incorporating these scientific methodologies into maritime planning and management cycles enables planning instruments to remain adaptive to technological innovation, changing patterns of marine resource use, and the dynamic environmental conditions of the ocean. This adaptive governance approach enhances the resilience of Maritime Spatial Planning while supporting the sustainable development of Portugal's maritime domain.

To complement the general spatial framework established by the Situation Plan, both European Union and Portuguese legislation provide mechanisms for incorporating unforeseen maritime activities through adaptive planning instruments. The Maritime Spatial Planning Directive requires Member States to implement spatial planning systems that promote the sustainable development of maritime sectors while leaving the specific design and structure of planning instruments to the discretion of national authorities (European Parliament & Council, 2014, Art. 4).

Within the Portuguese legal framework, this adaptive function is fulfilled through Allocation Plans (Planos de Afetação), which are prepared whenever a new maritime use or activity emerges that has not previously been identified in the Situation Plan. These plans undergo environmental assessment, public consultation, and formal approval before being adopted. Once approved, their spatial provisions are automatically incorporated into the Situation Plan, thereby ensuring the continued coherence, consistency, and legal certainty of Portugal's Maritime Spatial Planning framework while enabling it to respond flexibly to new economic activities and evolving management needs.

7. MARITIME SPATIAL PLANNING IN THE AZORES

7.1 THE AZORES SUBDIVISION: OPPORTUNITIES AND CHALLENGES FOR MARINE CONSERVATION

The framework of public international law establishes the jurisdictional foundations for the governance of maritime areas by defining the legal rights and responsibilities of States over the water column and the seabed. Under international





law, coastal States enjoy sovereign rights to explore, conserve, and manage the natural resources located within their Exclusive Economic Zone (EEZ) (United Nations, 1982, Art. 56). These rights provide the legal basis for the exercise of State authority over the sustainable use and management of marine resources.

This jurisdictional framework necessitates the establishment of governance systems capable of coordinating the diverse human activities taking place across extensive marine areas. Such systems seek to balance the expansion of the blue economy with the protection of marine ecosystems by mitigating the physical, chemical, and ecological pressures affecting both benthic and pelagic environments, particularly within ecologically sensitive regions.

To implement these legal principles within the European Union, the European institutions have established a binding legislative framework designed to overcome the limitations of fragmented, sector-based marine governance. The Maritime Spatial Planning Directive requires all coastal Member States to prepare and implement maritime spatial plans within their marine waters, while allowing national authorities discretion over the specific format and content of those plans in accordance with the principle of subsidiarity (European Parliament & Council, 2014, Art. 4).

The Directive provides a structured decision-making framework intended to reconcile the competing demands of emerging maritime industries with the objectives of marine biodiversity conservation. It further requires the standardised collection and exchange of marine data, as well as cross-border cooperation between neighbouring States, particularly in transboundary marine regions such as Macaronesia, where effective governance depends upon coordinated planning across shared ecological and oceanographic systems.

Within the Portuguese context, the transposition of the European Maritime Spatial Planning framework into national legislation resulted in the division of Portugal's maritime domain into four principal subdivisions, with a dedicated maritime spatial plan established for the Autonomous Region of the Azores. The adoption of the Situation Plan of the National Maritime Spatial Plan (PSOEM) for the Azores defines the spatial and temporal allocation of existing and potential maritime activities, ranging from mineral resource exploration to marine scientific research (Council of Ministers, 2024, p. 4).

The Plan provides a comprehensive spatial representation of areas of ecological significance, including sites designated for nature conservation and the protection of





marine ecosystem services. It also identifies public-use restrictions and regulatory measures intended to safeguard marine biodiversity from the expansion of commercial and industrial activities at sea. In doing so, the Azores Situation Plan establishes an integrated governance framework that seeks to reconcile sustainable economic development with the long-term conservation of one of the North Atlantic's most ecologically valuable marine environments.

Maritime Spatial Planning operates as an administrative governance mechanism through which marine areas are allocated to compatible and sustainable uses. This approach establishes clearly defined spatial and temporal boundaries for different maritime activities, thereby preventing conflicts arising from the overlapping of physical infrastructure while ensuring the orderly organisation of marine space through objective and transparent regulatory procedures.

By providing a stable and integrated planning framework, Maritime Spatial Planning supports continuous institutional oversight of maritime activities and promotes consistent regulatory standards across sectors. In doing so, it enhances legal certainty, facilitates the coordinated management of competing uses, and contributes to the sustainable governance of marine resources.

The effective implementation of Maritime Spatial Planning in the Azores depends upon a decentralised administrative structure involving multiple regulatory authorities. The Regional Directorate for Maritime Policies (Direção Regional de Políticas Marítimas) plays a central role in the management of Marine Protected Areas and the licensing of maritime economic activities. However, the governance framework is characterised by a complex institutional distribution of responsibilities, with overlapping competences shared between the regional administration and the Portuguese central government (Casimiro et al., 2026, p. 4).

This institutional arrangement necessitates robust coordination mechanisms to ensure coherent decision-making, harmonise regulatory oversight, and improve the enforcement of conservation measures across the various maritime zones under Portuguese jurisdiction. Enhanced inter-agency cooperation is particularly important for the effective management of the Azores' internal waters, territorial sea, Exclusive Economic Zone, and extended continental shelf, where integrated governance is essential to balancing sustainable economic development with the long-term protection of marine ecosystems.



The implementation of Maritime Spatial Planning in the Azores faces the technical challenge of integrating the ecosystem-based approach with climate change adaptation in response to increasing anthropogenic pressures. On the one hand, the use of quantitative indicators of ecological connectivity is essential for assessing and mitigating the cumulative impacts of emerging maritime industries, such as offshore wind energy and marine biotechnology, on local marine species and habitats (Zauchá et al., 2025, p. 1). On the other hand, the transition towards a sustainable ocean economy requires public authorities to adopt adaptive management approaches that reconcile the exploitation of marine resources with climate mitigation objectives and emissions reduction targets (Calado et al., 2024, p. 8).

Meeting these complementary objectives requires Maritime Spatial Planning to ensure that the spatial allocation of economic activities remains firmly grounded in the ecological carrying capacity and resilience of marine ecosystems. An ecosystem-based and adaptive planning framework is therefore essential to balancing economic development with the long-term conservation of marine biodiversity and the sustainable management of the Azores' maritime environment.

To address information gaps and enhance transparency in decision-making, contemporary ocean governance increasingly relies on digital platforms and Geographic Information Systems (GIS). The availability of interactive technological tools (Gutierrez et al., 2025, p. 5) enables stakeholders to consult the spatial boundaries of designated maritime activities and to assess applicable regulatory constraints before applying for licences or other rights to use marine space. These digital systems improve the accessibility of planning information while increasing legal certainty and administrative efficiency.

The standardisation and integration of marine spatial databases also strengthen technical collaboration between public authorities, the scientific community, and maritime industries. By providing a common evidence base, these information systems support the design of conservation areas and other spatial management measures through the practical assessment of land–sea interactions, ecological processes, and competing maritime uses. As a result, digital decision-support tools have become an essential component of ecosystem-based and adaptive Maritime Spatial Planning, facilitating evidence-informed governance and the sustainable management of marine resources.





The design of marine environmental monitoring networks requires the continuous measurement of the physical and chemical properties of the marine environment. The systematic collection of quantitative environmental data enables management authorities to refine regulatory procedures through evidence-based decision-making and to ensure that commercial activities remain within the ecological carrying capacity established for each management area. Continuous monitoring is therefore essential for evaluating ecosystem condition, detecting environmental change, and supporting adaptive management within the framework of Maritime Spatial Planning.

By integrating long-term environmental observation into marine governance, public authorities are better equipped to assess cumulative pressures, verify compliance with conservation objectives, and adjust management measures in response to evolving ecological conditions. Consequently, comprehensive monitoring programmes provide the scientific foundation for sustainable ocean governance, ensuring that economic activities are managed in accordance with the ecological limits and resilience of marine ecosystems.

Ultimately, the long-term sustainability of the Azores Subdivision depends upon the legal effectiveness of spatial protection measures and the conservation of its natural heritage through highly protected marine areas. Portuguese legislation expressly requires the Situation Plan to include both cartographic and textual provisions identifying areas designated for nature conservation and the maintenance of essential ecological processes (Government of Portugal, 2015, Art. 10). These legally binding spatial designations constitute a fundamental component of the maritime planning framework, ensuring that conservation objectives are formally incorporated into the allocation and management of marine space.

The establishment of Marine Protected Areas therefore represents a primary spatial planning mechanism through which competing private uses may be restricted or prohibited where necessary to safeguard marine biodiversity and ecosystem integrity. By placing legally enforceable limits on human activities within ecologically sensitive areas, the maritime spatial planning framework supports the long-term preservation of the Azores' marine environment while ensuring that large-scale industrial development remains compatible with the conservation of the archipelago's unique ecological values and the sustainable use of its marine resources.





8 CONCLUSIONS

Drawing upon the analysis of the legal, ecological, and administrative foundations of the law of the sea and ocean governance, several conclusions can be drawn regarding the role of the archipelagos and the Macaronesian region in marine conservation. The evidence examined throughout this study demonstrates that the integration of international legal principles, European maritime policy, and national governance frameworks is fundamental to ensuring the sustainable management of marine resources and the long-term protection of marine ecosystems within this strategically significant Atlantic region.

The first set of conclusions concerns the jurisdictional framework established by the United Nations Convention on the Law of the Sea (UNCLOS). The Convention provides the legal foundation for ocean governance by dividing the marine environment into distinct maritime zones, ranging from internal waters and the territorial sea to the continental shelf, the Exclusive Economic Zone (EEZ), and the high seas. This jurisdictional structure has created a coherent legal framework for the allocation of rights and responsibilities over marine resources. However, its application reveals an important legal and practical distinction in relation to island territories.

UNCLOS reserves the status of an archipelagic State exclusively for States constituted wholly by one or more archipelagos. Consequently, continental States are not entitled to draw archipelagic straight baselines around their offshore archipelagos. This legal distinction has significant implications for the governance of the Macaronesian region, as the European Union's outermost regions of the Azores, Madeira, and the Canary Islands must establish their territorial sea, Exclusive Economic Zone, and continental shelf by reference to each island individually rather than as a single archipelagic unit. As a result, jurisdiction is fragmented across marine ecosystems that are ecologically interconnected, creating governance challenges for the integrated management and conservation of biologically connected marine environments.

At the same jurisdictional level, this study concludes that international law requires a rigorous legal and scientific assessment of the natural capacity of islands to generate full maritime entitlements. Under UNCLOS, the distinction between an island capable of sustaining human habitation or an economic life of its own and a rock that cannot do so is of fundamental legal significance, as it determines the extent of the





maritime zones that may be claimed by a coastal State. The application of this provision directly influences the spatial extent within which States may exercise sovereign rights and jurisdiction under international law.

Compliance with this legal criterion is of particular importance in the North-East Atlantic, where it underpins the legitimacy of the extensive maritime areas administered by Portugal and other coastal States. It also defines the precise jurisdictional limits within which States regulate the exploration and exploitation of deep-sea mineral resources, including ferromanganese crusts, as well as the conservation and sustainable management of living marine resources. Accordingly, the legal classification of insular features remains a critical determinant of maritime governance, resource management, and environmental protection in the Macaronesian region.

From an ecological and marine biogeochemical perspective, the Macaronesian archipelagos constitute far more than territories subject to national jurisdiction; they represent strategically important components of the global ocean system. Their volcanic origin has created complex seabed topography that disrupts deep-ocean circulation and promotes the upwelling of nutrient-rich waters, thereby sustaining high levels of primary productivity and enhancing biological diversity. These submarine formations also provide centres of genetic diversity for deep-sea fauna and create relatively stable environmental refugia that contribute to the resilience of marine ecosystems.

Scientific evidence further indicates that the waters surrounding these islands function as effective carbon sinks, facilitating the sequestration of atmospheric carbon dioxide and contributing to climate regulation. However, these same ecosystems are particularly vulnerable to the effects of ocean acidification, which threatens marine biodiversity and ecosystem functioning. This environmental vulnerability is compounded by the intensity of transoceanic maritime transport. As major shipping routes intersect the Macaronesian region, ports serve as important pathways for the introduction of non-native species transported on ship hulls and through other maritime vectors. The establishment of invasive species has the potential to disrupt native ecological communities, alter trophic relationships, and compromise the long-term ecological integrity of these island ecosystems.

In response to these environmental vulnerabilities, the evolution of the law of the sea has progressively imposed more extensive environmental obligations upon the





administrations of island territories. The jurisprudence of international courts and tribunals confirms that the protection of the marine environment requires States to exercise due diligence in preventing, reducing, and controlling marine pollution, including pollution arising from greenhouse gas emissions. This obligation requires environmental decision-making to incorporate both the precautionary principle and the ecosystem approach when conducting environmental impact assessments prior to the authorisation of industrial activities.

Furthermore, the implementation of international agreements governing straddling fish stocks and highly migratory fish stocks requires fisheries management measures adopted within the Exclusive Economic Zone (EEZ) to remain consistent with those applied on the high seas. This integrated governance framework promotes the conservation of shared marine resources across jurisdictional boundaries and reinforces the precautionary approach by ensuring that scientific uncertainty cannot be invoked as a justification for postponing or avoiding measures necessary to prevent the overexploitation of fish stocks. Consequently, contemporary ocean governance increasingly relies upon science-based and precautionary regulation as essential principles for the sustainable management of marine biodiversity.

With regard to marine areas beyond national jurisdiction, this study concludes that the traditional governance model, which relied primarily on regional agreements and sector-specific arrangements, suffered from important institutional limitations, including fragmented representation and regulatory gaps that weakened the protection of the global ocean. The recent adoption of the Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ Agreement) represents a significant development in international ocean governance by addressing these shortcomings through the establishment of a comprehensive and universally applicable legal framework.

The BBNJ Agreement standardises procedures for the designation and management of Marine Protected Areas in the high seas and introduces binding requirements for environmental impact assessments of activities carried out in areas beyond national jurisdiction. The implementation of this treaty has direct implications for oceanic archipelagos, including those of Macaronesia, by promoting consistent ecological obligations in marine areas adjacent to their continental shelves and by establishing equitable rules governing access to, and the sharing of benefits derived from, marine genetic resources in accordance with the principle of the common





heritage of humankind. Consequently, the Agreement strengthens the coherence of international marine conservation while enhancing the legal framework for the sustainable governance of the global ocean.

Climate change also requires enhanced regulatory oversight of emerging marine technologies, particularly those designed to achieve negative emissions. Ocean governance frameworks must establish appropriate legal classifications for geoengineering interventions, such as ocean alkalinity enhancement and artificial upwelling, by assessing their compatibility with existing international rules on marine pollution prevention and the disposal of substances at sea.

The deployment of such interventions involves significant uncertainties, as large-scale chemical or physical modifications of marine environments may disrupt trophic interactions, alter biogeochemical processes, and affect the provision of ecosystem services. Consequently, the authorisation of any large-scale modification of the marine environment within archipelagic waters should be preceded by comprehensive ecological risk assessments, scientific evaluation, and the application of the precautionary principle. This approach is essential to ensure that climate mitigation measures do not generate additional pressures on already vulnerable island marine ecosystems.

The analysis of the institutional structure of Macaronesia demonstrates that ocean governance operates through a complex multi-level system of administration. The interaction between the competences of central governments of continental States, autonomous regional authorities, European Union legislation, and international maritime law creates overlapping responsibilities that may slow administrative responses to emerging climate-related challenges.

Reducing this institutional fragmentation requires the development of polycentric governance systems supported by interdisciplinary cooperation. Effective marine governance depends upon coordination mechanisms capable of integrating ocean observation, public policy development, and the practical knowledge of coastal communities and local fisheries sectors. Such collaborative approaches are essential to ensuring that decision-making processes account for social and economic impacts, promote a fair distribution of costs and benefits, and prevent the marginalisation of key local stakeholders in the management of marine resources.

At the macro-regional level, the European Union has established itself as a key actor in policy harmonisation through the implementation of common frameworks





designed to coordinate maritime governance. The European approach adopts a form of pragmatic multilateralism aimed at addressing transnational illegal activities while promoting the transition towards a sustainable blue economy. Through supranational regulation, the European Union requires digital traceability mechanisms to combat illegal, unreported, and unregulated fishing and maintains a precautionary administrative position regarding deep-sea mining until conclusive scientific assessments on toxic substances, ecological disturbance, and underwater noise impacts are available.

The principal technical instrument for implementing these objectives is Maritime Spatial Planning (MSP), a mandatory governance process requiring Member States to organise the simultaneous use of marine space. This framework seeks to reconcile competing demands, including resource exploitation, offshore energy infrastructure development, and the conservation of seabed ecosystems. By integrating economic, environmental, and social considerations into a single planning process, Maritime Spatial Planning provides the operational basis for achieving coherent and sustainable management of European marine areas.

The transposition of these spatial governance principles into Portuguese law, through the Situation Plan of the National Maritime Spatial Plan (PSOEM), demonstrates the requirement for a systematic mapping of the spatial and temporal distribution of all existing and potential marine uses. This framework confirms that Maritime Spatial Planning cannot be reduced to a simple economic allocation of maritime sectors; rather, it must incorporate ecological criteria as fundamental components of decision-making.

In the specific case of the Azores Subdivision, the formal establishment of these public-interest restrictions provides a stable legal framework that conditions the allocation of private-use licences within maritime space. By defining areas where conservation objectives prevail over competing activities, these restrictions ensure that economic uses are authorised only when compatible with the ecological and regulatory requirements established through Maritime Spatial Planning.

The effectiveness of this spatial governance framework depends on the implementation of digital platforms and Geographic Information Systems (GIS) capable of improving the transparency of administrative decisions and facilitating public participation. These technological tools enable stakeholders to access spatial information, evaluate planning constraints, and contribute to decision-making





processes, thereby strengthening accountability, scientific support, and social legitimacy in the management of the Azores' marine environment.

As a final conclusion, the sustainability of the law of the sea and ocean governance in island territories depends upon the transition towards a forward-looking, transparent, and adaptive model of administration. Such a governance framework requires institutional structures supported by the continuous financing and maintenance of ocean observation infrastructures, including satellite monitoring networks and in situ remote-sensing systems capable of providing reliable environmental information.

The standardised collection of physical, chemical, and biological data is essential for the development of digital models capable of assessing the cumulative impacts of emerging maritime industries and climate change on marine ecosystems. These scientific tools provide the evidence base necessary for adaptive decision-making and for the continuous adjustment of management measures.

Only through the practical integration of international legal obligations, coherent spatial governance, inter-agency coordination, and permanent scientific monitoring can oceanic archipelagos effectively preserve their ecological integrity while responding to the increasing pressures associated with the global expansion of marine resource exploitation. This integrated approach represents the foundation for resilient ocean governance and for the long-term conservation of island marine environments.

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